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UNU-WIDER
World Institute for Development Economics Research

Research Paper No. 2007/78

# The Role of the Household and Community in Determining Child Health

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November 2007

## Abstract

Nutritional status at a young age is positively associated with an individual's total human capital accumulated. Higher levels of human capital are in turn strongly correlated with an individual's economic and social well-being. Health is one such dimension of human capital and improvements in children's nutritional status improve an individual's overall lifetime well-being. This paper examines the various child level, household level, and community level characteristics that determine health status among children. The paper uses data from the three waves of the Indonesian Family Life Survey to assess the gender-specific determinants of child health outcomes. I do not find any evidence for gender-differential impact of the household and community characteristics in determining child health. I find that household characteristics like parental height have a strong positive effect on determining child health. There is some evidence supporting the positive association between household income and child health. Among the community infrastructure variables – measure of prevalence of electricity in the community and dummy for presence of paved road in the community are both positively associated with child health. The results obtained here are robust to a number of econometric concerns like measurement error in household income variable, correlation between community time-invariant unobservables and household specific unobservables, correlation between community time-invariant unobservables and community resource availability variables. Community level fixed-effects along with IV techniques used in this paper address the aforementioned methodological concerns.

Keywords: child health, well-being, nutrition, Indonesia

JEL classification: D10, I10, O10, O12



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This study has been prepared within the UNU-WIDER project on Gender and Food Security, directed by Basudeb Guha-Khasnobis.

UNU-WIDER gratefully acknowledges, in particular, the project support provided by the Finnish Ministry for Foreign Affairs, and the financial contributions to the overall research programme by the governments of Denmark (Royal Ministry of Foreign Affairs), Norway (Royal Ministry of Foreign Affairs), Sweden (Swedish International Development Cooperation Agency – Sida) and the United Kingdom (Department for International Development). Special thanks go to the CSSSC – Centre for Studies in Social Sciences, Calcutta, India, and UNU-Institute for Natural Resources in Africa, Accra, Ghana, for providing logistical support to the project meetings.

ISSN 1810-2611 ISBN 978-92-9230-031-9

**Acknowledgements**

I would like to thank John Ham, Duncan Thomas and seminar participants at University of Southern California, Asia Pacific Rim University 2006, Bureau for Research in Economic Analysis and Development (BREAD) summer school 2005, UNU-WIDER project meeting 2007, University of Melbourne 2007 and Monash University 2007 for helpful comments and suggestions. I am also thankful to Jeffrey B. Nugent for comments and continued support. I am especially indebted to John Strauss for continuous guidance, comments, encouragement and support. Financial support was provided by United Nations University – World Institute for Development Economics Research (UNU-WIDER) and College of Letters Arts and Sciences, University of Southern California. I am grateful to Basudeb Guha-Khasnobis for making this work a part of the 'Gender and Food Security' project at UNU-WIDER.

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Typescript prepared by Janis Vehmaan-Kreula at UNU-WIDER

## 1 Introduction

Health is an important indicator of an individual's overall well-being. Improvements in health status are positively associated with greater productivity and higher wage earnings. In particular it is found that taller men and women are likely to earn higher wage earnings even after controlling for education and other dimensions of health status (Thomas and Strauss 1997). The relationship between health and wages is two-way and hence separating out the exogenous determinants of health status among working age population becomes difficult. Also that improvement in health status among adults increases wage earnings primarily through improvements in productivity.

Papers from the economics and epidemiological literature have shown that higher investments made in health during childhood as measured by indicators of height are positively associated with higher completed grades of schooling during childhood and greater height attainment during adult life (Strauss and Thomas 1995, 1998, 2007; Alderman et al. 2006; Waterlow 1988).[1] This implies that poor nutrition during childhood affects future wage earnings via decreasing the accumulation of both aspects of human capital accumulation, health and education. In order to improve an individual's future well-being and to enjoy higher returns from investments in both health and education, it must be that factors that improve nutritional status among children are identified and appropriately targeted.

The main objective of this paper is to identify the factors that can explain for the causes of malnutrition among children. The two additional motivations for focusing on young children are: First, most of the deficits in height attainments occur during childhood as children are most vulnerable to both economic shocks and health shocks (Hoddinott and Kinsey 2001; Adair 1999). Second, an individual's pattern of growth in height is also predetermined at a young age (Martorell 1999; Waterlow 1988). It is hence, necessary to understand the determinants of child health in order to correct and influence these determinants in a way that the growth patterns in height can be permanently altered at an early stage of an individual's life.

The most widely used indicators of child health are height-for-age z-score (HAZ), weight-for-height z-score and weight-for-age z-score. Among the three indicators, HAZ is identified as a long run indicator of nutritional status as it captures for the entire stock of nutrition accumulated since birth (Waterlow 1988). Additionally anthropometric outcomes are not subject to systematic measurement error, a standard problem encountered while using subjective measures of health status for example: self reported morbidity. Hence anthropometric outcomes are more reliable indicators of nutritional deficiency. HAZ is standardized height calculated using the 1977 NCHS (National Center for Health Services) tables drawn from the United States population conditional upon age (in months) and sex.[2] Children with HAZ less than -2 are classified as undernourished and or stunted. Stunting in young children remains to be a serious source of concern in several developing countries, including

1 Individuals with higher levels of health and schooling not only enjoy higher private returns in terms of higher wage earnings but also enjoy higher social returns like longer life expectancy (see Schultz 1993 for more details).

2 Weight-for-height z-score and weight-for-age z-scores are also standardized measures calculated using the United States sample mean and standard deviations.

Indonesia, as poor nutrition during childhood has long lasting impact on an individual's future well-being.

Indonesia has witnessed considerable variation in its economic performance overtime. For example, it experienced a period of rapid economic growth between the years 1990 and 1996. During this period, the average growth in GDP per capita remained at and around 6 per cent. However, even with such high levels of economic growth, 40.6 per cent of children under the age of 5 were identified as malnourished and/stunted.[3] Shortly after the period of rapid economic growth, Indonesia suffered a sharp reversal in its economic performance during late 1997 and early 1998. Sudden depreciation of the Indonesian Rupiah led to an increase in the relative price of tradable goods, especially foodstuffs.[4] Nominal price of food increased resulting in an inflation of about 150 per cent within months. This increase in food prices was accompanied by an increase in nominal wage rates but an overall decrease in real wage rates. By 2000, however, Indonesia witnessed a rapid recovery in the growth rate of GDP per capita along with lower inflation rates.

Even though the stunted population has continued to decline during the recovery period, the absolute percentage of stunting still remains at a high 35.1 per cent – comparable to most poor Asia nations. Malnourishment among children continues to be a serious concern among policy makers in Indonesia.

