Journal of Contemporary Macroeconomic Issues
www.scekr.com

Intergenerational Transmission of Health: Evidence from Selected Districts of Pakistan

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PAPER INFO

Published:
June 2020
Volume 1
Issue 1

Keywords:
Intergenerational Mobility, Intergenerational Transmission, Health Status, Socio-economic Status, Human Capital

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ABSTRACT

The concept of intergenerational mobility has considerable economic implications for a family and society as well because sufficiently large intergenerational transmissions reflect inequality of opportunities. Intergenerational mobility has different attributes and intergenerational health transmission is a comparatively new area of research for the economists. This paper attempts to measure intergenerational health transmissions in Pakistan. The study uses field survey data of 2000 households, 1000 each from two generations to calculate intergenerational health transmissions from districts/cities of Islamabad, Karachi, Sukhar, Lahore, Vehari, Rajanpur, Peshawar and Quetta. This study examines the relationship between parental health and offspring health as well as the relationship between parental income and education and the health of children. The results establish strong intergenerational health transmissions in Pakistan.

1. Introduction

The health status of the people is a key indicator of the overall quality of life and a significant element for an economy. Health is an obvious basis of well-being of human as well as an instrument to increase income levels (Bloom et al., 2001). Healthy persons are more effective because they have higher efficiency and productivity level. Contrary to this, bad health and incidence of diseases hinder the productivity and evolution of an economy (Grossman 1972 a & b). It is undeniable fact that health is imperative element of human capital; but pity is that health is given trivial consideration (Dauda 2011).

Intergenerational mobility is a very wide-ranging topic as it has immense academic as well as practical significance. Across generations, intergenerational mobility is an up gradation of social and economic positions. Intergenerational transmissions have vital implications for inequality and economic growth (Solon, 1999; Black and Devereux, 2011). Parents transmit a number of genetic and non-genetic attributes to their children and health is one such basic component (Grossman 1972 b). Nevertheless, we know little about this relationship because literature on intergenerational health transmission is growing and to date (Black and Devereux, 2011).

Being a key element of human capital, health positively impacts an intergenerational mobility and nonetheless boosts overall productivity across generations. As in the instance of education and income, health outcomes are frequently transferred across generations (d'Addio, 2007). Enhanced health and food expenditures nurture the productivity. This increased productivity is human capital formation. The spending on health, good balanced diet and safe water intake reduce the probability of a person to fall sick, which adds to the better expectancy of life.

The nexus between the socioeconomic conditions, family environment and health is widely discussed in various studies. Literature shows the effect of parental income on the health status of their offspring (Apouey and Geoffard, 2013; Khanam et al., 2014; Fletcher and Wolfe, 2014; Case et al., 2002; Kuehnle, 2014). The persistent inequality in health status is seen through the prism of persistent inequality of socioeconomic conditions and family environment across generations (Lefranc et al., 2006; Bourguignon et al., 2007; Ferreira and Schady, 2009). To trace this inequality, three possible channels have been discussed in the literature. Following a latency phase, hence named latency model by Wadsworth (1999), the first way considers the direct impact of socio-economic status on health conditions in adulthood. Some certain risk or shock takes place in childhood that persists in adulthood with intervals. The second channel is called pathway model which has been used by Currie et al. (2009) and Case et al. (2005). These studies using parents' socioeconomic conditions, suggest an indirect effect of parental socioeconomic conditions on children's health and in ensuing life course investment in offspring's human capital over different generations. Intergenerational transmission of health, the third way, is used by Ahlburg (1998). He suggests that there is positive correlation between the health status of parents and children. The former two ways focus on causal link where later discusses correlation only.

