The Impact of a Disaster on Life in Sumatra: Evidence from before and after the December 26 Tsunami

Elizabeth Frankenberg, Jed Friedman, Nick Ingwersen, Jenna Nobles,
Fadia Saadah, Cecep Sukria Sumantri, Wayan Suriastini, Duncan Thomas

On December 26, 2004 a massive earthquake in the Indian Ocean spawned a tsunami that caused unparalleled devastation in the Indonesian province of Aceh. To provide systematically collected information on the full range of costs to individuals, families, and communities, and on the ways in which they reconstruct their lives and livelihoods in the aftermath of the disaster, we are in the midst of implementing the Study of the Tsunami Aftermath and Recovery (STAR). This report describes our progress to date.

Overview:

The STAR project is reinterviewing, in 2005, a subset of households that were interviewed in 2004 as part of the SUSENAS survey, a cross-sectional survey conducted annually by Indonesia's Central Bureau of Statistics. The subset of households for the 2005 interviews is drawn from the SUSENAS samples for Aceh and the neighboring province of North Sumatra. Our focus is on households in communities that sustained damage from the tsunami, but we also conduct interviews with households living along parts of the Sumatran coast that were not directly affected by the tsunami and with households located further inland. This strategy provides us with a group of comparison households which, although they may have been affected by the earthquake that triggered the tsunami, are considerably less likely to have been affected in directs way by the tsunami. Potentially, however, there may be indirect effects for these households in terms of loss of extended family or changes in the economic environment as a result of the reconstruction efforts and inflow of assistance. The target sample for STAR consists of 8,000 households in Aceh and an additional 4,000 households in North Sumatra. These households are located in over 750 communities.

To maximize our ability to make before-after comparisons, the 2005 questionnaire for STAR so that it repeats the questions included in the 2004 SUSENAS. The 2004 SUSENAS questionnaire was extremely detailed and provides information on morbidities and use of health care of each household member, along with information on household economic resources. In addition, one-quarter of households were administered an additional instrument which collected information on general health status, psycho-social health, injuries and symptoms associated with cardio-vascular disease and respiratory functioning, and, at the household level, extensive information on the quality, location and ownership of housing and land, and the quality of the environment, including the availability and quality of water.

In addition to repeating the SUSENAS questions, the STAR 2005 questionnaire adds additional questions that address, among other topics, exposure to the tsunami, changes in residence, work, and school enrollment, physical and mental health, and expectations for the future. Special attention is given to whether respondents have received post-disaster assistance and, if so, the source of the aid, nature of the aid and an estimate of the value of the aid.

The household survey is complemented with comprehensive information collected at the community level through interviews with community informants, including the village leader and a representative of the village women's group. These interviews provide information on the degree of physical destruction in the community, the availability of assistance from local community organizations and from national and international entities, and the recovery efforts underway at the time of each interview. We visit health facilities (public and private sector) and schools, and we collect prices from markets and stalls.

Results to Date

The tables that accompany this report present preliminary results based on the data that are available to date and encompass information from about 3,500 households. It is important to emphasize that these results are not representative of the populations of Aceh and North Sumatra, because the data are derived from the communities in which fieldwork took place relatively early, and these communities were not randomly selected. Nevertheless, the results provide an early indication of what we will learn from STAR.

In the tables that follow we stratify respondents according to whether their residence in 2004 was located within a community that sustained tsunami damage, as defined by Indonesia's Central Bureau of Statistics from information collected by CBS enumerators shortly after the tsunami. The magnitude of damage and destruction from the tsunami varies across communities in ways that are more nuanced than is captured by a dichotomy, but as the results will show, this classification does illustrate some dramatic differences between communities.

In its coverage of the tsunami and its aftermath the media repeatedly emphasized the tsunami's horrendous death toll, although to date no scientifically based data have been available from which to calculate excess mortality in areas where the tsunami struck. We present information on the mortality rates, by age and sex, in the tsunami-affected areas relative to the areas (Table 1). These estimates are derived from completed household rosters in which information on survival status is obtained for all members of household in 2004 (when no household member could be found, interviews were conducted with friends, neighbors, and community informants to determine what had happened to each member).

Mortality is clearly far higher mortality in the tsunami areas. For example, in the period since the 2004 interview, for each boy between the ages of 0 and 4 that died in a non-affected area, almost 19 boys died in the affected areas. For all age groups for both males and females, mortality is dramatically higher in the affected than in the non-affected areas. The survival differential between affected and non-affected areas is smallest among prime-age men and largest among prime-age women. More generally, for almost all age groups females are at survival disadvantage, and for most groups the difference is statistically significant (although at ages below five the disadvantage is greater for males).

