

Family context of mental health risk in Tsunami-exposed adolescents: Findings from a pilot study in Sri Lanka

K.A.S. Wickrama^{a,*}, Violet Kaspar^b

^a*Iowa State University Ames, IA, USA*

^b*Department of Psychiatry, University of Toronto, Canada*

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Abstract

Using survey data from 325 Tsunami-exposed adolescents and mothers from two villages in southern Sri Lanka, this pilot study investigated influences of Tsunami exposure and subsequent psychosocial losses on adolescent depressive and post-traumatic stress disorder (PTSD) symptoms. Findings generally support the study hypotheses: disaster exposure (for example experiences of property destruction and deaths of close others) contributes to depressive and PTSD symptoms in adolescents. Findings also show that psychosocial losses associated with Tsunami exposure, such as prolonged displacement, social losses, family losses, and mental health impairment among mothers, contribute to depressive and PTSD symptoms in adolescents. Results suggest that the influence of Tsunami exposure on adolescent mental health operates partially through Tsunami-related psychosocial losses. As expected, positive mother–child relationships provide a compensatory influence on both depressive and PTSD symptoms of adolescents. In addition, high levels of depressive symptoms among mothers increases the detrimental influence of other Tsunami-related psychosocial losses on adolescent mental health. These preliminary findings suggest ways to improve ongoing recovery and reconstruction programs and assist in formulating new programs for families exposed to both the Tsunami and other natural disasters. More importantly, findings from this pilot study emphasize the urgent need for larger systematic studies focusing on mental health following disaster exposure.

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Introduction

On December 26, 2004, Tsunami waves spawned by a magnitude 9.0 earthquake hit Indian Ocean countries. This unprecedented natural disaster claimed more than 200,000 human lives in the developing world. Sri Lanka suffered damage to

more than 50% of its coastal-belt region. The Tsunami took nearly 31,000 lives in Sri Lanka, left nearly 1 million people homeless, 4000 children without parents (Sri Lanka Tsunami Operation Center), and exposed millions of children and adults to traumatic events.

Previous disaster research suggests that although the majority of people exposed to natural disasters are resilient and recover from early post-trauma symptoms, serious mental health problems prevail among a substantial portion of those exposed (Kessler, Sonnega, Bromet, Hughes, & Nelson,

*Corresponding author. Tel.: +1 515 294 4704;
fax: +1 515 294 3613.

E-mail addresses: s2kas@iastate.edu (K.A.S. Wickrama),
violet_kaspar@camh.net (V. Kaspar).

1995; McNally, Bryant, & Ehlers, 2003; Norris, Murphy, Baker, & Perilla, 2004). Disaster research also suggests a high prevalence of psychiatric problems among disaster-exposed youth (Goenjian et al., 1995; La Greca, Silverman, Vernberg, & Prinstein, 1996; Warheit, Zimmerman, Vega, Khoury, & Gil, 1996), possibly leading to long-term mental health consequences (Azarian & Skriptchenko-Gregorian, 1998; Briere & Elliott, 2000; Najarian, Goenjian, Pelcovitz, Mandel, & Najarian, 1996; Pynoos, Steinberg, & Goenjian, 1996). The capacity for natural disasters to influence severely short- and long-term mental health is clear. However, prevalence rates of post-traumatic stress disorder (PTSD) among disaster-exposed youth reported in previous studies vary across a wide range. For example, Kalayjian and Jaeger (1995) reported a PTSD prevalence rate of 83% in a sample of Armenian adolescents exposed to an earthquake, whereas McDermott, Lee, Judd, and Gibbon (2005) reported a PTSD prevalence rate of only 7% among adolescents exposed to a wildfire. Differences may be due to disaster type, location, sample characteristics, and different assessment methods (Andermann, 2002; Norris, 2005).

