Inter-generational Transmission of Health Status in the U.S among Natives and Immigrants

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Abstract

The research on education points to significant inter-generational transmission which likely contributes to the inter-generational transmission of earnings and income. This paper addresses the question of whether another form of human capital, health, also provides similar insight in understanding mobility of earnings. Using NLSY, we first present new evidence on inter-generational transmission of health outcomes including weight, height, the body mass index, depression and asthma for both natives and immigrants. We show that both native and immigrant children inherit a prominent fraction of their health status from their parents. Next, we also find that mother's education decreases child's weight and the body mass index for natives, while single motherhood increases weight and BMI of children for both natives and immigrants. Taken together, these findings suggest that along with inter-generational correlation in education, persistence in health also contributes to the inter-generational transmission of economics.

1. Introduction

Social studies have long been interested in the intergenerational transmission of income and socioeconomic status. The literature on inter-generational correlations in economic status well established that even in a highly mobile society like the United States, both natives and immigrants inherit a prominent component of their economic status from their parents (Solon, 1992; Zimmerman, 1992; Borjas, 1992). However, these social studies have not decomposed the estimated inter-generational correlations into causal components. Such decomposition would help to identify factors that promote or retard mobility and also identify possible paths for government intervention. A further decomposition would identify the extent to which the causal components reflect genetic or environmental influences addressing the nature versus nurture debate. Human capital theory suggests that education and health are prime endowments affecting intergenerational transmission of economic status and earnings (Behrman et al, 1994).

Most economic models treat an individual's earnings as the sum of returns to the factor of production she brings to the market. These factors of production are often regarded as her accumulated skills summarized by schooling and labor market experience. However, a growing literature has shown that other individual traits involving height (Persico et al., 2004; Case and Paxson, 2004); obesity (Cawley, 2000, 2004), beauty (Hamermesh and Biddle, 1994), personality (Kuhn and Weinberger) and health (Currie and Madrian, 1999) are also important determinants of earnings differentials. Health capital forms a component of an individual's stock of human capital affecting labor market outcomes (Mushkin, 1962; Grossman, 1972; Currie and Madrian, 1999). The literature on intergenerational transmission has so far focused almost

exclusively on cognitive skills and investments in education in understanding the process behind intergenerational persistence of economic outcomes. Just as importantly, the inter-generational mobility in non-cognitive attributes including individual's health may also provide important insights in understanding high persistence in economic status.

The objective of this paper is to examine the extent of intergenerational transmission in health outcomes including height, weight, the body mass index, depression and asthma. We investigate these inter-generational correlations separately for natives and immigrants from different generations. We address three questions about the inter-generational transmission of health status. First, how large are inter-generational transmission of health for natives and immigrants from different generations and whether these inter-generational correlations differ between natives and immigrants. Second, are those who have been in the U.S for various generations more mobile compared to more recent immigrants? That is, do immigrants assimilate towards natives as they stay in the United States for generations? And lastly, is the intergenerational transmission of health stronger for lower socio-economic status groups? A significant interaction between SES and health outcomes of mother would suggest that the poor are at the higher risk of any negative effects of health limitations which would speed intergenerational transmission

To answer these questions, we use a nationally representative data set, the National Longitudinal Survey of Youth, which follows mothers in 1979 through 2004 and their children in 1994 through 2004. This feature of the data set enables us to link mother and their children as well as siblings. This is important because we can compare the health outcomes of the cousins, thus accounting for many prominent genetic and environmental attributes that are common in a family tree.

To preview our main results, we find that both children of natives and immigrants attain an important fraction of their health capital from their mother. We further show that mother's health outcomes contribute to generate persistence across generations both in terms of anthropometric measures: height, weight and the body mass index as well as emotional health outcomes such as depression. This remains true even when we introduce a rich set of controls for child's and mothers characteristics and household fixed effects models.

The remainder of the paper is organized as follows. Section 2 briefly reviews previous papers. Section 3 describes the main empirical strategy. Section 4 describes the data. Section 5 presents the main results using Ordinary-Least-Squares for natives and immigrants as well as the OLS results with averages. Section 6 concludes.

2. Literature Review

Research on inter-generational transmission of health status was first put forward by Sir Galton's well-known pioneering study, where he examines the relationship between the heights of children and their parents in 1886. He shows that children of short parents tend to be shorter than the average, while children of taller parents tend to be taller than average. Galton concluded that there was "regression towards mediocrity" in height and with the passage of time, heights would tend toward equality.

While a handful of studies examine the degree of intergenerational mobility in earnings and economic status across countries and over time (Solon, 1992; Zimmerman, 1992; Corak, 2004; Ferrie, 2005; Yuksel, 2007), few studies have attempted to investigate the intergenerational transmission of health outcomes. The intuition that

individuals' health along with their education endowments may provide important insights in understanding the mobility of earnings was first argued by Ahlburg (1998). He proposes that further investigation of mechanisms underlying inter-generational mobility in earnings will help us to identify the extent to which the causal components reflect genetic or environmental influences, that is address nature versus nurture debate. Eriksson, Bratsberg and Raaum (2007) make similar analyses using Danish Youth Cohort Study. They find significant correlations in health problems across generations. They also show that children from low-income families are more likely to experience health problems in adulthood, even when they control for parental health problems.