The media reports of excessive mortality are born out by the mortality differentials of Table 1. We turn now to a characterization of the experiences of survivors during and in the aftermath of the disaster (Table 2). Among survivors in the tsunami-affected areas, about one-third of the men and one-quarter of the women report having seen the wave come ashore, while higher proportions heard the sound of rushing water. Around 12% of men and 9% of women were actually swept up in the water, while 23% of men and 16% of women saw friends or family members struggling in the water. In the aftermath of the tsunami, between one-third and one-half of men saw corpses, searched for the bodies of family members, and helped with the clean up effort in various ways, as did between 20 and 40% of women. The statistics suggest that for many residents of the tsunami-affected areas the event was indeed extremely harrowing. In the areas designated as non-affected, however, only very small percentages of respondents report in the affirmative for the various indicators we consider —evidence that our community-level dichotomy does provide a meaningful distinction between being affected and (largely) unaffected. Not surprisingly, though, regardless of residence almost everyone interviewed reported feeling the December 26 earthquake—as was to be expected given that the quake was felt as far away as Bangkok and measured 9.3 on the Richter scale.

Having established the severity of the tsunami in terms of both mortality and the experiences it imposed on survivors, and the validity of our designator for tsunami-affected areas, we now turn to indicators of other changes that have occurred in the disaster's aftermath. Table 3 reports on the distribution of responses to questions on how life has changed since the tsunami, both within the community in general and for the respondent's family in particular. Differences between areas in

perceptions regarding changes since the tsunami are most dramatic for the categories indicating negative change. Only one percent of respondents in non-affected areas report that life either in their community or for their family, is much worse now than before the tsunami. In the affected areas, however, 11% and 7% of respondents report that life is now much worse for the community and for their family.

One of the consequences of the tsunami was tremendous damage to housing and personal property and the displacement of people who had resided close to the water. Table 4 considers residential dislocation in the aftermath of the tsunami. Among those who were interviewed in the tsunami-affected areas in 2004, 42% are no longer living in the same location, largely because their homes were damaged or destroyed in the disaster. Among those in the non-affected areas, only 13% have moved, and of those movers, the percentage whose residences were damaged or destroyed is 44% (most likely because of the earthquake, which affected areas further inland than did the tsunami).

Disruptions in work and sources of economic livelihood accompany residential dislocation. Table 5 considers these aspects of life after the tsunami. Relative to a year ago, fully 40% of respondents in the tsunami-affected areas report experiencing more unemployment since the tsunami, whereas only 15% of respondents in the unaffected areas report more unemployment. In the affected areas a lower percentage of individuals report working as their main activity in the last week and higher percentages of individuals report schooling and housework as their main activities.

We turn in Table 6 to schooling experiences for individuals age 15-24. Consistent with the data on main activity in the last week, there is a 10 percentage point difference in terms of individuals who report that they are currently in school, with greater school enrollment among those in the tsunami-affected areas. The earthquake and tsunami damaged and destroyed a number of schools, and the effect of this destruction on schooling attendance is clear from the statistics on missed school. Among young adults who were in school as of November, 2004, almost two-thirds missed at least two weeks of school in the tsunami-affected areas, whereas on 16% missed at least two weeks in the unaffected areas. The tsunami accounted for the missed school for the vast majority of respondents in the affected areas. Schooling disruptions sometimes occurred in Aceh before the tsunami because of political security issues, but it is clear from the question on schooling missed in 2005 relative to 2004 that the tsunami-affected areas experienced a much greater degree of disruption after the disaster, whereas there was no systematic change in the unaffected areas.

The traumatic experiences of the disaster, its immediate aftermath, and the disruption it imposed on aspects of day to day life have almost certainly taken a toll on health status. A standard measure of overall health status is self-rated general health status, where respondents are asked to rate their overall health in one of five categories ranging from very good to very bad. Results, stratified by location and gender are presented in Table 7 (because “very bad” was chosen by very few respondents, it is combined with “bad”). The results in this table provide no evidence that the tsunami affected health, but it is not clear how to interpret this. One possibility is that in evaluating their general health status, individuals compare themselves to others in their immediate vicinity, so that in the tsunami-affected areas, everyone’s health was affected by the same shock and no one’s evaluation of their relative position changed. Another possibility is that the much higher mortality in the tsunami-affected areas removed those who would have reported themselves in the poorest health.

