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CHILDREN'S HEALTH GRADIENT IN DEVELOPING COUNTRIES: EVIDENCE FROM INDONESIA

CHEOLSUNG PARK*

Hanyang University

Using data of children under age fifteen in Indonesia, I examine how the health gradient among children evolves over age. It is found that health status is strongly correlated with household income among children younger than seven, but not so among the older school-aged children. I find evidence that schooling explains partly the pattern, as schooling has a positive impact on health status of children of low-income families, but little impact on health status of children of high-income families. Accessibility to healthcare providers is found to play a significant role in shaping the gradient, but it does not explain directly the observed evolving pattern of the gradient.

Keywords: Child Health Gradient, Healthcare, Schooling, Developing Country
JEL classification: I12

1. INTRODUCTION

Correlation between individuals' health status and socioeconomic status (SES), or health gradient, is strong among adults both in developed countries (e.g., Smith, 1999) and in developing countries (e.g., Strauss and Thomas, 1998). The health gradient among young children and youth is less known. However, health gradient of the age group is important in two aspects. First, it helps us to understand the causal relationship between socioeconomic status and health status. Among children we can rule out the possibility that health status determines socioeconomic status. Therefore, a correlation between SES and health status among children is likely to indicate a causal effect of SES on health (Finch, 2003). Second, it can help us to find the factors that further or hinder intergenerational mobility. Health is likely to be an important determinant of investment activities in other types of human capital. Therefore, intergenerational transmission of health inequality, indicated by a strong gradient among children and youth, may be a potential impediment to social mobility.

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In the current literature on this issue there seems little dispute that the gradient is strong among pre-school aged children, but for older children the evidence is mixed. Furthermore, we have yet to uncover the whole mechanism that determines the health gradient among children and youth. Case *et al*. (2002) and Currie and Stabile (2003) show evidence that in the US and Canada the gradient is stronger among older children than younger ones. Case *et al*. (2002) find that the gradient and its steepening pattern cannot be explained away by variations in health insurance coverage, health at birth, parents' health, maternal labor supply, or health related behaviors. They suggest that the gradient is likely to be attributed to the relationship between SES and the child's chronic conditions. Currie and Stabile (2003) find that in Canada while there is little relationship between SES and the extent of recovery from a given shock, the arrival rate of bad health shocks is negatively correlated with SES. They suggest that the difference in the arrival rate is responsible for the steepening gradient.

However, drawing evidence mainly from British and European studies and data, West (1997) shows an almost opposite picture. His evidence indicates that, for most common health status measures except for severe chronic illness, the gradient is much weaker, often statistically insignificant, among children between ages 10 and 19 than among the younger ones. The gradient reappears among adults. He suggests that the 'equalization' in youth occurs as effects of the secondary school, the peer group, and youth culture overshadow those of the family and the neighborhood background.

This study, while continuing on the theme of the previous studies, contributes to the literature threefold. First, it extends the existing literature by supplying new evidence on children's and youth's health gradient from a developing country comparable to that in the previous studies. In developing countries children's health gradient has not been studied as much as infant mortality gradient or nutritional status gradient (Behrman and Deolalikar, 1988). I use data from waves 2 and 3 of the Indonesian Family Life Survey (IFLS). In light of the disagreement in the literature regarding the degree of health gradient among older children and youth, the children are split into two groups--pre-school aged children (ages 0 to 6) and the school-aged children (ages 7 to 14) --and their gradients are examined separately. Using a method similar to that of Case *et al*. (2002), I find that while the gradient is strong among infants and pre-school aged children, it is not significant among children older than six. The gradient reemerges strong among individuals older than nineteen years. These findings are similar to those of West (1997).

Second, I find evidence which indicates that schooling has a positive impact on health status of children from low-SES families but little impact on health status of high-SES children. The asymmetric effect of schooling on children's health status by SES explains, at least partly, why the gradient among school-age children is weaker than that among pre-school aged children. This finding suggests that an increased access to public education can enhance intergenerational mobility in developing countries by making not only the level of human capital but also the health status more equal across the next generations of different socioeconomic groups.

Third, I find that increased accessibility to private healthcare providers steepens the gradient, and that increased accessibility to public healthcare providers, albeit to a lesser degree, reduces it. The effect is found to be particularly strong among children 4 to 12 years old. It is estimated, however, that this does not contribute directly to weakening the health gradient among the school-aged children.

The remainder of the paper is organized as follows. In Section 2 the gradient patterns among Indonesian children below age fourteen across different age groups are examined. In Section 3 the two factors that may explain the evolving pattern of the gradient, schooling and access to healthcare, are investigated. In Section 4 the paper is concluded.

2. THE HEALTH GRADIENT AMONG CHILDREN IN INDONESIA

The data come from the waves 2 and 3 of the Indonesian Family Life Survey (IFLS) fielded in 1997 and 2000. IFLS is an on-going longitudinal socioeconomic survey in Indonesia. The sample is representative of about 83% of the Indonesian population and contains over 30,000 individuals living in 13 of the 27 provinces in the country. The first survey was conducted in 1993.

It conducts surveys on individuals, households, and community. The community survey provides information on healthcare providers and schools, among others. The survey has a separate module for children younger than 15 that provides us with rich information on the child's education history, morbidities, self-treatment, and inpatient and outpatient visits. For children younger than 11, the child's mother, female guardian, or caretaker answers the questions. Children between the ages 11 and 14 may respond for themselves. While some questions overlap the adult module and the child module, many questions on education and morbidities do not. To maintain consistency, the data from the child module is used mainly for this study.

Two measures of health of children younger than 15 are available. One is the subjective summary health measure. The respondent, who may be an adult family member of the child or the child himself or herself, reports whether the child is very healthy (reported health status = 1), fairly healthy (2), unhealthy (3), or very unhealthy (4). This health measure is available only for the waves 2 and 3. The other measure is the child's acute health problem symptoms such as fever, breathing difficulties, stomachache, etc. This measure is available for waves 1 through 3, but the questionnaire varies across waves. Unfortunately there is no information on chronic health problems.

