

Health shocks and inter-generational transmission of inequality: Evidence from Andhra Pradesh, India

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Introduction

- Income shocks affect the movements of households in and out of poverty, alter their investments, influence their livelihood strategies and welfare trajectories etc.
 - Covariate shocks (drought, flood etc.)
 - Idiosyncratic shocks (job loss, illness)
- This study deals with the welfare impact of particular type of idiosyncratic income shock, namely health shocks.
 - An illness or injury that weakens the health status of the household member(s) and generates a welfare loss (Khan, 2010)
 - Most common idiosyncratic shock
 - Most important reason for descent of households into poverty in developing countries (Krishna, 2007)

Welfare effects of health shocks

- Health shocks entail economic costs to households.
 - Direct costs like medical expenditure
 - Indirect costs like loss of income
- Households rely on formal or informal mechanisms to smooth consumption against these economic costs.
 - Savings, credit, sale of assets, taking extra work
- Empirical research find that the ability of the households to protect consumption against health shocks depends on
 - Household resources (Gertler and Gruber 2002),
 - Work status of members facing health shocks (Cochrane, 1991)
 - Access to financial markets (Islam and Maitra 2012),
 - Social capital or networks of family, friends etc. (De Weerdt and Dercon, 2006).

Welfare effects of health shocks

- Thus, poorer households in developing countries may find smoothing consumption over time and space very costly
 - Less-developed or imperfect credit and insurance markets
 - Lack of own economic resources like physical, human, financial capital
- Hence, they might adopt costly strategies like withdrawing children from school and sending them to work to cope with the financial burden.
- This in turn has implications for vulnerability to future shocks , inter-generation transmission of poverty and inequality etc.
- Thus, understanding the economic consequences of health shocks and their coping strategies helps inform public policy.

Objectives

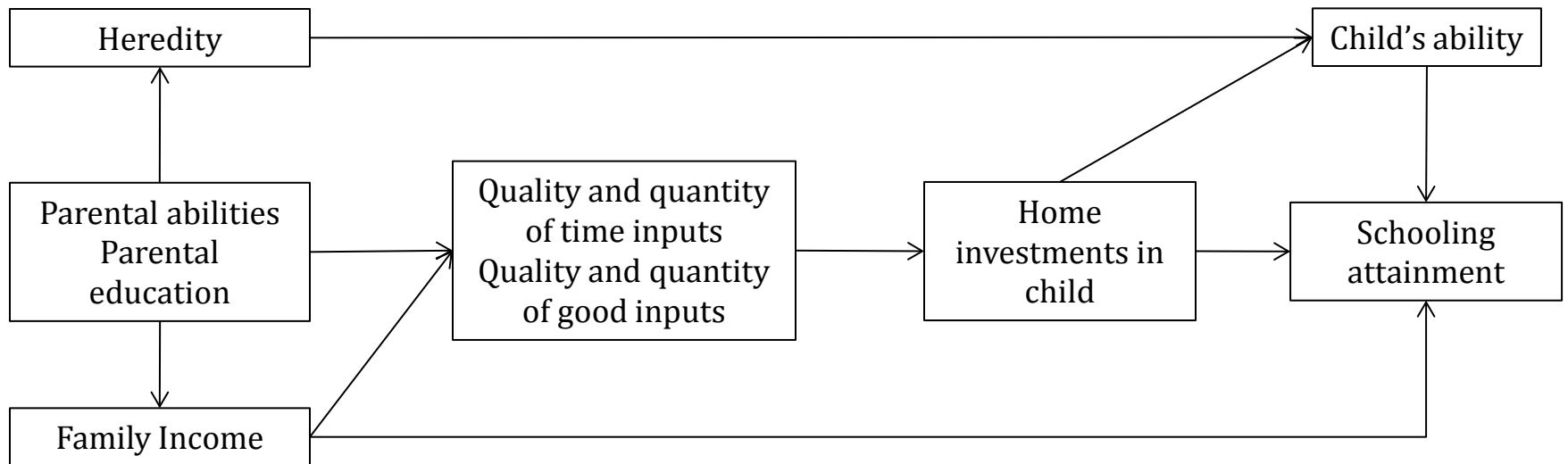
- Effect of parental health shocks on investments in child human capital using longitudinal data from Andhra Pradesh
 - role of timing of the shocks
 - pathways through which they affect human capital investment
 - differential effects of paternal and maternal health shocks
 - differential effects on younger and older children
 - importance of school quality

