THE ASSOCIATION BETWEEN MARITAL FUNCTIONING, FAMILY

CLOSENESS, AND TSUNAMI RELATED HEALTH:

MODERATION BY RELIGIOSITY

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THE ASSOCIATION BETWEEN MARITAL FUNCTIONING, FAMILY CLOSENESS, AND TSUNAMI RELATED HEALTH: MODERATION BY RELIGIOSITY

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The Association Between Marital Functioning, Family

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Moderation by Religiosity

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THESIS ABSTRACT

THE ASSOCIATION BETWEEN MARITAL FUNCTIONING, FAMILY CLOSENESS, AND TSUNAMI RELATED HEALTH: MODERATION BY RELIGIOSITY

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To date, marital outcomes and family closeness following natural disasters have not been extensively investigated. Previous research indicates that disaster experiences relate to adverse mental health outcomes, and there is evidence suggesting that these effects persist over time. While the rise of family problems is documented in disaster

research, marital satisfaction remains unreported on in disaster studies. In response to the adverse outcomes related to disaster, researchers have investigated what factors may be protective of mental health for disaster survivors. Religious coping is a prevalent topic in studies of trauma, stress, and disaster. The quality of coping employed tends to influence the outcomes realized. The purpose of the present study is to examine the relationships among physical health persisting form the 2004 Asian Tsunami, mental health outcomes, family closeness and marital satisfaction in Sri Lankan mothers. Secondarily, the moderating influence of religiosity on these relationships was also investigated. Each of these constructs was measured using self report instruments data were entered into a path analysis, where the data were examined.

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INTRODUCTION

A variety of events fit within the classification of a natural disaster. This term encompasses mass destroyers such as supercylclones (Suar, Mandal & Khuntia, 2002), floods (Smith, Pargament, Brant, & Oliver, 2000), hurricanes (Caldera, Palma, Penayo, & Kullgren, 2001), tornadoes (Menzel Baker, Hunt & Rittenburg, 2007), earthquakes (Proctor et al. 2007), and tsunamis (Bronisch et al. 2006).

One such disaster began from a large scale under water earthquake off the coast of Eastern Asia. Tsunami waves were spawned, massive enough to ravage a large portion of the continent including multiple countries. Hundreds of thousands were killed, maimed or lost within the writhing waves (Anderson, 2007). Accounts of mothers and fathers literally having their children ripped from their arms by the relentless tides, and others searching helplessly for missing loved ones amidst the debris and wreckage (Bronisch et al., 2006) are some examples of the traumatic events experienced by survivors. Many were compelled to search among decaying bodies in hopes of identifying the remains of friends and family members (Bronisch et al., 2006). The spread of carnage was estimated to have claimed more than 126,000 lives within the first minutes (Anderson, 2007). The effects of this disaster were devastating, and we need more information regarding how the results of the 2004 tsunami are still influencing survivors today.

Disasters, these incredibly destructive stressors, have captured the interest of researchers for decades. The ensuing research has focused largely on the mental health outcomes of individuals relatively soon after the disaster (Assanangkornchai, Tangboonngam, & Edwards, 2004; Catapano et al., 2001; Suar et al., 2002). The incidence of posttraumatic stress disorder (PTSD) and depressive symptoms are among the most common mental health constructs examined in disaster research. Studies investigating what personal characteristics or disaster circumstances predict variance in these symptoms is a prolific question within disaster research. Unexpectedness of the disaster is one such circumstance that relates significantly with the incidence of PTSD (Assanangkornchai et al., 2004). Furthermore, property destruction and loss of lives explained 10% of the variance in symptoms of both PTSD and depression in a study with a population of survivors from the 2004 tsunami (Wickrama & Kaspar, 2007). Other disaster experiences, like being injured have also been connected with a heightened likelihood of PTSD as well (McMillen, Smith & Fisher, 1997). This higher likelihood of PTSD also holds true for those who have experienced the injury or death of a family member (Caldera et al., 2001).

Personal characteristics such as a previous mental health problems (McMillen, Smith & Fisher, 1997, Caldera et al., 2001), trauma exposure (Weidmann, Fehm, & Fydrich, 2007), being female (McMillen, Smith & Fisher, 1997, Caldera et al., 2001), never having been married, or being illiterate (Caldera et al., 2001) have been identified as risk factors for the incidence of PTSD post disaster. Additionally, the intensity of resource loss explained 42% of the variance in depressive symptoms in one study of

earthquake damages in El Salvador (Sattler et al., 2006). It is clear that research has indicated that disasters relate to higher levels of mental health distress symptoms. These mental health outcomes may be immediate or long term (North, Hong, Suris, & Spitznagel, 2008). However, no studies have looked at the long term relational consequences for disaster survivors.

With regard to factors that may be protective against mental health problems post disaster, social support from the family, other trauma exposed peers and a sentiment of social acknowledgement of survivor trauma explained 23.3% of variance in lower indications of depression in one study (Weidmann, Fehm, & Fydrich, 2007). Other evidence of the importance of family members was found when adolescent survivors of the 2004 tsunami exhibited lower levels of depression and PTSD symptoms if they had a high quality relationship with their mothers (Wickrama & Kaspar, 2007). Family relationships are beginning to be addressed in the context of natural disaster within the literature. It is clear that positive and close relationships assist in coping with disaster. The relationship trauma survivors have with a higher power has also been investigated with regard to trauma.

Some aspects of religion and spirituality may facilitate recovery and even increase mental or emotional maturity known as posttraumatic growth (see Shaw, Joseph & Linley, 2005 for a review). The findings of researchers indicate that the use of religion in coping with disaster can yield both positive and negative outcomes. For instance, the use of positive religious coping predicted 33% of the variance in positive psychological outcomes after a flood in the American Midwest. On the other hand, negative religious

coping, including anger or distance from God or church and praying for miracles or bargaining with God, accounted for 21% of negative psychological outcomes (Smith et al., 2000). Religious coping in a negative way has also been found to predict a lower degree of hope as well (Ai, Peterson, & Huang, 2003). Other evidence indicates that those subscribing to a religious attribution style endorsing the concept of karma in response to trauma experienced more severe PTSD symptoms (Davidson, Connor & Lee, 2005). Further examples of religious coping resulting in positive outcomes include a finding by Calhoun et al. (2000) suggesting that openness to religious change is associated with post-traumatic growth. Positive religious-spiritual coping was predictive of optimism in Bosnian war refugees. This positive coping style was enhanced by the degree of religiousness indicated by respondents (Ai, Peterson & Huang, 2003). One possible explanation for what makes the difference in positive and negative use of religious coping and subsequent outcomes is found by Chen (1997). He notes that societies that are avoidant of grief after loss forfeit the opportunity to experience spiritual growth (Chen, 1997). Overall however, research on religion and trauma presents a scattered picture of what characteristics of religious activity and belief serve to buffer stress or exacerbate it.