To examine the gradient among the children and its evolution over the age into adulthood, in Figure 1 I draw the relationship between the summary health measure and log household income, or the health gradient, by age groups using data on children under age 15, and in Figure 2 I draw the relationship among those older than 14 using the adult

data.[1] The observations of the two waves are pooled together, and each plot is drawn using locally weighted scatter plot smoother.

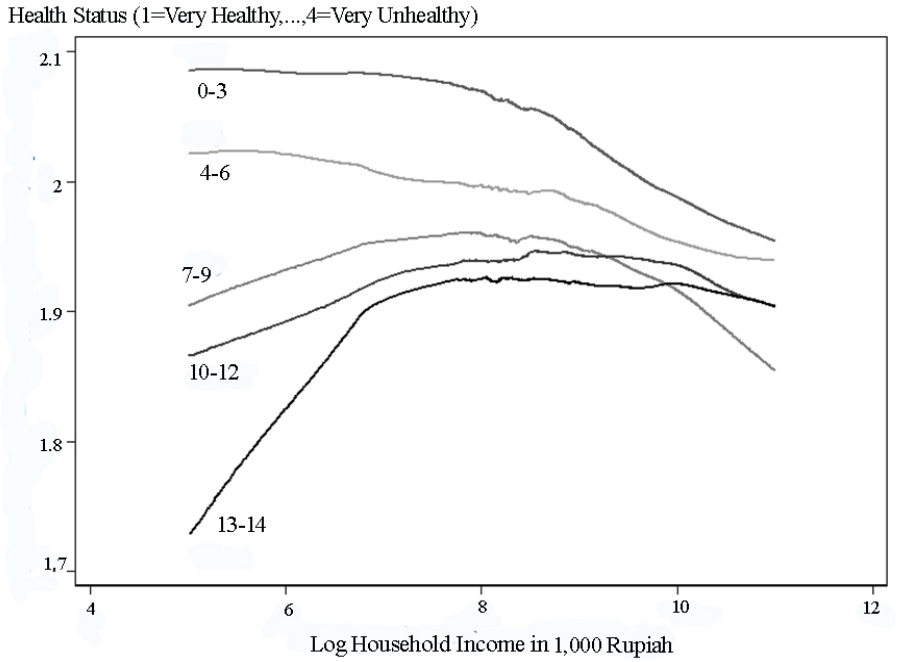

Figure 1. Relationship between Health Status and Log Household Income among Children by age group, ages 0 to 14

One pattern immediately noticeable in Figure 1 is that among children younger than 15 the gradient weakens as the age increases. For the age group 0 to 3 and the age group 4 to 6, the negative relationship between the reported health indicator — the higher the reported health indicator, the poorer the health — and log household income is clearly visible. For age group 7 to 9, however, the gradient plot appears to be of an inverse U shape. For the older age groups 10 to 12 and 13 to 14, it is flat in most areas, and even positively sloped over some range. In Figure 2 we can see that the gradient is still mostly flat in the age group 15 to 19. Then for the age group 20 to 29, the gradient appears to have an inverted U shape, yet negatively sloped in most income range. For the older adult groups, presence of strong gradient is unmistakable.

[1] Household income is measured in 1000 rupiah at the price level of the year 1999.

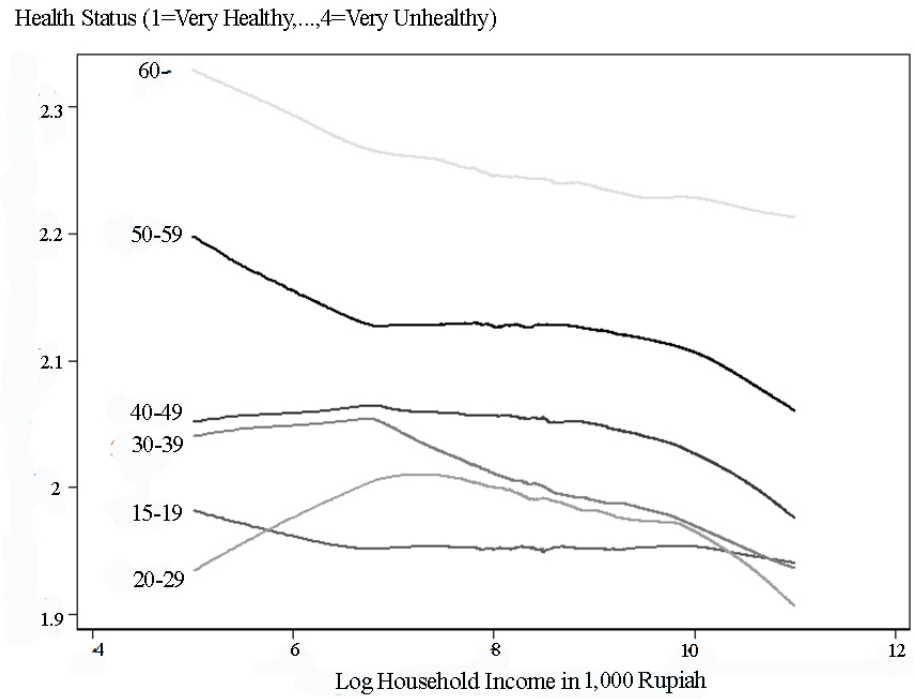

Figure 2. Relationship between Health Status and Log Household Income among Adults by age group, ages 15 and higher

Figures 1 and 2 suggest that while the health gradient is strongly visible among the pre-school aged children and the adults older than 19, the gradient is fairly weak among school-aged children and youth between the ages 7 and 19 in Indonesia. This is remarkably similar to what is observed by West (1997, p. 839) in the United Kingdom, and stark different from what is observed by Case *et al.* (2002) and Currie and Stabile (2003) who find in the USA and Canada respectably that the proportion of children reportedly in poor health increases with the children's age and the gradient steepens as age increases (e.g., Case *et al.*, 2002, p.1311).

