**Longer-term Consequences of Parental Death on Teenage Children's Well-Being: Evidence from an Exogenous Shock in Indonesia**

The question of how parental death affects teenage children's welfare has become more prominent as the AIDs epidemic has generated rising proportions of children in such circumstances. Arriving at answers however is complicated by the fact that researchers are rarely able to exploit situations where parental deaths are exogenously determined with respect to other behaviors that affect the children's welfare. Likewise, researchers find it difficult to determine whether outcomes reflect an immediate or longer term impact as most available datasets do not provide information on the timing of parent's death.

This paper addresses the above question and issues using a unique panel dataset collected before and after the December 2004 Indian Ocean tsunami. This dataset is collected as part of the Study of the Tsunami Aftermath and Recovery (STAR) which is a multiwave longitudinal study that draws on a subset of respondents to the 2004 National Socioeconomic Survey (SUSENAS), implemented in 10 months before the tsunami (wave A). With Statistics Indonesia's assistance, we fielded the first wave after the tsunami (wave B) between May 2005 and July 2006. We sought to re-contact 39,500 individuals originally interviewed in 585 enumeration areas in Aceh and North Sumatra. Additional follow-ups were conducted beginning in July 2006 (wave C), August 2007 (wave D) and July 2008 (wave E).

Using high resolution MODIS satellite imagery of the damage to the land immediately after the tsunami, we have stratified the study areas into three zones of damage: heavily damaged, moderately damaged and not directly damaged. Each study household is allocated to one of these zones based on the GPS co-ordinates of their location at the baseline survey, prior to the tsunami.

Our preliminary analysis focuses on the 566 children who survived the tsunami and were between 12 and 18 years of age at the time of post-tsunami interview, and had been living, before the tsunami, in the communities that were heavily damaged. We limit our analysis geographically to the heavy damaged zone because the majority of the parental deaths occurred in these areas. This also allows us to eliminate the concern that there might be unobserved factors that might be affecting the differences in the outcomes of orphan and non-orphan children in various damaged zones. Overall, about 29% of the population in the heavily damaged zone perished (the rate for the undamaged zone, in contrast, is only 2%). Among children in our target age range, about 30% were killed. We interviewed about 84% of these surviving children (14% were not relocated, 2% refused to be interviewed). Of these children, roughly 19% lost either parent, 14% lost a mother, 9% lost a father and 5% lost both parents.

This paper attempts to contribute to the literature in three ways. First, we use a plausibly exogenous source of parental death. Because the 2004 Indian Ocean tsunami and the havoc it wreaked were unanticipated and death in the affected areas was determined by largely idiosyncratic factors (such as proximity to the shore), the event provides a window into the question of how children's well-being is affected by parental deaths. Second, we examine a wider array of child outcomes than most papers are able to consider, extending our analysis

beyond children's current schooling enrollment to time allocation (household chores and work) as well as marriage probability. Third, we examine the longer term consequences of parental death on children's later life outcomes as they transition into adulthood.

We separately divide our analysis for male and female teenage children with the hypothesis that there could be gender differences in the impact of parental death. Our regression analysis will examine separately the impact of maternal and paternal death on these children. We briefly discuss below how the outcomes for the orphans and non-orphans vary over time from pre-tsunami period (wave A) to subsequent four years after the tsunami (waves B, C, D and E).

**I. School Enrollment**

A natural question with respect to children's well-being in the aftermath of a disaster and over a longer term pertains to how the disaster affects their formation of human capital. Most of the earlier studies (see for example, Gertler et. al. (2004), Case et. al. (2004), Case and Ardington (2006), Evans and Miguel (2007), among others) that examined the impact of parental death on children's well-being have looked on schooling outcomes. General results show that parental death, in particular maternal death, has deleterious impact on the children. It is however unclear whether the results refer to an immediate or a longer term impact of the parental death on children's well-being due to lack of information on the timing of parent's death.

Therefore in this paper, we examine this outcome on a longer term horizon. Figures 1A and 1B plots the school enrollment rate of male and female teenage children over time, as represented by the waves. The beginning of the trend line provides the baseline average for school enrollment prior to 2004 tsunami (wave A). While male orphans started out with a higher enrollment rate than the male non-orphans in the baseline, over time after the tsunami, their enrollment rate went down faster than the male non-orphans. On the other hand, relative to female non-orphans, female orphans are more likely to be enrolled in school from the baseline wave until wave D (2007) but then enrollment rates of orphans went down more abruptly than the non-orphans in wave E.