While family functioning in stress has not been neglected empirically, disaster researchers tend to focus on family process as a pre-existing factor predictive of various mental health outcomes (Proctor et al., 2007; Wickrama & Wickrama, 2007). This use of family variables as predictors rather than outcomes leaves a gap in the knowledge regarding how disaster actually affects the normative functioning of families. However,

pre-disaster family functioning has proved an important predictor of some post-disaster outcomes. For example, it appears that parental stress and negative mental health outcomes in response to disaster do predict poorer child mental health after a disaster (Proctor et al., 2007; Wickrama & Kaspar, 2007). However, the mechanisms responsible for this relationship are not as yet fully understood. Post disaster family outcomes which have been studied have been focused on increased negative family interactions or tensions (Catapano et al., 2001). Relationship quality and interactions post disaster seem sometimes ambiguous outcomes in the disaster research and deserve further attention. For example, Crabbs and Heffron (1981) note that loss and relocation associated with disaster lead to interpersonal problems, but they do not detail the process by which this occurs, or how this construct is defined. These interpersonal problems often stem from subsequent relocation or death which results in a loss of relationships (Crabbs & Heffron, 1981). Current tsunami research has begun to include constructs of family problems and how they interact with mental health outcomes and even religiosity (Wickrama & Kaspar, 2007). Preliminary findings indicated that family problems may mediate the relationship between tsunami exposure and mothers' mental health. Also, a strong sense of family cohesion predicted lower depressive symptoms post-tsunami. Religious participation also predicted fewer depressive symptoms although religion was only measured with one item (Wickrama & Wickrama, 2007). There still exists no solid understanding of how religious participation influences family cohesion or marital satisfaction, particularly in the context of a natural disaster. Studies looking at disaster outcomes appear to be of increasing salience because there is a large and growing number disasters being recorded

around the world (Centre for Research on the Epidemiology of Disasters (CRED), 2005) although all the reasons for the exponential increase in recorded disaster is unclear. More specifically, it may be that more disasters are reported as detection and communication of disasters becomes easier with technology. It is not ruled out however, that there may actually be more disasters occurring in the world now than before.

The premise of the current study is to understand how the persistent results of the 2004 tsunami including lingering health problems as studied in survivors of Sri Lanka, influence family relationships including marriage four years after the occurrence of the tsunami. Secondly the objective is to understand whether religiosity, may moderate that influence. The role of Judeo-Christian faiths and other theistic orientations has been documented in coping with stress (Ai, Peterson & Huang, 2003; Smith et al., 2000). However, the body of literature systematically studying non-theistic religions including Buddhism to cope with disaster was until recently, non-existent (De Silva, 2006). Religious participation in a Buddhist population in Sri Lanka found religious activity to be protective against post disaster depression (Wickrama & Wickrama, 2007). However, religion was not measured in detail.

Previous research findings and theoretical suggestions surrounding stressful events prompt the following questions. How do persisting physical health problems resulting from the 2004 tsunami impact marital satisfaction after controlling for mental health status four years after the tsunami? How do persisting physical health problems resulting from the 2004 tsunami relate to family functioning after controlling for mental health status four years after the tsunami? Finally, does Buddhist religiosity moderate the

relationship between physical health problems from the tsunami and marital satisfaction and family functioning after controlling for mental health status four years after the tsunami?

REVIEW OF LITERATURE

The purpose of this literature review is to examine the existing research concerning natural disasters, marital satisfaction, family functioning and religiosity. This review will specifically summarize research findings relating to the relationships between family functioning and varying measures of disaster exposure that prompt the questions examined in this study. Also it will review studies investigating the possible moderating role that religiosity plays between family functioning and disaster exposure as examined through the framework of the conservation of resources (Hobfoll, 1989) model.

Theoretical Background

The phenomenon of family stress has been a construct of interest for theorists and researchers alike across a rich and long history of investigation (Boss, 1992; Hobfoll, 1989; Hobfoll & Spielberger, 1992a; Hobfoll & Spielberger, 1992b; Kazak, 1992; Lavee, McCubbin & Patterson, 1985). The body of research literature does not always agree regarding how to define stress. This challenge has presented difficulty in empirically providing evidence that any one framework conceptualizing stress has validity over another (Hobfoll, 1989). The process by which events disturb resources and what attributes of remaining or replaced resources offset loss must be understood in order to face this ambiguity. The conservation of resources (COR) model (Hobfoll, 1989) is a progression of Hill's seminal ABCX model (Hill, 1958) by examining families of world

war II returning soldiers (Hobfoll & Spielberger, 1992b). This model has been employed to examine the effects of natural disaster by Sattler et al. (2006) who discovered that a significant 58% of variance in acute stress disorder symptoms and 42% of the variance in depressive symptoms was accounted for by resource loss in a study of survivors of the El Salvador Earthquakes in 2001.

The basic tenets of the COR model suggest that change in and of itself is not stressful, and that in fact, what creates stress for families is loss, an aspect frequently present in changes. Conceptualizing stress in terms of loss puts great emphasis on the importance of resources. Hobfoll (1989) suggests that specific types of resources hold import for people; these include object resources, condition resources, personal characteristic, and energy resources. Some stressors can evoke a string of sequential resource loss, producing stress (Hobfoll, 1989). The 2004 tsunami represents such a stress because the disaster prompted immediate losses such as injury and death (Anderson, 2007), as well as losses which proved to provide continuing challenges such as extensive home damages (Wickrama & Wickrama, 2007).