One may question, however, whether the subjective summary health measure used in Figures 1 and 2 is really comparable across individuals, especially those from different socioeconomic backgrounds. It is possible that a child of a high-SES family, who would be reported to be in good health had the child been compared to a child of a low-SES family, is reported to be in poor health because the respondent's reference group is other high-SES children who are likely to be healthier than the average children. Can this be responsible for the apparently weakening gradient in Figure 1?

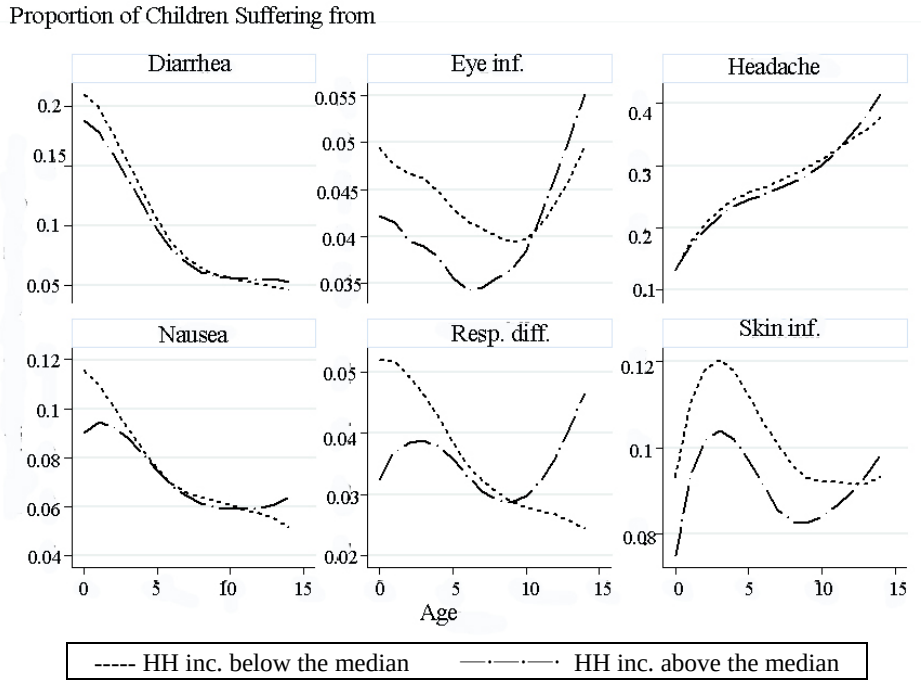

Figure 3. Proportions of Children Suffering from Various Symptoms, ages 0 to 14

To answer the question, in Figure 3 six graphs are drawn, each showing the smoothed proportion of children of high SES (household income above the median) and of low SES (household income below the median) suffering from diarrhea, eye infections, headache, nausea, respiratory difficulties, and skin infections. The prevalence of the symptoms is arguably the more objective measure of overall health status across cross-section than the proportion of reportedly unhealthy children. The graphs are drawn using IFLS waves 1, 2, and 3. Note that the proportion of children suffering from various symptoms, except for headache, declines in general with age at least up to 10. The difference between the low-SES and the high-SES children tends to decrease in most cases. It even appears that the difference changes from a positive to a negative one in later age groups. This is consistent to what is observed in Figure 1 for children under age 15.

While the graphs are useful in describing simple correlations, one can still ask whether they show the 'true' gradient, free from confounding effects of other factors. To examine it, I resort to statistical analysis similar to that used by Case *et al.* (2002) and Currie and Stabile (2003), in order to compare the results with theirs.

Table 1. Relationship between Health Status and Log Household Income: Ordered Probit Estimates by age group

	Reported Health (1=Very healthy, …, 4=Very unhealthy)				
Ages	0-3	4-6	7-9	10-12	13-14
Observations	4895	4130	4097	4233	2975
			Controls 1		
Log Household Income	-0.066	-0.039	-0.023	-0.007	-0.004
	(0.017)	(0.019)	(0.019)	(0.020)	(0.023)
			Controls 2		
Log Household Income	-0.066	-0.037	-0.021	-0.007	-0.004
	(0.017)	(0.019)	(0.019)	(0.020)	(0.023)
			Controls 3		
Log Household Income	-0.043	-0.030	-0.023	-0.000	-0.001
	(0.018)	(0.021)	(0.02)	(0.021)	(0.024)
Father's Education (excluded: none)					
1-6 years	-0.146	-0.180	0.096	-0.019	-0.030
	(0.085)	(0.097)	(0.091)	(0.078)	(0.102)
7-9 years	-0.150	-0.216	0.136	-0.148	0.002
	(0.096)	(0.111)	(0.109)	(0.098)	(0.133)
10-12 years	-0.161	-0.175	0.144	-0.180	-0.055
	(0.096)	(0.111)	(0.114)	(0.107)	(0.134)
13 years or more	-0.344	-0.116	0.158	-0.147	0.076
	(0.120)	(0.135)	(0.149)	(0.140)	(0.188)
Missing	0.027	0.128	0.001	-0.279	-0.107
	(0.209)	(0.215)	(0.210)	(0.200)	(0.205)
Mother's Education (excluded: none)					
1-6 years	0.134	-0.002	0.022	0.033	0.059
	(0.083)	(0.088)	(0.075)	(0.067)	(0.081)
7-9 years	0.103	-0.012	-0.006	0.050	-0.015
	(0.095)	(0.104)	(0.098)	(0.091)	(0.125)
10-12 years	0.002	-0.088	-0.076	0.072	-0.119
	(0.099)	(0.111)	(0.108)	(0.105)	(0.130)
13 years or more	0.072	-0.026	-0.027	-0.029	0.165
	(0.136)	(0.150)	(0.159)	(0.145)	(0.200)
Missing	-0.029	-0.255	0.172	0.142	0.245
	(0.182)	(0.376)	(0.203)	(0.252)	(0.291)

Notes: In the parentheses are robust standard errors allowing correlations within the same household. For Controls 1, each regression includes age, sex, and urban/rural dummies, dummies indicating whether the father or the mother is present in the household, the number of household members 0 to 18 years old and 19 years old or older, the year dummy, the province dummies, and the interactions of the year and the province dummies. For Controls 2, each regression includes all the variables in Controls 1 plus dummies indicating the relationship between the respondent and the child. For Controls 3, each regression includes the parents' education dummies in addition to all the variables in Controls 2.