**II. Work**

Since this age range (12-18) has the potential of going into labor market, we also examine how parental death affects the labor market participation of the children. Since the loss of a parent could mean a loss in financial resources available to the family, it is possible that children whose parents have died due to the tsunami are more likely to work than those children whose parents did not die. Particularly, a father's death may have more prominent impact among teenage boys' probability of working as they serve as substitute for the father as breadwinner of the family. Figures 2A and 2B plot the proportion of male and female teenage children who worked in the past week across the different waves. We find that while the male orphans and non-orphans have relatively similar rates of labor force participation in the baseline, over time a greater proportion of male orphans are likely to work compared to their non-orphans counterpart. Meanwhile, relative to female non-orphans who have a generally increasing trend in labor force

participation over time, the female orphans tend to have erratic labor market participation over time.

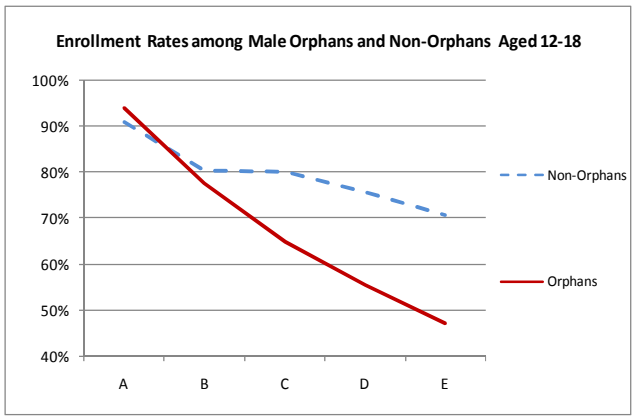
**III. Household Chores**

It is also of interest to examine the time use of teenage children at home, that is, whether they did any household chores in the past week. A natural hypothesis is that the loss of a parent, in particular the loss of a mother, may increase the time allocation at home of female orphans. Figures 3A and 3B plot the proportion of male and female children who did household chores in the past week over time. In general, male orphans tend to have lower propensity to do household chores when compared to male non-orphans for the baseline wave and two years after (wave C). But then this pattern changes afterwards with them more likely to do more household chores than their non-orphans counterpart in waves D and E. On the other hand, a smaller proportion of female orphans performed household chores in waves after the tsunami (waves B and C) although this pattern switches in waves D and E.

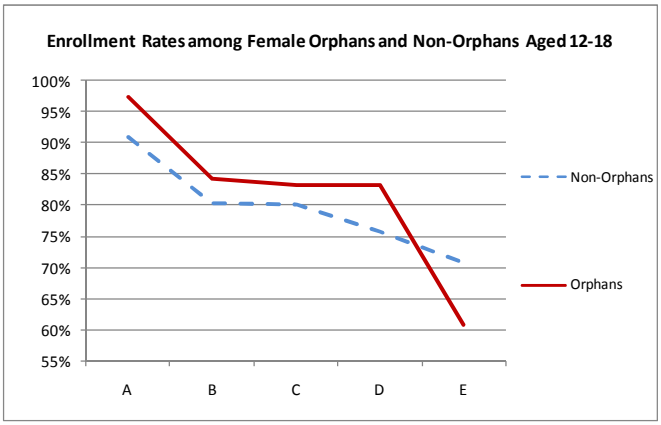
**IV. Marriage Probability**

Given the emotional and financial stress associated with parental death, it is a reasonable hypothesis that parental death may have an impact on the marriage probability of teenage orphans. Figures 4A and 4B display the marriage rates of male and female teenagers over time. We find that males in general are unlikely to get married in the subsequent years after the tsunami. In fact, no male orphan has gotten married until wave E (four years after the tsunami). On the other hand, interestingly, female orphans have an increasing trend in marriage probabilities over time. By four years after the tsunami, about 21% of this group has gotten married.

In general, these patterns reveal three things. First, there seems to be differences outcomes of orphans and non-orphans in general. Second, these patterns signify that there are also gender differences in the impact of parental death. Finally, it seems that parental death has long term affects on the lives of these children. In the coming months we will extend these analyses by developing regression models that allow us to control for more background features, and by considering the evolution of mental health outcomes.




(Figure 1A)

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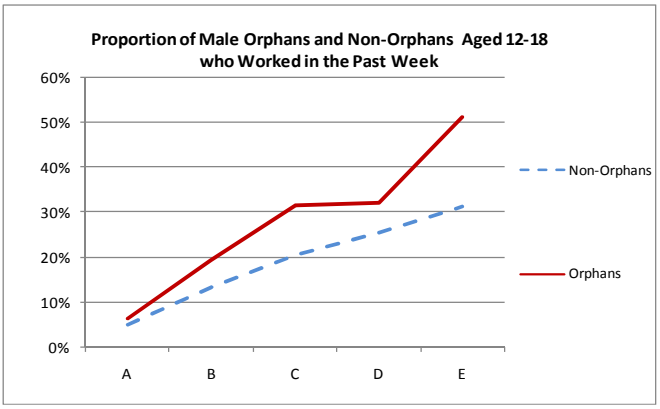


