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by

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What Determines the Gradient among Children in Developing Countries? Evidence from Indonesia

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Abstract

I estimate the gradient among children 0 to 14 years old across different age groups using data from Indonesia. I find that while the gradient is strong among the very young, it gets weaker and almost disappears among children older than 6. I find that unequal mortality of children by socioeconomic status depresses the gradient among children 3 years old or younger. I also find evidence that limited access to private healthcare providers decreases the gradient among children 4 to 12 years old. Schooling, on the other hand, is found to have a positive impact on health status of children from low-SES families but little impact on health status of high-SES children. It weakens the gradient among school-age children.

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1 Introduction

The strong correlation between individuals' health status and socioeconomic status (SES)—the 'gradient'—among adults is well documented (e.g., Smith 1999). Less known is the gradient among children and youth, although knowledge of it 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. Second, it can help us to find the factors that further or hinder intergenerational mobility. Health and other types of human capital investment are likely to be strongly correlated. Therefore, intergenerational transmission of health inequality, indicated by a strong gradient among children and youth, may be a potential impediment to social mobility.

In the current literature on this issue there seems little dispute that a strong gradient exists among pre-school aged children, but for older children the evidence conflicts. Recent works by 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.

On the other hand, drawing mainly from British and European studies and data, West (1997) shows an almost opposite picture of the gradient among children. He presents evidence that, for most common health status indicators except for severe chronic illness, the gradient is much weaker among children between ages 10 and 19 than among the younger ones. His evidence indicates that the gradient becomes nonexistent among youths before it 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 twofold. First, it extends the literature by supplying new evidence from a developing country. So far most research has been done on developed countries. Second, it examines mechanisms that may underlie the evolving gradient pattern among the children and youth. I concentrate on those that can be studied better in the context of developing countries, but are general enough to be applied to other societies. For the developed countries, the different degree of development in the society and the healthcare system may be considered as a counterfactual.

I use data from waves 1, 2 and 3 of the Indonesian Family Life Survey (IFLS). I examine the gradient among children 0 to 14 years old, using a method similar to that of Case et al. (2002). The finding indicates that while a strong gradient exists among infants and pre-school aged children, it all but disappears among children older than 6. The gradient reemerges among individuals older than 16 years. The findings are comparable to those of West (1997).

I examine three factors that may explain the weakening gradient among children in Indonesia—unequal attrition by SES due to child mortality, accessability to public and private healthcare providers, and impacts of schooling on children's health. I find evidence that attrition weakens the gradient among children under age 4, but not for older children. For the older children the other two factor are found to be more important. An easy access to private healthcare providers is found to increase the gradient among children 4 to 9 years old. So in many underdeveloped areas where few private healthcare providers operate the gradient is likely to be weak. Schooling, on the other hand, is found to have 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 weakens the gradient among school-age children.

2 The Gradient among Children in Indonesia

The data come from the waves 1, 2 and 3 of the Indonesian Family Life Survey (IFLS) fielded in 1993, 1997 and 2000. The observations are pooled together. Wave 2 and 3 data are mostly used, because wave 1 has no information on subjective health status of children. Ages of the children range from 0 to 14.

To investigate the gradient among the children, we use two health status measures. 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 for the waves 2 and 3. The other measure is the child's acute health problem symptoms such as fever, breathing difficulties, stomachache, etc.

[Figure 1 here.]

Figure 1 shows the relationship between health status and log household income among children by age group. Each plot is drawn using locally weighted scatter plot smoother. The graph shows two clear patterns. First, in the most income range, overall reported health status improves as the age increases. The almost monotonic improvement is interrupted only by age group 7 to 9 in the higher income range. Second, the gradient appears to get weaker as the age increases. For age groups 0 to 3 and 4 to 6, the negative relationship between the reported health status 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, it is flat in most areas, and even positively sloped over some range.

It is notable that what is shown in Figure 1 is a stark different picture from what Case et al. (2002) observe among American children and Currie and Stabile (2003) among Canadian children. They find 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, Figure 1, p. 1311). Figure 1 is rather similar to what West (1997) observes among British children (Figure 1, p. 839).

[Figure 2 here.]

Figure 2 shows the plots of the gradient among individuals aged 15 or older. It shows that the gradient, which seems to disappear for 7 to 14 year old children, reappears among adults. For the age group 15 to 19, the gradient is still mostly flat, but overall negatively sloped. For the age group 20 to 29, the gradient appears to have an inverted U shape, still it is negatively sloped in most income range. For the older age groups, the negative gradient is unmistakable. Reappearance of the gradient after a spell of equalization among youth is also observed by West (1997).

Figures 1 and 2 indicate equalization of health status among children 7 to 14 years old followed by reappearance of the gradient among the older age groups. One may question, however, whether the subjective summary health measure is really comparable across individuals, especially from different socioeconomic backgrounds. It is possible that a child of high SES, who would be reported to be in good health had the child been from 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. Is this responsible for apparently weakening gradient in Figure 1?

[Figure 3 here.]

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. Note that the proportion of children suffering from various symptoms, except for headache, generally declines 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.

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 here.]