Table 1 shows the ordered probit estimates with three different sets of controls, fashioned after Case *et al*. (2002)-labeled Controls 1, 2, and 3-of the relationship between children's reported health status and log household income by age groups. The means of variables of each age group are shown in Appendix Table 1. The specification Controls 1 controls for child's age, sex, urban/rural dummy, parents' presence at home dummy, the number of household members of two age groups (up to 18 years old, and 19 or older), the survey year dummy, the province dummies, and the interactions of survey year and province dummies. The specification Controls 2 controls additionally for the relationship between the respondent and the child in question. For children up to 10 years old, the respondent is the parent in most cases, while for the older children it is mostly the child himself or herself. The specification Controls 3 controls for, in addition, the father's and the mother's education level dummies.

The estimation results indicate that, except for a minor deviation with Controls 3, the older a child is, the smaller the magnitude of the log household income coefficient or the gradient is, as shown in Figure 1. The log household income coefficient is statistically significant at the 5 percent or smaller level for ages 0 to 3 under all the three specifications. The coefficient estimates range from -0.043 to -0.066. For ages 4 to 6, the magnitudes of coefficient estimates are smaller, ranging between -0.030 and -0.039. They are still statistically significant at the 6 percent level with Controls 1 and 2, but insignificant even at the 10 percent level with Controls 3. For the older age groups, the coefficient sizes are much smaller and none of them is statistically significant at any popular level under any specification.

The differences between the estimates with Controls 1 and those with Controls 2 are minimal. It suggests that the estimated gradient is little affected by the respondent's identity. The log household income coefficient estimate with Controls 3 is smaller in magnitude than those with Controls 1 and 2, since parental education is correlated with the household income. It does not change the overall pattern of the weakening gradient over the children's ages.

The father's education dummy coefficients-no formal education is the excluded category-are mostly, but not all, negative as expected. For age groups 0 to 3 and 4 to 6, some coefficients are statistically significant at a conventional level, but none is among the older age groups. On the other hand, the mother's education dummy coefficients are of mixed signs and none of them is statistically significant. It may be due to that the father's and the mother's education levels are positively correlated, or that the father's education coefficient picks up the effects of income on children's health unexplained by the log income coefficient.

All in all, the evidence gathered from the IFLS data indicates that health gradient is strong among pre-school aged children between ages 0 to 6, but weak among the older children. Then the gradient reappears to be strong among the adults. The estimation results suggest that health status of children between ages 7 and 14, and possibly that of youth between ages 15 and 19, is not correlated with economic status of the family. As pointed out earlier, the overall pattern of health gradient by age and the weak gradient

among the school-aged children are not common, but in no way unique to Indonesia. In the next section we explore possible explanations for those observations.

3. EXPLANATIONS FOR THE WEAKENING GRADIENT

In this section I examine two possible explanations for the pattern of weakening gradient among children shown in the previous section: schooling and access to healthcare. That the gradient among children is strongly correlated with the children's being younger than seven or not suggests strongly that schooling may equalize health status across different socioeconomic groups. This possibility has been discussed in West (1997) but not been tested. Access to healthcare providers, especially public one, may also be an equalizing force. In this section validity of the two explanations is investigated in turn.

3.1. Schooling

It is notable that in Figure 1and Table 1 the gradient is much stronger among children younger than the school age-the compulsory primary education in Indonesia starts at age 7-than among the older children. If I divide the sample of children in Table 1 into only two groups, one for those younger than age 7 and the other for the older, and estimate the gradients, I find that the log household income coefficient with Controls 3 is estimated to be -0.036 (standard error = 0.014) for the younger group and -0.008 (0.014) for the older group. It suggests that schooling may have some effects on health gradient.

There are indeed reasons to believe that schooling equalizes children's health status. In the setting of a developing country, children from low-SES families are likely to be exposed to more salubrious environment at school than at home. In addition, they can receive care from teachers at school who are likely to be better informed about healthcare than their parents, and learn how to improve personal hygiene and stay healthy. On the other hand, such benefit on health of schooling is likely to be smaller for children from high-SES families. The asymmetric effects of schooling on children's health by SES may contribute to narrowing the gap in health status among school-aged children of different SES.

In this section whether schooling has such equalizing effect is tested. I divide the children into two groups, one from families whose household income is below the median and the other from families whose household income is above the median. I test whether schooling has a positive effect on health status of children in the low-SES group, while it has little or even a negative effect on health status of children in the high-SES group, as posited above.

For the test to be valid, we should address the following two issues that may confound the test results. First, children's schooling status is likely to be a function of their health status among other factors. Furthermore, the effect of health on schooling

status is likely to be stronger among children from low-SES families than those from high-SES families. To deal with this 'reverse' causality problem, it is desirable to have an instrument variable for children's schooling status which is uncorrelated with their health. Second, unobserved heterogeneity may cause a spurious correlation between health status and schooling status. For example, parental preference may affect overall investment in human capital, including health and education, for the children. Nutritional intake during early childhood, for example, may affect children's education as well as health outcomes.