Theory

- Health shocks to parents may impact the quality and quantity of inputs to education production function of children through one or more pathways:
- Financial costs of schooling
 - Financial resources devoted to schooling may reduce (imperfect credit and insurance markets) – Becker and Tomes (1986)
- Parental time
 - Parental involvement in child's education and care-giving may reduce
- Children's time
 - Children's time may be devoted to household and market production activities (as opportunity cost increases)
- Psychological effects
 - Stressful events during childhood affect child's development

Theory

- Health shocks to parents may impact the quality and quantity of inputs to education production function of children through one or more pathways:



Source: Haveman and Wolfe (1995)

Evidence

- It is difficult to identify the specific pathways in empirical work. The focus is on cumulative effect on children's educational attainments.
- Measures of human capital investment/ accumulation used in the literature
 - Education expenditure (Wagstaff, 2007)
 - Current school enrolment (Gertler *et al.* 2004)
 - School attendance /participation (Yamano and Jayne, 2005)
 - Years of completed education (Case and Ardington, 2006)
 - Drop-out/transition (Sun and Yao, 2010)
 - Time spent in learning activities (Ainsworth et al., 2004)
- These measures capture different aspect of human capital accumulation process (input, output and outcome indicators).

Evidence

- Most of the work is concentrated on the impact of AIDS related adult mortality in Africa on children's schooling outcomes
- Millions of children were orphaned in Africa after the spread of AIDS epidemic and studies have investigated if there are differences between orphans' and non-orphans' schooling.

| Study | Country | Results |
|---------------------------|--------------|---|
| Ainsworth et al. (2005) | Tanzania | Hours spent at school reduces before death, enrolment in primary school is delayed |
| Yamano and Jayne (2005) | Rural Kenya | School attendance drops significantly by death of an adult among poor households |
| Case and Ardington (2006) | South Africa | Maternal orphans are less likely to be enrolled and complete few years of schooling |
| Evans and Miguel (2007) | Kenya | Substantial drop in school participation/attendance after death |

Data -Young Lives Survey

- *Young Lives* project that aims to study childhood poverty over a span of 15 years through household and child surveys.
 - Four countries: Ethiopia, India (Andhra Pradesh), Peru and Vietnam
 - Two age-groups of children: younger cohort of 2011 children born in 2001-02 and older cohort of 1008 children born in 1994-95
 - Three rounds: 2002 (R1), 2006 (R2) and 2009 (R3) are completed
 - The attrition rate from Round 1 to Round 3 is 3.6%; it reduces to 2.2% if attrition due to child-deaths is excluded (Galab *et al.*, 2011)
- Only *Young Lives* children are included in the analysis, school attainments of other children in the household are not studied
 - *Young Lives* is a random sample of “households with a 1-year (8-year) old child” in a particular area rather than random sample of all households in that community
 - Information on child health and learning ability available for *Young Lives* children only

Younger cohort

- 99.2% of the children were enrolled in primary or pre-primary education in R3.
- The minimum age of the younger cohort as of beginning of the school academic year (June) in 2009 (R3) is 6.95 years and the maximum is 8.4 years. They are expected to be enrolled in grade 2.
- However, 6.5% of the children were not-enrolled or still enrolled in pre-primary and 12.1% were attending Grade 1 in R3.
- Temporary delay in initiation into primary school?