Several factors emphasize the need to focus on the mental health consequences of Tsunami exposure, and psychosocial losses and resources of adolescents. First, youth often continue to exhibit severe levels of traumatic reactions following disaster exposure because they are generally more vulnerable and more exposed to trauma (Azarian & Skriptchenko-Gregorian, 1998; Ehlers, Mayou, & Bryant, 1998). For example, more than 50% of those who died in Sri Lanka as a result of the Tsunami were less than 19 years old. Moreover, traumatic exposure during adolescence occurs as youth pass through an already turbulent period of their lives (Yule et al., 2000). Early traumatic exposure clearly influences enduring behavioral (Shaw, Applegate, & Schorr, 1996) and mental health consequences (Kessler et al., 2005). Second, existing research suggests that the influence of disaster exposure on mental health problems operates partially through the erosion of psychosocial resources (Andermann, 2002; Smith & Freedy, 2000; Stevens & Slone, 2005). However, we know very little about how loss of psychosocial resources (i.e., vulnerabilities), and particularly family-related resource loss, combine with natural disaster exposure to influence the mental health of youth. Identification of these psychosocial processes (med-

iating and moderating) among Tsunami-exposed youth would greatly help ongoing and new mental health interventions in exposed areas. Third, preliminary findings from this study could assist in designing larger systematic studies focused on physical, psychological, and psychosocial recovery after natural disaster exposure. Thus, this pilot study uses data collected from 325 adolescents (12–19 years in age) and their mothers living in two southern Sri Lankan villages four months after the Tsunami disaster to investigate the associations among degree of Tsunami exposure, psychosocial resources and losses, and PTSD and depressive symptom levels of adolescents.

Conceptual model and specific hypotheses

Tsunami exposure and adolescent mental health

Previous studies have shown that the degree of disaster exposure due to property destruction, deaths, and serious injuries predict the prevalence and severity of PTSD and depressive symptoms (Freedy, Shaw, Jarrell, & Masters, 1992; Norris et al., 2004). In addition, those who directly experience traumatic events (e.g., deaths, injuries, threats to one's own life) experience stronger impact than do those whose experience is indirect (Galea et al., 2002; Norris et al., 2004). Finally, the exposure to multiple traumatic events may intensify the influence of exposure to any single Tsunami-related traumatic event (Goenjian et al., 1995). This relationship between Tsunami exposure and adolescent psychiatric symptom levels leads to two study hypotheses.

Hypothesis 1. Adolescents who experience higher levels of Tsunami exposure will exhibit higher levels of PTSD symptoms.

Hypothesis 2. Adolescents who experience higher levels of Tsunami exposure will exhibit higher levels of depressive symptoms.

These two hypothesized associations between Tsunami exposure and adolescent mental health appear in Fig. 1 as path D.

Tsunami-related psychosocial losses and adolescent mental health

For adolescents, psychosocial losses associated with Tsunami exposure include prolonged displacement,

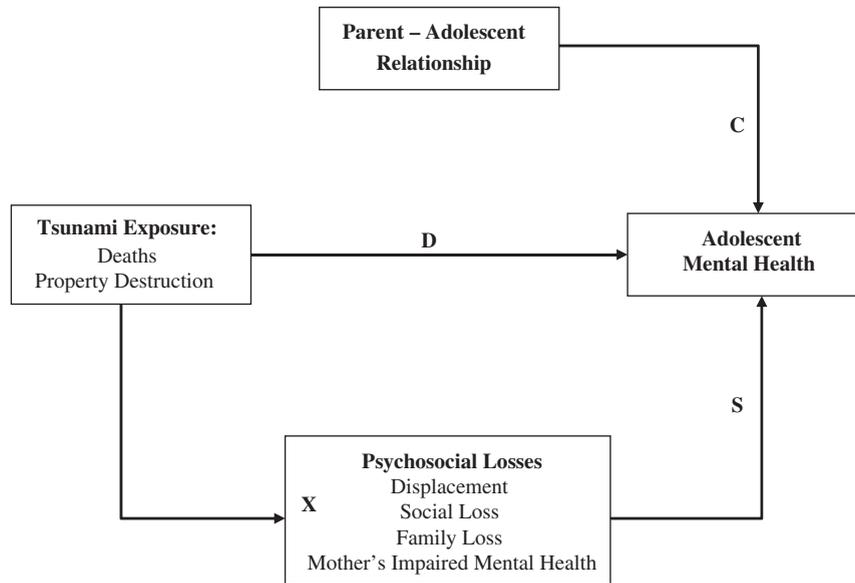


Fig. 1. Tsunami risk and resilience for youth psychiatric problems.

social loss (e.g., loss of school and friends), family loss (e.g., increased family conflicts), and impairment of mother's mental health. Prolonged displacement increases the risk of mental health problems in adolescents because usually active social and physical environments are lost and hope for the future may erode. Moreover, prolonged displacement is often associated with family conflicts (family loss) that could subsequently increase the risk for psychiatric problems among children. In the aftermath of devastation, parents' mental and physical health may also deteriorate (Kaniasty & Norris, 1993; Norris, 2005) and this in turn influences adolescent mental health. This relationship between Tsunami-related psychosocial losses and adolescent psychiatric symptom levels leads to Hypothesis 3.