Just as home damages present an obvious loss of resource, when physical and mental health is disturbed, the condition resource of health is lost. This loss may provoke other losses such as the ability to work to acquire other object resources. Injury, or loss of health from a natural disaster is a well documented variable in the research on disasters (Catapano et al., 2001; Proctor et al., 2007). However, current research lacks investigation of the connection between physical health problems that persist from

natural disasters and marriage and family functioning. Family variables such as increased conflicts were related to tsunami exposure in one study which also identified family cohesion as a protective factor (Wickrama & Wickrama, 2007). However, no direct studies of the influence of physical health problems from disasters on marital satisfaction and indicators of positive family functioning like closeness have been performed. Hobfoll (1989) through his COR model suggested that resource loss leads to stress which leads to varying negative outcomes or changes. Hobfoll (1989) then, would likely support hypotheses suggesting that the loss of physical health would produce stress. This stress in turn would be hypothesized to disturb family closeness and satisfaction felt within marriage.

In order to offset the loss provoked by stress, Hobfoll (1989) suggests that there are various ways to conserve, protect, or to manage loss of resources. These include a shifting of attention regarding resources in that there is reinterpretation or reframe of the stress as an opportunity for growth. In addition to reframing the stressor, resources can also be re-evaluated. This may entail de-valuing resources that are lost. Hobfoll (1989) suggests that this method of managing resource loss may be problematic in that it may require some to change their basic system of determining the value of resources. In fact posttraumatic growth is hampered by an avoidant attitude regarding loss according to Chen (1997) as minimizing loss precludes the opportunity to grieve and experience a transcendence of what is lost.

The COR model provides a basis for understanding natural disasters. An exploration of what is lost as a result of disaster will likely help to explain why stress is experienced by survivors. Also, Hobfoll (1989) explains how the loss of resources can be quelled by a variety of mental and physical buffers. This theoretical model is applied to address the questions posed in the current study because of its attendance to resource loss and what tends to offset the negative effects of resource loss.

Marital Satisfaction and Physical Health problems

The COR (Hobfoll, 1989) model would lead us to believe that the association between persistent physical health problems from natural disasters and marital satisfaction and family functioning would be negative. Hobfoll might explain this hypothesis in that health problems resulting from a natural disaster entail direct resource loss and potentially tax various resources within family relationships. There is a body of evidence in support of this hypothesis suggesting that persisting physical health issues relate to problems in marital and family relationships (Booth & Johnson, 1994; Murray, Murray, & Daniels, 2007; Trief et al., 2006). However, the relationship between family closeness and physical health problems has not been investigated in the context of natural disaster. Much of the natural disaster research has focused on an investigation of mental health outcomes (Assanangkornchai, Tangboonngam, & Edwards, 2004; Catapano et al. 2001, Suar, Mandal, & Khuntia, 2002). Mental health disorders which occur after stressful experiences have been shown to relate negatively to marital outcomes (Dekel & Solomon, 2006, Renshaw, Rodrigues & Jones, 2008). However, mental health disorders

resulting from disaster have not been investigated thoroughly in relation to marital satisfaction and family closeness.

In a longitudinal study examining health status and marital quality, Booth and Johnson (1994) tracked both over a three year period in a national sample from a study of 2,033 married individuals. All participants were under age 55. Participant households were chosen for the study using a clustered random-digit-dialing procedure, and information was attained through phone interviews. Exclusion criteria precluded those individuals were no longer married at the follow up data collection after 3 years and those whose health improved. This resulted in a final sample size of 1,298 persons. The researchers examined four questions: Does a decline in health affect the marital quality reported by the sick person? By the spouse? If so, by what mechanism do health declines affect the quality of the relationship? What factors moderate the effects of health declines on marital quality (Booth & Johnson, 1994)?

In order to measure changes in health status, a one question indicator, “In general, would you say your own health is excellent, good, fair, or poor?” was used at the first response and at follow up. Respondents were asked the same question regarding their spouse. Marital happiness was assessed using an 11-item scale which carries a reliability coefficient of .86. These items measured marital happiness, understanding received, agreement between spouses, information about the sexual relationship, whether the spouse was someone who would do things around the house, whether the spouse was someone they could do things with, and faithfulness. Divorce proneness, as an indication of marital stability was measured using a 13-item scale (α=.91) which indicated

frequency and timing of thoughts that the marriage was in trouble, talking to others about the possibility of divorce, separating from the spouse, or filing a petition. Four potential mediators including financial problems, household division of labor (indicating whether respondents thought the present division was fair), marital interaction (assessment of frequency of positive activities done together), and behavioral problems (easily angry, jealousness, dominance, criticism, moodiness, or not talking to the other) were assessed as well. The reliability coefficient for the marital interaction scale was marginal at α=.63. The problem behavior scale asked about the self if the respondent was sick, and about the spouse if the respondent was married to a sick person. The scale demonstrated marginally adequate internal consistency (α=.61; Booth & Johnson, 1994).

The researchers employed multiple regression equations to answer their questions and found that those who reported declines in health over the 3 year period also reported small declines in their marital happiness. Those respondents who were sick did not experience a significant increase in divorce proneness even if their health declined. However, respondents reporting about a sick spouse experienced a significant decline in marital happiness and increase in divorce proneness. This indicated that spouses experienced a somewhat greater impact on their marital happiness due to the sickness of a spouse than did the sick spouse themselves (Booth & Johnson, 1994).

The researchers also tested for what mechanisms explained the relationship between health declines and marital happiness. Booth and Johnson (1994) found a mediating effect manifested in a nullification of the relationship between respondents' health and marital happiness when all the potential mediating factors were taken together.

The health-marital happiness coefficient represents the linear relationship of marital quality regressed on health, and was modified as the mediators were entered stepwise. Money problems, thinking that the division of labor was not fair, and behavior problems removed nearly an entire point from the coefficient whereas decline in income and increase in household chores didn't appear to affect the coefficient. Booth and Johnson (1994) concluded that for those who experienced a decline in physical health and their spouses, the attending decline in marital happiness could be explained at least in part by the 4 mediating factors proposed. For the respondents reporting about a sick spouse, reduction in marital interaction and increase in behavior problems related to a reduction in the relationship between marital happiness and physical health. For those reporting health declines in their spouse, it appears that decreased interaction and increase in problem behaviors of the sick spouse had the greatest impact on marital happiness.

The findings of Booth and Johnson (1994) show that physical health problems tend to influence happiness in marriage through the toll illness takes on positive interactions and an increase of problem behavior. Research literature needs to expand on this finding to include considerations of health problems relating to natural disasters and would also benefit from including consideration of possible protective factors of family relationships in the context of physical health problems.