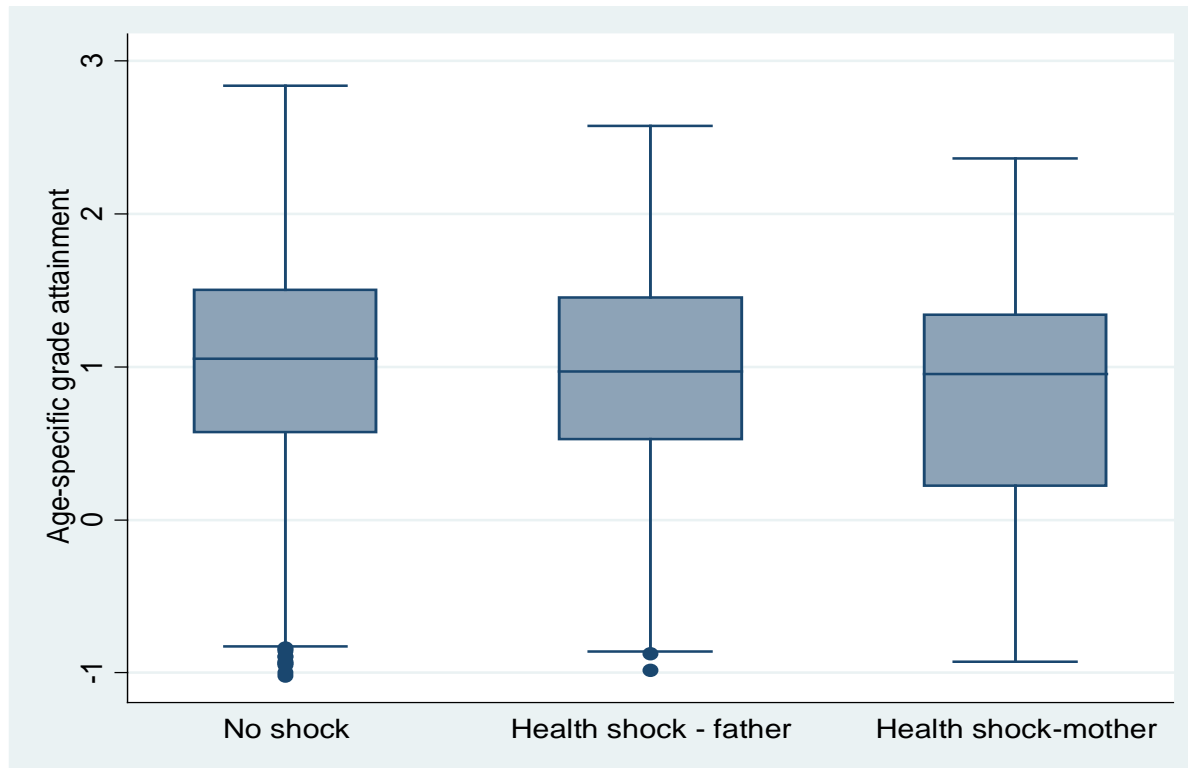
| Age (years) | Not-enrolled | Pre-primary | Grade 1 | Grade 2 | Grade 3 | Grade 4 or above | Total |
|-------------|--------------|-------------|---------|---------|---------|------------------|-------|
| 6.9-7.5 | 10 | 50 | 103 | 217 | 302 | 40 | 722 |
| 7.5-8.0 | 5 | 48 | 111 | 224 | 374 | 238 | 1,000 |
| 8.0-8.5 | 1 | 10 | 20 | 34 | 79 | 63 | 207 |
| Total | 16 | 108 | 234 | 475 | 755 | 341 | 1,929 |

Younger cohort

- We use the following outcome variables to investigate if there is a temporary delay in enrollment in primary school due to parental health shocks.
- The first is an indicator variable that takes value 1 if the child is enrolled in grade 2 (grade 1) or above and 0 otherwise.
- The second is a continuous variable defined as follows :
 - Age-specific grade attainment= $(\text{Grade enrolled} - 1) / (\text{Age in years} - 6)$
 - Takes value 1 if child has completed grade appropriate for the age.
 - Takes values more than 1 if grade completed is higher than that expected of the child's age and vice versa.

Younger cohort

- Age-specific grade attainment



Older cohort

- 97% of children were enrolled in a primary school in R1 which is lower compared to enrollment rates of younger cohort in R3 when they were of the same age.
- Enrollment rates dropped to 75% in the case of older cohort when the children transitioned from primary to upper-primary or secondary schools in R3.
- Termination of schooling due to parental health shocks?

