

Children in the Aftermath of the Tsunami: Evidence from Indonesia

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Humanitarian crises, whether natural or manmade, have potentially devastating impacts for children. The 2004 Indian Ocean tsunami was one of the most destructive disasters in human history, killing upwards of 200,000 people and displacing another 1.5 million. The majority of casualties occurred in Indonesia, where the high level of mortality was accompanied by tremendous damage to property and infrastructure.

In this paper we investigate the consequences of the tsunami for children in two provinces in Indonesia: Aceh, which bore the brunt of the damage, and neighboring North Sumatra, which suffered far less. We analyze a unique dataset collected as part of the Study of the Tsunami Aftermath and Recovery (STAR). STAR 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. With Statistics Indonesia assistance, we fielded the first wave STAR between May 2005 and July 2006. We sought to recontact 39,500 individuals originally interviewed in 585 enumeration areas in Aceh and North Sumatra. We were able either to interview or establish the survival status of over 90% of the original respondents. Additional follow-ups have been conducted in 2006/07 and 2007/08.

Among the areas encompassed by the baseline survey, those that were closest to the epicenter of the earthquake and that experienced the greatest inundation of water suffered the greatest damage from the disaster. Other areas suffered no damage because of the shape of the coastline. 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.

In this paper we examine outcomes for children in Aceh and North Sumatra along three dimensions: loss of or separation from parents, disruption to schooling, and health. We briefly summarize preliminary results below before turning to a description of our plans for additional work.

I. Death and Absence of Parents

One of the main public concerns in the immediate aftermath of the tsunami was the potential for thousands of children to have been left orphaned by the catastrophe. Indeed, many early media reports focused on the dangers of increased child trafficking as a result of orphaned children.

Our results show that while children in the heavily damaged zone are much more likely to have only surviving parent than are children in the less damaged areas, it is extremely uncommon to have lost both parents. As displayed in Table 1, in the heavily damaged zone about 13% of children have lost a parent, in comparison to about 7% in

the less damaged areas (these results are not limited to deaths directly traceable to the tsunami, since the loss of a parent by any cause affects child well-being, and the long-running civil war in Aceh prior to the tsunami caused higher than average death among prime age adults). Among children in the heavily damaged zone, 1.7% have lost both parents, whereas the figure is less than 1% for children in the other zones.

One of the reasons for the relatively low rates of orphanage as defined by loss of both parents is in a natural disaster mortality rates are correlated across family members. In households where both the mother and father perished, the children did as well.

Among the children who lost one or both parents, over 90% have other close kin with whom they now reside. Although STAR is designed to track children and interview them in institutions if that is where they are now living, only 6 children were interviewed in an institution in the first follow up wave of STAR, and only one of them was orphaned by the tsunami. Our data are consistent with UNICEF estimates, which reported that only 60 children in all of Aceh had been left without support from any adult they had known before the disaster.

Table 1. Parent Status Reports for Children less than 15 Years Old

	Damage Zone		
	Severe	Moderate	None
Death of Parents			
One	10.9%	6.7%	7.1%
Both	1.7%	0.3%	0.3%
Absence of Parents			
One	7.7	6.4	7.1
Both	3.2	1.4	1.6

Reported either by the child (for children aged 11-14) or the caretaker

The tsunami caused a great deal of change in family living arrangements, both directly as a result of the death and destruction that it brought, and indirectly in that eventually the reconstruction projects brought new job opportunities that were worth migrating to for some adults. The second panel of Table 1 presents results on parental absence, possibly as a result of labor migration. This panel suggests that across all damage zones some children are living separately from parents, and that this source of absence is worth of attention as well.

The tsunami had consequences other than its implications for mortality, and we turn now to an assessment of how schooling progress was impeded by the disaster, which destroyed school facilities as well as other types of infrastructure.

II. Schooling

A natural question with respect to children's well-being in the aftermath of a disaster pertains to how the disaster affects their daily lives and the formation of human capital. Studies of children's psychological well-being have suggested that children are best

served by returning to a regular routine, including school attendance, as quickly as possible. Indeed, after basic needs for water, food, clothing, and shelter had been met, many relief agencies turned to providing temporary schools in areas where school buildings had been destroyed. We investigate the of disruption to schooling by analyzing the impact of tsunami on several schooling outcomes for children aged 4-20, such as the probability of missing school (for at least two weeks) in the period after the tsunami, the number of weeks out of school, the probability of enrollment at the time of the first follow-up survey, and probability of aspiring for post-secondary school education.