Table 1 shows the ordered probit estimates with three different sets of controls—labelled Controls 1, 2, and 3—of the relationship between children's reported health status and log household income—adjusted by the price level in 1999—by age groups[1]. Note that the results confirm what is shown in Figures 1 and 3. The estimation results indicate that, with a minor exception in Controls 3, the older the children are, the smaller the magnitude of the log household income coefficient or the gradient. 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 statistically significant at the 6 percent level with Controls 2 and 3, but not even at the 10 percent level with Controls 3. For 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, suggesting that the estimated gradient in children's health status is little affected by the respondent's identity. Under the specification of Controls 3 the father's education seems to have a significant impact on health status of children 4 to 6 years old, but little impact on children of other age groups. It is a bit surprising that the mother's education seems to have insignificant effect on children's health. It may be due to that the father's and the mother's education 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. Controlling for the parents' education tends to reduce the magnitude of the estimated gradient across the age groups, but it does not change the overall pattern of the weakening gradient over the children's ages.

All in all, the examinations of the data from Indonesia indicate that the gradient among children 0 to 14 years old is strong initially but weakens over the ages. For children aged between 7 to 14, children's health status does not appear to have anything to do with economic status of the family. The gradient then reappears strongly among adults. This pattern is similar to that found among British children but opposite to that among American or Canadian children. What explains this pattern of weakening gradient?

3 What Explains the Weakening Gradient Pattern?

There can possibly be many explanations, but in this section I focus on those that can be studied better, if not only, in the setting of a developing country than of a developed country. The focus on those explanations serve two purposes. One is to identify factors that have not been studied in the previous research on developed countries and are likely to be useful in understanding general situations in developing countries. The other is to understand better the mechanisms that give rise to the gradient by using the situations in developing countries as 'counterfactuals' to those in developed countries. For example, one may hypothesize that differences in the quantity and the quality of medical care individuals receive explain the gradient. The hypothesis cannot be easily tested in developed countries where there is little exogenous—for example, geographical—variation in accessibility to medical care providers. In developing countries, on the other hand, there is larger variations in it which can be exploited to test the hypothesis.

Here I examine three possible explanations in turn for the pattern of weakening gradient in Indonesia: unequal attrition of children by socioeconomic status, generally limited access to healthcare service providers, and possibly equalizing effect of schooling. The first factor, attrition, may weaken the gradient, because children in poor health are more likely to die in low-SES households than in high-SES households. The negative relationship between child mortality and SES is observed in almost any society (e.g. Finch 2003), but it may be stronger in countries where the child mortality rate is high. In such countries like Indonesia, living children from low-SES families are likely to be more robust innately than their counterparts from high-SES families. It may lead to weakening gradient pattern among children, if the innate health status has strong long-term effects on individuals' health.

The second possible explanation is limited access to healthcare service providers. The positive relationship between the SES and children's health may arise (partly) because the SES makes a difference in the quality and the quantity of health service purchased for the children. If, however, the health service market, especially one that serves for children beyond infancy, is underdeveloped and access to it is limited regardless of SES, medical care the children receive may not differ significantly by SES. Then the children's health status may equalize over time.

The third possible explanation to be examined in this section is the equalizing effect on children's health of school environment. This is motivated by the observation in Table 1 that the gradient is significantly weaker among school-aged children than among infants and preschoolers. The children from low-SES families, especially in developing countries with a low hygiene standard, are likely to be exposed to the environment more salubrious in school than at home. Children from high-SES families, on the other hand, may not experience such benefit from changes in environment. Therefore, it may result in equalization of the health status among school-aged children.

Now let us examine one by one whether the three explanations hold in the data.

3.1 Attrition due to Child Mortality

Child mortality rate in Indonesia is high. According to the World Bank, Indonesia's under-five mortality rate (U5MR) in 2002 was 43 per 1,000 live births, while in the USA and Canada it was 8 and 7 respectively. In 2002 Indonesia's infant mortality rate (IMR) was 32 per 1,000 live births, while the USA's and Canada's was 7 and 5[2]. The IMR and the U5MR of Indonesia at the time when the IFLS data were collected, in 1993, 1997, and 2000, were even higher. According to the Indonesia Bureau of Statistics (*Badan Pusat Statistik* or BPS), the IMR was 66, 52, and 46 and the U5MR was 93, 71, and 60 in years 1994, 1997, and 1999[3].

As in most developing as well as developed countries, Indonesian child mortality has a negative relationship with the family's socioeconomic status. Gwatkin et al. (2000) estimate that in 1997 IMR of the poorest 20 percent in household wealth in Indonesia was 78, while that of the richest 20 percent was 23. They estimate U5MR for the two groups to be 109 and 29 respectively. Using the IFLS data, we can examine the relationship between child mortality and SES more in detail.

[Table 2 here.]

Table 2 shows the (unweighted) percentages of children who are reported to be dead between IFLS interviews, that is, in three to four year period, by age and by household income. Overall, as expected, child mortality is negatively correlated with the household income. Among the children interviewed in waves 1 and 2, 0.7 percent of children in households whose household income is below the median are reported to be dead by the next interview, while 0.4 percent of children in above-the-median-income households are. The difference is found to be statistically significant at the 5 percent level. The difference seems to be narrower in wave 2 than in wave 1 and statistically insignificant in wave 2[4]. As expected, child mortality occurs mostly among the very young. In below-the-median-income households, 3.4 percent of children aged 0 at either the wave 1 or the wave 2 interview are reported to be dead by the time of the next interview. The percentage decreases with age—2.1 percent for the one-year-old children, 1.6 percent for the two-year-old children, and below 1 percent for those older than two. As for the better-off children, the pattern is same, but with a lot lower mortality rate which seldom exceeds 1 percent at any age. Statistical test results reported in Table 2 show that there is a significant difference in child mortality rate across SES among the very young, but not among those older than two years. Statistical tests reject, at the 5 percent level among all and at the 10 percent among those interviewed in wave 2, equality of child mortality rates between the below-the-median-income and the above-the-median-income households for children younger than three years. For the older children, however, the equality hypothesis is never rejected at any conventional level.