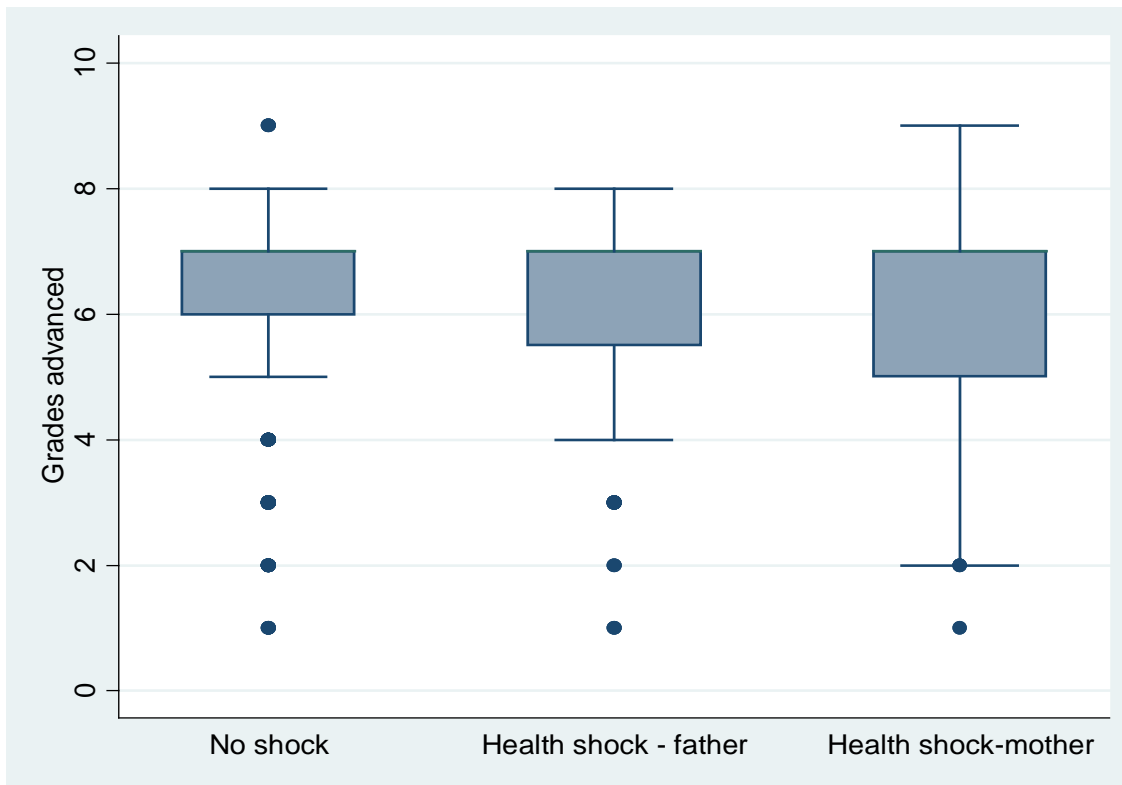
| Older cohort | R1 (2002) | | R3 (2009) | |
|-----------------------|-----------|------------|-----------|------------|
| | Number | Percentage | Number | Percentage |
| Currently in school | 982 | 97.42 | 756 | 75.00 |
| Dropped out of school | 23 | 2.28 | 219 | 21.72 |
| Never attended school | 3 | 0.30 | 1 | 0.00 |
| Attrition | - | - | 32 | 3.17 |
| Total | 1008 | 100 | 1008 | 100 |

Older cohort

- The outcome variables are as follows:
- The first is an indicator variable whether the child is enrolled in school in R3, conditional on school enrolment in R1.
- Dropping out of school need not imply lower educational attainment if children may continue education once the household recovers from shock.
- So I use another outcome variable
 - Grades advanced = Grade completed in R3 – Grade completed in R1
 - Conditional on enrolment in R1

Older cohort

- Grade advancement



Methodology

- Conditional logit model controlling for community (here, village or urban ward) fixed effects in the case of binary outcomes
 - Conditional logit procedure only retains those communities where both dropouts and currently enrolled children are present
 - Controls for community-level factors like access to schools and health centers and other factors that may influence the children in a community
- Least squares regression with fixed effects in case of continuous variables
 - Controls for community level factors that influence children's schooling outcomes

Methodology

- The key regressors of interest are
 - self-reported parental health shocks (serious illness or death of father or mother of *Young Lives* child) during R1-R2 and R2-R3. →
- Other explanatory variables are grouped into following categories:
 - Child characteristics include age, gender, birth order and number of siblings of the *Young Lives* child. In the case of older cohort (who are already in school), continuation of school education or advancement in grades crucially depends on the ability of the child which is captured using learning achievement scores as measured in R1 .
 - Household characteristics include years of schooling of mother and father, initial wealth quartile group and whether household belongs to socially disadvantaged groups like SC, ST and Muslim categories.
 - School characteristics – quality of nearest primary schooling

Challenges in estimation

- Following factors might bias the estimates
- Unobserved time-invariant factors
 - Health shocks are not random events; households facing health shocks may display certain characteristics (social status, mobility) that may also determine school attainment. Failure to control for these characteristics may generate biased estimates (Yamano and Jayne, 2005).
- Unobserved time-varying factors
 - Other events might have occurred during the same period that influence parental health outcomes as well as school attainment of children (Evans and Miguel, 2004). For instance, local weather and crop shocks, parental job loss, child morbidity etc.