Hypothesis 3. Tsunami-related psychosocial losses as measured by days displaced, social losses, family losses, and mother depression will increase depressive symptoms (Hypothesis 3A) and PTSD symptoms (Hypothesis 3B) among adolescents.

These hypotheses appear as Path S in Fig. 1.

Positive parent–child relationships and adolescent mental health

The most important research question related to Tsunami-exposed adolescents involves the identification of family-related resilience processes (Nor-

wood, Ursano, & Fullerton, 2000) that influence symptom trajectories by establishing lower initial levels (severity) and altering patterns of increase and decline over time (Beiser & Wickrama, 2004). Specifically, strong attachment to parents may be an important resilience factor for Tsunami-affected youth (Luthar, Cicchetti, & Becker, 2000).

Research in western societies suggests that authoritative parenting associated with positive parent–child relationships fosters confidence that may reduce emotional difficulties in response to trauma (Conger et al., 2002; Darling & Steinberg, 1993). Although this proposition may be more applicable to families in developing societies, it has not been tested adequately (Beiser, Hamilton, Wickrama, & Rummens, under review). In the developing world and in rural cultures in particular, mother–child relationships are often very close, strong, and warm. High levels of warmth and control/monitoring are also found in Sri Lanka. Close mother–child relationships generally continue through the adolescent years. This leads to Hypothesis 4.

Hypothesis 4. Positive parent–child relationships should relate to decreased levels of Tsunami-related PTSD and depressive symptoms among adolescents.

This hypothesized association appears as Path C in Fig. 1.

Amplification of the influence of disaster experiences by mother depression

Previous disaster research suggests that women are more vulnerable to the negative consequences of disaster exposure than are men. In Sri Lanka, mothers may be more vulnerable than fathers to Tsunami exposure and related loss of shelter, family and livelihood. This differential vulnerability may place mothers at higher risk of experiencing depressive symptoms. The resulting problems of mothers can indirectly influence the mental health of adolescents.

The detrimental influence of post-Tsunami losses (e.g., displacement, family conflicts, and social loss) on adolescent mental health may not only endure but also intensify within such depressive family environments. Conversely, non-depressed family environments may protect adolescents from the detrimental influence of Tsunami-related psychosocial losses or expedite mental health recovery. This moderation (amplification) leads to Hypothesis 5.

Hypothesis 5. Mothers' experience of depressive symptoms should amplify the influence of Tsunami-related psychosocial losses including prolonged displacement, social losses, and family losses on adolescent depressive symptoms and PTSD.

The 'X' appearing in Fig. 1 denotes this hypothesized amplification of adolescent depressive and PTSD symptoms as a function of maternal depression.

Method

Site selection and participating families

Data for this pilot study come from a total survey of all the families living in two Tsunami-exposed villages, Kudawella-W and Kudawella-O within the Hambantota district in southern Sri Lanka. Although more than 100 villages in the Hambantota district experienced Tsunami exposure, site selection centered on identifying villages with poverty rates, rurality, and accessibility comparable to characteristics of villages across the entire district in general (i.e., villages not at the extremes on these characteristics). However, site selection also considered potentially significant variation in Tsunami exposure between these two villages as well as the families that inhabit them. Kudawella-W is a rural village with full exposure to the ocean, whereas

Kudawella-O is also a rural village but has no direct ocean exposure. Inhabitants in both villages rely heavily on the fishery for their main occupation. Identification of families within each village relied on Voter Registers prepared by the Department of Election of Sri Lanka. Register maintenance occurs through annual updating by a village officer under the supervision of the district officer. Local administrators and researchers consider these voter registers as reliable registries of all families inhabiting a specific village. Of the 155 voter-registered families living in Kudawella-W nearly 84% ($N = 130$) provided data for this study. Similarly, nearly 82% ($N = 119$) of the 145 voter-registered families living in Kudawella-O participated.