Further evidence of the connection between physical health and marital functioning shows a relationship between diabetes outcomes and marital quality (Trief et al. 2006). A sample of 134 diabetes patients in upstate New York, were recruited as part of IDEATel, a randomized controlled trial funded by the Center for Medicare and

Medicaid services enrolling more than 1,500 elderly diabetes patients. Recruiting criteria included being a Medicare beneficiary, having diabetes, living in a medically underserved area, and being married or cohabiting for more than 1 year.

To measure marital quality, the *Spanier Dyadic Adjustment Scale* (DAS) (Spanier, 1976) (α = .96), and the *Perceived Marital Stress Scale* (PMSS) (Pearlin & Schooler, 1978) (α = .86) were used. Demographic information including age gender, the length of respondent diabetes, education level, income, body mass index (BMI), and smoking history was gathered for the baseline data collection and at a one-year follow up. Additionally, blood pressure and blood and urine samples were collected. Blood glucose control was assessed by measuring glycated hemoglobin (HbA1c) levels which indicated blood glucose over the past 2-3 months. Depressive symptoms were assessed using the *SHORT-CARE Depression Scale* (α=.80) (Gurland, Golden, Teresi & Challop, 1984). Diabetes related distress was assessed using the *Diabetes Distress Scale* (α=.89) (Polonsky et al., 2005). Finally, comorbidity of other health problems was indicated and coded using the Charlson co-Morbitity Index (Charlson, Pompei, Ales, & MacKenzie, 1987). The researchers found that greater marital satisfaction predicted improvement in 1-year HvA1c in the group participating in the IDEATel project. This project is an intervention giving diabetes patients information on tracking blood sugar, nutrition and other medical topics through telephone contact and internet video conferencing with medical professionals. The researchers also found that while the best predictor of depression at follow up was depression at baseline, other significant predictors of variance in depression at follow up included greater marital stress (13%), and less marital

satisfaction (8.7%) at baseline. However, the indicators of marital satisfaction did not predict diabetes related distress at follow up. Finally, for those in the intervention group, it was found that greater marital stress at baseline predicted greater diabetes related distress (DDS) at follow up (p = .089) albeit at a marginally significant level. As the monitoring of blood pressure and blood glucose readings was a continuing process over the course of this study, it is evident that physical health problems influence daily life (Trief et al. 2006). It appears that physical health problems relate negatively to marital satisfaction. This idea is supported in the finding that martial stress predicted later physical health symptom distress. Depression was also predicted in part by marital problems suggesting that physical and mental health problems both take a toll on marital satisfaction. Moreover, problems with the marital relationship may even hamper one's ability to cope with illness. However, receiving community support from program enrollment seemed to offset the negative outcomes on marriage from the ill-effects of diabetes. Physical health can influence marital satisfaction, and there are also some supports that tend to offset the impact of poor health on marital satisfaction. Further research uncovering other potential protective factors of marital satisfaction in the context of physical health problems is needful to understand what else may buffer the stress of a physical ailment.

Family functioning and Physical Health problems

Physical health problems also relate to family functioning in a context broader than the marital relationship (Murray, Murray, & Daniels, 2007). Murray et al. (2007)

investigated two questions relating to family functioning and physical health. The researchers selected their sample for study among those suffering from fibromyalgia, a disease affecting the soft tissue in the joint and often resulting in chronic pain. The two questions investigated were, can the symptom severity of fibromyalgia be predicted by the level of differentiation of self, age-of-onset, and stressful events occurring within a year prior to the age-of-onset? Also, which predictor variables account for the greatest amount of variance in symptom severity of fibromyalgia?

The researchers conducted the study with 201 respondents whose average age was 47 years (SD=10.4 years). The sample was comprised of 169 females and 31 males and one transgendered person. Within the sample were 196 Caucasian individuals, 2 American Indian, and 2 bi-racial participants. The age of onset of fibromyalgia symptoms averaged at 31 with a range from birth to 62 years (SD=13.55 years). Participants were recruited through various internet contacts and comprised a non-randomized convenience sample.

The Differentiation of self inventory-revised (DSI-R; Skowron & Schmitt, 2003), a Bowenian based scale designed to tap into differentiation of self, was used to indicate family relationship functioning (α=.92). The researchers assessed stressful events using the Perceived stress scale (PSS; Cohen, Kamarck & Mermelstein, 1983). The PSS was used to measure respondents' perception of stress in his/her life on a daily basis (α=.78-86). Also, the Life Experiences Scale (LES; Sarason, Johnson, & Siegal, 1978) was used to identify positive and negative life events and their impact (α=.56-.88). Finally, the Fibromyalgia Impact Questionnaire (FIQ) is comprised of 20 items measuring the current

health status of fibromyalgia patients (Burckhardt, Clark, & Bennett, 1991) and was utilized to assess symptom severity (α=.79).

The researchers found through a simultaneous multiple regression model with adequate fit ($F_{3,297}$=16.80, $p < .0001$) that level of differentiation and stressful life events explained 19% of variance in symptom severity of fibromyalgia patients. Age of onset was not a significant predictor of variance in symptom severity. The investigators used stepwise multiple regression equations to discern which variables predicted the most variance in symptom severity. In the first regression model, perceived stress in daily life accounted for 27% of the variance in symptom severity. In the second model, perceived daily stress and negative life events in the year prior to symptom onset taken together predicted nearly 30% of the variance in symptom severity (Murray et al., 2007). In other words, physical health problems may be aggravated in their severity by the daily stress that accompanies them, and previous stressful life events.

In another multiple regression model, the level of differentiation, age of onset, and stressful life events in the year prior to onset predicted 19% of the variance in symptom severity. The researchers noted that consistent with Bowen theory, those who had higher levels of differentiation were able to appraise life events and symptoms less negatively and seemed to have better ability to cope. The reverse is also possible, that those with lower symptom distress and fewer stressful life events seem to have higher levels of differentiation. It seems that one's relationship with family relates to the experience, and perhaps coping of a physical ailment.

We need to know more about how family cohesion and other elements of functioning relate to physical health problems resulting from a variety of causes. If positive family functioning aids in managing the effects of physical health problems, interventions focused on the family level could aid those suffering from persisting physical health problems. Booth and Johnson (1994), Trief et al. (2006), and Murray et al. (2007) add to our understanding of how physical health problems relate to marriage and family. The same questions investigated by these researchers, and others, need to be examined in the unique context of natural disaster as disaster survivors may be unique in the physical health and relationship challenges they face.