It suggests that if there is any effect of attrition due to child mortality on the gradient in child health, the difference is made mainly in the first couple years of children's lives. It should be noted, however, that the effect of attrition on the gradient could be far reaching beyond the first two years. Inborn frailty may play an important role in determining children's health status as children get older. Furthermore, since in the cross-section older children have been subjected to the higher chance of child mortality than their younger counterparts in the early stage of their lives, the impact of attrition could be stronger among older children than younger ones.

I investigate how big a role attrition plays in determining the gradient, exploiting that there are substantial regional variations in child mortality in Indonesia. BPS statistics show that in 1999 provincial IMR ranged from 24 (DKI Jakarata) to 81 (Nusa Tenggara Barat) and provincial U5MR from 29 (DKI Jakarata) to 114 (Nusa Tenggara Barat). The variation was even wider in the past. Across the thirteen provinces where the IFLS was originally conducted in 1993, I find that the unweighted mean and variance of provincial U5MRs are 100 and 1764 in 1990, 86 and 1078 in 1994, 71 and 910 in 1997, and 58 and 542 in 1999.

Significant inter-provincial differences in child mortality can also be seen in the IFLS data. I run a probit regression of a child's mortality between interviews on the child's log household income, age dummies, sex dummy, urban/rural dummy, log household size, a dummy indicating the father's presence at home, the parents' education level dummies, interview year dummy, and dummies indicating the provincial U5MR in the year of interview. The province-year with the lowest U5MR (DI Yogyakarta-1997) is excluded from the U5MR dummies. I find that for the age group 0–2 each of the U5MR dummy coefficients is estimated to be positive and statistically significant at the 1 percent level and that the dummy coefficients are jointly statistically significant at the 1 percent level. For the older age groups, the U5MR dummy coefficients are not statistically significant jointly or separately at any conventional level.

If mortality heavily affects the gradient and its cross-sectional pattern across ages, given such a large variation in child mortality across provinces, it is likely that the gradient in low-mortality provinces differs significantly from that in high-mortality provinces. To examine whether it is the case, I augment the children's health status equations estimated in Table 1 by including interaction terms between the province-year U5MR rank dummies and the log household income variable in the equations, and test whether the interaction term coefficients are jointly significant. The U5MR rank dummies are constructed in the following way. First, to each age group in each wave is matched the provincial under-five mortality rate in the year when the children in the group are 5 years or younger[5]. Second, within an age group the province-year U5MR is ranked from the lowest to the highest. Then the first in the rank—province-year with the lowest U5MR—being excluded, a dummy variable is generated for each rank. For each age group the number of U5MR rank dummies ranges between 22 and 25.

[Table 3 here.]

Table 3 reports the augmented ordered probit regression results for the specification Controls 3. Results for specifications Controls 1 and Controls 2 are similar to those reported in the table and omitted for brevity. For each of the first three age groups, the gradient in health among children with the lowest U5MR province-year, although imprecisely estimated for age groups 4–6 and 7–9, is estimated to be much steeper than the 'average' gradient estimated in Table 1. The difference appears to be the largest for the children aged 0 to 6—the gradient among those with the lowest U5MR province-year is estimated to be about four times as large as the average gradient. For the three young age groups, furthermore, most coefficients of the interaction terms are estimated to be positive. That is, high child mortality rate seems to depress the observed gradient among living children aged 0 to 8.

For the age groups 10 to 12 and 13 to 14, on the other hand, the estimated gradient among children with the lowest U5MR province-year is positive and statistically insignificant at any conventional level. Moreover, with only a few exceptions, the interaction term coefficients are negative. So it seems that for children older than eight years high child mortality does not decrease but increases the gradient. For the 13 to 14 age group, it is notable that the interaction term coefficient is strongly significant for the 2nd and 3rd U5MR rank dummies, suggesting that in those relatively low child mortality environment, the gradient is greater for that age group.

Joint tests of the interaction terms indicate that child mortality makes a significant difference in the gradient among 0-to-3-year-old and 13-to-14-year-old children—the interaction term coefficients are jointly statistically significant at the 5 percent level. In the latter group, however, it is largely due to the first two interaction term coefficients, while in the former group, many interaction term coefficients are statistically significant on their own. The evidence indicates that while attrition due to mortality weakens the gradient among children 0 to 3 years old, it has little effect on the gradient among the older children.

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. Many of them are not staffed permanently. 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 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 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, World Health Organization 2002).

How can accessability 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 accessability 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.

[Table 4 here.]

First let us see whether the healthcare utilization pattern indeed differs by socioeconomic status in Indonesia. Table 4 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.