Interview schedule and project staffing

University educated women from nearby areas conducted in-home interviews. Interviewers completed a 2-day training session wherein day one focused on data collection methods with special attention to psychiatric symptoms (depression and PTSD) and in-class exercises, and day two provided a session for reviewing and pilot testing interview procedures. Interviewer training focused mainly on collecting data from adolescents and mothers regarding PTSD and depressive symptoms but did not involve case diagnosis. An experienced local psychiatric therapist assisted with the training session and ensured that she would be available for potential therapy assistance during the interview period. The survey team included one teacher, one development officer, and a public health inspector who served as trained coordinators and supervised the project within each village. The primary project investigator, a Sri Lankan currently living in the United States, stayed in the area during the survey to advise and monitor all research activities, making numerous visits to villages to meet families, village leaders/offices, and priest to ensure the highest possible participation rate. Completed questionnaires were checked for data quality, and measures were taken to correct interview procedures whenever necessary.

Measures

Tsunami exposure

A *property destruction index* was created to capture the cumulative influence of property destruction by summing response to six questions that assessed the severity of Tsunami damages to (1)

the house, (2) durable household items, (3) consumer goods, (4) vehicles or boats, (5) equipment or machinery, and (6) farm animals or birds (e.g., cattle and poultry). Scoring for all six items used a 4-point scale with response options of not at all (1), a little (2), substantial (3), or complete (4). Mother reports of the number of deaths of family members, close relatives, and neighbors provided the basis for determining *loss of lives*. Substantial correlations between these two measures of Tsunami exposure and symptoms of PTSD and depression provided evidence for the predictive validity of both exposure measures (see Table 1).

Psychosocial losses

Displacement duration was the number of days the adolescent lived in relief centers or temporary housing (e.g., tents). *Social loss* was measured by a single item asking whether the Tsunami had terminated playgroups, study groups, or other peer groups in the community or school. Family loss was the sum of adolescents' responses to five items that asked whether (1) increased family violence/conflicts, (2) increased parental alcohol consumption, (3) damages to parental occupation, and (4) parental mental health problems following the Tsunami influenced their activities. Response options for social and family loss were: not at all (1), a little (2), substantial (3), or complete (4).

Table 1
Descriptive statistics and reliability of key measures

Measure	<i>M</i>	<i>SD</i>	Coefficient α
Deaths ^{a,b}	1.09	0.92	—
Days displaced ^b	32.20	40.16	—
Property destruction ^b	11.86	4.94	—
Family loss	12.02	2.56	.62
Social loss ^b	3.91	1.44	—
Community loss ^b	5.89	1.85	—
Mother relationship	72.36	6.30	.75
Adolescent depressive symptoms (Achenbach, 1991)	11.26	6.21	.80
Adolescent PTSD symptoms	13.03	5.54	.65
Mother depressive symptoms ^a (CES-D)	25.68	8.31	.71
Mother PTSD symptoms ^a	17.07	4.53	.61

^aMother reports.

^bCount measures.

Parent–child relationship

Assessment of parent–child relationship quality used mothers' responses to five items asking whether (1) you get along with your child, (2) you just do not understand your child, (3) your child keeps his/her promises to you, (4) your child makes too many demands on you, and (5) your child insists on having his/her own way. Response options for the five items included: always (1), often (2), about half the time (3), not often (4), and never (5). Summing the five responses after reversing responses to items 1 and 3 yielded a measure of *parent–child relationship quality*. The English version of this measure suggests adequate reliability ($\alpha = .85$) and previous studies have used this measure among different ethnic groups in different countries (Conger et al., 2002; Simons, Whitbeck, Conger, & Melby, 1991). Information available from this study (see Table 1) indicates acceptable reliability and validity for this measure.

Depressive symptoms

Ten depression items from the Youth Self Report (YSR) derived from Child Behavior Checklist (Achenbach, 1991) asked adolescents about their feelings during the past 7 days. Sample items included, I would rather be alone than with other people, I felt tired, I felt lonely, I cried a lot, and I did not have much energy. Scores for this composite measure of *adolescent depressive symptoms* could potentially range from 0 to 30. The YSR has been translated into several languages with good psychometric properties (Achenbach, 1991).

Mothers' responses to 20 items from the Center for Epidemiological Studies Depression Scale (CES-D, Radloff, 1977) served as an index of *mother's depressive symptoms*. Scores on the composite measure could range from 0 to 60. Use of the English version of this measure in various studies (e.g., Wickrama & Chalandra, 2003) suggests good psychometric properties (internal consistency of .90). The CES-D has been widely used in cross-cultural mental health studies and translated versions have good psychometric properties (e.g., Noh, Beiser, Kaspar, Hou, & Rummens, 1999).