Challenges in estimation

- To check for endogeneity issues, we perform the following empirical tests, following the methodology used in Beegle et al. (2006).
- Firstly, I check whether health shocks are persistent, i.e., correlated over time using a dynamic panel regression model.

| Variables | coefficient | se |
|---------------------|-------------|--------|
| Lagged health shock | 0.1013 | 0.0737 |
| Head age | -0.0178 | 0.0190 |
| Age squared | 0.0002 | 0.0002 |
| Female | 0.8970*** | 0.1126 |
| Primary education | -0.0640 | 0.0805 |
| Regular salaried | -0.1274 | 0.1035 |
| Wealth quartile II | 0.0008 | 0.0902 |
| Wealth quartile III | -0.0749 | 0.0983 |
| Wealth quartile IV | -0.1306 | 0.1272 |
| SC | 0.2280** | 0.0899 |
| ST | 0.1539 | 0.1360 |
| Muslim | 0.1973 | 0.1451 |
| Dependency ratio | -0.0294 | 0.0602 |
| Disability | 0.3480*** | 0.1067 |
| Elderly | 0.6425*** | 0.0777 |
| Old cohort | 0.1518** | 0.0733 |
| Round 3 | -0.7619*** | 0.0684 |
| Observations | 5,839 | |

Challenges in estimation

- Secondly, I check if children with low school participation are also more likely to have parents who face health shocks, i.e., if lagged non-participation in school predicts parental health shocks.

| Variables | Younger cohort | | Older cohort | |
|------------------------------------|----------------|-------|--------------|-------|
| | Coefficient | Se | Coefficient | se |
| Lagged non-participation in school | -0.240 | 0.228 | 0.246 | 0.247 |
| Head age | -0.034 | 0.047 | 0.013 | 0.039 |
| Age squared | 0.000 | 0.001 | -0.000 | 0.000 |
| Female | 1.117*** | 0.257 | 1.003*** | 0.181 |
| Primary education | -0.233 | 0.178 | -0.113 | 0.168 |
| Regular salaried | 0.146 | 0.217 | 0.034 | 0.204 |
| Wealth quartile II | 0.256 | 0.195 | -0.139 | 0.179 |
| Wealth quartile III | -0.348 | 0.229 | -0.149 | 0.191 |
| Wealth quartile IV | -0.340 | 0.274 | -0.284 | 0.245 |
| SC | 0.325 | 0.206 | 0.071 | 0.187 |
| ST | 0.017 | 0.294 | -0.052 | 0.307 |
| Muslim | 0.184 | 0.318 | -0.070 | 0.315 |
| Dependency ratio | 0.064 | 0.110 | -0.026 | 0.142 |
| Disability | 0.414* | 0.224 | 0.956*** | 0.201 |
| Elderly | -0.062 | 0.162 | 0.187 | 0.158 |
| Round 3 | | | -0.361*** | 0.140 |
| Observations | 1677 | | 1,902 | |

Findings – Younger cohort

| Variables | Age-specific grade enrollment | | Age-specific grade attained | |
|--------------------------------------|-------------------------------|-------|-----------------------------|-------|
| | coefficient | se | coefficient | se |
| Parental health shocks R1-R2 | -0.663** | 0.282 | -0.104** | 0.042 |
| Parental health shocks R2-R3 | 0.118 | 0.315 | 0.051 | 0.045 |
| Age of the child | 0.063** | 0.031 | - | - |
| Female | 0.707*** | 0.237 | 0.190*** | 0.030 |
| Birth order -1 | -0.273 | 0.260 | -0.061* | 0.035 |
| Siblings | -0.004 | 0.124 | -0.021 | 0.017 |
| Father – years of schooling | 0.001 | 0.027 | -0.003 | 0.004 |
| Mother – years of schooling | 0.039 | 0.037 | 0.011** | 0.005 |
| Wealth quartile II (R1) | 0.184 | 0.327 | -0.033 | 0.046 |
| Wealth quartile III (R1) | -0.355 | 0.339 | -0.142*** | 0.049 |
| Wealth quartile IV (R1) | -0.121 | 0.499 | -0.033 | 0.067 |
| Regular salaried job (R1) | -0.503 | 0.324 | -0.018 | 0.046 |
| SC | 0.914** | 0.371 | 0.111** | 0.045 |
| ST | -0.263 | 0.424 | -0.001 | 0.063 |
| Muslim | 0.016 | 0.506 | -0.058 | 0.071 |
| Household migrated (R1-R3) | -0.357 | 0.424 | -0.170*** | 0.065 |
| Nearest primary school quality - bad | -0.471 | 0.288 | -0.151*** | 0.052 |
| Constant | - | - | 1.043*** | 0.072 |
| Observations | 1,184 | | 1,901 | |
| Pseudo or adj. R-squared | 0.099 | | 0.183 | |