Another way to assess health is to ask about the experience of particular symptoms. Table 8 reports the frequencies of symptoms of poor physical health in the month before the 2005 interview (the symptoms were chosen to match the list from SUSENAS 2004). For three general symptoms (fever, cough, and flu/cold), reported levels are fairly high for males and females in both locations, but are considerably higher for those in the tsunami-affected locations than for those in unaffected areas. The locational differences are smaller for more specific complaints, such as asthma, diarrhea, and toothaches. These

results suggest that in fact the tsunami has taken a toll on health, but it is not being reflected in the overall self-rating of health status.

Exposure to natural disasters and their aftermath is often accompanied by the emergence of symptoms of post-traumatic stress disorder (PTSD). Table 9 presents results for symptoms of PTSD. For each symptom information is provided on whether it was ever experienced in the period since the tsunami, and on whether it is currently experienced. Several things emerge from this table. First, for both men and women in affected and unaffected areas, symptoms of post-traumatic stress disorder have been quite prevalent since the tsunami. Second, the prevalence of symptoms since the tsunami is considerably higher in the tsunami-affected areas than in the unaffected areas. Third, the prevalence of symptoms has subsided considerably, and by the time of the interview and for most indicators was quite low in the unaffected areas.

Our description of the preliminary results began with a discussion of respondents' reports regarding how life had changed since the events of December 26, 2004. STAR also asks respondents about their expectations for the future. Tables 10 and 11 present information on these expectations. A strikingly optimistic outlook emerges in the responses. In the tsunami-affected areas almost 40% of respondents feel that in a year's time, life for both their community and their family will be somewhat or much better than it is now (this compares to 25-30% among respondents in unaffected areas).

With respect to more specific dimensions of life, there is also evidence of optimism (Table 11). Among respondents who were living in a tsunami-affected location but are no longer there at the time of the interview, almost three-quarters expect to return to their pre-tsunami location. There is more uncertainty about how income levels will change over the next year, particularly in tsunami-affected locations, but 17% believe that their income will increase relative to its current level (versus 12% of those in unaffected areas). Among young adults who left school since November 2004, 16% of those in tsunami areas and 10% in non-tsunami areas have plans to return. Finally, regarding general health status, although individuals in tsunami-affected areas did not report their overall health as worse than those in unaffected areas, almost half expect their overall health to be somewhat better in one year (versus about a quarter of those in unaffected areas).

Conclusions and Future Work

The results presented here barely scratch the surface of the descriptions and analyses that are possible with the STAR data, yet they paint a fascinating picture of the complexity of the situation in tsunami-affected areas, and of the tenacity of the survivors. Over the next few months we will develop additional measures of the tsunami's impact and we will introduce controls to identify which groups have been hit the hardest.

Table 1
Age and gender-specific mortality rates in tsunami-affected areas relative to non-tsunami areas

	Males	Females	Difference between males and females
Age 0-4	18.8 (2.0)*	11.4 (2.1)*	7.4 (2.9)*
Age 5-14	16.0 (1.2)*	16.7 (1.3)*	-0.7 (1.8)
Age 15-24	10.4 (1.2)*	18.1 (1.3)*	-7.7 (1.8)*
Age 25-34	7.9 (1.4)*	14.2 (1.4)*	-6.3 (2.0)*
Age 35-44	12.4 (1.6)*	20.8 (1.6)*	-8.3 (2.2)*
Age 45-54	16.5 (1.8)*	21.0 (1.8)*	-4.5 (2.6)
Age 55-64	16.5 (2.5)*	14.2 (2.5)*	2.3 (3.5)
Age 65+	11.0 (2.9)*	31.7 (2.8)*	-20.8 (4.0)*
N	6,795	6,813	13,608

Table 2
Exposure to the Disaster and its Aftermath

	Males		Females	
	Tsunami-affected clusters	Non-affected clusters	Tsunami-affected clusters	Non-affected clusters
Feel earthquake	99	98	100	99
Hear rushing water	43	8	34	5
See the water come ashore	33	5	24	3
Swept up in the water	12	1	9	1
See family or friends struggle in water	23	2	16	1
See corpses	53	7	41	4
Search for or identify corpses of family	38	4	24	2
Help clean up or help in camps	42	7	20	3