Post-traumatic stress disorder

PTSD symptom levels for both adolescents and mothers were assessed using 17 DSM-IV diagnostic interview items (American Psychiatric Association, 1994). This PTSD measure, assessing symptom severity for a specific traumatic event, consists of

items for three sub-scales: re-experiencing, avoidance, and hyper-arousal, and has been used for different ethnic groups, including Southeast Asian, West Asian, African, Balkan, and Middle Eastern groups (Kaspar, 1998, 2002). The items include PTSD symptoms specified in the DSM-IV, and were developed from English versions of measures shown to have good psychometric properties for screening PTSD (e.g., Kessler et al., 1995; Turner & Gil, 2002).

The primary project investigator translated all study measures from English to Sinhalese working jointly with an experienced local mental health professional (see Marin, 1992). After pilot testing with five village respondents, translated versions underwent appropriate item revisions to aid understanding and improve clarity. Descriptive statistics and internal consistency information presented in Table 1 for the key study measures demonstrate that the translated symptom measures possess acceptable levels of reliability.

Results

Prevalence of mental disorder

We computed prevalence rates of PTSD *as qualified for diagnosis* based on DSM-IV criteria (considering Tsunami experience/exposure, one or more re-experiencing item, three or more avoidant items, and two or more hyper-arousal items; we did not assess duration) in Kudawella village. For mothers, the prevalence rate of PTSD (qualified

for diagnosis) was 19.6%, whereas prevalence of PTSD (qualified for diagnosis) was more than double (40.9%) among adolescents. The prevalence rate of depression using the cut-point of 16 (Radloff, 1977) on the CES-D scale (0–60 possible range) for mothers was 37.8%.

Table 2 presents zero-order correlations among key study measures for the total sample with most of the observed relationships being consistent with the hypothesized general model. As expected, all of the secondary risk factors such as number of days displaced, social losses, and family losses correlated with indicators of trauma exposure including damages, property losses, number of deaths of close individuals, and injuries experienced. Mother–child relationship quality shares negative associations with both depressive and PTSD symptoms reported by adolescents.

Testing Hypotheses 1 and 2

Tests of study hypotheses employed structural equation modeling (SEM) that provides an extension of linear regression methods. Estimation of model coefficients used maximum likelihood methods available in the AMOS 4.0 software package (Arbuckle & Wothke, 1999).

Consistent with Hypotheses 1 and 2, both Tsunami exposure constructs measured via property destruction and loss of lives uniquely contributed to adolescent symptoms of depression ($\beta = .28, p < .01$ and $\beta = .13, p < .01$, respectively) and PTSD ($\beta = .24, p < .01$ and $\beta = .19, p < .01$, respectively)

Table 2
Zero-order correlations among study measures

Measure	Adolescent depressive symptoms	Adolescent PTSD symptoms	Mother depressive symptoms	Mother PTSD symptom
Deaths ^a	.20*	.35*	.05	.30*
Days displaced	.44*	.29*	.30*	.17*
Property destruction	.40*	.31*	.36	.15*
Family loss	.45*	.34*	.45*	.25*
Social loss	.25*	.18*	.14*	.06
Community loss	.36*	.26*	.35*	.06
Mother relationship	−.30*	−.79*	.09	−.17*
Adolescent depressive symptoms	1.00	.54*	.31*	.30*
Adolescent PTSD symptoms	.54*	1.00	.23*	.40*
Mother depressive symptoms ^a	.31*	.23*	1.00	.49*
Mother PTSD symptoms ^a	.30*	.40*	.49*	1.00

^aMother reports.

* $p < .05$.

after accounting for the association between both predictors ($r = .62$). Together, property destruction and lives lost explained 10% of the variance in both depressive and PTSD symptoms (see Fig. 2).

Testing Hypotheses 3

Fig. 3 presents the maximum likelihood estimates for the influences of psychosocial losses on adolescent PTSD and depressive symptoms after controlling for Tsunami exposure (property destruction and lives lost).

Consistent with Hypothesis 3, psychosocial losses including number of days displaced ($\beta = .20, p < .01$), social loss ($\beta = .10, p < .01$), family loss ($\beta = .30, p < .01$), and mother’s depressive symptoms ($\beta = .23, p < .01$) significantly predicted adolescent depressive symptoms after controlling for Tsunami exposure. Fig. 3 presents the most parsimonious model with a good fit to the data after removing non-significant regression paths (NFI = .96, CFI = .97).