Disasters and Mental Health

What researchers have focused more intently on in relation to natural disasters are mental health outcomes. Specifically, investigators of this topic have often attended to posttraumatic stress disorder (PTSD) and depression as main outcomes (Assanangkornchai et al., 2004; Catapano et al., 2001; Suar et al., 2002). For instance, Catapano et al., (2001) sought to assess the prevalence of PTSD in the community of Sarno, in Southern Italy after a landslide which occurred in May of 1998. One year after the landslide, a random sample of 272 individuals living in Sarno were contacted by mail and recruited to participate. The sample also included a control group selected from a nearby town, San Valentino Torio, which was not physically damaged in the disaster.

The researchers gathered information with three assessments. The sociodemographic form is a 34-item self-report index developed for the study. It gathered details regarding respondents' demographics, physical injuries of self or family members,

and material damages including home damage. It also asked about the need to move after the landslide, debts and increased expenses. It included information on family difficulties and work problems. This entailed tensions, unusual behaviors, drug abuse, school problems, loss or change of job, or hard work conditions. It also assessed sources of aid such as family, friends, public institutions or volunteer associations. Finally, it included whether victims had received information on the event, and behaviors to adopt in case of further emergencies. The General Health Questionnaire (Fontanesi, Gobetti, Zimmermann-Tansella & Tansella, 1985; Goldberg, 1972) was administered as a general screen for mental health problems. Finally, the Self-Rating Scale for Post-Traumatic Stress Disorder (Calier, Lambers, Van Uchelen, & Gersons, 1998) was used to assess for PTSD. Information on the reliability of these measures was not included.

Using t-tests, the researchers found that the only demographic difference between the two groups was that those recruited in the control group were more often employed. Of the affected group in Sarno, 39% reported home loss or damage. Sixty-five percent reported losing at least one family member or friend in the disaster, and 48% has resulting financial problems. Finally, 29% experienced occupational difficulties and 32% complained of family problems resulting from the landslide. Most of the respondents in Sarno (80%) reported never having received any information about the cause of the landslide, 79% received no information about the risk of subsequent disasters, 53% were not given any information about an evacuation plan, and 44% reported receiving no direction on how to behave in case of ‘alarm’. Fifty-six percent allegedly received no support from public institutions or other sources post-disaster.

The average GHQ score for the affected group in Sarno was 8.6 (SD=6.8). A score of 5-6 or above indicates a mental health problem. In the non-affected group in San Valentino Torio, the average GHQ score was 5.2 (SD=5.5). These averages were significantly higher in Sarno (F=15.6, df = 1, 342, $P < .0001$). In Sarno, 59% of respondents were considered probable cases of PTSD, and 35% of the respondents in Valentino Torio. The number of respondents who were victims of PTSD was significantly higher in the affected group ($\chi^2 = 13.3$, df = 1, $p = 0.0001$). This suggests that close proximity to disaster, or intensity of exposure relates to mental health outcomes.

A GHQ score indicating a mental health problem was significantly associated with being female ($\chi^2 = 18.7$, df = 1, $p < 0.000$), having a low education level ($\chi^2 = 8.4$, df = 2, $p < 0.015$), and unemployment ($\chi^2 = 18.2$, df = 2, $p < 0.01$). Also, a GHQ score above cut-off was reported significantly more frequently by those in Sarno who reported financial problems ($\chi^2 = 7.3$, df = 1, $p < 0.007$), personal physical injuries ($\chi^2 = 5.6$, df = 1, $p < 0.02$), physical injuries of family members ($\chi^2 = 8.7$, df = 1, $p < 0.003$), psychological problems suffered by family members ($\chi^2 = 12.6$, df = 1, $P < 0.0001$) and leaving their home in the last 3 months ($\chi^2 = 8.7$, df = 1, $P < 0.003$). Mental health problems relate negatively to physical injuries sustained in the disaster to the respondent and family members. However, we do not have information about physical health problems that persist long term after disasters and their influence on mental health outcomes, or family relationships.

Factor analysis of the GHQ yielded distinct subscales including anxiety and sleep disturbance, subjective efficiency, depression, and social impairment. Respondents in Sarno had higher scores on these subscales than their San Valentino Torio counterparts. Those who were categorized as having PTSD also more often experienced personal physical injury ($\chi^2 = 9.6$, df = 1, $P < 0.01$), injuries sustained by family members ($\chi^2 = 8.1$, df = 1, $P < 0.01$), family problems ($\chi^2 = 9.0$, df = 1, $P < 0.01$), and having to leave home in the past 3 months ($\chi^2 = 6.2$, df = 1, $P < 0.05$) (Catapano et al., 2001). This finding lends information about the co-existence of injuries, and family problems with mental health problems. Studies including family problems as an outcome of disaster effects may yield distinct and important findings even controlling for mental health status.

From these findings it is safe to assume that the intensity of natural disaster exposure is related to higher mental health distress levels. It is also clear that the incidence of mental health problems relates to the outcomes of disaster, namely, physical injury of self or family members, and family problems. It is evident that physical injury relates negatively to psychological outcomes. However, this study gathered information regarding the incidence of injury as opposed to persisting health problems resulting from the disaster. Also, differentiating between family problems and problems within the marital relationship may or may not have shown that disaster influences these relationships in distinct ways.

Suar, Mandal, and Khuntia (2002), expanded on these findings to further investigate the affects of disaster exposure, but went further to study if disaster exposure

was buffered by the mobilization of resources. They hypothesized that psychological outcomes following a supercyclone in Orissa, India could be explained relative to the magnitude of resource loss that survivors incurred. They predicted that those closer to the epicenter of the cyclone would experience greater psychological distress and exhibit a more external locus of control. They also hypothesized that distress would be magnified proportional to resource loss and conversely, distress would diminish with resource support. They formulated these hypotheses based on Hobfoll's (1989) COR model.