Some of the studies have explored correlations between health outcomes of children and various parental health measures. Peck (1992) uses body stature as health indicator and conclude that incidence of upward intergenerational mobility can be more common among tall persons. Similarly, the health perceptions of the individuals, who have faced positive intergenerational mobility, are more likely to be good. Breierova and Duflo (2004) detect that an education of both fathers and mothers and child health have negative relation as the parental education shrinks infant mortality. Chou et al. (2010) find that during the decade of 1960, the growth of high schools (junior) affects child healthiness and mortality in Taiwan. It is found that the parental educational level reduces the possibilities of underweight and pre-mature deliveries. Currie and Moretti (2007) link the birthweight US children and their mothers. Propper et al. (2007) conduct research about UK to find correlations between physical and mental health of mothers and health measures of their under-7 year children. On the basis of US data, Classen (2010) carries out a study to find linkages between the weights both children and their mothers when both generations are between 16 and 24 years of their ages. Venkataramani (2011) investigates the links of heights of parents and their less than 6-years children in Vietnam. Using microdata from 38 developing countries, Bhalotra and Rawlings (2011, 2013) examined the connections between the heights of the mothers and the probability of child survival. Coneus and Spiess (2012) use various health measures and observe health associations between parents and below 4 year old kids in Germany. Bauldry et al. (2012) observe links between self-assessed health of children and their parental health conditions in US. Johnston et al. (2013) study the correlations between English mothers and their kids and investigate intergenerational correlations in mental health for three generations. Genetic transmission has vital role to explain the

intergenerational transmission in health. Thompson (2014) concludes higher health association for biological children than adopted children. Kuehnle (2014) estimate the casual impact of household income on their offspring's health in United Kingdom. The correlation between health of parents and their older adult children of Indonesia is studied by Kim et al. (2015); Currie and Moretti, (2007); Bhalotra and Rawlings (2013); Kim et al. (2015) also provide evidence of greater health transmission in low income and less developed areas. Le and Nguyen (2015) conduct study about UK to associate child health mental health of mothers. Darden and Gilleskie (2016) observe the impacts of US parents' health shocks on their grown-up children's self-assessed health.

Murray et al. (1985) have found that the parent's lifestyles have also significant impact on child's health status. People of lower socio-economic status (SES) have adverse health outcomes (Marmot & Wilkinson 1999; Smith, 1999; Currie and Moretti, 2003). Furthermore, a positive independent effect of the socio-economic status is found suggesting that the intergenerational transmission of low birth weight is stronger for poorer mothers. Case et al. (2005, 2002) in their study have found a link between family income and overall child health status.

This paper is an important contribution to research into intergenerational health transmission as this is the first paper to estimate the magnitude of correlations of parental health on child health in Pakistan. However, this study has some data limitations and further studies should be conducted to cope with data constraints. These studies should focus on determining casual links and finding mechanism behind the results of the study. Section II deals with the data and the measurement of intergenerational health transmissions. Results have been examined in section III and the study has been summed up in section IV.

II. Data and Methodology:

This study based upon a survey data, conducted by the authors. The multi-topic household survey was conducted in rural as well as urban areas of all four of the provinces of Pakistan and federal capital Islamabad. The data collected by interview of the head and other members of the family. The data were relied upon eight of the districts/cities of Islamabad, Karachi, Sukhar, Lahore, Vehari, Rajanpur, Peshawar and Quetta. The number of respondents was selected on the basis of population of 1998 census. A number of existing studies have tried to find out suitable method for measurement of intergenerational mobility (Solon 1999). Typically two methods have been used to find the level of intergenerational income mobility. These methods are the approach of income elasticity (log-linear regression model) and the approach of transition matrices (Dearden et al., 1997). For the measurement of intergenerational income mobility, some recent literature has employed third approach; logistic regression analysis. We have used log-linear regression model for the measurement intergenerational health transmissions. This model provides quite simple methodology to measure intergenerational transmissions of health. In case of simple-linear regression model, the health status of an offspring depends upon the health status of the parents. H_{child} denotes the health status of sons/daughters and $H_{parents}$ denotes the health status of parent(s).

$$H_{child} = \alpha + \beta H_{parents} + \varepsilon$$

A fraction of health variable, transferred from parents to next generation on average, measures intergenerational transmission of health. The regression coefficient $ß_1$ shows intergenerational transmission of health and the error term ε classifies other effects, having no relationships with that

of parental health. β deals with the strength of the statistical connections between the health status of the two generations. Empirical estimates of $ß_1$, have a trend to lie within 0 to 1. $ß_1$ indicates the fraction of health variables transmitted from the parents to the children on average. If $ß_1$ has minimum value (zero), it represents no transmission and if $ß_1$ has maximum value (one), it displays whole transmission. Absolute transmission shows that the health statuses of parents are totally related to the health statuses of their next generation while no transmission signifies that the health statuses of parents are not transmitted to their offspring.

We have used three dependent variables to quantify intergenerational transmission of the health status. The variables, used in these models include percentage expenditures on health (EOH), number of average visits of household members to doctors (NVD) and number of births with skilled care (NBSC) of the offspring. Percentage expenditures on health, number of visits to doctors and number of births with skilled care, logarithm of annual income of household and average years of education of household of first generation are explanatory variables in these models. The detail of the variables of regression models is presented in Table 1.