To deal with those issues in the test, in this section, I deviate from the ordered probit model to a linear probability model with unobserved heterogeneity. The dependent variable is the binary health status variable-good $(=1)$ and poor $(=0)$-derived from the reported health status. It is set to 1 (= good) if the reported health status is very healthy or fairly healthy, and 0 (= poor) if the reported health status is unhealthy or very unhealthy. The model can be written as follows:

$$\Pr(\textit{good health}_{it}) = \alpha I(\textit{attending a school}_{it}) = X_{it}^{'}\beta + Z_i^{'}\gamma + c_i + \varepsilon_{it}, \quad (1)$$

where *i* is the individual index, *t* is the time index, $I(\cdot)$ is the indicator function, X_{it} is the vector of other time-variant explanatory variables such as age, age squared, log household income, dummies indicating parental presence at home, the number of household members, urban dummy, respondent's relationship to the child, and the distance to public and private healthcare providers. Z_i is the vector of individual-specific time-invariant explanatory variables such as the child's sex, the parental education, and the province of residence.[2] The set of explanatory variables is similar to that of the augmented Controls 3 in Table 4 minus the interaction terms.

As discussed before, unobserved heterogeneity c_i is likely to be correlated with the schooling status. To tackle this problem, I apply the fixed effect estimation method to estimate the parameters of Equation (1).[3] Furthermore, the schooling status is instrumented by the median distance from the village to primary schools for children 12 years old or younger and to junior secondary schools for children older than 12. This distance is positively correlated to the cost of attending the school and therefore correlated to children's schooling status. I assume that, controlling for other factors in X_{it} and Z_i, the distance to schools is uncorrelated to children's health status. I also control for median distances to public and private healthcare providers, because the distance to schools may be correlated with them.

[2] The province of residence does not vary over time for observations used for the estimations in this section, because information on the distance to schools is available only for those who have stayed in the original 313 communities of IFLS throughout the three waves.

[3] This prevents the coefficients of time-invariant explanatory variables, γ, from being estimated.

Table 2. Effects of Schooling on Health Status by Socioeconomic Status

	(A) Average Household Income Below Median				(B) Average Household Income Above Median			
	Without IV		With IV		Without IV		With IV	
Variable	Coef.	Std. error	Coef.	Std. error	Coef.	Std. error	Coef.	Std. error
Attending a School	0.028	0.017	0.461	0.154	0.011	0.017	0.592	1.190
Age	0.003	0.009	-0.084	0.033	0.006	0.007	-0.120	0.255
Age Squared	-0.0002	0.001	0.003	0.001	-0.001	0.0004	0.004	0.009
Log Household Income	0.004	0.004	0.004	0.007	-0.014	0.006	-0.022	0.017
Father at Home	-0.026	0.025	-0.017	0.033	-0.011	0.059	-0.045	0.130
Mother at Home	0.003	0.035	-0.034	0.042	0.055	0.068	0.034	0.093
Number of Household Members 0-18 years old	-0.001	0.008	-0.002	0.010	-0.003	0.007	-0.019	0.038
Number of Household Members 19 or older	0.002	0.009	0.002	0.012	0.005	0.005	0.009	0.015
Urban Dummy	0.014	0.045	0.006	0.062	0.059	0.031	0.070	0.069
Respondent's Relationship to the Child								
Father	0.011	0.016	0.017	0.017	0.006	0.014	0.007	0.030
Sibling	0.003	0.025	-0.001	0.030	-0.035	0.025	-0.035	0.056
Aunt/Uncle	-0.049	0.088	-0.074	0.103	0.035	0.047	0.048	0.099
Grand Parents	-0.069	0.050	-0.052	0.059	0.022	0.043	0.032	0.081
Child Self	0.023	0.017	0.084	0.031	-0.010	0.014	0.080	0.176
Other	-		-		-0.009	0.024	0.227	0.435
Med. Distance to Public Healthcare Providers	-0.001	0.002	-0.0003	0.003	-0.0004	0.002	-0.001	0.005
Med. Distance to Private Healthcare Providers	0.002	0.002	0.001	0.003	0.002	0.002	0.003	0.004
Intercept	0.878	0.065	1.037	0.100	0.967	0.096	1.334	0.735
Number of Observations	8328				8046			

Note: Standard errors are computed using the bootstrap procedure with 100 replications.

Table 2 shows the estimation results. Panel (A) shows the results for children from households whose average income over waves 2 and 3 is below the median. Panel (B) shows the results for children from households with the higher average income. Each panel shows two results, one estimated without using the IV and the other estimated using the IV.

The result without using the IV in panel (A) suggests that the probability of children from low-SES households to be healthy increases by about 3 percent with schooling. The coefficient is marginally statistically significant at the 10 percent level (p-value

$= 0.096$). The result suggests, albeit moderately, that schooling has a positive correlation with health status of children from low-SES families. The second result, estimated using the IV, provides the stronger evidence that schooling improves health status of children from low-SES families. The coefficient size of the schooling status dummy variable is much greater and statistically significant at the 1 percent level.[4] At the first stage regression, the distance to school is estimated to be strongly correlated with the schooling status. As expected, the coefficient is negative (-0.014) and statistically significant at any conventional level (standard error $= 0.003$).[5]

For the children from high-SES households, on the other hand, we cannot find any strong evidence that schooling affects their health status. In neither of the estimation results of panel (B) we can reject that the schooling dummy coefficient is equal to zero at any conventional level. The two-stage coefficient estimate is much larger in the magnitude than the coefficient estimated without using the IV, but still statistically insignificant. It should be noted that at the first stage the distance to schools coefficient is estimated to be negative (-0.007) but not statistically significant even at 10 percent level (p-value $= 0.157$). It suggests that the distance to schools is a poor IV for children from high-SES households.

The estimation results of Table 2 point to that schooling improves health status of children of low-SES families, while there is little evidence that it does the same for children of high-SES families. It suggests that in Indonesia equalization of health status through schooling is likely to happen, caused mainly by improvement of health status among children from low-SES families.