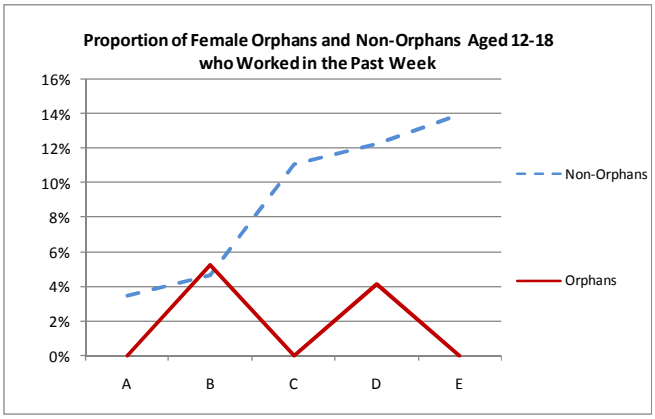


(Figure 2A)

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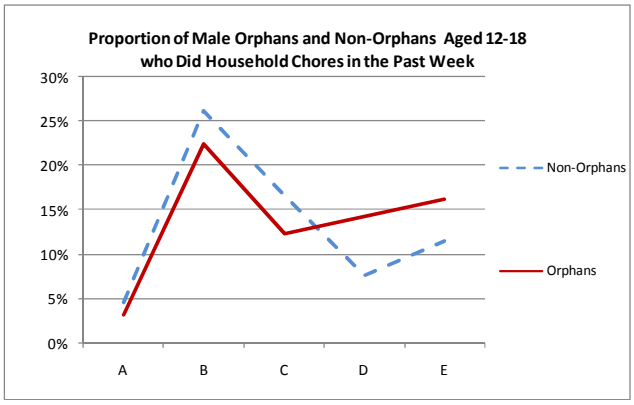


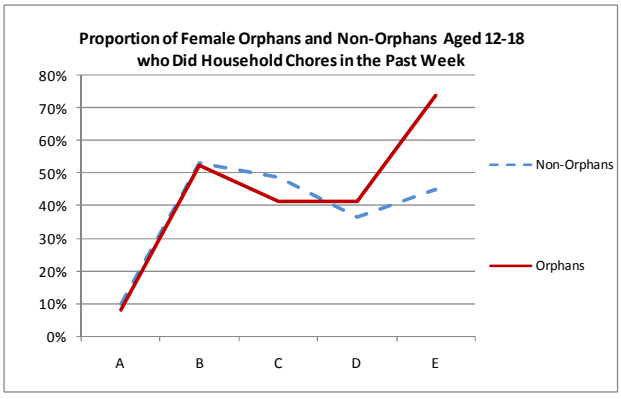


(Figure 3A)

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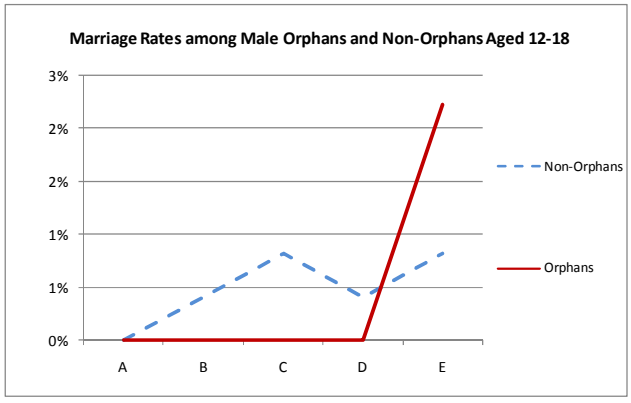


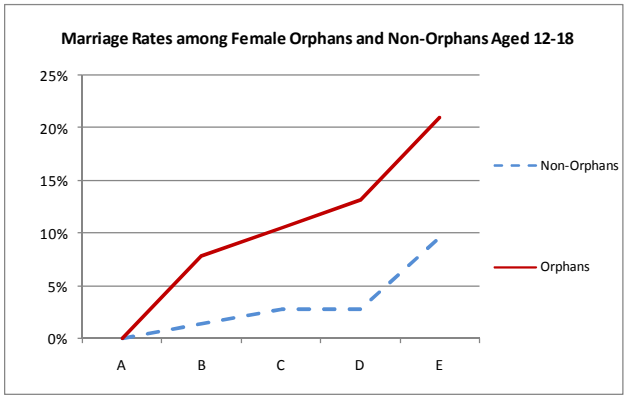


(Figure 4A)

(Figure 4B)