Table 1

Description of Variables

Variable	Definition	Expected Relationship
DEPENDENT VARIABLES		
EOH2	Total Expenditures (in percentage) on Health of Household of 2nd Generation (Sons/Daughters).	Dependent Variable
NVD2	Average Visits (in-number) of Household of 2nd Generation's (Sons/Daughters) Members to Doctor.	Dependent Variable
NBSC2	Births (in-number) with Skilled Care in Household of 2nd Generation (Sons/Daughters).	Dependent Variable
Regressors		
EOH 1	Total Expenditures (in-percentage) on Health of Household of 1st Generation (Parents). Hypothesis: If EOH1 is high, EOH2 will be high.	Positive
NVD1	Average Visits (in-number) of Members of Household of 1st Generation (Parents) to Doctor. Hypothesis: If NVD1 is high, NVD2 will be high.	Positive
NBSC1	Births (in-number) with Skilled Care in Household of 1st Generation (Parents). Hypothesis: If NBSC1 is high, NBSC2 will be high.	Positive

LYH1	Logarithm of Annual Income of Household of 1st Generation (Parents). Hypothesis: If LYH1 is high, EOH2, NVD2, NBSC2 will be high.	Positive
AEYH1	Average Education (in years) of Household of 1st Generation (Parents). Hypothesis: If AEYH1 is high, EOH2, NVD2, NBSC2 will be high.	Positive

The descriptive analysis is presented in the following Table 2.

Table: 2.

Descriptive Statistics of Dependent and Independent Variables

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
EOH1	3.129167	3	7	1	1.437133
EOH2	5.123611	5	10	1	1.757954
NBSC1	0.265278	0	3	0	0.451134
NBSC2	2.491667	3	6	0	1.502872
NVD1	3.393056	3	6	1	0.997748
NVD2	4.898611	5	8	3	1.167239
AEYH1	3.291667	3	11	0	2.21097
YH1	690868.1	469250	5055500	55000	638533.2

The econometric models to estimate intergenerational transmissions of health are elaborated below:

$EOH2 = \alpha + ß_1\ EOH1 + \varepsilon$ (1)

$EOH2 = \alpha + ß_1\ EOH1 + ß_2\ LYH1 + \varepsilon$ (2)

$EOH2 = \alpha + ß_1\ EOH1 + ß_2\ AEYH1 + \varepsilon$ (3)

$NVD2 = \alpha + ß_1\ NVD1 + \varepsilon$ (4)

$NVD2 = \alpha + ß_1\ NVD1 + ß_2\ LYH1 + \varepsilon$ (5)

$NVD2 = \alpha + ß_1\ NVD1 + ß_2\ AEYH1 + \varepsilon$ (6)

$NBSC2 = \alpha + ß_1\ NBSC1 + \varepsilon$ (7)

$NBSC2 = \alpha + ß_1\ NBSC1 + ß_2\ LYH1 + \varepsilon$ (8)

$NBSC2 = \alpha + ß_1\ NBSC1 + ß_2\ AEYH1 + \varepsilon$ (9)

III: Results and Discussion:

We have applied Ordinary Least Square (OLS) method to find out health transmission across two generations.

Table: 3.

Health Transmission (Expenditures on Health) across Two Generations

Dependent Variable: EOH2				
Included observations: 1000				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	2.977	0.130	22.9	0.0000
EOH1	0.686	0.0378	18.148	0.0000
R-squared	0.314	F-statistic		329.232
Adjusted R-squared	0.313	Prob.(F-statistic)		0.000000

For estimation, 1000 observations are comprised. The variable of EOH2 has a positive relationship with EOH1 which means that as EOH1 increases, the EOH2 also increases. The sign of the coefficient is expected one because theory explains the same relationship. As shown in Table 3, 0.686 fraction of health expenditures from 1st generation household is transmitted to the 2nd generation household. So far as statistical significance is concerned the relationship is significant at 1 percent level which means that chance of error in experimentation is less than 1 percent. The R^2 represents the goodness of fit and explains variation in the model on account of the variables of the model and value of R^2 is sufficient to believe that variables of the model explains more than 31 percent variation in model which is a good value keeping in view cross sectional data. The F-Statistic shows probability of less than 1 which is good. Overall the model is good which confirms the theoretical hypothesis as well.