Table 4 shows three noticeable tendencies in healthcare utilization in Indonesia. First, the number of visitors is positively correlated with the household income in any age group and for most types of healthcare providers. This is likely due to the income effect on healthcare utilization. Furthermore, households with higher income 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 accessing healthcare providers can actually be lower than that of low-income households. Second, the number of visitors decreases as children’s age increases in a given income quartile. This is consistent to the observation in Figure 1 that the overall health status improves as the children’s age increases. 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 healthcare providers and 22 percent to private. As for visitors from the highest income quartile, 35 percent to public and 42 percent to private. It is notable that 72 percent of all visitors to private healthcare providers belong to households whose income is in the upper half. 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 accessability to public and private healthcare providers by the median distance 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.

The data shows that the urban communities have the greater number of private and public healthcare providers and also have them closer than the 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 5. 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 5 here.]

Table 5 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 5 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.

Now let us examine the estimation results of the augmented model in panels (B). First, it is notable that the estimated magnitude of the log household income coefficients is greater than that of the original model for ages 4 to 12. It suggests that the gradient is likely to be higher where both public and private healthcare providers are nearby than where they are farther away. The coefficients are, however, statistically insignificant at any conventional level except for the age group 7 to 9 with controls 2.

Second, 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. The coefficient size implies that as the median distance to public healthcare providers shortens by 1 km, the positive effect of a 1% increase in household income on the probability of a child being very healthy decreases by 0.1 to 0.4 percentage points at the mean. This is consistent to the proposition that the easier the access to public healthcare providers, the weaker the gradient. 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.

Third, 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 accessability to private healthcare providers tend to increase the gradient

The estimation results of Table 5 indicate that accessibility to public and private healthcare providers is a determinant of the gradient. 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. The estimation results suggest that the accessability factor depresses the gradient estimates for ages 4 to 12 and contributes to shaping the weakening gradient pattern in Indonesia. The influence of accessability to healthcare providers on the gradient seems to be the greatest for the age group 7 to 9.

3.3 Schooling and the Gradient

It is noticeable that in Figure 1 and Table 1 the gradient is much stronger among children younger than the compulsory primary school age—age 7—than among the older children. If I divide the children into two groups, younger than age 7 and 7 or older, the estimated coefficient of the log household income with Controls 3 is -.036 (standard error = .014) for the younger group and -.008 (.014) for the older. One may infer from it that schooling lowers the gradient. However, the evidence does not imply that the structural break in the gradient happens at age 7. Furthermore, the gradient coefficient estimates show a clearly decreasing pattern even before age 7. Table 1 shows that the coefficient estimates of the log household income variable for ages 4 to 6 are lower than those for ages 0 to 3 by 30 to 40 percent in magnitude.

Nevertheless, equalizing effect of schooling on children's health status may indeed exist. 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 health care than their parents. On the other hand, children from high-SES families are not likely to get such health benefits from schooling. The asymmetric effects of schooling on children's health by SES may contribute to weakening the gradient among school-aged children.

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 and while it has little or even a negative effect on health status of children in the high-SES group.

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, parents' preference may affect overall investment in human capital, including health and education, for the children. Nutritional intake during early childhood may affect children's cerebral as well as other physical development.

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:

$$\Pr(\text{good health}_{it}) = \alpha I(\text{attending a school}_{it}) + \mathbf{X}'_{it}\boldsymbol{\beta} + \mathbf{Z}'_{i}\boldsymbol{\gamma} + c_i + \varepsilon_{it}, \tag{1}$$

where i is the individual index, t is the time index, $I(\cdot)$ is the indicator function, $\mathbf{X}_{it}$ is the vector of other time-variant explanatory variables such as age, age squared, log household income, dummies indicating parents' 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. $\mathbf{Z}_i$ is the vector of individual-specific time-invariant explanatory variables such as the child's sex, the parents' education, and the province of residence[8]. The set of explanatory variables is similar to that of the augmented controls 3 in Table 5 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)[9]. 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 correlated to the cost of attending the school and therefore children's schooling status. I assume that, controlling for other factors in $\mathbf{X}_{it}$ and $\mathbf{Z}_i$, the distance to schools is uncorrelated to children's health status.

[Table 6 here.]

Table 6 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 first result 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 indeed a positive effect on health status of children from low-SES families. The second result, estimated using the IV, provides even stronger support for it. The coefficient size of the schooling status dummy variable is much greater and statistically significant at the 1 percent level[10]. 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).

For the children from high-SES households, on the other hand, we cannot find any 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.

All in all the estimation results of Table 6 point to that schooling equalizes health status among children. It appears that in Indonesia equalization through schooling is caused mainly by improvement of health status among children from low-SES families. Schooling seems to have little effect on health status of children from high-SES families.

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 adult populations. In this paper I study how the gradient among children 14 years old or younger in Indonesia shapes in 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 high mortality of unhealthy infants and toddlers from low-SES families depresses the gradient among children 3 years old or younger, but not among the older. Evidence indicates that among the older children accessability to healthcare providers and schooling play significant roles 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. In many underdeveloped ares of Indonesia where few private healthcare providers operate, the gradient is, therefore, likely to be weak. Schooling, on the other hand, is found to have a positive impact on health status of low-SES children but little impact on health status of high-SES children. This should contribute to weakening the gradient among school aged children.