Findings – Older cohort

| VARIABLES | Conditional enrollment | | Grade advancement | |
|------------------------------|------------------------|-------|-------------------|-------|
| | coefficient | se | coefficient | se |
| Parental health shocks R1-R2 | -0.134 | 0.287 | 0.047 | 0.124 |
| Parental health shocks R2-R3 | -0.735** | 0.294 | -0.255* | 0.138 |
| Age of the child (months) | -0.135*** | 0.032 | - | - |
| Female | -0.485** | 0.239 | -0.103 | 0.101 |
| Siblings | -0.487*** | 0.123 | -0.129** | 0.052 |
| Father – years of schooling | 0.076* | 0.039 | 0.005 | 0.015 |
| Mother – years of schooling | 0.099* | 0.056 | 0.016 | 0.019 |
| Wealth quartile II (R1) | 0.676** | 0.308 | 0.235 | 0.146 |
| Wealth quartile III (R1) | 0.821** | 0.362 | 0.498*** | 0.158 |
| Wealth quartile IV (R1) | 1.732*** | 0.663 | 0.331 | 0.230 |
| Regular salaried job (R1) | 0.189 | 0.462 | 0.156 | 0.161 |
| SC | 0.781** | 0.321 | -0.160 | 0.144 |
| ST | -0.450 | 0.529 | -0.151 | 0.234 |
| Muslim | -1.501*** | 0.559 | -0.148 | 0.241 |
| Reading – Nothing (R1) | -1.313*** | 0.469 | -1.162*** | 0.230 |
| Reading – Letters only (R1) | -0.495* | 0.274 | -0.242* | 0.126 |
| Numeracy – Incorrect (R1) | -0.146 | 0.388 | -0.107 | 0.192 |
| Household migrated (R1-R3) | -1.424** | 0.621 | -0.385 | 0.305 |
| Constant | | | 6.683*** | 0.231 |
| Observations | 694 | | 865 | |
| Pseudo/Adj. R-squared | 0.268 | | 0.219 | |

Conclusions

- Younger cohort
 - Higher the years of schooling attained by the mother, higher the chances of grade enrolment at the appropriate age.
 - Migration of household and unavailability of quality primary school in the community has a significant negative effect on primary school enrollment.
- Older cohort
 - Drop-out rates are found to be high among the older and female children.
 - Higher the number of siblings, higher the drop-out rates and lower the advancement in grades.
 - Father's and mother's years of schooling improve the odds of children continuing education at upper-primary and secondary level.
 - Similar is the case of wealthier households, i.e., children belonging to top-most (initial) wealth quartile groups have higher probability of continuing to secondary education.
 - Migration of the household into a different community negatively impacts the child's education at least temporarily.

Conclusions

- In the case of younger children, there is a temporary delay in the enrollment into primary education, while in the case of older cohort, schooling attainment is reduced by 0.26 years due to parental health shocks.
- In early childhood, maternal shocks are more important which mainly affects child's human capital development through time devoted to childcare. →
- In the later stage, income channels are more important since paternal health shocks reduce the schooling attainment while maternal shocks do not have significant impact.
- Other income shocks like job loss and child's initial cognitive ability are significant predictors of schooling attainment of children.