There are several studies that address the inter-generational transmission in birth weight. Emanuel et al. (1992) find a positive relation between infant and parents' birth weight using 1958 British Birth Cohort Study. In a similar vein, Collins et al. (2002) use Illinois vital statistics records to analyze correlations in birth weight among US-born and foreign-born white and black women. They document a general increase in average birth weights across generations among native born women. However, among immigrant women the pattern was reverse-black immigrant women have babies of higher birth weight than their native born daughters-. Currie and Moretti (2007) revisit the same question using individual birth records from California and show substantial inter-generational correlation in health. They also find that persistence in birth weight is more important for low socioeconomic status individuals.

This study also relates to the literature looking at association between mother's socioeconomic status and infant and child health. These studies have shown that mother's education in particular is strongly associated with infant's birth weight both in US and in

developing countries (Strauss and Thomas, 1995 for developing countries; Currie and Moretti, 2003 for the US). They find that more educated mothers are less likely to have low or very low birth weight babies, and their babies are less likely to die within their first year of life. These effects persist well into adulthood: Case, Fertig and Paxson (2005) find that mother's education predicts self reported health at age 42. In line with this research, we also investigate the impact of mother's SES on child health outcomes.

In addition, an extensive literature has clearly established that individual's health is an important ingredient of professional and personal success. For instance, the effects of obesity on labor market outcomes for the US and Europe have been assessed in a large number of studies. One of the most robust findings is that obese women tend to earn less than their non-obese counter parts and that there are differences by ethnicity and/ or race in the US, while results are not as robust for Europe (Cawley, 2007 for the US; Garcia and Quintana-Domeque, 2006 for Europe). On the other hand, Black et al. (2007) using data from Norway find that lower birth babies have worse outcomes both in short run in terms of one year mortality rate and longer run in terms of educational attainment and earnings. Taken together, these studies suggest that both overweight and low birth weight individuals tend to earn less.

Other studies also examine the relation between height and earnings and find that a person's height is strongly correlated with his or her income. Judge and Cable (2004), Persico et al. (2004) and Case and Paxson (2006) find similar results and report that for both men and women an additional inch of height is associated with a one to two percent increase in earnings in the U.S.

Taken together, these studies suggest that labor market rewards height and penalize obesity and low birth weigh. Along these findings, we believe that examining to what extent health endowments are transmitted across generations will improve our understanding of persistence in earnings and income.

3. Estimation Framework

In this study, we examine the similarity in health outcomes between mothers and children as follows. Let

$$H_{1i}=\rho H_{0i}+ \beta X_{1i} +\varepsilon_{1i} \qquad (1)$$

where H_{1i} is child health outcomes including weight, height, the body mass index, depression and asthma; H_{0i} is the health outcomes of mother; X_{1i} is all other characteristics of mothers generation that affect children's health outcomes as well as child characteristics and ε_{1i} is a random shock. This equation should be regarded as a reduced-form equation, where ρ being determined by multiple factors containing genetic and behavior attributes transmitted from mothers to children. In this formulation, H_{0i} controls for all of the factors that affected the mother's health outcomes, while X_{1i} will include everything else, such as the genetic heritage of the father and additional characteristics of the mother that did not affect her own health outcomes.

The coefficient ρ measures the degree of persistence or immobility in the society and is the fraction of the mother's health status that her child inherits. Estimates of ρ close to unity imply high persistence and limited mobility whereas values of ρ close to zero suggest low persistence and almost complete intergenerational mobility in health outcomes. Presumably, any real number could be obtained from the estimation of

equation (1); a negative value of ρ would refer to a situation where mothers are high in their generations' distribution of health, while their children tend to be low in their own generations' distribution. We are not aware of any study that investigates the intergenerational transmission in health outcomes including height, weight, the body mass index, depression and asthma; however most empirical studies in the intergenerational mobility of earnings between father-son pairs find ρ to lie between zero and one, while some studies investigating the mobility of economic status between father-daughter and mother-daughter pairs have found negative estimates of ρ.

We begin with models estimating the direct impact of mother's health outcomes on child's health outcomes, turning afterwards to models that incorporate controls for the child's race, sex and age to control for potential age differentials. Apparently, we do not observe all the characteristics of the mothers (including the characteristics of the fathers they choose) that might be correlated with child's health outcomes. However, ignoring X variables such as mother's total household income, mother's years of education, mother's marital status, unemployment rate in the region of residence that might be correlated with child's health may yield to upper bound estimated coefficient. Therefore, to address the potential omitted variables problem, we intoduce more controls to equation (1) including mother's background characteristics. One may expect the persistence coefficient to fall as we include more controls to the model.

In addition, we also re-estimate equation (1) including household fixed effects. Household fixed effect enables us to assess the effect of mother's health outcomes on child health outcomes, exploiting a variation between children of sisters that have at least one and generally two common parents. Including household fixed effects allows us to

control for genetic traits, mother's background characteristics as well as the family environment when mother was growing up. The difference that may arise between models with and without household fixed effects can be attributed to all other remaining genetic differences and contemporaneous factors that differentially affect child's health outcomes.