3.2. Access to Healthcare Providers

Indonesian healthcare system consists of the large public sector and the growing private sector. There are several kinds of public health centers. The main one is the government health center (*puskesmas*) which numbers more than 7,100. They have permanent staff that includes a doctor and provide the majority of the population with various kinds of medical service. At the lower level, especially in small villages, government health subcenters (*puskesmas pembantu*), integrated health posts (*posyandus*), and other simpler health centers provide villagers with more basic medical service. Not many of them are permanently staffed. Patients are charged small fees which may be waived for those who cannot afford them. Indonesia also has more than 800 public hospitals. They are subsidized by the government, but a significant portion of their revenue is collected from fees charged to their patients. In the private sector, more

[4] In an alternative specification I use age dummies instead of age and squared age variables. Under the specification, the schooling dummy coefficient is 0.33 (p-value $= 0.13$) without the IV and 2.04 (p-value $= 0.096$) with the IV.

[5] The full first-stage result is available upon request.

than 350 private hospitals, mostly owned by social and religious institutions, are in operation. Smaller private healthcare providers such as clinics had more than 50% of share in outpatient care prior the economic crisis in 1997. Revenue of the private healthcare providers mostly come from user fees and a small portion from insurance.[6] Most of private healthcare providers are concentrated in big cities and utilized by the better-off population (Frederick and Worden, 1993; Organization, 2002). Some studies have been done on effects of placement of public healthcare providers on child mortality in Indonesia (Pitt *et al*., 1993; Frankenberg, 1995), but little research on its effect on child health or health gradient.

How can accessibility to healthcare providers affect the gradient? Since in principle anyone can use the public healthcare service for little or no charge, other things being equal, easy and equal access to public healthcare providers is likely to reduce the gradient. On the other hand, easy access to private healthcare providers is likely to increase the gradient. While those who cannot afford the fees will not utilize the private service anyway, those who can will use the service more easily and cheaply if private healthcare providers are nearby.

Such potential effects of accessibility to public and private healthcare providers on the gradient may explain the weakening gradient pattern among children observed in Section 2. In vast rural areas of Indonesia it is easier to access public healthcare providers than to private healthcare providers. This may contribute to weakening the gradient and its effect may be more pronounced among older children than the younger. In this section I examine whether the explanation is empirically valid.

First let us see whether the healthcare utilization pattern indeed differs by socioeconomic status in Indonesia. Table 3 shows the number of children--sum of waves 2 and 3 records--who visited a healthcare institution for outpatient care during four weeks prior to the interview, by household income quartile, age group, and type of the healthcare provider. Public healthcare provider consists of public health centers and hospitals. Private healthcare provider includes private hospitals, clinics, and physicians. The 'other' category includes nurses, midwives, paramedics, and traditional medicine practitioners.

[6] Only an estimated 15% of the Indonesian population has health insurance, the majority of which are employees of the government and large corporations.

Table 3. Number of Visitors to Healthcare Providers for Outpatient Care Last Four Weeks, by Income Quartile, Age, and Healthcare Provider Type: Sum of Waves 2 and 3

Income Quartile	Provider Type	Age group					
		0-3	4-6	7-9	10-12	13-14	All
1st	Public	89 (38.7)	67 (55.4)	46 (55.4)	43 (50.0)	27 (60.0)	272 (48.1)
	Private	56 (24.3)	23 (19.0)	16 (19.3)	19 (22.1)	10 (22.2)	124 (21.9)
	Other	85 (37.0)	31 (25.6)	21 (25.3)	24 (27.9)	8 (17.8)	169 (29.9)
	Total	230	121	83	86	45	565
2nd	Public	172 (44.1)	104 (45.6)	60 (45.1)	53 (46.9)	30 (52.6)	419 (45.5)
	Private	81 (20.8)	49 (21.5)	26 (19.5)	20 (17.7)	12 (21.1)	188 (20.4)
	Other	137 (35.1)	75 (32.9)	47 (35.3)	40 (35.4)	15 (26.3)	314 (34.1)
	Total	390	228	133	113	57	921
3rd	Public	175 (40.9)	104 (43.3)	83 (49.4)	58 (49.2)	43 (57.3)	463 (45.0)
	Private	118 (27.6)	72 (30.0)	40 (23.8)	29 (24.6)	17 (22.7)	276 (26.8)
	Other	135 (31.5)	64 (26.7)	45 (26.8)	31 (26.3)	15 (20.0)	290 (28.2)
	Total	428	240	168	118	75	1029
4th	Public	149 (30.1)	102 (38.1)	80 (38.1)	71 (41.3)	41 (36.0)	443 (35.2)
	Private	207 (41.8)	104 (38.8)	89 (42.4)	72 (41.9)	52 (45.6)	524 (41.6)
	Other	139 (28.1)	62 (23.1)	41 (19.5)	29 (16.9)	21 (18.4)	292 (23.2)
	Total	495	268	210	172	114	1259

Note: In the parentheses are the distributions of healthcare provider types, in percentage points, for the given income quartile and age group.

Table 3 shows three noticeable tendencies in healthcare utilization in Indonesia. First, the number of visitors decreases as children's age increases in a given income quartile. This may be due to improving health status of children by age as is observed in Figure 1. Second, the number of visitors is positively correlated with the household income in any age group and for most types of healthcare providers. Richer households are more likely to afford not only fees but also travel costs than poorer households. Furthermore, they are likely to live closer to private as well as public healthcare providers-for example, in urban areas-than those with lower income, so that their cost of travel can actually be lower than that of low-income households. Third, as household income increases, they resort less to public but more to private healthcare providers. Out of 565 total visitors from households of the lowest income quartile, 48 percent of them are to public, 22 percent to private, and 30 percent to other healthcare providers. As for 1259 total visitors from the highest income quartile, 35 percent are to public, 42 percent to private, and 23 percent to other healthcare providers. It is notable that 72 percent of all visitors to private healthcare providers belong to households whose income is in the upper half, while only 57 percent of all visitors to public healthcare providers is. This confirms that the private healthcare sector caters mainly to individuals of high socioeconomic status, which may affect the gradient in the society in the particular way as discussed above.

