

## Transfers in Response to a Massive Shock: Interactions between Family and Public Support

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The Indian Ocean tsunami associated with the December 26, 2004 Sumatra-Andaman earthquake killed over 150,000 Indonesians living along the coast in the northern part of the island of Sumatra. In some areas, mortality rates exceeded 50% and many parts of the coast were completely devastated by the water from the tsunami which reached up to 5 kms inland. It is estimated that over half a million people lost their homes and a large number of people lost their entire livelihoods. Public infrastructure including roads and bridges was seriously damaged and many communities were completely isolated for an extended period of time.

The widespread loss of life and damage due to the tsunami elicited a massive and unprecedented humanitarian response. It is estimated that aid from outside Indonesia exceeded \$7 billion. At the same time, the government along with many community and religious organizations within Indonesia mobilized to assist those that had been affected by the tsunami. This study highlights the complementarities between this assistance and support provided by family and friends, a more traditional source of aid in low income populations. Longitudinal survey data from Aceh, the northern most province in Indonesia, are examined to identify the beneficiaries of public and private aid.

Contrasts are drawn between those who received aid from the government and from non-government organizations, with those who received aid from religious organizations and those who received aid from family or friends. In addition to whether a household receives aid, we examine the nature of the aid – be it in cash or in the form of goods such as construction materials – and the value of the aid provided. In all cases, we assess whether aid was targeted at those who were most deleteriously impacted by the tsunami and explore whether there is evidence that family support responds to support provided by the public sector.

The baseline round of the survey, the Study of the Tsunami, Aftermath and Recovery, was collected from over 9,000 households in coastal Aceh about 10 months prior to the tsunami in February 2004. The first re-survey was conducted between May 2005 and June 2006. Over 90% of the original respondents were either re-interviewed or confirmed to be dead. Additional follow-ups have been conducted in 2006/07 and 2007/08. The baseline survey is representative of the population living in coastal areas in Aceh. Those areas that were closest to the epicenter of the earthquake and those exposed to the highest water from the tsunami suffered the greatest damage. Other areas suffered no damage because of the shape of the coastline. Using high resolution MODIS satellite imagery from before and immediately after the tsunami to identify damage to the land, the study areas have been stratified 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. We are, therefore, able to relate aid to the extent of damage in the area the household was living. We also relate aid to characteristics of the household prior to the tsunami, destruction of assets because of the tsunami and death of household or family members.

The heavily damaged zone accounts for about 15% of the study population. On average, one in four people died because of the tsunami in those areas. There was moderate damage in the second zone, which covers 50% of the study population and where one in 25 people died. The control area, where there was no direct damage accounts for the rest of the study population.

Table 1 provides an overview of the extent to which households in these areas received some form of assistance. As shown in panel A of the table, over half the households received some aid with over four out of five of the households in the heavily damaged zone receiving aid. Nearly two-thirds of the households in areas that were moderately damaged received some aid and nearly 40% of households in areas that were not directly damaged received some aid. Over one-third of household received aid from the government, over a quarter from NGOs and one in six from friends or family. Religious organizations provided aid to one in twelve households. Aid from government and non-government organizations (NGOs) was relatively well-targeted to areas that were damaged – particularly aid from NGOs. Religious organizations provided assistance to both the heavily and moderately damaged areas. In sharp contrast, aid from families and friends is only moderately associated with whether the household was living in an area that sustained heavy damage.

These patterns are reinforced in panel B of the table which reports sources of aid among those who received aid. Almost every household in the heavily damaged areas received aid from either the government or an NGO with 40% receiving aid only from the government or NGO. Only 4% of households in these areas relied exclusively on friends or family for aid. Among households in areas that were not directly damaged, about 3% received aid from only the government or an NGO whereas one-third received assistance from friends or family.

We turn next to an examination of the household characteristics that are predictive of aid receipt. Table 2 provides results from some preliminary multivariate logistic regressions. Odds ratios and robust asymptotic t statistics are reported in the table. Future research will estimate multinomial models along with models that examine whether aid is in cash or goods and also the value of the aid.

Regressions in the first panel control household size and composition at baseline, resource availability at baseline as indicated by whether the household owned a house, productive assets (such as land, livestock or buildings other than a house) and more liquid assets (household goods, jewelry or cash). The models also control (the logarithm) of per capita expenditure at baseline as well as the education of the household head.

There is clear evidence that both the government and NGOs targeted resources towards poorer households. Higher levels of per capita expenditure, a better educated head and having productive assets prior to the tsunami are all associated with a lower probability of receiving aid from the government or from an NGO. Religious organizations tended to target households with few assets and low levels of per capita expenditure. Families and friends were more likely to assist those who did not own a house or productive assets. Education and per capita expenditure are not related to the receipt of aid from family and friends although more children is associated with a higher probability of aid from them.

The models include two sets of covariates that capture the magnitude of the shock associated with the tsunami. The first set measures whether assets owned by the household were destroyed

by the tsunami. They are strong predictors of receipt of aid from all sources. A household that lost its house was over twice as likely to receive aid from the government or NGOs relative to a household that did not. Similar patterns emerge for the loss of productive assets. The loss of liquid assets is an even more powerful predictor of receipt of aid. This is driven by the loss of household goods and indicates that households who lost everything because their houses were destroyed were the most likely beneficiaries of public assistance. Religious organizations tended to target households that lost their houses and tended to not aid those who lost productive assets. Assistance from family and friends is significantly more likely among households that suffered asset losses but the odds ratios are much smaller than estimated for public assistance.