Just as importantly, the extent of intergenerational transmission of health outcomes might be mitigated by mother's socioeconomic status. The interaction of mother's SES and health outcomes will allow us to quantify to what extent the intergenerational correlations in health vary between different socioeconomic groups. To analyze the impact of the interaction between mother's SES and mother's health outcomes, we would like to estimate the following regression:

$$H_{1i}=\rho H_{0i} + \beta_1 X_{1i} + \beta_2 H_{0i} * X_{1i} + \varepsilon_{1i} \qquad (2)$$

where β_2 measures the combined effect of socioeconomic status and health outcomes of the mother on child's health outcomes. However, we do not require X_{1i} to have a linear effect, thus we estimate a more flexible model such as:

$$H_{1i}= \beta_1 X_{1i} + \beta_2 H_{0i} * X_{1i} + \varepsilon_{1i} \qquad (3)$$

where X_{1i} is a vector of indicators for quartiles of mother's total household income distribution and of the unemployment rate in the region of residence in 1979, the first year mother was interviewed. These measures of X's are predetermined, and not designated by the subsequent choices of the mother.

A potentially important limitation in estimating (1), (2), and (3) is that health variables are self-reported, which raises the issue of measurement error. In addition, parent's health outcomes may be subject to the transitory shocks such as:

$$H_{0i} = H_{0i}^{*} + \mu_{0i} \qquad (4)$$

where H_{0i}^{*} is the permanent health outcome and μ_{0i} is transitory fluctuations around long-run status due to transitory shocks and random measurement error. Then, applying least squares to equation (1) using H_{0i} instead of H_{0i}^{*} will lead to a downward bias in estimates due to the classical measurement error in mother's health outcomes. In particular, the probability limit of the estimated slope coefficient ρ is

$$\text{plim } \rho \text{ hat} = \rho \ [\sigma_H^2 / (\sigma_H^2 + \sigma_{\mu 0}^2)] < \rho \qquad (5)$$

The magnitude of this bias depends on the ratio of signal to total variance, $\sigma_H^2 / (\sigma_H^2 + \sigma_{\mu 0}^2)$, where σ_H^2 is the variance of mother's permanent health status, and $\sigma_{\mu 0}^2$ is the variance of transitory shocks to the permanent health status. Following the literature on intergenerational transmission of economic status (Solon, 1992; Zimmerman, 1992), we account the bias arising due to classical measurement error by averaging mother's health outcomes over multiples years. Applying least square estimation and assuming the errors are uncorrelated over time would yield an estimate of ρ with probability limit

$$\text{plim } \rho_{avg} = \rho \ [\sigma^2_H / (\sigma^2_H + (\sigma_{\mu 0}^2 / T))] \qquad (6)$$

where T stands for the number of years. The bias will decrease as we average mother's health status over more years.

4. Data Description

The empirical analysis relies on two data sets to analyze the degree of intergenerational transmission of health for both natives and immigrants in the U.S. First, we use the National Longitudinal Survey of Youth 1979 (NLSY79), which has information on parents' health outcomes as well as parents' household characteristics. All

youths in the sample were between fourteen and twenty-two years of age as of December 1978. In accordance with the NLSY79 sample design, all eligible individuals ages 14 to 21 who resided in a surveyed household at the end of 1978 were selected as respondents. As a result, the 11,406 civilian respondents interviewed in 1979 originated from 7,490 unique households; 2,862 households included more than one NLSY79 respondents which consist of 5,914 siblings.

For the children's health outcomes, we utilize Children of NLSY79, Young Adult File. The child sample consists of all children born to female NLSY79 respondents. This sample is nationally representative of the children of women who were born from 1957 to 1964 and who are living in the United States in 1978. Starting in 1994, NLSY79 children who are aged 15 by end of the interview year were interviewed separately as young adults.

NLSY79 and Children of NLSY79, Young Adult File has information on both child's and parents self-reported weight, height, BMI, depression status and whether either child and parent has asthma. Both data sets also provide information about a rich set of individual and household characteristics such as race, sex, age, immigration status, marital status, total household income, living in urban area and unemployment rate in the region of residence.

Our analysis is primarily conducted using 3956 mother-children pairs for natives and 915 for immigrants. We include all NLSY79 female respondents that have a child in Children of NLSY79, Young Adult File and who have non-missing information on the health outcomes between 1981 and 1994. Similarly, for the children's generation, we include all children in 2004, who have information about their own health outcomes.

Table 1 presents the descriptive statistics for young adults sample separately for natives and immigrants from different generations. We define a first generation immigrant as an immigrant who was born outside the United States herself and whose parents and grandfather were also born outside the U.S. The second generation immigrants are those who were born in U.S and either their mother or father was born outside the U.S. NLSY79 also includes information about the birth place of the grandfather which enables us to identify the third generation immigrants. Using this information, we classify third generation immigrants as those who have grandfather born outside the United States and both themselves and their parents born in the U.S.

From Table 1, it can be observed that natives are heavier, taller, have higher BMI and more likely to be depressed compared to immigrants from all generations. Note however that Column 6 in Table 1 shows that the children of third generation immigrants may look similar to natives in terms of health outcomes. Focusing on children of third generation immigrants, we see that this generation is heavier, taller, has higher BMI and is more likely to be depressed relative to immigrants from more recent generations. The increase in the resemblance between natives and immigrants who have been in the United States for various generations raises questions about the assimilation of immigrants towards native norms in terms of health outcomes.