Participants were recruited informally from survivors living in temporary camps. The sample of 65 persons excluded those under age 18 or those with a history of any psychiatric or other medical disorders. There were 45 males and 20 females in the sample, with an average age of 38 years (SD = 14.1). The education level averaged 9.2 years (SD = 5.2) and all were from semi-urban areas. Another group of 65 participants, considered as an unaffected comparison group, lived 40 km away or more from the epicenter of the cyclone and reported no loss of property or life. In the unaffected group there were 32 males and 33 females whose average age was 35.5 years (SD = 11.9) and whose education level averaged near 10.6 years (SD = 5.0). The two groups were not significantly different in age or education level, however the affected population (within 10 km of the actual devastation area) tended to be comprised of joint families more often than the unaffected group.

The researchers measured neuroticism with 20 items from the Maudsley Personality Inventory (Eysenck, 1959). The scale demonstrated a marginally adequate internal consistency coefficient of $\alpha = .62$. Internal versus external locus of control was

assessed using the Internal-External Locus of control Scale (Rotter, 1966). The alpha reliability for this scale was also relatively low at .61. Anxiety was assessed using 9 items from the Trait Anxiety Inventory (Speilberger, Gorsuch, & Lushene, 1970). Depression was measured using 15 items from the Beck Depression Inventory (Beck, 1967), and PTSD was assessed with a clinical interview developed on the basis of the DSM-IV (American Psychiatric Association, 1994).

Suar et al. (2002) also used some scales developed specifically for their study to assess total loss and social and economic support. Total loss was assessed by asking respondents to indicate a pre and post number of family members, amount of agricultural land, total rooms in their homes, rooms damaged, total livestock. Social and economic support ranged from 0-6 and was indicated by questions asking respondents if they had received social or economic support from various sources including family, relatives, community members, nongovernmental organizations, government or any other resources.

To assess for differences in mental health outcomes for those affected and not affected, the researchers dummy coded each respondent as either 1 = affected or 0 = unaffected. Multiple regression models revealed positive beta coefficients when status of being affected was regressed on psychological outcomes. The beta coefficients were significant for anxiety ($\beta = .24$ $p < .01$), depression ($\beta = .21$ $p < .05$) and PTSD ($\beta = .77$ $p < .001$), but not for external locus of control. When gender and neuroticism were controlled, the beta coefficients were all heightened, and the effect of external locus of control reached significance ($\beta = .18$ $p < .05$). The variables of total loss, as well as social

and economic support, were added to the regression analyses of the affected group as controls. Losses incurred by those in the affected group controlling for gender, neuroticism and support still explained 15% of the variance in locus of control, 35% of variance in anxiety, 31% of variance in depression, and 61% of PTSD symptoms (Suar et al., 2002). The researchers' hypotheses were supported in that exposure intensity was related to greater psychological distress just as in Catapano et al.'s 2001 study. Furthermore, in support of the COR model, greater social and economic support was negatively related to anxiety and depression. However, high levels of support had no protective effect on PSTD or locus of control (Suar et al., 2002).

This study is in clear support of the COR model in that loss seems to be what predicted adverse outcomes for survivors as opposed to the event itself. Injury of self and family members was related negatively to psychological outcomes, but ongoing health problems as a result of the disaster were not considered. The population was also limited to adults who were not studied in a relational context. Finally, the researchers considered some of the resources that allow survivors to increase, replace or manage the loss of other resources. However, a more complete consideration of buffer resources may have included religious activity and belief.

The influence of religion was considered by Assanangkornchai, Tanboonngam, and Edwards (2004) in a study of survivors of the Hat Yai flood which hit Thailand in 2000. The subjects in this study were recruited from three urban areas in Hat Yai where water levels ranged from 2-2.5 m and flood duration lasted from 4.5-5.5 days, and one rural sub-district in the area. One hundred households were randomly selected and all

residents over 14 years of age were interviewed culminating in a total sample of 590 individuals. The sample was comprised of 208 men and 382 women. Their ages ranged from 14-85 with the mean age being 41.9 years (SD = 16.5). Sixty-four percent of the sample was married, and 94% were Buddhists. Roughly one third of the sample had finished primary or high school while 11% had no formal education and twenty-one percent were recipients of college, university, or other higher education. Occupations within the sample varied with 10% laborers, 17% house-workers and the rest of the sample was comprised farmers, gardeners, government officers or private business officers.

A three part structured questionnaire was administered to respondents. The first section was designed to assess type and condition of property, household size, water level in and near property, duration of shortage of food, drinkable water and electricity as well as personal property damage and loss. The next section asked about demographic information, intensity of exposure to stressors including injury, illness or seeing dead people or body parts. It also gathered information on loss of relatives, friends, and acquaintances as well as respondents' perception of the degree of their losses. This section gathered indication of how prepared respondents were for the flood and the level to which it was an unexpected event. Finally, the second section included items assessing activities during the flood, previous disaster exposure and subjective emotional and behavioral responses to the flood. The third section of the questionnaire included a Thai version of the General Health Questionnaire GHQ (Nilchaikovit, Sukying, & Silpakit,

1996) to assess mental health status and the Impact of Event Scale (Horowitz, Wilner, & Alvarez, 1979) to investigate PTSD symptoms in respondents.

There were several factors which increased the likelihood of poor mental health outcomes. Logistic regression analyses revealed that survivors who perceived that the flood had caused severe personal loss were twice as likely to have a mental health problem as those who reported little or no loss. Additionally, having a large household (3-6) meant that respondents were 1.95 times as likely to report a mental health problem ($p = .01$) as those with smaller households. Knowing someone killed in the flood resulted in a risk 1.98 ($p = .014$) times larger than those who did not for having a mental health problem. Interestingly, those able to collect almost all of their possessions were at 2.14 times the risk of reporting a mental health problem than those who recovered none of their possessions ($p = .018$). Perhaps being able to collect part of one's possessions was a reminder of the extent of the destruction and what was lost.

Other challenges resulting from the flood included 30% of the sample reporting unemployment as a negative life change 10 weeks after the disaster. Fifty-nine percent of the sample declared that they experienced an increased difficulty working. Eight percent of respondents indicated that they experienced more quarrels with family members 10 weeks post-flood. The researchers noted that these conditions existed together in their sample, but no further analysis was performed to investigate how family interaction problems related to injury or mental health outcomes (Assanangkornchai et al., 2004).