The findings of this paper shed light on how social conditions can magnify or reduce the gradient. A bit ironically, improved prenatal and postnatal care for mothers and infants, which will reduce the child mortality rate, may increase the gradient among young children. 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 improve, 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 quite conflicting evidence on how the gradient pattern evolves. In the future research it looks worthwhile to atudy why the differences occur. It will help us to understand better the mechanism behind the relationship between socioeconomic status and health status of individuals.

Notes

[1]The means of variables of each age group are shown in Appendix Table 1.

[2]The figures, as of October 2004, are reported in http://www.worldbank.org/data/.

[3]The figures, as of October 2004, are found in http://www.bps.go.id/sector/population/table5.shtml.

[4]One may question why the child mortality rate reported in Table 2 is far lower than the national average. There are two reasons. First, the figures in Table 2 are the percentages of children reported to be dead by the next interview among those who were *alive* and interviewed in waves 1 or 2. Children who were born but died soon after or within a couple of years after birth during the intervening time between the interviews—three to four years—are not counted in Table 2. It certainly makes the child mortality rate for the very young, aged zero to three or four, underreported in Table 2. Underreporting by this reason is likely to be more severe among low-SES households than high-SES households so that the child mortality gap across SES is likely to be *underestimated* in Table 2. Second, villages or areas in Indonesia that were not covered by the IFLS because of remoteness or poor accessability may be areas where the child mortality rate is very high.

[5]To the children aged 0–5 interviewed in wave 2 (year 1997) provincial U5MR in 1997 is matched. To those aged 6–8, 9–11, and 12–14 in wave 2, provincial U5MR in 1994, 1990, and 1988 is respectively matched. To those aged 0–5, 6–8, 9–11, and 12–14 in wave 3 (year 2000), provincial U5MR in 1999, 1997, 1994, and 1990 is respectively matched. The matchings are done based on the province the children reside in at the time of interview.

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

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

[8]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.

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

[10]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.

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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	-.066	-.039	-.023	-.007	-.004
	(.017)	(.019)	(.019)	(.020)	(.023)
	Controls 2:				
Log household income	-.066	-.037	-.021	-.007	-.004
	(.017)	(.019)	(.019)	(.020)	(.023)
	Controls 3:				
Log household income	-.043	-.030	-.023	.000	-.001
	(.018)	(.021)	(.020)	(.021)	(.024)
Father's education					
1–6 years	-.146	-.180	.096	-.019	-.030
	(.085)	(.097)	(.091)	(.078)	(.102)
7–9 years	-.150	-.216	.136	-.148	.002
	(.096)	(.111)	(.109)	(.098)	(.133)
10–12 years	-.161	-.175	.144	-.180	-.055
	(.096)	(.111)	(.114)	(.107)	(.134)
13 years or more	-.344	-.116	.158	-.147	.076
	(.120)	(.135)	(.149)	(.140)	(.188)
Missing	.027	.128	.001	-.279	-.107
	(.209)	(.215)	(.210)	(.200)	(.205)
Mother's education					
1–6 years	.134	-.002	.022	.033	.059
	(.083)	(.088)	(.075)	(.067)	(.081)
7–9 years	.103	-.012	-.006	.050	-.015
	(.095)	(.104)	(.098)	(.091)	(.125)
10–12 years	.002	-.088	-.076	.072	-.119
	(.099)	(.111)	(.108)	(.105)	(.130)
13 years or more	.072	-.026	-.027	-.029	.165
	(.136)	(.150)	(.159)	(.145)	(.200)
Missing	-.029	-.255	.172	.142	.245
	(.182)	(.376)	(.203)	(.252)	(.291)

Note: 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 2: Percentage of children who died before the next IFLS interview

	Waves 1 and 2			Wave 2		
	Household income			Household income		
Age at interview	below the median (p_1)	above the median (p_2)	p-value for $H_0 : p_1 = p_2$	below the median (p_1)	above the median (p_2)	p-value for $H_0 : p_1 = p_2$
0	3.39	0.67	0.005	2.87	0.79	0.089
1	2.10	0.94	0.138	2.04	1.27	0.469
2	1.57	0.18	0.013	1.63	0.32	0.099
3	0.45	0.18	0.446	0.78	0.00	0.142
4	0.78	0.32	0.294	0.00	0.57	0.184
5	0.62	0.69	0.903	0.33	0.62	0.606
6–8	0.19	0.32	0.455	0.22	0.28	0.786
9–11	0.06	0.15	0.410	0.00	0.19	0.175
12–14	0.45	0.41	0.881	0.48	0.48	0.988
0–14	0.68	0.42	0.016	0.60	0.50	0.476
Obs.	8708	10632	–	5321	6355	–

Table 3: Impacts of child mortality difference on the gradient: Ordered probit estimates of province-year U5MR rank × log household income coefficients