I measure the accessibility to public and private healthcare providers by the median distance (in kilometers) to them from the community or village families live in. Due to underdevelopment of public transport and infrastructure, in developing countries long traveling distance incurs sizeable time and monetary costs to individuals, especially those with limited means. The IFLS keeps track of healthcare institutions used by the local population of 313 communities and has information on the distance to the institutions from the village reported by the community leader. Public healthcare providers recorded in IFLS are government health centers and integrated health posts.

The median number of public healthcare providers per community used to obtain the median distance is 7 (308 communities) in wave 2 and 12 (313 communities) in wave 3. The corresponding numbers for private healthcare providers are 12 (313 communities) in wave 2 and 16 (312 communities) in wave 3. The mean of the median distance to public healthcare providers from a community is 3.0-standard deviation is 2.6 in wave 2 and 3.5 in wave 3-in both waves and to private providers is 2.7 (standard deviation $= 2.6$) in wave 2 and 3.9 (standard deviation $= 4.6$) in wave 3.

Urban communities have the greater number of private and public healthcare providers and also have them closer than rural communities. Controlling for the province dummies and the wave dummy, the urban communities, on average, are estimated to have 2 more public and 4 more private healthcare providers than the rural communities. Under the same setup, median distance from an urban community to public healthcare providers is, on average, 2 km shorter and to private healthcare providers 3.2 km shorter than that from a rural community.

To estimate how the distance to public and private healthcare providers affects the gradient, I augment the ordered probit model of Table 1. I add to the model two interaction terms-one between the log household income variable and the median distance to public healthcare providers variable and the other between the log household income variable and the median distance to private healthcare providers variable. The two median distance variables are also added to the model. The estimation results are shown in Table 4. Note that since the distance information is available only for 313 communities where the original IFLS respondents resided in 1993, the sample size used in this section is smaller than that of Table 1.

Table 4 shows the results with two sets of control variables—Controls 2 and 3.[7] For each set of controls two estimates of the gradient are presented, one of the original model (panels A) and the other of the augmented model (panels B). The estimated gradient in Table 4 of the original model for each age group is slightly smaller than its counterpart in Table 1. Yet the weakening pattern of the gradient is clearly present.

[7] The results with Control 1 are almost identical to those with Control 2.

Table 4. Estimated Effects of the Distance to Health Institutions on the Gradient

		Reported Health (1=Very healthy, …, 4=Very unhealthy)				
	Ages	0-3	4-6	7-9	10-12	13-14
	Observations	3777	3396	3543	3746	2658
		Controls 2				
(A)	Log Household Income	-0.06	-0.029	-0.018	-0.014	0.013
		(0.019)	(0.021)	(0.020)	(0.021)	(0.024)
(B)	Log Household Income	-0.039	-0.056	-0.059	-0.036	0.022
		(0.028)	(0.029)	(0.027)	(0.028)	(0.031)
	Med. Distance to Public Institutions ×	-0.003	-0.009	-0.023	-0.011	-0.004
	Log Household Income	(0.006)	(0.007)	(0.007)	(0.008)	(0.008)
	Med. Distance to Public Institutions	0.03	0.088	0.194	0.092	0.036
		(0.051)	(0.059)	(0.055)	(0.065)	(0.064)
	Med. Distance to Private Institutions ×	-0.002	0.011	0.02	0.01	-0.001
	Log Household Income	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
	Med. Distance to Private Institutions	0.009	-0.11	-0.178	-0.085	-0.003
		(0.041)	(0.048)	(0.046)	(0.056)	(0.048)
		Controls 3				
(A)	Log Household Income	-0.044	-0.02	-0.022	-0.003	0.019
		(0.020)	(0.023)	(0.022)	(0.022)	(0.025)
(B)	Log Household Income	-0.036	-0.038	-0.027	-0.014	0.04
		(0.030)	(0.034)	(0.032)	(0.031)	(0.038)
	Med. Distance to Public Institutions ×	-0.003	-0.006	-0.017	-0.009	-0.004
	Log Household Income	(0.007)	(0.008)	(0.008)	(0.008)	(0.010)
	Med. Distance to Public Institutions	0.053	0.117	0.215	0.084	-0.003
		(0.065)	(0.070)	(0.066)	(0.073)	(0.073)
	Med. Distance to Private Institutions ×	0.002	0.009	0.018	0.01	-0.002
	Log Household Income	(0.006)	(0.007)	(0.006)	(0.007)	(0.008)
	Med. Distance to Private Institutions	-0.059	-0.14	-0.209	-0.095	0.022
		(0.056)	(0.060)	(0.056)	(0.065)	(0.056)

Notes: In the parentheses are robust standard errors allowing correlations within the same household. Coefficients are estimated with the right-hand-side variables listed in the note of Table 1.

Now let us examine the estimation results of the augmented model in panels (B). First, all the interaction term coefficients between log household income and median distance to public healthcare providers are estimated to be negative, ranging from -0.003 to -0.023. It implies that the health gradient is stronger where public healthcare providers are farther away than where they are nearby. That is, the closer to public healthcare providers, the weaker the gradient, as posited above. It should be noted, however, that the interaction term coefficient is statistically significant at the 5% level only for the age group 7 to 9. For the other age groups, it is not statistically significant at any popular

level.

Second, the coefficients of the interaction term between log household income and the median distance to private healthcare providers are estimated to be mostly positive. Furthermore, with Controls 2 the coefficient is statistically significant at 6% for the age group 4 to 6, at any level for the group 7 to 9, and at 11% level for the group 10 to 12. With Controls 3, it is statistically significant at a conventional level for the age group 7 to 9. The interaction term coefficient estimates imply, as discussed earlier, that increased accessibility to private healthcare providers tend to increase the gradient.