Furthermore, there were also other factors were linked with the increased likelihood of experiencing PTSD symptoms. Those who perceived that their losses were

severe were 3.9 times as likely to have PTSD ($p < 0.001$). Religious affiliation also influenced the likelihood of PTSD. Those who were not Buddhist were a significant 3.41 times as likely to have PTSD as those who were Buddhist ($p = .013$). This suggests that being part of a minority religion was related to an increase risk of an adverse emotional reaction to the disaster. Perhaps some were separated from support systems or a sense of community that came from being a part of the majority religion. These findings might also indicate that being religious or even specifically Buddhist provides a buffer against mental health problems from disaster. The literature needs to have a greater understanding of the mechanisms by which religion serves as a buffer or exacerbating force with regard to mental health outcomes and disasters.

It is clear that many of the circumstances that follow a natural disaster are linked to adverse mental health outcomes. While we know that family relationships tend to suffer in tandem with the occurrence of disaster, the literature doesn't contain much detail regarding how family closeness may be influenced. Furthermore, if family relationships suffer, it will be important for the research literature to take into account the possible influences of disaster on marriage as well.

Stressful Experiences and Marriage

Unfortunately, there is no existing research to draw upon to explain how adverse mental or physical health outcomes from natural disasters relate to marriage. However, mental health outcomes and marriage have been studied within the context of war (Dekel & Solomon, 2006; Renshaw et al., 2008). Wars and natural disasters have key differences that make them distinct experiences. Those affected by war may be embittered by a sense

of vengeance against the enemy (Ai, Peterson & Huang, 2003), while those affected by a disaster may blame a variety of influences and factors for their losses (Smith et al., 2000). One of the most traumatizing aspects of natural disaster is the unexpected nature of most of them (Assanangkornchai et al., 2004). Those traumatized by war experiences may not anticipate specific traumas, but soldiers are likely prepared to some degree for the danger they face. Natural disasters and war are also similar in that they both are comprised of varying traumatic events, and usually affect a large number of people simultaneously (Menzel Baker, Hunt & Rittenburg, 2007). Researchers studying war have queried about whether poor marital outcomes are due to traumas or mental health outcomes due to trauma itself (Dekel & Solomon, 2006).

Marital relations in a study by Dekel and Solomon (2006) were conceptualized by marital adjustment, spousal aggression, and sexual satisfaction. The variables were compared across three groups. The comparison groups comprised those who were prisoners of war (POWs) with PTSD, POWs without PTSD, and veterans who were not POWs. General findings indicated that the marital difficulties experienced by POWs were indeed related to PTSD symptoms. Also, POW's number of PTSD symptoms associated significantly with marital adjustment (r = -.43, p = <.001), verbal aggression (r = .41, p = <.001), physical aggression (r = .23, p = <.05), and sexual satisfaction (r = -.27, p = <.001). Regarding whether marital difficulty was due to PTSD symptoms or the trauma experience of being a POW, there was some evidence to suggest that the experience itself controlling for PTSD symptoms had a significant relation to lower quality marital adjustment. This was noted in the finding that the POWs without PTSD were two times

as likely to score beneath the clinical cutoff for the Dyadic Adjustment scale (DAS; Spanier, 1976) than the control group (Dekel & Solomon, 2006).

Dekel and Solomon's study (2006) clarified that PTSD symptoms, trauma experiences and adverse marital outcomes are related. Further, the researchers noted that beyond the adverse influence of mental health problems, other aspects of the traumatic experience appear to relate negatively to marital adjustment. Renshaw, Rodrigues and Jones (2008) presented findings which further support that negative mental health status, following a traumatic event or events, associates negatively with indicators of marital functioning. Using the *Relationship Assessment Scale* (RAS; Hendrick, 1988), a 7 item questionnaire with Likert-type scale indicators, Renshaw et al. (2008) investigated marital satisfaction post national guard duty in Iraq. They also included measures of PTSD, depressive symptoms and then asked each respondent to give the same information about their spouse. They found that when spouses perceived that their husband experienced of high levels of combat exposure (i.e. controlling for level of combat exposure), the combat exposure reported by the soldier didn't relate significantly to the spouse's marital satisfaction (r = .-07, p = .59). On the other hand, when the spouse perceived that their husband experienced low levels of combat exposure, the soldier's report of his combat exposure was significantly, negatively related to spouse's marital satisfaction (r = .-.44, p = .001). This suggests a possible moderation of spouse's perception of exposure on the relationship between self-reported exposure and spouse marital satisfaction. Links between combat exposure and marital satisfaction in spouses have not been found in previous research. Furthermore, when spouse's perceived low

levels of combat exposure, soldier self-report of symptoms was negatively related to spouse marital satisfaction (r = .-46, p < .001 for PTSD symptoms and r = -.48, p = <.001 for depressive symptoms). This suggests that spouse's perception of combat exposure levels also may moderate the relationship between self-reported symptoms and spouse marital satisfaction.

A negative relationship appears to exist between persisting physical health problems and family relationships (Booth & Johnson, 1994; Murray et al., 2007; Trief et al., 2006). Persisting physical health problems resulting from natural disasters have not been studied in a family context, however. Adverse mental health outcomes such as PTSD and depression are more often studied as disaster outcomes (Assanangkornchai et al., 2004; Catapano et al., 2001; Suar et al., 2002). Some researchers have indicated an increase in family problems or conflict after disaster (Catapano et al., 2001; Suar et al., 2002). However, we still do not know how or if these problems persist along with other lingering effects of disaster, including mental health problems. Researchers have documented findings suggesting that other traumatic experiences such as combat exposure in war, relate to both adverse mental health outcomes, and marital functioning problems (Dekel & Solomon, 2006; Renshaw et al., 2008). The distinct mental health and physical health consequences of disaster will also need to be considered in their effect on marriage if we are to obtain a comprehensive understanding of trauma, mental health, and family relationships. These findings are in general support of the COR model (Hobfoll, 1989) as losses incurred in natural disasters including the loss of physical and mental health would naturally create stress.

Disasters and Family Relationships

Some of this research supporting the COR model takes place within the disaster context (Catapano et al. 2001; Suar et al., 2002), while some of it does not (Dekel & Solomon, 2006; Renshaw et al., 2008, Trief et al., 2006). Some of these studies are inclusive of family relationship variables (Catapano et al., 2001). However, no studies exist which primarily investigate the influence of disaster on family closeness. Studies connecting natural disasters with family functioning have included family closeness as a protective factor against mental distress post disaster (Wickrama & Wickrama, 2007), and positive parent child relationships as predictive of lower mental health distress after disaster (Wickrama & Kaspar, 2007). Family variables have also been included in studies to understand what coping styles families use predict the best mental health outcomes for family members (Vigil & Geary, 2008), and also what parent-child interaction styles before disaster predict mental health symptom distress (Proctor et al., 2007). These disaster studies are often conducted rather soon after the disaster occurrence to understand the breadth of immediate effects that ensue (Catapano et al., 2001; Wickrama & Kaspar, 2007; Wickrama & Wickrama, 2007).