The primary goal of this paper is to determine the magnitude of the impact of the various child level, household level, and community level characteristics in determining child health status as measured by HAZ. Gender differences in health outcomes at a young age result in differences in attained height as an adult, which can also potentially manifest into differences in wage earnings (Waterlow 1988, Thomas and Strauss 1997). Hence, we also examine the gender specific determinants of child health outcomes.

In order to examine the aforementioned objectives, the paper uses data from the three waves of the Indonesian Family Life Survey (IFLS). I construct a panel data for children between 3 and 59 months in 1993 and follow them through 1997 and 2000 waves of the survey.

The paper contributes to the already existing literature on health outcomes in multiple ways: (1) Growing evidence shows that child health is strongly correlated with adult health outcomes and hence a contribution to the literature examining the determinants of child health becomes even more relevant (see Thomas and Strauss 2007 for a recent review) (2) Ghuman et al. 2005 shows that correlation between community level unobservables and household specific unobservables can produce biased coefficient estimates on the household level characteristics. They show that not accounting for this correlation creates an almost 40-50 per cent overestimation or underestimation in the estimated coefficient of the family background characteristics like parental height and education variables. To address this issue, the paper captures the independent effects of

3 Children with height-for-age z-scores < -2 are classified as 'stunted'.

4 Rice is a staple food consumption commodity for the people of Indonesia and the price of rice alone increased by over three times during the crisis period.

the family background characteristics on child health, using community level fixed-effects. This also addresses endogeneity in the community level characteristics and hence allows us to obtain reliable parameter estimates on both the community level characteristics and household level characteristics. (3) Additionally we treat our indicator of long run income as measured by household per capita consumption expenditure, that is, PCE as endogenous and compare the extent and sources of bias in per capita household consumption expenditure between the OLS and IV estimates in the static model. This has been addressed in the literature, but only by a few papers, primarily due to the lack of available data on possible instruments for PCE. (4) We also contribute to growing literature on instrument relevance and use test statistics that qualify the instruments used in the paper.

We find that parental height capturing parent's genetic endowments has a strong positive effect on child health and parental schooling has little independent influence on determining child health. Income effects are strong and positive controlling for the endogeneity in the PCE variable. Community infrastructure also has some role to play in determining child health, even after using community fixed-effects to remove all time-invariant community level unobservables from the empirical specification.

The rest of the paper is organized as follows. Section 2 provides a brief review of earlier work in the literature. Section 3 outlines the household behaviour in determining child health and describes the empirical specification used for estimation purposes. Section 4 describes the data used, discusses summary statistics and other descriptive. The main results of the paper are described in section 5. Conclusion is outlined in section 6.

## 2 Literature review

There exists a vast literature examining the determinants of child health. Previous studies have either estimated a health production function or reduced form health demand function. This section of the paper reviews some of the important determinants of child health that have previously been established in the literature.

Existing studies using cross-sectional data have found parental height and education to play an important role in determining child health. Barrera (1990), Wolfe and Behrman (1982), Thomas and Strauss (1992) and Ghuman et al. (2005) all show that mother's schooling has a positive and statistically significant impact in determining child health as measured by HAZ. The impact of father's schooling is also usually found to have a positive and significant impact in determining child health (Thomas and Strauss 1992; Thomas et al. 1990; Ghuman et al. 2005). Genetic endowments are captured by measures of parental height. Barrera (1990) and Thomas et al. (1990) show that mother's height in cm and father's height in cm have a strong positive effect on current health status of the child. Parental schooling and height are both well established determinants of child health (also see Strauss and Thomas 1995 and 1998 for a review).

Another important determinant of child health is household's overall economic resource availability/income constraint. Different measures of household income like per capita household consumption expenditure, household assets, unearned income, and non-mother's earnings have all alternatively been used to examine their impact on child health (Fedorov and Sahn 2005; Ghuman et al. 2005; Thomas and Strauss 1992).

Limited literature captures the role of community level characteristics mostly because they are not always collected by micro-level household surveys. Earlier work using community level data have found that indicators of community infrastructure like measure of paved road, measure for water and sanitation facility and availability of sewerage system to have positive effect on child health (Wolfe and Behrman 1982; Thomas and Strauss 1992). Community level prices of food consumption goods like price of dairy products and price of sugar has a negative impact on child health (Thomas and Strauss 1992). Price of other health inputs includes distance to health facility which shares an inverse relationship with child health. Recent works assessing community programme placement effects have also found a positive association between community public health programmes and child health (Frankenberg et al. 2005).

However, some of the main limitations of the previous work lie in not separating the exact magnitude of the right hand side characteristics from the unobservables in the empirical specification. Most studies include a lot of the potentially endogenous right hand side variables that can confound the parameter estimates obtained on the household and community level variables. For example: number of siblings, calorie intake, length of breastfeeding and household size are all treated as exogenous (Wolfe and Behrman 1982). In addition, recall that in the light of endogenous programme placement issues, not accounting for the correlation between community infrastructure variables and community level unobservables can bias coefficient estimates on the community characteristics (Rosenzweig and Wolpin 1986). A recent paper by Ghuman et al. (2005) also show that the possible correlation between household specific unobservables and community specific unobservables can bias the coefficient estimated on the household characteristics as well.

Using cross-sectional data one can either explicitly control for the observed community level characteristics or used community level fixed-effects to remove the unobservables from the empirical specification, unless there are two levels of geographical information with one level associated with the actual community level observables and the other related to the unobservables in the empirical specification.

The aim of this paper is to address several of the empirical and methodological concerns discussed in this section and the introduction of the paper. The next section outlines the theoretical model and the empirical specification used for estimation purposes.

## 3 Model and empirical specification

### 3.1 Theoretical framework

Parent's make investments in their children's health with the aim of improving the child's current and future economic and physical well-being. Following Strauss and Thomas (1998, 2008) and Thomas and Strauss (1992), the static health production function can be written as follows:

$$H_t^* = f\,[M_t;\, E_t,\, \mu_c,\, \mu_h,\, G;\, \theta_{ht}] \qquad (1)$$

Where, current health status in period t is specified as a function of current period health inputs conditional upon environmental factors, child characteristics, household characteristics and genetic endowments. $H_t$ is current health status, measured by HAZ. $M_t$ is health input at time t which includes – food and non-food consumption goods used towards the maintenance and or improvement of child health. $E_t$ characterizes the environment where the child lives reflecting water and sanitation facility and other infrastructure in the community. $\mu_c$, $\mu_h$ and G capture the behavioural factors that affect the transformation and utilization of the various health inputs in determining current health output. G captures for all genetic endowments reflecting genotype[5] and phenotype[6] influences that affect child health. $\mu_c$ captures child specific characteristics like the child's age and sex. Age and sex are important determinants of patterns in attained height.[7] $\mu_h$ captures household specific characteristics like parent's completed grades of schooling. Parents completed grades of schooling influences parents' choice of health inputs used in improving child health outcomes. $\theta_{ht}$ reflects all unobserved time varying health shocks – illness and infections. We assume $\theta_{ht}$ to be an iid shock that the child faces in each period t.