	Reported health (1=Very healthy… 4=Very unhealthy)				
Ages	0–3	4–6	7–9	10–12	13–14
Observations	4895	4130	4096	4233	2975
	Controls 3:				
Log household income	-.179	-.124	-.053	.132	.021
	(.080)	(.110)	(.187)	(.120)	(.140)
Log household income	.254	-.003	.024	-.211	-.394
×2nd U5MR rank dummy	(.109)	(.149)	(.254)	(.169)	(.198)
Log household income	.184	-.028	.151	-.122	-.384
×3rd U5MR rank dummy	(.133)	(.175)	(.250)	(.176)	(.179)
Log household income	.110	.331	.074	-.159	.135
×4th U5MR rank dummy	(.121)	(.157)	(.247)	(.141)	(.174)
Log household income	.283	.073	-.088	.058	-.093
×5th U5MR rank dummy	(.149)	(.162)	(.210)	(.147)	(.309)
Log household income	.140	.197	.222	-.135	-.065
×6th U5MR rank dummy	(.089)	(.137)	(.215)	(.201)	(.268)
Log household income	.295	.141	-.108	.029	.071
×7th U5MR rank dummy	(.084)	(.139)	(.198)	(.155)	(.178)
Log household income	.107	-1.293	.388	.038	-.048
×8th U5MR rank dummy	(.127)	(.585)	(.229)	(.185)	(.196)
Log household income	.113	-.369	.115	-.242	-.006
×9th U5MR rank dummy	(.103)	(.283)	(.206)	(.143)	(.164)
Log household income	-.095	.002	.040	-.168	.039
×10th U5MR rank dummy	(.152)	(.183)	(.207)	(.145)	(.176)
Log household income	.213	.023	-.044	-.151	.122
×11th U5MR rank dummy	(.095)	(.131)	(.208)	(.154)	(.152)
Log household income	.183	.304	-.119	-.602	-.117
×12th U5MR rank dummy	(.102)	(.185)	(.220)	(.678)	(.171)
Log household income	.098	.053	.156	-.275	-.020
×13th U5MR rank dummy	(.107)	(.130)	(.274)	(.148)	(.156)
Log household income	.310	.321	-.043	-.194	.071
×14th U5MR rank dummy	(.119)	(.155)	(.245)	(.136)	(.164)
Log household income	.105	.166	.004	.018	-.085
×15th U5MR rank dummy	(.092)	(.135)	(.200)	(.140)	(.157)
Log household income	.085	.227	-.093	-.087	-.159
×16th U5MR rank dummy	(.133)	(.171)	(.202)	(.200)	(.186)
Log household income	.176	-.020	.121	-.152	.144
×17th U5MR rank dummy	(.106)	(.130)	(.203)	(.142)	(.176)
Log household income	.087	.148	.036	-.078	-.010
×18th U5MR rank dummy	(.101)	(.145)	(.193)	(.139)	(.160)
Log household income	.122	.124	.057	-.205	-.034
×19th U5MR rank dummy	(.138)	(.133)	(.236)	(.142)	(.139)
Log household income	.115	.305	.181	-.088	-.159
×20th U5MR rank dummy	(.134)	(.166)	(.198)	(.135)	(.161)

(*Continued to the next page*)

Table 3: Impacts of child mortality difference on the gradient: Ordered probit estimates of province-year U5MR rank × log household income coefficients (continued)

	Reported health (1=Very healthy... 4=Very unhealthy)				
Ages	0–3	4–6	7–9	10–12	13–14
Observations	4895	4130	4096	4233	2975
Controls 3:					
(*Continued from the previous page*)					
Log household income	.114	.096	-.050	.059	-.153
×21st U5MR rank dummy	(.129)	(.127)	(.201)	(.172)	(.175)
Log household income	.180	.044	.026	.023	-.001
×22nd U5MR rank dummy	(.090)	(.137)	(.226)	(.170)	(.257)
Log household income	-.021	.083	.084	-.199	.083
×23rd U5MR rank dummy	(.125)	(.117)	(.216)	(.131)	(.156)
Log household income	.076	.147	.095	-.031	-.072
×24th U5MR rank dummy	(.125)	(.131)	(.291)	(.205)	(.160)
Log household income	–	.109	-.117	-.116	-.015
×25th U5MR rank dummy		(.183)	(.223)	(.165)	(.168)
Log household income	–	.181	-.246	-.179	–
×26th U5MR rank dummy		(.203)	(.253)	(.171)	
Log household income	–	.146	.139	-.161	–
×27th U5MR rank dummy		(.115)	(.193)	(.149)	
Log household income	–	.162	.016	-.174	–
×28th U5MR rank dummy		(.130)	(.195)	(.132)	
Log household income	–	.076	.046	-.073	–
×29th U5MR rank dummy		(.139)	(.187)	(.137)	
Log household income	–	.143	-.132	-.246	–
×30th U5MR rank dummy		(.152)	(.272)	(.159)	
Log household income	–	.136	-.038	-.143	–
×31st U5MR rank dummy		(.165)	(.199)	(.134)	
Log household income	–	-.089	.001	-.162	–
×32nd U5MR rank dummy		(.143)	(.230)	(.161)	
Log household income	–	-.052	.159	-.241	–
×33rd U5MR rank dummy		(.180)	(.214)	(.155)	
Log household income	–	-.053	-.049	-.187	–
×34th U5MR rank dummy		(.194)	(.221)	(.160)	
Log household income	–	–	-.033	-.108	–
×35th U5MR rank dummy			(.211)	(.167)	
Log household income	–	–	-.060	–	–
×36th U5MR rank dummy			(.283)		
Joint test of the interaction terms (*p*-value)	.000	0.190	0.196	0.470	0.014

Note: In the parentheses are robust standard errors allowing correlations within the same household. For the list of other control variables, refer to the Note to Table 1.