Only family loss ($\beta = .29, p < .01$) and mother’s depressive symptoms ($\beta = .28, p < .01$) significantly predicted adolescent PTSD symptoms. In addition, lives lost contributed directly to adolescent PTSD symptoms ($\beta = .13, p < .05$). The set of predictors in the model explained 38% and 26% of the observed variance in depressive symptoms and PTSD symptoms, respectively, after taking into account the association between the two ($r = .53$).

Testing Hypotheses 4

Consistent with Hypothesis 4, mother–child relationship quality directly reduced adolescent depressive ($\beta = -.12, p < .05$) and PTSD symptom

levels ($\beta = -.30, p < .01$). These findings support the hypothesized direct compensatory role of positive mother–child relations. In addition, the general reduction in adolescent mental health impairment linked with high quality parent–child relationships suggests the operation of a potentially important protective/resilience mechanism.

Testing Hypotheses 5

Splitting the sample into two groups (by mean split) reflecting low and high levels of mother’s depressive symptoms allowed for examination of the potential amplifying (interaction) effect of mother’s depression on the relationship between psychosocial losses and adolescent depressive and PTSD symptom levels (see Fig. 4). For adolescents with depressed mothers (Panel A of Fig. 4), social loss ($\beta = .16$), family loss ($\beta = .36$), and days displaced ($\beta = .20$) significantly influenced depressive symptoms (all $ps < .01$). In addition, family loss significantly influenced PTSD symptom levels ($\beta = .35, p < .01$) of adolescents of depressed mothers. However, psychosocial losses did not significantly contribute to adolescent symptom levels of adolescents with mothers who were not depressed (see Panel B of Fig. 4).

Discussion

The findings of this pilot study generally support study hypotheses in that the degree of Tsunami exposure captured by both property destruction and deaths caused by the Tsunami contributed to depressive and PTSD symptoms among adolescents. However, property destruction experienced by families did not significantly associate with the

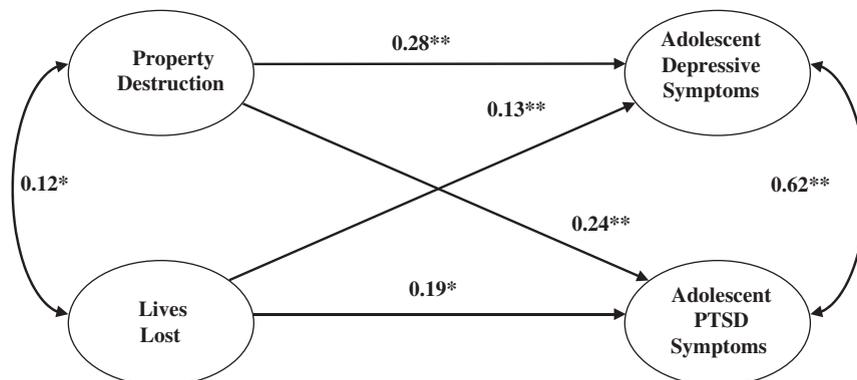


Fig. 2. Maximum likelihood estimates for the Tsunami exposure and adolescent mental health model (Hypotheses 1 and 2).