Following Strauss and Thomas (2008), we assume that the household's utility function in period t depends on consumption goods that include food and non-food commodities, $C_t$, leisure, $L_t$, and the health status of the child, $H_t$, and certain unobserved preference shocks that the household faces $\theta_{pt}$. We assume that households do not derive any direct utility from the consumption of health inputs except from its indirect use in the accumulation of child health output.

Households decide to allocate health based on the following utility maximization problem: the household maximizes utility in period t–U (2), subject to a time and budget constraint as given in equation (3) and a child health production function as given in equation (4):

$$\text{Max: } U = u\,[C_t, H_t, L_t\,; \theta_{pt}] \qquad (2)$$

$$P_t^c C_t + P_t^m M_t = w_t (T_t - L_t) + \pi_t \qquad (3)$$

$$H_t = f\,[M_t; E_t, \mu_c, \mu_h, G; \theta_{ht}] \qquad (4)$$

Where $P_t^c$ is a vector of prices of food and non-food consumption goods, $P_t^m$ is the price of other health inputs like distance to health facility, $w_t$ is the wage rate, $T_t$ is parents total time endowment, $L_t$ is total number of hours spent in leisure activities, profit income from farm and non-farm activities including non-labour income is captured by $\pi_t$.

Using simple first order conditions, we can solve for the optimal amount of child health input, $M_t^*$ as follows:

5 Genotype influences include genetic endowments that are passed from the parents to the child via their DNA.

6 Phenotype influences capture all observable characteristics of an individual, such as shape, size, colour, and behaviour that result from the interaction of genotype influences with the environment.

7 See Waterlow (1988) for more discussion on differences in patterns of height attainments by age groups and sex.

$$M_t^* = m\,[P_t^c, P_t^m, w_t, E_t, \pi_t; \mu_c, \mu_h, G, \theta_{ht}, \theta_{pt}] \qquad (5)$$

Where $M_t^*$ includes current period prices of health inputs, consumption goods and wage rates and measure of household income. $\mu_c$, $\mu_h$ and G capture household tastes and preferences, child demographics, health shocks and genetic endowments.

The static conditional health demand function (6) can be derived by plugging $M_t^*$ for $M_t$ in equation (1):

$$H_t^* = m\,[P_t^c, P_t^m, w_t, E_t, \pi_t; \mu_c, \mu_h, G, \theta_{ht}, \theta_{pt}] \qquad (6)$$

The conditional child health demand function derived in (6) expresses the current measure of health status as a function of the price of consumption (food and non-food) goods, prices of health inputs, wage rates, profit income. $\mu_c$, $\mu_h$ and G capture household and child specific characteristics that either directly or indirectly affect the determination of child health status in every period t. $E_t$ captures community infrastructure availability that either directly affect child health or affect the utilization of health inputs used in accumulating current health.

Below, I describe the empirical counterpart of equation (6) used for estimation purposes.

### 3.2 Empirical specification

The empirical counter part of the static conditional health demand function (6) can be written as follows:

$$H_{it} = \beta_0 + \beta_1 H_{it-1} + \sum_{j=1}^{R} \beta_j X_{jit} + \sum_{j=1}^{S} \beta_j Z_{ji} + \varepsilon_i + \varepsilon_h + \varepsilon_c + \varepsilon_{it} \qquad (7)$$

$H_{it}$ is the main outcome variable of interest and captured by the child's HAZ in period t. X's capture the time-varying regressors which include age of the child, price of food consumption goods, wage rates, price of health inputs, community resources and log (real per capita household consumption expenditure). The time-invariant regressors in Z include sex of the child, mother's completed grades of schooling, father's completed grades of schooling, mother's height in cm and father's height in cm. There are four sources of unobservables in the model: $\varepsilon_i$, $\varepsilon_h$, $\varepsilon_c$, and $\varepsilon_{it}$. $\varepsilon_i$ captures the time invariant individual specific unobservables reflecting the child's inherent healthiness. $\varepsilon_h$ captures all time-invariant household specific unobservables reflecting parental preferences toward child health and parents time discount rate. $\varepsilon_c$ captures all time-invariant community specific unobservables like community time-invariant endowments and political associations. $\varepsilon_{it}$ includes child specific time varying unobservables like health shocks and other random shocks all of which are unknown to the econometrician at date t.

# 4 Data

## 4.1 Indonesian family life survey

The data used in this paper comes from the three (1993, 1997, 2000) waves of the Indonesian Family Life Survey (IFLS), an ongoing large-scale socio-economic survey conducted in Indonesia. The IFLS collects extensive information at the individual, household and community level. The survey includes modules on measures of health, household composition, labour and non-labour income, farm and non farm assets, pregnancy, schooling, consumption behaviour, contraceptive use, sibling information and immunization (see Frankenberg et al. 1995, 2000, and Strauss et al. 2004 for more details on sample selection and survey instruments).

The first wave of the IFLS was fielded during late 1993 and early 1994 (IFLS1). The sample surveyed in 1993-94 represented 83 per cent of the Indonesian population living in 13 of Indonesia's 27 provinces at the time. Provinces were selected to maximize representation of the population, capture the cultural socio-economic diversity of Indonesia, and be cost-effective to survey given the size and the terrain of the country. In IFLS1, 7,224 households were interviewed. The first follow-up wave was surveyed during the second half of 1997 (IFLS2) just before the major economic and financial crisis in Indonesia. In IFLS2, 7,629 households were interviewed of which 6752 were original IFLS1 households and 877 were split-off households. In IFLS2, 94.3 per cent of all original IFLS1 households were contacted. The third wave (IFLS2+) was a special follow-up survey fielded during late 1998. A 25 per cent sub-sample of the original IFLS1 households were contacted in late 1998 with the aim of analyzing the immediate impact of the 1997-98 economic and financial crisis. The fourth wave of the IFLS was fielded in 2000 – IFLS3. A total of 10,435 households were interviewed in 2000. Of these, 6,661 were original IFLS1 households and 3,774 households were split-off households. In IFLS3, 90.9 per cent of all original IFLS1 households were interviewed (Strauss et al. 2004). The follow-up surveys were only designed to target the original IFLS1 households. The IFLS follows households that move out of the community in which they are interviewed in the baseline year keeping attrition low (Thomas et al. 2001).