Table 2 reports the summary statistics of mothers' generation separately for natives and immigrants. Similar to child's generation, native mothers are also heavier, taller, have higher BMI and more likely to be depressed relative to immigrant mothers. In addition, native mothers have more years of schooling and higher total household income compared to first and second generation immigrants as well. On the other hand, it seems

that third generation immigrant mothers look very similar to natives in terms of both health outcomes and household characteristics such as years of education, total household income and whether being married in 1979. The fact that third generation immigrants have more years of education as well as higher total household income may suggest that immigrants indeed assimilate into native norms also in terms of income and education as they stay in the U.S for the various generations.

Comparison of Table 1 and Table 2 points out that the mean age for children is 20 years of age, while the mean age for mothers' generation is 21 years of age. This pairing represents the earliest observational date for mothers and latest observational date for children. Hence both mothers and children are captured in the same stage of their life-cycle; thus helping us to avoid any potential issues that may arise due to age differentials across generations.

5. Results on Inter-generational Transmission of Health Status

This section presents estimates of the intergenerational-mobility in health status, ρ, using measures of health including weight, height, the body mass index, depression and asthma. Estimation procedures, as discussed in the previous section involve ordinary least squares and ordinary least squares using averages of mother's health outcomes.

A. *OLS Results*

All OLS estimations involving weight, height and the body mass index are conducted using 1981 information for mother's generation and 2004 information for child's generation. We choose these years in essence to eliminate any age related issues that may arise; hence these years correspond to earliest available observation for mothers

and latest observation for children. The mean age for mothers and children is approximately 20 in 1981 for mothers and in 2004 for children. On the other hand, we only have information regarding depression status of the mothers in 1992 and 1994. Although we are not able to capture mother-child pairs exactly in the same point in their life-cycle, we still believe that it is worthwhile to conduct analysis using depression to see to what extent child is influenced by the attributes of the mother. Finally, we have information about whether an individual has ever been diagnosed from asthma in 2004 for both generations. Asthma cases observed latter in life are generally associated with genetic endowments, therefore the observed correlation across generations, if anything else, will mainly illustrate the extent of transmission in genetic traits.

1. *Inter-generational Transmission of Weight*

We begin the empirical analysis with an examination of the association between mother's weight and child's weight. Results are reported in Panel A of Table 3, separately for children of native-born and immigrants. Columns (1) and (5) show estimations from models without controls for children of natives and immigrants, respectively. These estimates can be interpreted as 50% of the mother's weight is transmitted to her children for natives, while immigrant children attain 70% of their weight from their mother. Although, we observe a lot of persistence in terms of weight across generations for both natives and immigrants, comparison of persistence coefficient between natives and immigrants suggest that indeed the persistence is stronger for immigrants. In columns (2) and (6), we control for child's characteristics by including child's sex, race and in particular by including both child's and mother's age to account for the fact that health outcomes may be sensitive to the age. To illustrate, the coefficient

estimate in column (2) drops by 7.6 percent for natives and by 18.1 percent for immigrants mainly due to racial differentials in weight outcomes. In addition, once we control for child's characteristics, the persistence coefficient is no longer significantly different between natives and immigrants. This finding suggests that the differences in the racial composition of natives and immigrants might lead to a substantial difference in inter-generational transmission of weight.

The extent of inter-generational transmission of weight may differ between individuals belonging to different SES groups. In order to consider such differences, we estimate models including additional controls for mother's background characteristics such as total household income, years of education, unemployment rate in the region of residence, whether living in the urban area and mother's marital status in 1979. Columns (3) and (5) contain corresponding estimates for persistence of weight across generations introducing controls for mother's background characteristics. Although the estimated coefficients on mother's weight are somewhat reduced after we account for mother's background characteristics, we still observe a lot of persistence in weight across generations.

Just as importantly, from column (3), it appears that mother's years of education has a remarkable impact on weight of native mothers' children. More specifically, every additional years of mother's education is associated with 2.42 pounds decrease in child's weight in 2004 for natives. On the other hand, column (7) provides evidence suggesting that mother's education decreases child's weight for immigrants as well; however small numbers of observations makes harder to detect this effect. Interestingly, for immigrants, children of married mothers tend to be 15 pounds thinner compared to children of single

mothers indicating that detrimental impact of single motherhood might be stronger for children of immigrants than the children of natives. Moreover, in contrast to previous studies examining the extent of the intergenerational transmission of birth weight (Currie and Moretti,2003; Currie and Moretti,2007), we find that mother's other background variables involving whether being in low income quartile and unemployment rate in the region of residence does not have any effect on child's health outcomes for both natives and immigrants.

Finally, columns (4) and (8) show models including household fixed effects. This specification takes advantage of variation among children of siblings as an only source of variation, and therefore controls for many permanent unobserved factors that might vary across families. Despite the fact that standard errors increase substantially, the point estimates on mother's weight virtually remains unchanged for natives in these models.

2. *Inter-generational Transmission of Height*

Height of population reflects both its genetic endowment and its long-run nutritional intake and health status (Fogel, 1994). This observation suggests that child's height is determined by combination of the genetic endowments as well as the environment a child grows up and SES of her family. To explore to what extent mother's height is transmitted to her children, we estimate inter-generational transmission models for height as well. The persistence coefficients of height are displayed in Panel B of Table 3 separately for children of natives and immigrants. The coefficient estimates on mother's height reveal a lot of persistence in terms of height across generation as well, though the persistence in height is slightly less compared to persistence in weight across different specifications. From Column (1) and (5) of Panel B, it appears that native

children attain 40% of their height from their mothers, whereas the corresponding coefficient for children of immigrants is 47%. Although children of immigrants are somewhat more likely to inherit their mothers' height, the persistence coefficient is not appreciably different between children of natives and immigrants.