Table: 4

Health Transmission (Expenditures on Health) across Two Generations

Dependent Variable: EOH2				
Included observations: 1000				
Variable	**Coefficient**	**Std. Error**	**t-Stat.**	**Prob.**
C	10.567	1.161	9.102	0.0000
EOH1	0.408	0.078	523	0.0000
LYH1	0.576	0.049	11.76	0.0000
R^2	0.39	F-ratio		223.83
Adjusted R^2	0.365	P-value		0.000000

Source: Author's own calculation through Eviews 3.1

Table 4 shows that the variable EOH2 has a positive relationship with EOH1 and LYH1 which means that EOH2 increases as both EOH1 and LYH1 increase. Regression coefficients of both independent variables show that the incomes and health expenditures of first generation household largely shape the health expenditures of the second generation household. Overall the value of R^2 is also sufficiently high to make the model good. This result is also statistically significant.

Table: 5

Health Transmission (Expenditures on Health) across Two Generations

Dependent Variable: EOH2

Included observations: 1000

Variable	**Coefficient**	**Std. Error**	**t-Stat.**	**Prob.**
C	-16.721	1.87	-8.94	0.0000
EOH1	0.418	0.061	6.852	0.0000
AEYH1	0.551	0.055	10.02	0.0000
R^2	0.470	F-ratio		318.15
Adjusted R^2	0.469	P-value		0.000000

In case of intergenerational health transmission, when average education years of 1st generation are also included, it is observed that the relationship between percentage health expenditures and average education years of 1st generation and percentage health expenditures of 2nd generation is positive which is as per expectation because children of educated family have higher probability to be more healthy than the children of poor families. The value of R^2 is sufficiently high. Overall the model is good which confirms the theoretical hypothesis as well.

Table: 6

Health Transmission (Number of Average Visits of Household Members to Doctors) across Two Generations

Dependent Variable: NVD2

Included observations: 1000

Variable	**Coefficient**	**Std. Error**	**t-Stat.**	**Prob.**
C	1.914	0.102	18.765	0.0000
NVD1	0.879	0.029	30.31	0.0000
R-squared	0.566	F-statistic		934.51
Adjusted R-squared	0.565	Prob.(F-statistic)		0.000000

The variable of NVD2 has a positive relationship with NVD1 which means that as NVD1 increases, the NVD2 also increases. The sign of the coefficient is expected one because theory explains the same

relationship. As shown in Table 6, 0879 fraction of number of average visits to doctors by members of first generation household is transmitted to the second generation household. So far as statistical significance is concerned the relationship is significant at 1 percent level which means that chance of error in experimentation is less than 1 percent. The value of R^2 is very good value keeping in view cross sectional data. Overall the model is good which confirms the theoretical hypothesis as well.

Table: 7

Health Transmission (Number of Average Visits of Household Members to Doctors) across Two Generations.

Dependent Variable: NVD2

Included observations: 1000

Variable	Coefficient	Std. Error	t-Stat.	Prob.
C	3.069	0.255	12.035	0.0000
NVD1	0.398	0.061	6.524	0.0000
LYH1	0.491	0.035	14.03	0.0000
R-squared	0.338	F-statistic		183.408
Adjusted R-squared	0.337	Prob.(F-statistic)		0.000000

Table 7 shows that the variable NVD2 has a positive relationship with NVD1 and LYH1 which means that NVD2 increases as both NVD1 and LYH1 increase. Regression coefficients of both independent variables show that the incomes and number of average visits to doctors of first generation household largely shape the number of average visits to doctors of the second generation household. Overall the value of R^2 is also sufficiently high to make the model good. This result is also statistically significant.

Table: 8

Health Transmission (Number of Average Visits of Household Members to Doctors) across Two Generations

Dependent Variable: NVD2

Included observations: 1000

Variable	Coefficient	Std. Error	t-Stat.	Prob.
C	1.914	0.202	9.475	0.0000
NVD1	0.482	0.073	6.602	0.0000
AEYH1	0.551	0.055	10.02	0.0000
R-squared	0.314	F-statistic		329.232
Adjusted R-squared	0.313	Prob.(F-statistic)		0.000000

In case of intergenerational health transmission, when average education years of 1st generation are also included, it is observed that the relationship between number of average visits to doctors and average education years of 1st generation and number of average visits to doctors of 2nd generation is positive. The value of R^2 is sufficiently high. Overall the model is good which confirms the theoretical hypothesis as well.