The estimation results of Table 4 indicate that accessibility to public and private healthcare providers is a determinant of the gradient, especially for age groups 4-6, 7-9, and 10-12. Where public healthcare providers are nearby, the gradient is likely to be weaker. Where private healthcare providers are nearby, the gradient is likely to be stronger. So, everything else equal, the gradient is likely to be weaker in places where public healthcare providers predominate the healthcare sector, for example, in rural villages, than in places where private healthcare providers abound, for example, in urban cities.

Is the accessibility factor responsible for the weakening pattern of the gradient? Unlikely. The weakening pattern is largely untouched, particularly with Controls 3, even when distances to public and private healthcare providers are controlled. Under the assumption that the distances are zero, we still find that the gradient of age groups 10-12 and 13-14 is weaker than that of the younger age groups.

4. CONCLUSION

How the relationship between socioeconomic status and health status of individuals evolves over lifetime and what gives rise to such relationship have long been studied. Most studies have been conducted using adults and among children those from developed countries. In this paper I examine the health gradient of children 14 years old or younger in Indonesia by different age categories. It is found that while the gradient is strong among children younger than 7, the gradient gets weaker and almost disappears as the age increases, before reappearing among adults. This weakening pattern of the gradient among Indonesian children is similar to the gradient pattern found among British and European children, but opposite to that among American and Canadian children.

I have found evidence that that schooling contributes to equalizing health status of children of different socioeconomic background. It is estimated that schooling has a positive impact on health status of low-SES children but little impact on health status of high-SES children. The asymmetric effect of schooling on children's health status by SES explains, at least partly, why the gradient among school-age children is weaker than that among pre-school aged children.

Accessibility to healthcare providers is found to play a significant role in shaping the

gradient. In areas where private healthcare providers are nearby, whose service children from low-SES families may find unaffordable, the gradient among children 4 to 12 years old appears to be stronger than in areas where they are farther away. Being close to public healthcare providers, on the other hand, is found to decrease the gradient. The study finds, however, that this is not likely to explain directly the weakening pattern of the gradient.

The findings of this study shed light on how social conditions can magnify or reduce the gradient. Good public healthcare system is likely to reduce the gradient, while growth of the private sector in healthcare is likely to increase the gradient. At the early stage of economic and social development, expansion of public education can bring health benefits to children from low-SES families. It is likely that, as the general level of hygienic conditions improves, the health benefits of schooling will decrease. These social and public health implications of the findings of this study are derived from the context of developing countries, but more generally applicable.

The current literature on the gradient among children, including this study, provides mixed evidence on how the gradient pattern evolves. In the future research it appears worthwhile to study why the differences occur. It will help us to understand better the mechanism behind the relationship between socioeconomic status and health status of individuals.

Appendix

Appendix Table 1. Means of Variables

Ages	0-3	4-6	7-9	10-12	13-14
Observations	4895	4130	4097	4233	2975
Binary or Discrete Variables (percentages shown)					
Health Status					
Very Healthy	9.17	10.15	10.79	12.28	13.21
Fairly Healthy	77.61	81.33	83.65	81.83	82.12
Unhealthy	13.01	8.40	5.42	5.74	4.64
Very Unhealthy	0.20	0.12	0.15	0.14	0.03
Child's Sex (1=female, 0=male)	49.05	48.81	49.21	48.95	49.61
Urban Dummy (1=urban, 0=rural)	44.72	43.41	40.54	41.93	43.56
Respondent's Relationship to the Child					
Mother	82.12	73.12	66.61	32.93	9.04
Father	12.87	17.60	19.92	12.52	3.66
Sibling	0.94	2.11	4.25	2.76	1.28
Aunt/Uncle	0.84	1.72	1.86	1.18	0.34
Grandparent	3.06	5.25	5.05	2.39	0.87
Child Himself or Herself	0.06	0.19	2.29	48.22	84.77
Other	0.10	0.00	0.02	0.00	0.03

Father's Present at Home (1=present, 0=absent)	90.64	88.47	86.19	84.03	82.02
Mother's Present at Home (1=present, 0=absent)	97.96	94.79	93.14	90.50	88.74
Father's Education Level					
No Formal Education	4.17	5.54	7.08	7.61	8.40
Elementary	37.12	40.34	43.10	44.25	44.81
Junior Secondary	15.24	13.24	12.13	10.75	10.05
Senior Secondary	24.70	20.70	15.99	14.39	12.57
Tertiary or Higher	8.29	7.34	6.49	5.60	4.34
Other or Missing	10.48	12.83	15.21	17.41	19.83
Mother's Education Level					
No formal Education	6.03	8.62	11.74	13.39	14.45
Elementary	44.39	48.55	51.23	50.89	52.03
Junior Secondary	18.10	14.60	12.25	11.36	9.88
Senior Secondary	23.21	17.85	12.94	10.44	8.71
Tertiary or Higher	5.66	4.82	3.88	3.73	2.66
Other or Missing	2.61	5.57	7.96	10.18	12.27
Wave Dummy (1=wave 3, 0=wave 2)	57.08	53.05	52.75	52.30	48.81
Continuous Variables (means shown)					
Log Household Income in 1,000 Rupiah	8.60	8.57	8.56	8.58	8.60
Child's Age	1.57	4.97	8.00	11.00	13.51
Number of Household Members 0 to 18 years old	2.68	2.85	3.08	3.13	3.06
Number of Household Members older than 18	2.89	2.69	2.58	2.62	2.65

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Mailing Address: Cheolsung Park, College of Economics and Finance, Hanyang University, Seoul 133-791, South Korea. Tel: 82-2-2220-2582. E-mail: cheolsung@hanyang.ac.kr.

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