The last set of characteristics condition on whether the household was living in an area that was damaged at the time of the tsunami. The evidence is extremely clear that the government and especially NGOs focused on areas that were heavily damaged even after conditioning on household characteristics and indicators of household-specific damage. NGOs are over 10 times more likely to assist households in the heavily damaged areas, relative to households in areas that were not damaged and about 5 times more likely than households in moderately damaged areas. The government followed a similar pattern although it spread aid more broadly across coastal Aceh. Religious organizations tended to favor areas that were moderately damaged – indicating they were attempting to reach vulnerable households in areas that were not well-served by the public sector.

Aid from family and friends stands in stark contrast: households that were living in the heaviest damaged areas were no more likely to receive aid than those in areas that were not damaged. This may reflect that the households that sustained the most damage moved in with their families and friends living elsewhere. Preliminary analyses of post-tsunami mobility indicate that is not the case. In fact, the majority of displaced households moved to temporary quarters in camps. Moreover, conditional on resources and the magnitude of damage, households that were living in moderately damaged areas were significantly less likely to received aid from friends or family than those who lived in areas that were not damaged.

The results suggest that targeting of aid from the public sector is largely community-specific and that religious organizations seek to complement services provided by the public sector. Family and friends have considerably more information on the well-being of people who were affected by the tsunami and the evidence indicates that their support was directed as those who were not otherwise benefiting from aid in their communities. Further research will explicitly test these hypotheses drawing on models that sweep out community-level characteristics and multinomial probit models that will model the sources of aid jointly allowing correlations across outcomes. These models will be complemented with analyses that exploit the value of aid and the shares of aid by source.

The research will provide new insights into the ways in which families provide insurance in the face of a major shock and the extent to which family behavior is responsive to the support provided by the public sector. This speaks to the question of whether there is a leaky bucket in public assistance and provides evidence on the optimality of public programs that seek to assist those who are the poorest or those who suffer the greatest loss in the face of negative shocks.

Table 1a: Distribution of aid recipients across tsunami damage and by aid source

Damage zone	% of HHs	Received any aid	Received aid from			
			Govt	NGO	ReligOrg	Family
Heavy	15	84	67	66	9	25
Moderate	50	59	41	30	11	15
None	35	38	19	6	2	17
Total	100	55	37	27	8	17

Table 1b: Distribution of aid recipients, conditional on receiving some aid

Damage zone	Conditional on receiving some aid, received aid from						
	Govt	NGO	Relig	Org	Family	All sources	Govt or NGO
Heavy	80	79	11	30	2	95	37
Moderate	70	50	19	26	1	88	41
None	51	17	6	45	0	63	50
Total	68	49	14	31	1	84	42

Table 2: Predictors of aid receipt

Odds ratios from logistic regressions	Aid received from			
	Gov't	NGO	Religious Org	Family & Friends
<i>Measured prior to tsunami</i>	(1)	(2)	(3)	(4)
HH composition				
HH size	0.96 (1.6)	0.93 (1.6)	0.99 (0.2)	0.97 (1.0)
Number children	1.05 (1.3)	1.01 (0.1)	1.03 (0.5)	1.12 (3.2)
Number elderly	1.01 (0.1)	0.78 (2.2)	1.08 (0.5)	1.12 (1.3)
[1] if female head	0.99 (0.1)	0.88 (1.0)	1.57 (2.8)	0.88 (1.3)
Education of HH head (years)	0.97 (3.1)	0.97 (2.3)	1.00 (0.1)	1.02 (1.9)
HH resources				
Own house pre-tsunami?	0.91 (1.3)	0.99 (0.1)	0.61 (3.4)	0.54 (8.4)
Own productive assets pre-tsunami?	0.84 (2.8)	1.45 (4.6)	0.82 (2.0)	0.88 (2.1)
Own liquid assets pre-tsunami?	1.28 (2.0)	0.94 (0.5)	0.96 (0.2)	1.08 (0.7)
Log per capita exp	0.82 (2.9)	0.68 (4.3)	0.70 (2.5)	1.05 (0.8)
<i>Measured after tsunami</i>				
HH composition				
HH size	1.04 (1.3)	0.95 (1.6)	1.13 (3.0)	0.83 (5.6)
Number children	1.08 (2.0)	0.99 (0.1)	1.00 (0.0)	0.97 (0.7)
Number elderly	0.90 (1.4)	0.99 (0.1)	0.86 (1.2)	1.77 (6.6)
Female head	1.08 (0.9)	0.91 (0.8)	1.05 (0.3)	2.32 (10.4)
Damage to HH resources				
House destroyed/damaged by tsunami?	2.31 (8.1)	2.45 (7.4)	4.19 (10.4)	1.27 (2.1)
Productive assets destroyed/damaged by tsunami?	1.88 (5.0)	2.29 (6.2)	0.61 (2.9)	1.43 (2.7)
Liquid assets destroyed/damaged by tsunami?	4.35 (13.9)	4.02 (12.0)	1.93 (4.4)	1.60 (4.5)
<i>Level of damage where resided at time of tsunami</i>				
Moderate	2.02 (6.1)	3.62 (6.2)	3.16 (5.0)	0.84 (2.0)
Heavy	3.74 (7.5)	12.07 (10.4)	1.92 (2.0)	1.16 (1.3)

Notes: 9,701 HHs in each logistic regression. Robust asymptotic t statistics below odds ratios take into account clustering.