Columns (2), (3), (6) and (7) of Panel B show the effects of sequentially introducing the variables that discussed above. Including more controls for both child's characteristics as well as mother's background lead the persistence coefficient to fall as expected in almost all specification. Additionally, in contrast to child's weight, it seems that mother's socioeconomic status in general does not have any impact on height of child regardless of mother's immigration status. The two remaining columns in Panel B display the estimates obtained using household fixed effects. From these columns we clearly note that a great fraction of the mother's height is transmitted to child in particular for natives even when we control for genetic traits and mother's background characteristics.

3. *Inter-generational Transmission of BMI*

We also principally consider the amplitude of inter-generational correlation in the body mass index (BMI), defined as weight in kilograms divided by height in meters squared. BMI has a particular importance; hence it reflects both height and weight of the individual and known as a standard measure of fatness and obesity in epidemiology and medicine (Cawley, 2000). Panel C of Table 3 contains the ordinary-least-squares estimates of the persistence coefficients for BMI. The results clearly indicate that mother's BMI is transmitted to her child in great extent suggesting that there is a great deal of inter-generational transmission across generations even when we incorporate our

analysis with a more precise measures of health. From Panel C, the basic specification indicates that children of native mothers attain 45 percent of their mothers' BMI, while children of immigrant mothers resemble 58 percent of their mothers' BMI.

Models accounting for mother's background characteristics document that human capital of the mother is prominent in determining the child's BMI for both natives and immigrants. In addition, mother's marital status also seems to matter for child's BMI along with mother's education, in particular for children of immigrants. Just as importantly, models estimating household fixed effects yield the point estimates of the persistence coefficients that remains virtually unchanged once we control for a quite rich set of factors for natives, though standard error are somewhat higher.

4. *Inter-generational Transmission of Depression Status*

Having shown that there is indeed a lot of persistence in anthropometric measures including weight, height and the body mass index, we will now describe the results for psychological health outcome, depression. We define depression as an indicator variable that equals to one if the respondent has depression in any means. Panel D of Table 3 displays the estimation results for depression. Examining Panel D, we see that for natives, children of depressed mothers is more likely to be depressed themselves suggesting inter-generational transmission of attitudes across generations. Surprisingly, we do not observe the same pattern for immigrants. The point estimates of persistence coefficient range from 7.5% to 8.5% across different specifications suggesting that the children of depressed mother are on average 8% more likely to be depressed latter on in their life compared to children of non-depressed mother. Interestingly, columns (2) and (3) indicate that SES of mother does not have any effect on the child's depression.

5. *Inter-generational Transmission of Asthma*

Studies of inter-generational transmission of health have been generally carried on special diseases as cancer and Alzheimer's disease to understand association between genes and specific diseases (Ahlburg, 1998). In a similar vein, we analyze the inter-generational transmission in asthma to understand to what extent a highly prevalent disease; asthma is being transmitted over generations. Panel E of Table 3 reports estimation results for asthma conditions. The point estimates on a mother having asthma indicate that the inter-generational correlation in asthma is approximately 17.5 % for children of natives and 25% for children of immigrants. Although it appears that the extent of inter-generational transmission of asthma is higher for immigrants, persistence for natives is not significantly different from persistence for immigrants.

B. *OLS Results with Averages*

Table 4 directs attention toward the possibility of the measurement error in the mother's health outcomes. Averaging mother's health status should improve the ratio of signal to total variance, thus reducing the extent of the error-in-variables bias. Results are presented using child's health outcomes in 2004 and two and three year's averages for mother's health status. The estimates corresponding to a three years averaging of mother's health status are 0.454 for weight, 0.426 for height, 0.414 for BMI, while 0.151 for depression when we average mother's depression over two years for natives. Overall, the persistence coefficient for natives increases as we average over more years for all health outcomes. Therefore, comparison of estimations using a single year measures for

mother's health outcomes with those averaging mother's health status over two and three years clearly suggests that measurement error is indeed a problem for natives. Therefore, accounting for the error-in-variables will increase the persistence of health status across generations. On the other hand, for immigrants we find increased persistence merely for height when we use two and three year's averages of mother's health status. In addition, in line with our previous findings, we find that the persistence for natives is similar to those of immigrants even when introducing three years averages of mother's health status.

6. Conclusion

In this study, we investigate the extent of inter-generational correlation in health separately for natives and immigrants. We use National Longitudinal Survey of Youth that contains information about individual's health outcomes. We provide new evidence on intergenerational transmission of health status across generations. We find that children inherit both anthropometric health measures such as weight, height and the body mass index as well as emotional health outcomes including depression and health limitations as asthma from their mothers in great extent. This high correlation persists even when a rich set of controls including mother's background characteristics and household fixed effects are introduced into the models. We also show that mother's education is negatively associated with child's weight and the body mass index. In addition, we find that single motherhood increases weight for both children of natives and immigrants. Finally, we show that inter-generational correlation coefficient increases for

natives as we average mother's health outcomes over more years suggesting that measurement error is likely to be a problem.