Table 3: Perceptions of How Life Has Changed Since the Tsunami

	In the respondent's community		For the respondent's family	
	Tsunami-affected clusters	Non-affected clusters	Tsunami-affected clusters	Non-affected clusters
Life is much better	1%	0%	1%	0%
Somewhat better	5	3	9	5
About the same	60	72	59	77
Somewhat worse	23	23	24	17
Much worse	11	1	7	1
N				

Table 4
Residential Dislocation in the Tsunami's Aftermath

	Tsunami-affected clusters	Non-affected clusters
Percentage of respondents who have moved since the tsunami	42%	13%
Percentage whose pre-tsunami residence was damaged or destroyed (among those no longer living in their pre-tsunami location)	88%	44%

Table 5
Work-related Outcomes in the Tsunami's Aftermath

	Tsunami-affected clusters	Non-affected clusters
Relative to a year ago have you experienced more or less unemployment		
More	40%	15%
About the same	49	78
Less	11	7
Main activity in the previous week		
Work	46%	55%
School	14	10
Housework	34	29
Other	6	6

Table 6
Education-Related Outcomes in the Tsunami's Aftermath
(Adults 15-24 years old)

	(Adults 15-24) Tsunami-affected clusters	Non-affected clusters
% currently in school	50%	40%
% who missed at least two weeks of school since the tsunami	65%	16%
% for whom school was missed because of the tsunami	88%	50%
Comparison of amount of school missed in 2005 relative to 2004		
A lot more (2005)	23%	6%
Somewhat more	39	14
About the same	27	63
Somewhat less	8	10
A lot less	3	8

Table 7
Self-reported General Health Status

	Males		Females	
	Tsunami-affected clusters	Unaffected clusters	Tsunami-affected clusters	Unaffected clusters
Very good	16%	18%	11	13
Good	68	65	70	67
Fair	12	14	15	17
Bad or very bad	4	4	4	3

Table 8
Symptoms of Poor Physical Health in the Past Month

	Males		Females	
	Tsunami-affected clusters	Unaffected clusters	Tsunami-affected clusters	Unaffected clusters
Fever	33%	28%	37%	29%
Cough	40	34	39	33
Flu/cold	42	32	42	32
Asthma	7	7	6	5
Diarrhea	9	7	9	8
Headache	29	29	35	35
Toothache	13	10	15	12
Other	19	18	20	21
Normal activities disrupted by poor health	24	25	25	25

Table 9
Symptoms of Post-Traumatic Stress Disorder

		Males		Females	
		Tsunami-affected clusters	Non-affected clusters	Tsunami-affected clusters	Non-affected clusters
Repeated memories of the disaster	Since the tsunami	46%	26%	53%	30%
	Currently	9	2	12	3
Feeling upset at reminders	Since the tsunami	84	68	89	74
	Currently	32	10	47	13
Avoiding reminders	Since the tsunami	14	6	17	6
	Currently	4	1	5	1
Feeling future will be short	Since the tsunami	19	17	21	18
	Currently	4	3	4	2
Trouble sleeping	Since the tsunami	40	33	48	42
	Currently	9	5	13	6
Feeling angry	Since the tsunami	27	9	28	10
	Currently	5	2	6	2
Feeling super-alert	Since the tsunami	69	61	74	66
	Currently	27	16	40	21
Fear of the sea	Since the tsunami	39	26	63	36
	Currently	8	5	27	10

Table 10
Perceptions of How Life in General Will be One Year from Now

	In the respondent's community		For the respondent's family	
	Tsunami-affected clusters	Non-affected clusters	Tsunami-affected clusters	Non-affected clusters
Much better	4%	3%	6%	3%
Somewhat better	35	22	37	28
About the same	56	71	44	65
Somewhat worse	4	5	2	4
Much worse	1	0	0	0

Table 11
Respondent's Expectations Regarding Residence, Work, Schooling and Health

	Tsunami-affected clusters		Non-affected Clusters	
Expectation regarding returning to their pre-tsunami location (among those currently living away)	73%		60%	
Expectations for income levels in one year relative to now				
Increase	17%		12%	
Stay the same	32		51	
Decrease	3		5	
Don't know	47		32	
Expectations regarding returning to school (among those 15-24 and currently not in school)	16%		10%	
Expectations for health status in one year (relative to now)	Males	Females	Males	Females
Much better	5%	5%	2%	2%
Somewhat better	48	49	23	24
About the same	43	41	67	68
Somewhat worse	4	4	6	7
Much worse	0	0	0	0