Sample attrition can be a problem only if, first, observable factors that result in attrition are correlated with the error term in the specification of interest (7) and second, if unobservables in the attrition equation are correlated with the unobservables in the empirical specification of interest (Fitzgerald et al. 1998). There are two sources of unobservables in the empirical specification that can be potentially correlated with the unobservables in the attrition equation – household specific unobservables capturing household's preferences towards better health and child specific unobservables reflecting child's ability to fight diseases. Recall that in the previous paragraph we summarized the household level attrition rates in the IFLS suggesting that selection at the household level is not likely to bias our coefficient estimates of interest. But we still need to assess if attrition at the individual level is likely to create selection biases.

In 1993 we have 2,203 children between the age of 3 and 59 months for whom we have complete information on age in months, sex and height in cm. Of these 2,203 children 1,966 were followed in 1997 and 2,051 of the original sample was re-contacted in 2000. A total of 1,819 children between 3 and 59 months in 1993 can be followed through 1997 and 2000 waves of the data; this sample excludes observations deleted due to measurement error in height attainments. There is 10.76 per cent attrition between 1993 and 1997 and 6.90 per cent between 1997 and 2000. Re-contact rates are much lower in 1997 as compared to 2000. A simple mean test on the difference in height attainments between all children in 1993 and children who were lost over time is -0.76 with standard error of 0.80. The mean height attainments between children who were present in 1993 and those who were followed through in 1997 and 2000 are not statistically different. This indicates that attrition rates are not related to differences in initial period health status. It also suggests that attrition at the individual level is not related to child's unobserved ability to fight diseases and or absorb nutrients and hence not likely to bias our parameter estimates from equation (7).

The IFLS is unique in a number of ways: (1) it links individual, household and community level data together bringing in enormous information that enables us to better understand the impact of household characteristics on individual level observables controlling for community infrastructure availability. (2) IFLS interviews members from different age groups (0-14 years, interviewed by proxy, 15-49 years and 50 years and older) capturing the overall demographic composition in a household. (3) Only few surveys have health measurements in particular height in cm. (4) The data quality of the IFLS is excellent as numerous checks were done at the field level and the data entering level. For example: IFLS provides best guessed age in years, date of birth year, date of birth month and date of birth day information for all panel and new respondents from all three waves of the survey. Numerous variables are double checked across waves and across books within the same wave to provide correct information to the user.

### 4.2 Data descriptive

The paper uses data on 1,819 panel children between the ages of 3 to 59 months in 1993 who are also followed through 1997 and 2000. Height measured under the age of 5 years is strongly correlated with attained body size (body mass index – BMI) as an adult (Hoddinott and Kinsey 2001). Hence, the sample is restricted to children less than 5 years in 1993. There is also an additional unintended advantage of restricting the sample to this age cut-off. The child health production function varies between young children and teenagers going through pubescent growth spurts (Waterlow 1988). The sample is restricted to include children who are less than 12 years of age in 2000 in order to keep the model specification time invariant for our complete sample. Our final sample includes 1,819 children for whom I have complete anthropometric details from all three survey rounds.

The outcome variables of interest in this paper are: height-for-age z-score (HAZ) and is identified as a long run indicator of an individual's overall nutritional status (Martorell 1999). HAZ score is used as the dependent variable in estimating the static child health demand function. The other right hand side variables in the regression estimates include real per capita household consumption expenditure, parent's height in cm, parent's completed grades of schooling, location indicator, community level time varying characteristics including price of food consumption goods, prices of health resources and measures of infrastructure availability.

Location/geographic information for all respondents are available at four administrative units in Indonesia (from smallest to the largest): community, kecamatan (subdistrict), kabupatan (municipality) and province. One would ideally like to use the community as our location variable to remove any location specific time-invariant unobservables from the model and also use village level time varying characteristics as our right hand side controls. There are two challenges that we face in using community as our location variable (1) community level data is only available for respondents residing in the 321 original IFLS communities. The IFLS does not provide detailed community level information for mover households except for some communities in 2000 (see details in the mini-CFS questionnaire from Strauss et al. 2004). (2) To do any location specific fixed effects, we must have data on at least two children residing in the same community from each of the three waves of the IFLS. In order to be able to match households with community level information in all three waves of the survey, and estimate fixed-effects models to remove time-invariant community level unobservables, I use the following decision rule to create my 'location' variable aimed at overcoming the two above mentioned constraints.

I create a 'location' variable which is assigned with the community code if there are five or more children residing in the same community.[8] In cases where this criterion fails, I assign the 'location' variable with the next level of aggregation, that is, the kecamatan[9] code following the same rules. Similarly the kabupatan and lastly the province codes are assigned to the location variable in order to obtain at least five children from each of the newly created location variable. This new aggregation of the geographic units helps us to combine the household and community level information together and also allows us to use fixed-effects estimation techniques at the location level.

Tables A1 and A2 show trends in mean HAZ and percentage of children classified as stunted over the three waves of the IFLS. I find improvement in mean HAZ over time for children using both repeated cross-sectional[10] and panel data.[11] The statistics indicate that mean HAZ worsen until 1997 and then improve during 1997-2000. The percentage of children classified as stunted increases from 1993 to 1997 and then declines between 1997 and 2000. To summarize, trends in child health status as measured by HAZ have steadily improved by the year 2000. Yet, in levels the percentage of children classified as stunted is high and comparable to that of many poorer nations of the world.

Table A3 reports sample averages on all variables used in the regression specifications. It gives us information on the mean and standard deviation of all variables used in the regression specifications.

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8 It is usually the case that less than five children are found only in communities which were not the original IFLS1 communities and are communities where mover households resided.

9 The kecamatan and kabupatan codes are based on BPS codification that can be easily linked to other nationally representation data like the SUSENAS. The definition of a kecamatan and a kabupatan continues to change over time. In order to use systematic codes of the kecamatan and kabupatans over time, I use the 1999 BPS codes that define the kecamatan and kabuptan codes for all IFLS communities from all three years of the survey.

10 Using data for children between 3 and 59 months from 1993, 1997 and 2000 waves of the IFLS.

11 Using data for children initially between 3 and 59 months in 1993 and following the same children through 1997 and 2000.

## 5 Results

We start with the baseline specification pooling male and female children, where HAZ is regressed on a series of child characteristics, household characteristics and community/location interacted time dummies to capture the role of time-varying community characteristics in determining child health. In the second specification, HAZ is regressed upon child characteristics, household characteristics and actual location/community level time-varying characteristics. We also separate boys and girls and run independent regressions to capture gender specific determinants of child health.