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Table 1.Descriptive Statistics for Young Adults

	All	Natives	Immigrants			
			All	2nd Gen	3rd Gen.	4rd. Gen
	(1)	(2)	(3)	(4)	(5)	(6)
Weight	158.39	159.71	152.70	150.74	151.32	156.38
	(40.570)	(40.570)	(37.732)	(34.203)	(35.543)	(40.812)
Height	67.048	67.155	66.589	66.386	66.281	67.147
	(4.125)	(4.143)	(4.017)	(3.998)	(3.864)	(4.138)
BMI	24.739	24.872	24.165	24.065	24.184	24.257
	(5.557)	(5.659)	(5.058)	(4.608)	(4.958)	(5.628)
Depression	0.288	0.295	0.260	0.259	0.271	0.254
	(0.453)	(0.456)	(0.439)	(0.438)	(0.445)	(0.436)
Asthma in 2004	0.176	0.175	0.180	0.150	0.213	0.188
	(0.381)	(0.380)	(0.385)	(0.357)	(0.410)	(0.392)
Age	18.648	18.711	18.376	18.443	18.362	18.302
	(3.490)	(3.523)	(3.330)	(3.292)	(3.358)	(3.350)
Female	0.488	0.487	0.493	0.477	0.487	0.514
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
White	0.456	0.438	0.533	0.418	0.573	0.651
	(0.498)	(0.496)	(0.499)	(0.493)	(0.495)	(0.477)
Black	0.389	0.461	0.082	0.074	0.090	0.085
	(0.488)	(0.498)	(0.275)	(0.262)	(0.287)	(0.279)
Hispanic	0.224	0.132	0.615	0.799	0.630	0.362
	(0.417)	(0.339)	(0.487)	(0.401)	(0.483)	(0.481)
American Indian	0.014	0.014	0.010	0.006	0.006	0.020
	(0.116)	(0.119)	(0.102)	(0.078)	(0.077)	(0.140)
Asian\ Pasific Islander	0.004	0.002	0.010	0.018	0.003	0.004
	(0.062)	(0.049)	(0.097)	(0.133)	(0.057)	(0.061)
Other race	0.091	0.056	0.238	0.307	0.215	0.168
	(0.287)	(0.231)	(0.426)	(0.462)	(0.411)	(0.374)

Table 3. Intergenerational Transmission of Health

	Children of Native-Born				Children of Immigrants			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Child's Weight								
Mother's Weight	0.500 ***	0.460 ***	0.428 ***	0.359 *	0.276 *	0.715 ***	0.597 ***	0.527 ***	-0.384	0.268
	(0.040)	(0.040)	(0.056)	(0.199)	(0.150)	(0.094)	(0.091)	(0.090)	(0.608)	(0.439)
Low Income Quartile			2.318	7.078				-5.906	-24.127	
			(2.649)	(17.592)				(4.221)	(29.862)	
Mother's Education in 1979			-2.388 **	2.255				-0.755	-6.995	
			(0.998)	(3.042)				(1.158)	(8.847)	
Unemp. Rate in Region in 1979			0.710					0.385		
			(0.460)					(0.725)		
Married in 1979			-2.612	-49.960 ***				-16.219 ***	74.105 ***	
			(10.473)	(19.409)				(6.085)	(15.168)	
R^2	0.077	0.284	0.245	0.458	0.446	0.161	0.412	0.417	0.573	0.551
N	4017	3601	2125	1098	1826	818	757	431	240	403
Panel B: Child's Height										
Mother's Height	0.402 ***	0.416 ***	0.389 ***	0.338 ***	0.366 ***	0.489 ***	0.482 ***	0.435 ***	0.258	0.511 *
	(0.030)	(0.023)	(0.029)	(0.095)	(0.079)	(0.069)	(0.064)	(0.079)	(0.177)	(0.293)
Low Income Quartile			0.081	-1.711				-0.118	-8.307 ***	
			(0.177)	(1.414)				(0.382)	(2.064)	
Mother's Education in 1979			0.069	-0.023				0.157	0.299	
			(0.087)	(0.272)				(0.130)	(1.134)	
Unemp. Rate in Region in 1979			0.007					-0.065		
			(0.037)					(0.071)		
Married in 1979			0.459	-0.071				0.000	10.075 ***	
			(0.598)	(1.485)				(0.625)	(0.664)	
R^2	0.062	0.562	0.546	0.619	0.643	0.098	0.551	0.545	0.646	0.673
N	4051	3632	2144	1099	1828	820	759	431	240	400
Panel C: Child's BMI										
Mother's BMI	0.450 ***	0.393 ***	0.386 ***	0.403 **	0.282 **	0.584 ***	0.469 ***	0.537 ***	-0.394	0.234
	(0.032)	(0.035)	(0.050)	(0.184)	(0.143)	(0.076)	(0.066)	(0.083)	(0.652)	(0.444)
Low Income Quartile			0.362	2.740				-0.706	2.532	
			(0.394)	(2.363)				(0.700)	(4.346)	
Mother's Education in 1979			-0.434 ***	0.379				-0.243	-2.994	
			(0.152)	(0.437)				(0.197)	(2.679)	
Unemp. Rate in Region in 1979			0.104					0.099		
			(0.065)					(0.106)		
Married in 1979			-0.918	-7.393 ***				-2.515 **	6.376 *	
			(1.569)	(2.115)				(1.005)	(3.711)	
N	3994	3579	2108	1092	1818	802	743	423	237	396
R^2	0.092	0.164	0.157	0.397	0.339	0.161	0.241	0.284	0.488	0.399
Child's Age, Sex,and Race		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Household Characteristics			Yes	Yes				Yes	Yes	
Grandmother Fixed Effect				Yes	Yes				Yes	Yes

Notes: Standard error are reported in paranthesis. Standard errors are clustered at the family level. Asterisks denote significance levels (*=.10, **=.05, ***=.01). Household characteristics include:mother's household income, mother's maritalstatus, whether household lived in urban area and unemployment rate in current residence for the first year in which the mother was interviewed. Each row is from a separate regression using 1982 for parents and 2004 for young adults. Each regression is weighted using 2004 Young Adult Weights.