Table 4: 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 5: 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	-0.060	-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	0.030	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	0.020	0.010	-0.001
	Log household income	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
	Med. distance to private institutions	0.009	-0.110	-0.178	-0.085	-0.003
		(0.041)	(0.048)	(0.046)	(0.056)	(0.048)
		Controls 3:				
(A)	Log household income	-0.044	-0.020	-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	0.040
		(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	0.010	-0.002
	Log household income	(0.006)	(0.007)	(0.006)	(0.007)	(0.008)
	Med. distance to private institutions	-0.059	-0.140	-0.209	-0.095	0.022
		(0.056)	(0.060)	(0.056)	(0.065)	(0.056)

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

Table 6: 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	
Variables	Coef.	Std. error	Coef.	Std. error	Coef.	Std. error	Coef.	Std. error
Attending a school	.028	.017	.461	.154	.011	.017	.592	1.190
Age	.003	.009	-.084	.033	.006	.007	-.120	.255
Age squared	-.0002	.0005	.003	.001	-.001	.0004	.004	.009
Log household income	.004	.004	.004	.007	-.014	.006	-.022	.017
Father at home	-.026	.025	-.017	.033	-.011	.059	-.045	.130
Mother at home	.003	.035	-.034	.042	.055	.068	.034	.093
Number of hh members 0-18 years old	-.001	.008	-.002	.010	-.003	.007	-.019	.038
Number of hh members 19 or older	.002	.009	.002	.012	.005	.005	.009	.015
Urban dummy	.014	.045	.006	.062	.059	.031	.070	.069
Respondent's relationship to the child								
Father	.011	.016	.017	.017	.006	.014	.007	.030
Sibling	.003	.025	-.001	.030	-.035	.025	-.035	.056
Aunt/Uncle	-.049	.088	-.074	.103	.035	.047	.048	.099
Grand parents	-.069	.050	-.052	.059	.022	.043	.032	.081
Child self	.023	.017	.084	.031	-.010	.014	.080	.176
Other	–		–		-.009	.024	.227	.435
Med. distance to public healthcare providers	-.001	.002	-.0003	.003	-.0004	.002	-.001	.005
Med. distance to private healthcare providers	.002	.002	.001	.003	.002	.002	.003	.004
Intercept	.878	.065	1.037	.100	.967	.096	1.334	.735
Number of observations	8328				8046			

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

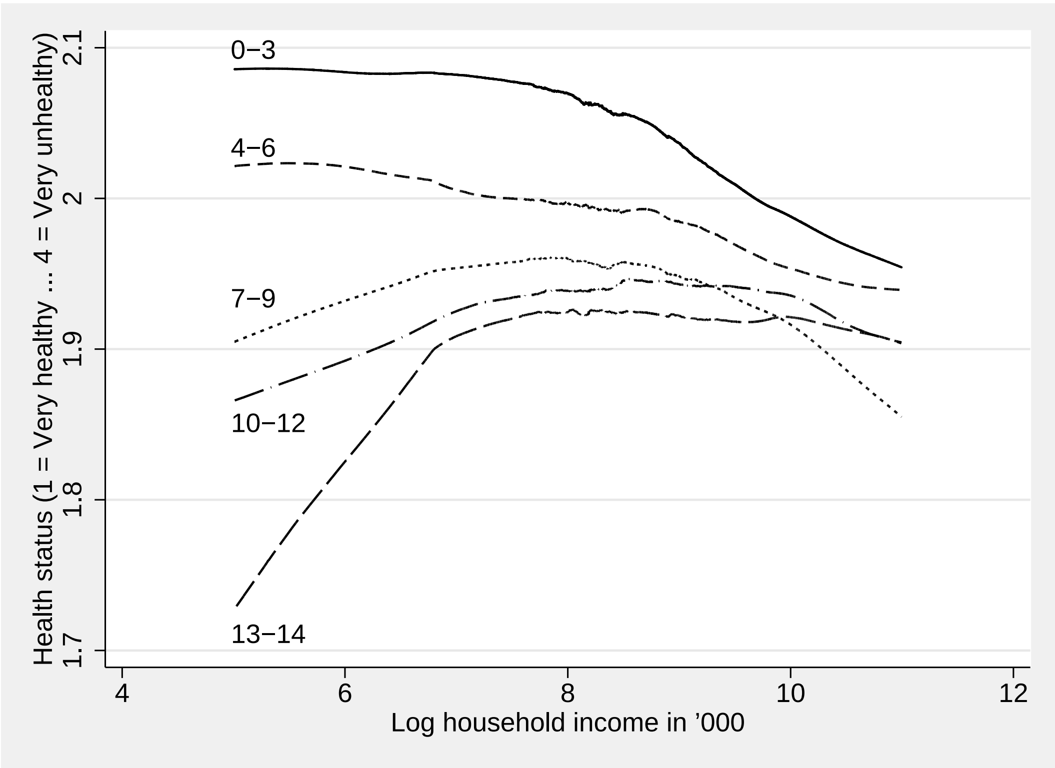

Figure 1: Relationship between health status and log household income among children by age group, ages 0 to 14