Coefficient estimates from regressing HAZ on a series of child and household characteristics controlling for community interacted time dummies are reported in Table A4. The coefficient on the male dummy from Table A4 has a negative sign, suggesting that females have better health than male children. This result is striking when compared to other African countries/other Asian countries like India and China that exhibit comparable levels of stunting, where one finds large significant gender differentials in favour of boys vis-à-vis girls. For Indonesia this is not very surprising, since the country does not traditionally suffer from large gender differences in human capital accumulation outcomes.[12] The relationship between HAZ and age in months is non-linear and the coefficient on the spline variables captures this non-linearity suggesting that z-scores decline till age of 24 months and then improves and remain unchanged. The interaction terms between the spline variables and sex dummy capture the gender specific changes of health outcomes. We find that boys tend to grow earlier and females tend to catch-up later. But overall females still continue to have higher z-scores as compared to boys.

Household characteristics include parents completed grades of schooling, parental height in cms and measure of household income. Parents schooling variable captures for the efficiency with which health inputs are transformed into health output. The coefficient estimates on mothers completed grades of schooling and fathers completed grades of schooling as reported in Table A4 shows the expected positive relationship between parental schooling and child health. Every additional year of mothers schooling increases z-scores by 0.015 (column 1, Table A4) standard deviations. Fathers schooling has a positive though insignificant impact on z-scores. The IV estimates reported in column 4, Table A4 also our preferred estimates indicate that neither of the parental characteristics have statistically significant impact in determining child health. The positive correlation between household per capita consumption expenditure and mother's schooling is likely to have biased the coefficient estimate on mothers schooling upwards in column 1, Table A4. This is in contrary to much of the evidence in the literature (see Thomas and Strauss 1998 for review). Parental height variables reflect the impact of genetic endowments in determining current health. Mother's height in cm and father's height in cm both capture the impact of different genetic endowments in ascertaining current health status. Every 1 cm increase in mother's height improves z-scores by 0.04 standard deviations and every 1 cm increase in father's height improves z-scores by 0.03 standard deviations (column 4, Table A4). Mothers' height is likely to have a higher impact in determining child health as compared to fathers' height. This is similar to the results found by Ghuman et al. (2005) and

12 The pattern of no gender-differentials is also found in another important aspect of human capital accumulation that is, education as measured by primary school enrollment rates (Deolalikar 1993).

Thomas and Strauss (1992). Thomas and Strauss (1992) suggest that mother's height captures her healthiness during pregnancy and hence directly related to determining current health of the child.

The final household characteristic included in the regression specification is that of household income. Logarithm of real per capita household consumption expenditure is used to capture the household's complete resource availability. OLS estimates of PCE from Table A4, column 1 can be both upward biased due to its correlation with time invariant household specific unobservables and downward biased due to measurement error in data. In columns 2 and 3 of Table A4 we replace PCE with productive assets and total assets respectively as our exogenous measure of income. Assets are exogenously determined in a static model and hence can be replaced by PCE in columns 2 and 3 of Table A4. The results indicate that children residing in households with higher income enjoy better health. IV estimates are reported in column 4 of Table A4 where PCE is instrumented with the sum of household productive assets, unproductive assets and unearned income, which are assumed to be exogenous in a static model. I find that coefficient estimate on PCE has increased from 0.08 (column 1, Table A4) to 0.24 (column 4, Table A4) showing that IV estimates of income have much larger impact on current health status. The increase in the coefficient estimate of PCE from OLS to IV regressions indicates that OLS estimates of PCE are likely to be biased downward due to measurement error and not biased upwards due to omitted variables. The role of income is largely consistent with most related work looking at the determinants of child health in a static setting (Thomas et al. 1991).

Coefficient estimates from regressing HAZ on a series of child, household and community/location time-varying characteristics are reported in Table A5. The coefficient estimates on the child characteristics and household characteristics do not change between the estimates reported in Tables A4 and A5. As long as we can control for the over time variation and across community variation using dummy variables our parameter estimates on the household characteristics and child characteristics will remain consistent. However, from policy point of view, governments' interest lies in investing and improving community level infrastructure and health resources that are most likely to improve child health status.

Among the community level time-varying characteristics, increase in the price of rice is associated with improvements in child health in both urban and rural areas (column 4, Table A5). A priori one would think that increase in the price of the staple food consumption commodity must be associated with a decline in child health. However, rice has little nutritional component by itself. It is only a source of carbohydrates for the body which provides energy. If households had access to other food consumption goods (excluding rice and including better substitutes for rice) like cassava, milk, vegetables and meat; then the prices of those food consumption goods would be more important in determining child health as compared to price of rice. Due to a lot of the missing variable problem in other price data we are only able to control for price of rice, price of oil and price of condensed milk among our right hand side variables. Increase in the price of oil and condensed milk are both associated with decline in child health (column 4, Table A5). Both are in line with the story that it is important to control for the prices of goods that are more suitable in determining child health. Oil though, has little nutritional value, is used to prepare a majority of the Indonesian food varieties and hence an important part of household consumption basket. Community infrastructure availability like presence of paved road in the community and availability of electricity in the community are both positively associated with improvements in child health. Children residing in communities with a paved road have 0.10 standard deviation higher z-scores as compared to their counterparts from other communities. Similarly children residing in communities with greater prevalence of electricity have 0.0026 standard deviation higher z-scores as compared to their counterparts from other locations.

Additionally, in the light of endogenous programme placement issues, not accounting for the correlation between community infrastructure variables and community level unobservables can bias coefficient estimates on the community characteristics (Rosenzweig and Wolpin 1986). A recent paper by Ghuman et al. (2005) shows that the correlation between community level unobservables and household specific unobservables can produce biased coefficient estimates on the household level characteristics as well. They show that not accounting for this correlation creates an almost 40-50 per cent overestimation or underestimation in the estimated coefficients of the family background characteristics like parental height and education variables. To address this issue, the paper uses location fixed-effects to remove all potential location/community level time-invariant unobservables from the specification. The richness of the IFLS allows me to control for the endogeneity in the community level characteristics and allows us to obtain reliable parameter estimates on both the community level characteristics and the household level characteristics.