Table 3. Intergenerational Transmission of Health_continued

	Children of Native-Born					Children of Immigrants				
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	
Panel D: Child's Depression										
Mother's Depression	0.082 ***	0.077 ***	0.085 ***	0.095	0.088	-0.003	0.003	0.013	0.041	-0.006
	(0.018)	(0.019)	(0.025)	(0.096)	(0.075)	(0.037)	(0.038)	(0.057)	(0.213)	(0.113)
Low Income Quartile			-0.016	-0.218				-0.043	-0.058	
			(0.028)	(0.243)				(0.051)	(0.192)	
Mother's Education in 1979			-0.017 *	-0.013				-0.019	-0.041	
			(0.010)	(0.039)				(0.018)	(0.113)	
Unemp. Rate in Region in 1979			0.000					0.005		
			(0.005)					(0.009)		
Married in 1979			-0.071	-0.421				-0.121	1.014 ***	
			(0.066)	(0.318)				(0.090)	(0.204)	
N	4057	3635	2143	1101	1833	861	796	449	250	422
R^2	0.009	0.044	0.042	0.104	0.119	0.000	0.079	0.093	0.283	0.083
Panel E: Child's Asthma										
Mother's Asthma	0.171 ***	0.177 ***	0.176 ***	0.013	0.102	0.228 ***	0.224 ***	0.281 ***	0.426	0.525
	(0.029)	(0.031)	(0.045)	(0.134)	(0.116)	(0.050)	(0.051)	(0.069)	(0.675)	(0.330)
Low Income Quartile			0.002	0.348				0.060	-0.237	
			(0.026)	(0.327)				(0.068)	(0.538)	
Mother's Education in 1979			-0.002	0.003				-0.010	0.153	
			(0.011)	(0.032)				(0.015)	(0.102)	
Unemp. Rate in Region in 1979			-0.003					-0.004		
			(0.005)					(0.009)		
Married in 1979			0.022	0.064				0.008	0.015	
			(0.085)	(0.135)				(0.099)	(0.081)	
N	3875	3483	2059	1056	1752	834	770	436	242	405
R^2	0.025	0.034	0.036	0.234	0.187	0.040	0.096	0.128	0.370	0.288
Child's Age, Sex and Race		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Household Characteristics			Yes	Yes				Yes	Yes	
Grandmother Fixed Effects				Yes	Yes				Yes	Yes

Notes: Standard error are reported in paranthesis. Standard errors are clustered at the family level. Asterisks denote significance levels (*=.10, **=.05, ***=.01). Household characteristics include:mother's household income, mother's marital status, whether household lived in urban area and unemployment rate in current residence for the first year in which the mother was interviewed. Each row in Panel D is from a separate regression using 1992 for parents and 2004 for young adults. Each row in Panel E is from a separate regression using 2004 for both parents and young adults. Each regression is weighted using 2004 Young Adult Weights.