Table 2 presents the results of preliminary multivariate regressions of the effects of tsunami damage and other individual and household characteristics on the schooling outcomes.

The preliminary results show that the children in the most heavily damaged areas have a higher probability of missing school and a greater number of weeks out of school compared to the areas without damage, which most likely reflects damage to infrastructure. This possibility will be investigated using data from the STAR community and facility survey, which provides information on damage and closure of neighborhood schools in the aftermath of the disaster, as well as on receipt of assistance for rebuilding schools.

Of the measures of socioeconomic status, among children from households in the bottom quartile of the expenditure distribution, as expenditure levels rise, the probability of missing school for two weeks or more falls, and the duration of schooling missed falls.

Interestingly, despite being the most hit by the tsunami, children in the severely damaged zones and lightly damaged zones have higher probabilities of enrolling and have higher aspirations than those in the undamaged zones. These results likely reflect differences prior to the tsunami that emerge in analysis of the pre-tsunami SUSENAS data (results not shown). We will extend the analysis to incorporate the impact of having lost a parent to death.

With respect to other characteristics of the children and their parents, younger children (aged 4-6) are more likely to enroll in school while older children (aged >12) are less likely to be enrolled. As expected, higher parental education is associated with higher probability of enrolling and aspiring for post-secondary education. Likewise, those in third quartile of household income are more likely to enroll children to school.

These results provide preliminary evidence that disruption effect might be greater for older children than younger ones. Likewise, there is some interesting evidence that certain individual and household characteristics can serve as protective measures in mitigating the effects of natural disasters on schooling outcomes. Additional analyses will incorporate a rich set of predictors at individual, household and community levels to examine how their effects differed between tsunami-damaged and undamaged areas,

as well as examine separately the impact on younger children (aged 4-12) vis-à-vis the older children (aged 12-20) to see the differential impact of tsunami damage between these age groups.

Moving forward, the paper will examine the impact of the tsunami on physical and mental health outcomes of children in Indonesia as well, and relate these outcomes to covariates measured at the level of the child, the household, and community.

Table 2. Effect of Tsunami on Education Outcomes for Children aged (4-20)

<i>Control Variables</i>	<i>Dependent Variables</i>			
	(1) <i>Missed School, 2+ weeks, 2005</i>	(2) <i>Weeks Out of School in 2005</i>	(3) <i>Enrollment at Interview</i>	(4) <i>Aspirations for post-secondary</i>
Severe damage	3.623**	4.09**	0.69**	0.387**
Light damage	2.325**	1.465**	0.274**	0.336**
Aged (4-6yrs)	0.528**	0.126	1.841**	-0.164*
Aged (7-12yrs)	-0.003	-0.017	0.138**	0.07**
Aged (>12yrs)	0.047**	0.333*	-0.568**	-0.058**
Female	-0.045	-0.157	0.208**	0.287**
Mother's education (0-6 yrs)	-0.042*	-0.038	0.11**	0.07**
Mother's education (7-12yrs)	0.055**	0.026	0.103**	0.165**
Mother's education (>12yrs)	0.035	0.104	0.159**	0.119*
Father's education (0-6 yrs)	-0.025	0.027	0.055**	0.026+
Father's education (7-12yrs)	-0.016	-0.044	0.07**	0.068**
Father's education (>12yrs)	0.04	0.047	0.112**	0.245**
ln(PCE)1 (0,12.2)	-1.156**	-1.591**	0.121	0.292+
ln(PCE)2 (12.2, 12.6)	0.433	1.001	0.413	-0.038
ln(PCE)3 (12.6, 13)	-0.167	-0.693	0.653*	0.615*
ln(PCE)4 (>13)	0.092	0.221	0.124	0.493**
Constant	7.919**	18.872**	-13.15**	-3.317
Observations	8252	6199	10929	8801
Wald chi2	1440.7		2796.89	904.66
R-squared		0.09		
F stat		40.36		

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

x ln(PCE)1 -ln(PCE)4 in dollar units.