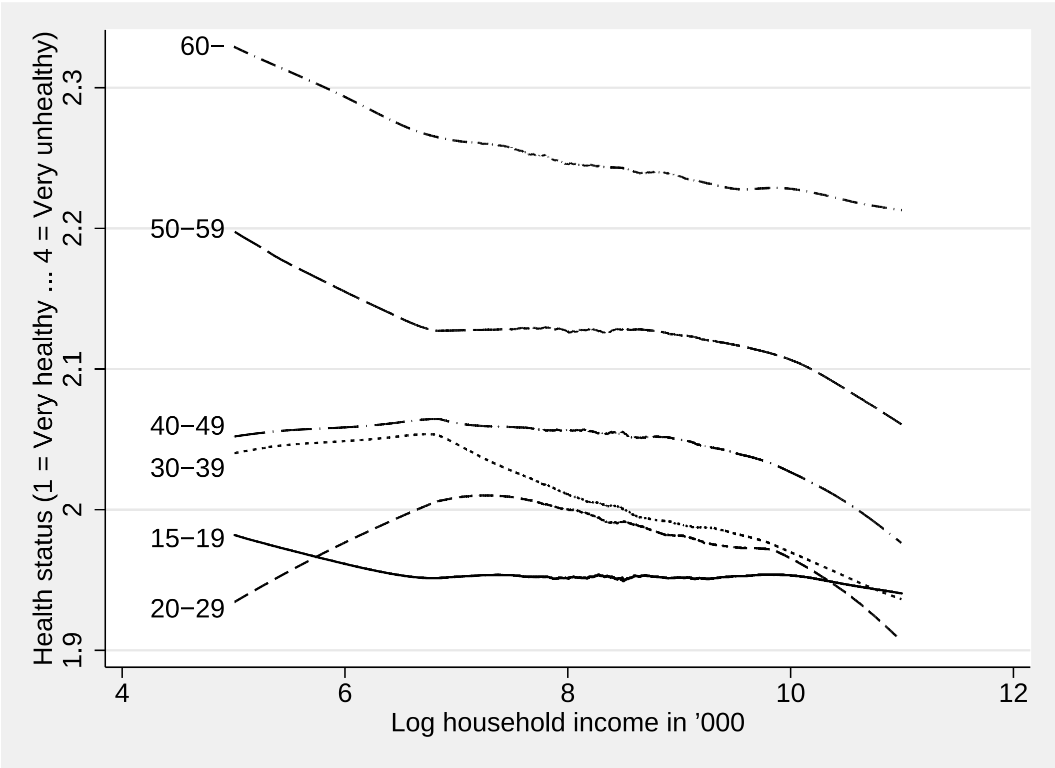

Figure 2: Relationship between health status and log household income among adults by age group, ages 15 and higher

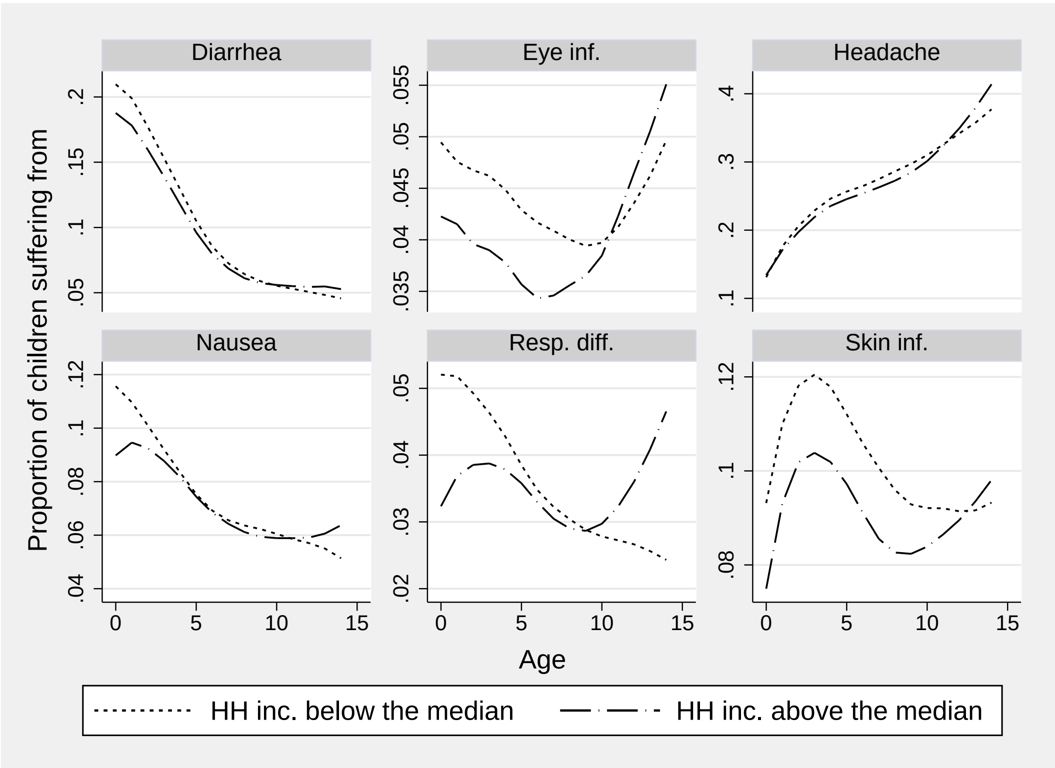

Figure 3: Proportion of children suffering from various symptoms, ages 0 to 14

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
Repondent'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 eduation	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 eduation	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	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