Table 4. Intergenerational Transmission of Health using Averages

	Children of Native-Born			Children of Immigrants		
	1-Year	2-Years	3-Years	1-Year	2-Years	3-Years
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Child's Weight						
Mother's Weight	0.428 ***	0.442 ***	0.452 ***	0.527 ***	0.509 ***	0.436 ***
	(0.056)	(0.059)	(0.057)	(0.090)	(0.103)	(0.106)
Low Income Quartile	2.318	2.049	2.521	-5.906	-6.645	-7.387
	(2.649)	(2.656)	(2.684)	(4.221)	(4.498)	(4.628)
Mother's Education	-2.388 **	-2.297 **	-2.203 **	-0.755	-0.584	-0.753
in 1979	(0.998)	(0.979)	(0.979)	(1.158)	(1.170)	(1.230)
Unemp. Rate in Region	0.710	0.663	0.740	0.385	0.311	0.433
in 1979	(0.460)	(0.461)	(0.462)	(0.725)	(0.759)	(0.785)
Married in 1979	-2.612	-3.037	-2.785	-16.219 ***	-14.000 **	-13.444 *
	(10.473)	(10.629)	(10.615)	(6.085)	(6.962)	(7.268)
N	0.245	2109	2064	0.417	416	405
R^2	2125	0.248	0.256	431	0.408	0.402
Panel B: Child's Height						
Mother's Height	0.389 ***	0.412 ***	0.420 ***	0.435 ***	0.488 ***	0.499 ***
	(0.029)	(0.029)	(0.029)	(0.079)	(0.086)	(0.088)
Low Income Quartile	0.081	0.076	0.112	-0.118	-0.103	-0.099
	(0.177)	(0.177)	(0.177)	(0.382)	(0.388)	(0.383)
Mother's Education	0.069	0.064	0.062	0.157	0.157	0.168
in 1979	(0.087)	(0.089)	(0.090)	(0.130)	(0.133)	(0.138)
Unemp. Rate in Region	0.007	0.008	0.009	-0.065	-0.077	-0.074
in 1979	(0.037)	(0.036)	(0.036)	(0.071)	(0.074)	(0.074)
Married in 1979	0.459	0.421	0.482	0.000	0.143	0.244
	(0.598)	(0.598)	(0.604)	(0.625)	(0.632)	(0.644)
N	0.546	2131	2098	0.545	417	410
R^2	2144	0.550	0.550	431	0.552	0.556
Panel C: Child's BMI						
mother's BMI	0.386 ***	0.411 ***	0.415 ***	0.537 ***	0.530 ***	0.446 ***
	(0.050)	(0.053)	(0.051)	(0.083)	(0.085)	(0.095)
Low Income Quartile	0.362	0.360	0.408	-0.706	-0.636	-0.759
	(0.394)	(0.397)	(0.400)	(0.700)	(0.755)	(0.783)
Mother's Education	-0.434 ***	-0.416 ***	-0.401 ***	-0.243	-0.237	-0.261
in 1979	(0.152)	(0.151)	(0.151)	(0.197)	(0.201)	(0.234)
Unemp. Rate in Region	0.104	0.097	0.107 *	0.099	0.066	0.084
in 1979	(0.065)	(0.065)	(0.065)	(0.106)	(0.112)	(0.118)
Married in 1979	-0.918	-0.945	-0.970	-2.515 **	-2.130 **	-1.880 *
	(1.569)	(1.594)	(1.581)	(1.005)	(1.047)	(1.113)
N	2108	2089	2043	423	409	396
R^2	0.157	0.161	0.168	0.284	0.273	0.253
Panel D: Child's Depression						
Mothers' Depression	0.085 ***	0.147 ***		0.013	0.031	
	(0.025)	(0.032)		(0.057)	(0.077)	
Low Income Quartile	-0.016	-0.026		-0.043	-0.056	
	(0.028)	(0.027)		(0.051)	(0.055)	
Mother's Education	-0.017 *	-0.011		-0.019	-0.021	
in 1979	(0.010)	(0.011)		(0.018)	(0.018)	
Unemp. Rate in Region	0.000	0.001		0.005	0.004	
in 1979	(0.005)	(0.005)		(0.009)	(0.010)	
Married in 1979	-0.071	-0.073		-0.121	-0.158	
	(0.066)	(0.068)		(0.090)	(0.100)	
N	2143	2113		449	430	
R^2	0.042	0.051		0.093	0.095	

Notes: Standard error are reported in paranthesis. Standard errors are clustered at the family level. Asterisks denote significance levels (*=.10, **=.05, ** characteristics include:mother's household income, mother's marital status, whether household lived in urban area and unemployment rate in current residence for the first year in which the mother was interviewed. Each regression is weighted using 2004 Young Adult Weights.

Table 5. Intergenerational Transmission of Health for 1st, 2nd and 3rd Generation Immigrants

	Child's Weight				Child's Height				Child's BMI			
	All	First	Second	Third	All	First	Second	Third	All	First	Second	Third
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Mother's Weight	0.390 ***	0.371 *	0.524 ***	0.485 ***	0.437 ***	0.288 **	0.310 **	0.690 ***	0.443 ***	0.438 *	0.685 ***	0.321 ***
	(0.101)	(0.210)	(0.153)	(0.155)	(0.082)	(0.098)	(0.170)	(0.132)	(0.089)	(0.223)	(0.130)	(0.122)
Low Income Quartile	-3.411	1.222	-1.726	-5.409	0.086	-0.308	-0.470	0.362	-0.402	0.365	0.427	-1.027
	(4.466)	(6.903)	(6.736)	(7.417)	(0.385)	(0.578)	(0.798)	(0.525)	(0.747)	(1.258)	(1.080)	(1.066)
Mother's Education in 1979	-1.376	-2.274	1.530	-2.964	0.102	0.119	-0.263	0.299	-0.315	-0.356	0.367	-0.780 *
	(1.184)	(1.712)	(3.128)	(2.926)	(0.126)	(0.155)	(0.453)	(0.260)	(0.216)	(0.345)	(0.417)	(0.444)
Unemp. Rate in Region in 1979	0.343	2.259 *	-0.444	-0.845	-0.019	0.110	0.055	-0.191	0.021	0.272	-0.080	0.015
	(0.702)	(1.182)	(1.531)	(1.270)	(0.067)	(0.099)	(0.152)	(0.126)	(0.107)	(0.245)	(0.181)	(0.167)
Married in 1979	-12.921 *	-46.385 ***	-5.465	3.161	0.028	0.037	-0.411	1.529	-1.824 *	-7.833 **	-2.512	-0.484
	(7.040)	(13.311)	(18.901)	(11.670)	(0.566)	(1.681)	(2.648)	(1.045)	(1.063)	(3.213)	(1.852)	(1.720)
N	461	166	150	145	466	169	150	147	451	160	147	144
R^2	0.367	0.411	0.452	0.470	0.550	0.613	0.552	0.631	0.222	0.250	0.409	0.287

Notes: Standard error are reported in paranthesis. Standard errors are clustered at the family level. Asterisks denote significance levels (*=.10, **=.05, ***=.01).
Household characteristics include:mother's household income, mother's marital status, whether household lived in urban area and unemployment rate in current residence for the first year in which the mother was interviewed.