Our next aim is to investigate the gender specific determinants of child health. However, it is always important to do a simple test of pooling to see if the pooled sample should be split into boys and girls separately or not. A simple test of pooling provides an overall $chi^2$ of 1.39 with p-value of 0.11, suggesting that we cannot reject the null of pooling our sample of boys and girls together. Prior evidence suggests that, in examining mortality rates, Kevane and Levine (2001) find no evidence of 'missing girls' that is, daughters are not likely to suffer from higher rates of mortality as compared to sons. Also, Levine and Ames (2003) show that even in the aftermath of the crisis, girls did not fare worse than boys. However, from general interest it may be interesting to see if not all but some of the household and community characteristics vary by gender. To be able to capture this, we run separate regressions for male children using all child, household and community level characteristics as our right hand side control variables. Tables A6 and A7 report coefficient estimates from the regression of HAZ on a series of child, household and community time varying characteristics for male and female children separately.

The coefficient estimates from column 4, Table A6 (preferred estimates) indicates that parental height has a strong positive significant effect on the health status of male children with mothers height having a higher impact than fathers height. Parental schooling variables continue to have little role in determining child health. Income effects are strong with positive and statistically large role in determining child height. The prices of all food consumption goods are negatively associated with child health among boys but not statistically significant. Prevalence of electricity is the only measure that has a positive effect on child health.

The coefficient estimates from column 4, Table A7 (preferred estimates) that parental height has a strong positive significant effect on the health status of female children too but with the only difference that mothers height and fathers height have identical impact on determining child health. This is contrary to most of the literature which suggests that mother's height has between 0.1-0.2 standard deviations higher impact in determining child health as compared to father's height. Parental schooling variables continue to have little role in determining child health. Income effects are weak. Price of rice has a positive effect on female child health. The price of oil is negatively associated with child health among girls and is statistically significant. Prevalence of electricity is the only measure that has a positive effect on child health. Part of the increase in price of rice could reflect income effects and hence the coefficient on the instrumented log (pce) being statistically insignificant. Among the community infrastructure variables presence of paved road in the village affects female health outcomes positively.

## 6 Conclusion

The aim of the paper is to examine the gender specific determinants of child health outcomes among children between 3 and 59 months. For this purpose, we construct a panel data for children between 3 and 59 months in 1993 and follow them through 1997 and 2000 waves of the Indonesian Family Life Survey. We do not find any evidence towards gender bias or gender differential impact of household and community characteristics in determining child health. We find that Indonesia is not plagued with the problem of gender bias or favouring boys, as discussed earlier in the paper as well. The main results indicate that mother's height and father's height have an important role in determining child health. This confirms to the role played by genetic endowments in determining health. Mother's height continues to have a larger role in determining child health as compared to father's height. We find little role for parental schooling in determining child health. Parental schooling could affect child health through a number of other variables like total household income and community resources. Hence, the lack of independent impact of parental schooling on child health does not suggest there is no impact, only that the mechanism of the impact is unknown. Household income has a strong positive effect on child health. Among the food prices – price of oil is negatively and price of rice positively related to child health. The community infrastructure variables in particular measure of electricity and paved road both have a positive impact on child health.

## Appendix

Table A1: Summary statistics on HAZ for children (3-59 months) using a repeated cross-sectional data

| Years | % HAZ < -2 | Mean | Mean changes between (years) |
|---|---|---|---|
| 1993<br>(2,203) | 40.26<br>(0.010) | -1.578<br>(0.038) | -0.127*** (1997-1993)<br>(0.051) |
| 1997<br>(2,356) | 41.38<br>(0.010) | -1.705<br>(0.036) | 0.272*** (2000-1997)<br>(0.044) |
| 2000<br>(3,537) | 34.88<br>(0.008) | -1.432<br>(0.028) | 0.145*** (2000-1993)<br>(0.046) |

Notes:

Robust standard errors corrected for clustering at the household level reported in parentheses. *** significant at 1%.

Cross-sectional data refers to data on children between 3 and 59 months in 1993, 1997 and 2000.

Source: IFLS 1993, 1997 and 2000.

Table A2: Summary statistics on HAZ for children (3-59 months) using panel data

| Years | % HAZ < -2 | Mean | Mean changes between (years) |
|---|---|---|---|
| 1993<br>(1,819) | 40.626<br>(0.011) | -1.625<br>(0.039) | -0.134*** (1997-1993)<br>(0.036) |
| 1997<br>(1,819) | 42.056<br>(0.012) | -1.758<br>(0.027) | 0.077*** (2000-1997)<br>(0.019) |
| 2000<br>(1,819) | 38.647<br>(0.011) | -1.681<br>(0.025) | -0.055 (2000-1993)<br>(0.037) |

Notes:

Robust standard errors corrected for clustering at the household level reported in parentheses. *** significant at 1%.

Panel data refers to data on children between 3 and 59 months in 1993 followed through 1997 and 2000.

Source: IFLS 1993, 1997 and 2000.

Table A3: Summary statistics of all variables used in empirical estimation (observations = 5,457)

| Variable | Mean | Standard deviation |
|---|---|---|
| Height-for-age z-score (HAZ) | -1.68 | 1.30 |
| Height in cms | 105.86 | 19.42 |
| Mothers height | 150.54 | 5.11 |
| Fathers height | 161.38 | 5.36 |
| Mothers school | 5.96 | 3.93 |
| Fathers school | 6.90 | 4.33 |
| Log (real pce) | 9.87 | 0.76 |
| Square root (real per capital productive assets) | 1.51 | 2.61 |
| Square root (real per capital total assets) | 4.48 | 3.79 |
| Distance to the closest health centre (kms) | 5.08 | 4.57 |
| Percentage of households with electricity | 76.68 | 26.92 |
| Log real male wage rate | 6.56 | 0.52 |
| Log real female wage rate | 6.19 | 0.85 |
| Log of real price of rice ('000s Rupiah) | 0.86 | 0.20 |
| Log of real price of condensed milk ('000s Rupiah) | 5.17 | 1.52 |
| Log real price of oil ('000s Rupiah) | 1.74 | 0.43 |
| Dummy = 1 if the community has paved road | 0.74 | 0.44 |
| Dummy = 1 if midwife present in the community | 0.51 | 0.50 |
| Number of health posts in a community | 7.23 | 6.51 |
| Dummy = 1 if missing father's height | 0.08 | 0.27 |
| Dummy = 1 if missing mother's height | 0.03 | 0.16 |
| Dummy = 1 if missing mother's school | 0.01 | 0.08 |
| Dummy = 1 if missing father's school | 0.02 | 0.12 |

Source: IFLS 1993, 1997 and 2000.