Robustness checks

- Conditional on both parents alive in R1
- Conditional on no migration from the community
- Different indicators of child health used in the analysis
- Borrowing constraints faced by household (access to formal and informal credit markets)

Implications

- Households that are low on socio-economic status are more vulnerable to health shocks (Dhanaraj, 2014).
- These in turn reduce their future economic well-being of children through reduced school participation and thereby perpetuating poverty and inequality.
- Policy interventions to retain children in school should be explored for the state of Andhra Pradesh.
- The state had a Gross Enrolment Ratio of 100.76 in the primary level that dropped to 79.12 in the upper primary level according to DISE (2011).
- Safety nets like conditional cash transfers programs like that of Progressa in Mexico which have a condition on school attendance can be explored as policy options to mitigate the inter-generational economic consequences of parental health shocks.

Thank you!

Income shocks faced by households

| Type of shocks | Between child birth and Round 1 (%) | | Between Round 1 and Round 2 (%) | | Between Round 2 and Round 3 (%) | |
|-------------------------------|-------------------------------------|-------|---------------------------------|-------|---------------------------------|-------|
| | Younger | Older | Younger | Older | Younger | Older |
| Serious illness / death | 18.55 | 27.38 | 28.67 | 31.79 | 18.20 | 20.71 |
| Theft / fire / eviction | 5.87 | 5.65 | 9.44 | 7.95 | 6.00 | 4.26 |
| Job loss / Education expenses | 7.96 | 14.48 | 3.64 | 4.12 | 1.38 | 1.12 |
| Livestock loss / disease | 5.82 | 8.04 | 6.31 | 7.75 | 7.64 | 9.34 |
| Crop loss / damage | 28.19 | 32.74 | 18.15 | 21.63 | 21.32 | 22.34 |
| Natural disasters | 22.28 | 24.11 | 30.56 | 31.19 | 9.58 | 11.27 |
| Price fluctuations | | | 11.13 | 11.27 | 78.58 | 74.72 |
| Others | 0.10 | 0.14 | 2.92 | 4.23 | 8.82 | 9.54 |
| Observations | 2011 | 1008 | 1950 | 994 | 1951 | 985 |



Coping strategies against health shocks

| Household response | Between Round 1 and Round 2 | | Between Round 2 and Round 3 | |
|---|-----------------------------|-----------|-----------------------------|-----------|
| | Younger (%) | Older (%) | Younger (%) | Older (%) |
| Ate less | 0.59 | 2.15 | 1.19 | 0.41 |
| Bought less | 2.38 | 2.96 | 2.63 | 2.46 |
| Migrated to find work | 1.93 | 2.42 | 0.95 | 0.41 |
| Nothing | 17.68 | 13.44 | 8.35 | 0.82 |
| Received help from the community | 2.08 | 4.03 | 2.39 | 8.61 |
| Received help from relatives/friends | 20.51 | 18.55 | 20.05 | 20.08 |
| Received help from government/NGO | 1.04 | 0.27 | 2.39 | 3.69 |
| Sent children to be cared for by friend | 0.74 | 0.54 | 0.72 | 1.23 |
| Sent children to work | 0.15 | 1.34 | 0.24 | 0.41 |
| Sold possessions/belongings | 0.74 | 0.81 | 0.48 | 1.23 |
| Took children out of school | 0.15 | 1.34 | 0.24 | 0.41 |
| Used credit | 34.32 | 33.87 | 30.55 | 32.79 |
| Used savings | 10.4 | 7.8 | 16.47 | 15.57 |
| Worked more | 4.9 | 7.26 | 7.4 | 6.97 |
| Mortgaged | 0.15 | 0.27 | 1.91 | 1.23 |
| Others | 1.78 | 1.88 | 1.43 | 2.05 |



Findings

| Variables | Younger cohort | | Older cohort | |
|----------------|----------------------|---------------------|------------------------|---------------------|
| | Grade enrollment | Grade attainment | Conditional enrollment | Grade advancement |
| Father (R1-R2) | -0.177 (0.380) | -0.075 (0.052) | -0.152 (0.338) | 0.016 (0.150) |
| Mother (R1-R2) | -0.928*** (0.349) | -0.120** (0.055) | -0.018 (0.386) | 0.057 (0.160) |
| Father (R2-R3) | 0.206 (0.430) | 0.036 (0.056) | -0.836** (0.361) | -0.227 (0.166) |
| Mother (R2-R3) | 0.260 (0.388) | 0.040 (0.058) | -0.568 (0.388) | -0.227 (0.184) |
| Constant | | 1.043*** (0.072) | | 6.674*** (0.232) |
| Observations | 1,184 | 1,901 | 694 | 865 |