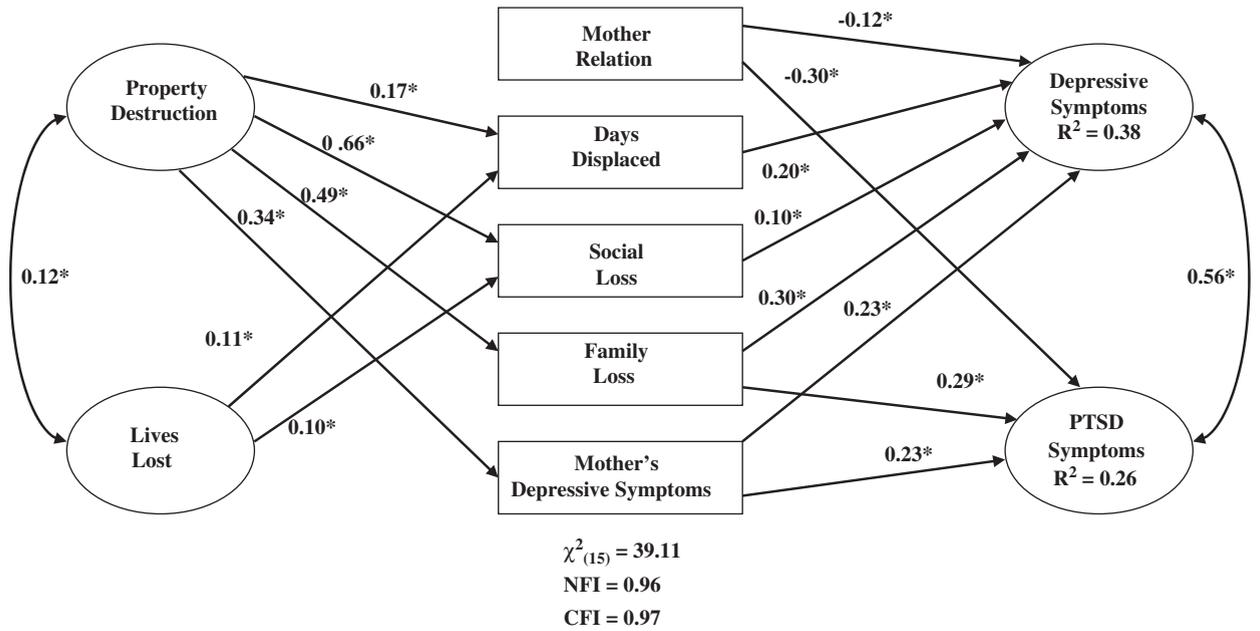


Fig. 3. Maximum likelihood estimates for the model predicting adolescent depressive and PTSD symptoms from psychosocial losses and mother relations (Hypotheses 3 and 4).

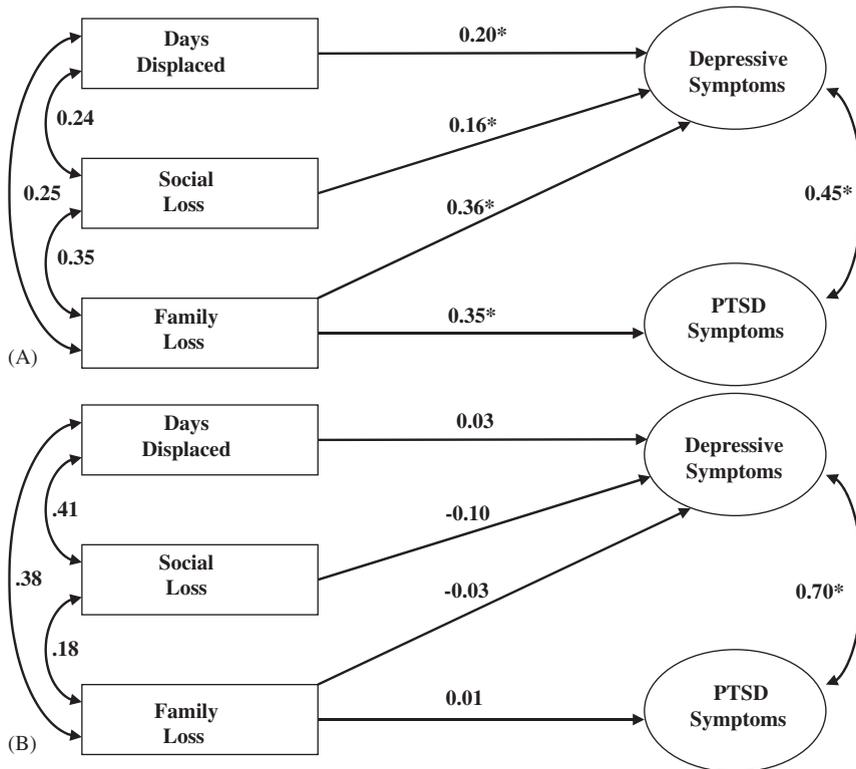


Fig. 4. Maximum likelihood model estimates for mothers' depression as a moderator of influences on adolescent depressive and PTSD symptoms (Hypothesis 5).

number of deaths experienced. Higher PTSD and depressive symptoms among adolescents were also associated with psychosocial losses including prolonged displacement, social losses, family losses, and impairment of mother's mental health. As expected, higher levels of mother-child relationship quality corresponded with lower levels of depressive and PTSD symptoms of adolescents. These findings also suggest that the detrimental influences of other Tsunami-related psychosocial losses on adolescent mental health increased as the level/severity of mothers' depressive symptoms increased.