Table A4: Static health demand function for the pooled sample (boys and girls) with location interacted time dummies

| Variables | (1) OLS HAZ | (2) OLS HAZ | (3) OLS HAZ | (4) IV HAZ |
|---|---|---|---|---|
| Male dummy (dsex) | -0.7659*** | -0.7528*** | -0.7647*** | -0.7890*** |
| | (0.2838) | (0.2835) | (0.2841) | (0.2843) |
| Spline in age in months (<24) | -0.0780*** | -0.0773*** | -0.0778*** | -0.0793*** |
| | (0.0094) | (0.0094) | (0.0094) | (0.0094) |
| Spline in age in months (•24) | -0.0013 | -0.0012 | -0.0013 | -0.0015 |
| | (0.0014) | (0.0014) | (0.0014) | (0.0014) |
| Spline in age in months (<24)*dsex | 0.0340*** | 0.0333*** | 0.0338*** | 0.0352*** |
| | (0.0129) | (0.0129) | (0.0129) | (0.0129) |
| Spline in age in months (•24)*dsex | -0.0029*** | -0.0028*** | -0.0028*** | -0.0030*** |
| | (0.0010) | (0.0010) | (0.0010) | (0.0010) |
| Mothers height | 0.0480*** | 0.0482*** | 0.0480*** | 0.0475*** |
| | (0.0042) | (0.0042) | (0.0042) | (0.0042) |
| Fathers height | 0.0359*** | 0.0364*** | 0.0357*** | 0.0351*** |
| | (0.0038) | (0.0038) | (0.0038) | (0.0038) |
| Mothers schooling | 0.0154** | 0.0187*** | 0.0161** | 0.0094 |
| | (0.0070) | (0.0069) | (0.0070) | (0.0078) |
| Fathers schooling | 0.0026 | 0.0051 | 0.0024 | -0.0019 |
| | (0.0064) | (0.0064) | (0.0064) | (0.0067) |
| Log (real pce) | 0.0886*** | | | 0.2478*** |
| | (0.0305) | | | (0.0907) |
| Productive assets | | -0.0012 | | |
| | | (0.0071) | | |
| Total assets | | | 0.0158*** | |
| | | | (0.0059) | |
| Observations | 5457 | 5457 | 5457 | 5457 |
| Number of group (location time) | 674 | 674 | 674 | 674 |

Notes:

Robust standard errors in parentheses with clustering at the individual level.

*** Significant at 1%, ** significant at 5%.

Source: IFLS 1993, 1997 and 2000.

Table A5: Static health demand function for the pooled sample with actual community/location level characteristics

| Variables | (1) OLS HAZ | (2) OLS HAZ | (3) OLS HAZ | (4) IV HAZ |
|---|---|---|---|---|
| Male dummy (dsex) | -0.6707** | -0.6644** | -0.6727** | -0.6876** |
| | (0.28) | (0.28) | (0.28) | (0.28) |
| Spline in age in months (<24) | -0.0757*** | -0.0751*** | -0.0756*** | -0.0773*** |
| | (0.009) | (0.009) | (0.009) | (0.009) |
| Spline in age in months (•24) | 0.0017** | 0.0016** | 0.0015* | 0.0018** |
| | (0.0008) | (0.0008) | (0.0008) | (0.0008) |
| Spline in age in months (<24)*dsex | 0.0295** | 0.0291** | 0.0294** | 0.0304** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Spline in age in months (•24) * sex | -0.0028*** | -0.0028*** | -0.0027*** | -0.0029*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Mothers height | 0.0480*** | 0.0482*** | 0.0480*** | 0.0474*** |
| | (0.004) | (0.004) | (0.004) | (0.004) |
| Fathers height | 0.0358*** | 0.0361*** | 0.0354*** | 0.0349*** |
| | (0.003) | (0.003) | (0.003) | (0.003) |
| Mothers schooling | 0.0148** | 0.0174** | 0.0148** | 0.0082 |
| | (0.007) | (0.006) | (0.007) | (0.007) |
| Fathers schooling | 0.0020 | 0.0038 | 0.0013 | -0.0029 |
| | (0.006) | (0.006) | (0.006) | (0.006) |
| Log (real pce) | 0.0687** | | | 0.2485*** |
| | (0.02) | | | (0.08) |
| Productive assets | | 0.0010 | | |
| | | (0.006) | | |
| Total assets | | | 0.0158*** | |
| | | | (0.0057) | |
| Price of rice | 0.2930** | 0.2821** | 0.2650** | 0.3211** |
| | (0.13) | (0.13) | (0.13) | (0.13) |
| Price of oil | -0.0692* | -0.0583 | -0.0621* | -0.0971** |
| | (0.03) | (0.03) | (0.03) | (0.03) |
| Price of condensed milk | -0.0025 | -0.0024 | -0.0019 | -0.0027 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Rural dummy | -0.0214 | -0.0411 | -0.0516 | 0.0291 |
| | (0.17) | (0.17) | (0.17) | (0.17) |
| Rural dummy * price of rice | -0.2925** | -0.2867* | -0.2687* | -0.3072** |
| | (0.14) | (0.14) | (0.14) | (0.15) |
| Distance to puskesmas | 0.0052 | 0.0048 | 0.0046 | 0.0064 |
| | (0.004) | (0.004) | (0.004) | (0.004) |
| Electricity | 0.0026** | 0.0026** | 0.0025** | 0.0026** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Dummy = 1 for paved road | 0.1108** | 0.1113** | 0.1111** | 0.1099** |
| | (0.05) | (0.05) | (0.05) | (0.05) |
| Male wage rate | 0.0275 | 0.0324 | 0.0301 | 0.0147 |
| | (0.04) | (0.04) | (0.04) | (0.04) |
| Female wage rate | 0.0205 | 0.0228 | 0.0232 | 0.0145 |
| | (0.02) | (0.02) | (0.02) | (0.02) |
| Observations | 5457 | 5457 | 5457 | 5457 |
| Number of location | 269 | 269 | 269 | 269 |
| Location fixed effects | Yes | Yes | Yes | Yes |

Notes:

*** significant at 1%, ** significant at 5%, * significant at 10%. Robust standard errors reported with clustering at the individual level.

(1), (2) and (3) estimates reported from using OLS estimation with community/location level fixed effects.

(4) IV estimates reported with community/location level fixed effects. Log of real PCE instrumented with total household assets.

Source: IFLS 1993, 1997 and 2000.