Table: 9

Health Transmission (Number of Births with Skilled Care) across Two Generations

Dependent Variable: NBSC2

Included observations: 1000

Variable	**Coefficient**	**Std. Error**	**t-Stat.**	**Prob.**
C	2.065	0.076	27.171	0.0000
NBSC1	0.956	0.060	15.93	0.0000
R-squared	0.460	F-statistic		252.96
Adjusted R-squared	0.459	Prob.(F-statistic)		0.000000

The variable of NBSC2 has a positive relationship with NBSC1 which means that as NBSC1 increases, the NBSC2 also increases. Table 9 shows that 0.686 fraction of number of births with skilled care in household of 1st generation household is transmitted to the 2nd generation household. The values of R^2 and F-Statistic are good. Overall the model is good which confirms the theoretical hypothesis as well.

Table: 10

Health Transmission (Number of Births with Skilled Care) across Two Generations.

Dependent Variable: NBSC2

Included observations: 1000

Variable	**Coefficient**	**Std. Error**	**t-Stat.**	**Prob.**
C	3.069	0.255	12.035	0.0000
NBSC1	0.384	0.036	10.67	0.0000
LYH1	0.518	0.044	11.77	0.0000
R-squared	0.441	F-statistic		228.287
Adjusted R-squared	0.440	Prob.(F-statistic)		0.000000

Table 10 shows that the variable NBSC2 has a positive relationship with NBSC1 and LYH1 which means that NBSC2 increases as both NBSC1 and LYH1 increase. Overall the value of R^2 is also sufficiently high to make the model good. This result is also statistically significant.

Table: 11

Health Transmission (Number of Births with Skilled Care) across Two Generations

Dependent Variable: NBSC2

Included observations: 1000

Variable	Coefficient	Std. Error	t-Stat.	Prob.
C	0.831	0.063	13.19	0.0000
NBSC1	0.343	0.036	9.528	0.0000
AEYH1	0.458	0.049	9.347	0.0000
R-squared	0.328	F-statistic		174.776
Adjusted R-squared	0.326	Prob.(F-statistic)		0.000000

Table 11 shows that the relationship between number of births with skilled care in household of and average education years of 1st generation and number of births with skilled care in household of 2nd generation is positive which is as per expectation. The value of R^2 is sufficiently high. Overall the model is good which confirms the theoretical hypothesis as well.

IV. Conclusion and Policy Implications:

This study estimates intergenerational health transmission in Pakistan and it has presented a wide-ranging overview about intergenerational transmission of health. The study verifies that the health of children has positive relation with their parental health status. Healthier parents have healthier children. The study suggests that income or socio-economic status of family is positively correlated with the health outcomes of the next generation as richer parents have healthier children. The situation is reverse for low income parents. Inequalities in earnings and income are linked across generations which result in sizeable intergenerational transmission of health status and low intergenerational health mobility. Similarly, parental education level has robust positive effect on the health level of the next generation. The children of parents, having more years of education are healthier as compared to the children of parents, having no education or less years of education.

The estimation results show the fact that sufficiently large intergenerational health transmissions persist in Pakistan, which reflects the harsh reality that the children from different income groups do not have equal opportunities to improve their health status. These results are in line with the previous literature, conducted in different developed and under-developing countries. Extensive empirical evidence is available to prove that there is significant correlation between parental and offspring health outcomes. This type of analysis opens the door for many different empirical applications.

The conclusions, mentioned above, embark upon the economic policymakers from Pakistan to focus on increasing intergenerational mobility. Any household's circumstances and living conditions at the time of a child's birth should not limit his/her opportunities. The governmental interventions are imperative to increase equity and economic efficiency of opportunities and health

facilities. Greater investments in health are required to boost human capital formation. This is the only way to eradicate inequality and poverty from the society. The government should focus on preventive and curative health measures simultaneously to enhance the health status and life expectancy in the country. As the rich class relies on private health sector, developed and fully equipped public health sector will benefit the poor class and their health status will improve.

The government should take measures to improve the quality of drinking water and nutrition level and hygienic conditions also. These steps will also improve health status. This study indicates that the educational status of a family affects health status of offspring, which ultimately impacts human capital formation. Education level should be improved through policy intervention.

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