These findings suggest important practical implications. Specifically, prolonged displacement of families contributes to adolescent mental health problems substantively, potentially resulting in a loss of hope among parents and children fostering depressive feelings and increasing the risk for parental mental health problems. This situation emphasizes the need for rapid reconstruction and recovery efforts by both government and non-government agencies. However, growing allegations of slow progress and ineffectiveness of governmental and non-governmental programs currently exist in Sri Lanka (Auditor General Report—Sri Lanka, 2005).

Restoration of destroyed schools to operational status helps provide a social environment that operates in a compensatory manner to reduce the risk for youth psychiatric problems. When youth feel that teachers, friends, and neighbors support them, they are more likely to engage in normal activities, even in the face of significant environmental adversity. Conversely, delayed recovery from Tsunami damages and lack of restoration of pre-Tsunami lifestyles could lead youth to retreat to the past as an escape from present disappointments, spurring depressive feelings that eventually result in the development of disorders (Beiser & Wickrama, 2004).

Diminished direct influences of Tsunami exposure variables on adolescent mental health in the presence of psychosocial losses suggest that psychosocial resource loss may be as important as Tsunami exposure. That is, the influence of Tsunami exposure on adolescent mental health problems operates largely through psychosocial losses. For example, increased family conflicts and the impaired mental health of mothers resulting from Tsunami exposure contributed to adolescent mental health problems. In addition, a positive parent-child relationship reduced depressive and PTSD symptom

levels of adolescents. Thus, family attributes such as parent-child relationships, family conflict/problems, and mother mental health may operate as unique predictors of adolescent mental health following Tsunami exposure.

Despite traumatic exposures and experiences, the case in Sri Lanka presents a distinct situation because the disaster affected individuals living in a developing country. Although most families in affected communities experienced disaster exposure, the findings of this pilot study show that family members possess unique individual and contextual resilience and risk factors (Andermann, 2002; Stevens & Slone, 2005). Seemingly, social resources (e.g., strong parent-child relationships) serve as important resilience factors to compensate for losses. Finally, the mental health of mothers following the disaster provided a buffer to protect the adolescent from disaster exposure. These preliminary findings also point to the need for family-specific and family focused intervention and psychiatric therapy programs. Such programs should integrate family and psychiatric therapy components with other social and economic recovery activities at the family level.

Although these preliminary findings identify potentially modifiable mediating and moderating mechanisms through which Tsunami exposure influences adolescent mental health problems, several important limitations to this pilot study deserve mention. First, these two study villages and/or their inhabitants may not represent the larger Tsunami-exposed population of Sri Lanka in terms of socioeconomic characteristics. Second, the limited sample size did not allow for testing of important hypotheses using a systematic analysis. Third, observed significant path coefficients do not eliminate the possibility of hypothesized relationships in the reverse direction. For example, mentally impaired adolescents could provide negatively biased reports of social and family losses. Fourth, the measures used in this study represent the first use of Sinhalese versions of these measures. Although English versions of these measures and various translated versions appear in previous studies, these Sinhalese instruments require further systematic testing for cultural validity and reliability. Finally, interviewers received only 2 days of training on the assessment instrument and data collection procedures, which may not have provided optimal interviewer training. Despite these potential limitations, preliminary findings of this pilot study

emphasize the urgent need for larger systematic studies with improved designs that include representative samples and optimal measures.

This study suggests that the mental health of mothers serves as a key resource and a moderating factor for adolescent mental health. Preliminary analysis of prevalence rates, means, and correlations also indicates that Tsunami-exposed mothers report relatively high levels of PTSD and depressive symptoms. Similar to the report on adolescents presented here, mothers may possess unique individual and contextual resilience and risk factors (Andermann, 2002; Stevens & Slone, 2005). Familial and extra-familial social support may be particularly important factors capable of directly counteracting detrimental influences of Tsunami exposure and related psychosocial losses. Extra-familial social support includes support received from friends, relatives, neighbors, informal groups, and religious groups within the community. In developing countries like Sri Lanka, other informal community groups including savings and credit groups, water and firewood fetching groups, and labor-exchange groups often serve as additional sources of social support (Wickrama & Keith, 1994). Data collection for this pilot study included assessments of these factors in association with mothers' mental health. Future research will examine other associations.

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