Table A6: Static health demand function for male children with actual community/location level characteristics

| Variables | (1) OLS HAZ | (2) OLS HAZ | (3) OLS HAZ | (4) IV HAZ |
|---|---|---|---|---|
| Spline in age in months (<24) | -0.0468***<br>(0.0085) | -0.0469***<br>(0.0085) | -0.0472***<br>(0.0085) | -0.0477***<br>(0.0086) |
| Spline in age in months (•24) | -0.0011<br>(0.0008) | -0.0011<br>(0.0008) | -0.0012<br>(0.0008) | -0.0011<br>(0.0008) |
| Mothers height | 0.0548***<br>(0.0054) | 0.0547***<br>(0.0054) | 0.0547***<br>(0.0054) | 0.0552***<br>(0.0054) |
| Fathers height | 0.0307***<br>(0.0052) | 0.0309***<br>(0.0052) | 0.0303***<br>(0.0052) | 0.0308***<br>(0.0053) |
| Mothers schooling | 0.0223**<br>(0.0093) | 0.0217**<br>(0.0092) | 0.0189**<br>(0.0092) | 0.0121<br>(0.0102) |
| Fathers schooling | 0.0092<br>(0.0077) | 0.0090<br>(0.0076) | 0.0067<br>(0.0077) | 0.0034<br>(0.0080) |
| Log (real pce) | -0.0208<br>(0.0347) | | | 0.2436**<br>(0.1185) |
| Productive assets | | -0.0055<br>(0.0097) | | |
| Total assets | | | 0.0146**<br>(0.0071) | |
| Price of rice | 0.0079<br>(0.1663) | 0.0106<br>(0.1662) | -0.0051<br>(0.1659) | 0.0412<br>(0.1666) |
| Price of oil | -0.0359<br>(0.0488) | -0.0396<br>(0.0491) | -0.0418<br>(0.0490) | -0.0722<br>(0.0499) |
| Price of condensed milk | -0.0049<br>(0.0185) | -0.0051<br>(0.0185) | -0.0037<br>(0.0186) | -0.0037<br>(0.0189) |
| Rural dummy | -0.3015<br>(0.2369) | -0.2910<br>(0.2360) | -0.2932<br>(0.2356) | -0.1817<br>(0.2458) |
| Rural dummy * price of rice | -0.1686<br>(0.2003) | -0.1715<br>(0.2000) | -0.1600<br>(0.1994) | -0.2091<br>(0.2026) |
| Distance to puskesmas | 0.0070<br>(0.0053) | 0.0073<br>(0.0054) | 0.0068<br>(0.0054) | 0.0093*<br>(0.0055) |
| Electricity | 0.0039***<br>(0.0014) | 0.0039***<br>(0.0014) | 0.0038***<br>(0.0013) | 0.0038***<br>(0.0014) |
| Dummy = 1 for paved road | 0.0146<br>(0.0645) | 0.0127<br>(0.0646) | 0.0124<br>(0.0644) | 0.0083<br>(0.0659) |
| Male wage rate | 0.0836<br>(0.0567) | 0.0817<br>(0.0567) | 0.0891<br>(0.0566) | (0.0577) |
| Female wage rate | 0.0091<br>(0.0356) | 0.0075<br>(0.0357) | 0.0096<br>(0.0357) | -0.0070<br>(0.0368) |
| Observations | 2893 | 2893 | 2893 | 2893 |
| Number of location | 258 | 258 | 258 | 258 |

Notes:

Robust standard errors in parentheses.

*** significant at 1%; ** significant at 5%; * significant at 10%.

Source: IFLS 1993, 1997 and 2000.

Table A7: Static health demand function for female children with actual community/location level characteristics

| Variables | (1)<br>HAZ | (2)<br>HAZ | (3)<br>HAZ | (4) IV<br>HAZ |
|---|---|---|---|---|
| Spline in age in months (<24) | -0.0774*** | -0.0761*** | -0.0766*** | -0.0779*** |
| | (0.0095) | (0.0095) | (0.0096) | (0.0096) |
| Spline in age in months (•24) | 0.0012 | 0.0011 | 0.0010 | 0.0012 |
| | (0.0009) | (0.0009) | (0.0009) | (0.0009) |
| Mothers height | 0.0449*** | 0.0459*** | 0.0458*** | 0.0445*** |
| | (0.0066) | (0.0066) | (0.0066) | (0.0067) |
| Fathers height | 0.0440*** | 0.0454*** | 0.0449*** | 0.0434*** |
| | (0.0057) | (0.0057) | (0.0057) | (0.0057) |
| Mothers schooling | -0.0020 | 0.0025 | 0.0007 | -0.0040 |
| | (0.0118) | (0.0116) | (0.0118) | (0.0128) |
| Fathers schooling | -0.0087 | -0.0046 | -0.0068 | -0.0105 |
| | (0.0107) | (0.0107) | (0.0107) | (0.0110) |
| Log (real pce) | 0.1294*** | | | 0.1892 |
| | (0.0421) | | | (0.1232) |
| Productive assets | | -0.0008 | | |
| | | (0.0087) | | |
| Total assets | | | 0.0126 | |
| | | | (0.0088) | |
| Price of rice | 0.6772*** | 0.6532*** | 0.6396*** | 0.6884*** |
| | (0.2022) | (0.2025) | (0.2036) | (0.2028) |
| Price of oil | -0.1059** | -0.0841 | -0.0868 | -0.1161** |
| | (0.0534) | (0.0531) | (0.0530) | (0.0560) |
| Price of condensed milk | -0.0006 | 0.0003 | 0.0001 | -0.0009 |
| | (0.0198) | (0.0197) | (0.0198) | (0.0199) |
| Rural dummy | 0.2354 | 0.2149 | 0.1972 | 0.2451 |
| | (0.2484) | (0.2489) | (0.2500) | (0.2501) |
| Rural dummy * price of rice | -0.4092* | -0.4084* | -0.3893* | -0.4097* |
| | (0.2209) | (0.2206) | (0.2223) | (0.2214) |
| Distance to puskesmas | 0.0032 | 0.0028 | 0.0029 | 0.0033 |
| | (0.0060) | (0.0060) | (0.0060) | (0.0061) |
| Electricity | 0.0018 | 0.0017 | 0.0017 | 0.0018 |
| | (0.0017) | (0.0017) | (0.0017) | (0.0017) |
| Dummy = 1 for paved road | 0.1980** | 0.1962** | 0.1970** | 0.1987** |
| | (0.0877) | (0.0875) | (0.0874) | (0.0877) |
| Male wage rate | -0.0463 | -0.0345 | -0.0371 | -0.0518 |
| | (0.0696) | (0.0697) | (0.0695) | (0.0695) |
| Female wage rate | 0.0384 | 0.0388 | 0.0379 | 0.0383 |
| | (0.0450) | (0.0448) | (0.0449) | (0.0451) |
| Observations | 2554 | 2554 | 2554 | 2554 |
| Number of location | 260 | 260 | 260 | 260 |

Notes:

Robust standard errors in parentheses with clustering at the individual level.

***significant at 1%; ** significant at 5%; *significant at 10%.

Source: IFLS 1993, 1997 and 2000.

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