Wickrama and Wickrama (2007) studied the family context of mental health risk in tsunami affected mothers in Sri Lanka. The sample was comprised of 325 mothers from Sri Lanka whose children were mostly over age 10. Respondent families were identified and contacted through voter registration records. They were recruited from 2 villages in Sri Lanka, Kudawella-W and Kudawella-O. Site selection from over 100 villages in the Hambantota district was based on poverty levels, rurality and accessibility.

All families contacted for the study were living in temporary housing in their own village. The data was collected 3-4 months after the tsunami struck.

The researchers included a measure of tsunami exposure to assess the degree of destruction survivors' experiences to their physical possessions and lives of family and close individuals. First, a damages index was created ($\alpha = .76$) to measure the severity of tsunami damages to property. Six questions, all rated on a Lickert type scale ranging from 1 (*not at all*) to 4 (*complete*) asked about the extent of damage to the home, livestock, vehicles and other possessions. Another 2 item scale was created to indicate the amount of life destruction sustained by survivors. It included questions regarding the number of deaths and injuries to family members, close relatives and neighbors. Pre-tsunami poverty was assessed using 7 items from a scale adapted from Conger et al., (1994). The first six items identified whether the family had money for the things they needed including leisure activities, food, clothing and equipment. The last question asked about whether the pre-tsunami income matched family expenses or not.
The questions were answered on a five-point scale ranging from 'strongly disagree' to 'strongly agree.'

The researchers measured secondary tsunami risks to understand what conditions might explain mental health outcomes. Displacement duration was indicated by asking how long families had been out of their homes in days. Next, family conflict, was measured by self report of increased family conflict and violence, and decreased support from family members following the tsunami. Child problems, another risk factor, were measured by asking about the presence of child health problems, and child behavior

problems that currently influenced activities following the tsunami. Family conflict and child problems were measured on the same 4 point Lickert scale used for property destruction. The two scales were highly correlated ($r = .26$, $p < 0.01$) and were combined to capture a latent construct of family problems. Resilience factors were also taken into account and included "familism," marital status, number of children, community support, religious participation, and hardiness. Fourteen items on a 5 point scale ranging from 'strongly disagree' to 'strongly agree' were adapted from a scale by Portes and Rumbaut (2001) to measure family closeness and cohesion, or "familism." Respondents also indicated whether they participated in community activities pre-tsunami. They were also asked regarding neighbors before the tsunami, specifically about whether neighbors looked after each other in times of trouble and looked out for one another's children. The community and neighbor items were combined as a latent construct of community support. Religious activity was captured with only one item asking about frequency of attendance at religious services. Mental hardiness was assessed by questions pertaining to respondent hope for the future and confidence in their ability to persevere.

Mental health outcomes (e.g. Depression, PTSD) were assessed using pre-established measures. Depression was indicated by a translated version of the Center for epidemiological Studies Depression Scale (CES-D; Radloff, 1977). PTSD symptom levels were assessed using diagnostic interview questions from the DSM-IV (American Psychiatric Association, 1994).

Wickrama and Wickrama (2007) found that family problems mediated symptoms of depression and PTSD and property destruction. The researchers used *t* coefficients to

test for significant effects in the sample. All *t* statistics greater than 1.96 for the degrees of freedom in the models were significant. The direct effect of property destruction was significantly predictive of depressive symptoms (β=.69, *t* = 6.51), after adding family problems to the model, the influence of property destruction was significantly reduced (β = .22). The direct effect of property destruction was also significantly predictive of PTSD symptoms (β = .26, *t* = 4.52). After adding family problems to the model, the influence of property destruction was again significantly reduced (β = .11) (Wickrama & Wickrama, 2007). Family problems in previous research have been defined as a "secondary risk" post disaster (Kaniasty & Norris, 1993), and perhaps wrongly so in light of the findings of Wickrama and Wickrama (2007).

However, family problems (Wickrama & Wickrama, 2007) did not mediate between life destruction (captured by items indicated mothers' report of the number of deaths/injuries sustained among neighbors and family) and the mental health outcomes of PTSD and depression. Perhaps this is an indication that the brief conceptualization of family problems failed to capture all the ways the family dynamic could be influenced.

Resilience factors shown to be protective against depression included familism (β = -0.016), community support (β = -0.08), and hardiness (β = -0.22). Those factors found to be protective of mothers against PTSD included a smaller number of children (β = -0.17), religious participation (β = -0.16), and hardiness (β = -0.26).

Religion as a resilience factor in the study by Wickrama and Wickrama (2007) was measured by one items only indicating frequency of participation. This item did not address what attributions, or other religious involvement may have served as a buffer. It

appears however, that religion may serve as moderator between tsunami exposure and mothers' mental health. To investigate this question, the researchers split the sample at the median into high and low religion participation groups. PTSD symptoms were more frequent in the low participation group (M = 17.03, SD = 4.36) than in the high participation group (M = 14.32, SD = 4.25; $p < 0.05$). The relationship between property destruction and PTSD symptoms was also higher among the low religious group (β = 0.26) than in the high religious participation group (β = 0.03). This difference was significant at a level of $p < 0.05$ as was the difference in the relationship between life destruction and PTSD symptoms. In the group that was considered high on religious participation, the relationship between life destruction and PTSD symptoms was β = 0.06 whereas for those who were low on religious participation, the same relationship was higher (β = 0.20). When a median split analysis was performed findings were similar in that the relationship between number of children and PTSD symptoms was β = -0.28 for those in the high familism group, and β = -0.01in the low familism group. Mothers in the low familism group also had significantly higher PTSD scores than those in the high familism group ($p < 0.05$) (Wickrama & Wickrama, 2007).

These findings suggest important potential conclusions regarding families and disaster. First, mediation analyses suggested that disasters take effect on mental health at least in part through relationship disturbances. If this is true, it's unfortunate that we don't know more about how relationships are affected since these problems could be a major contributor to mental health issues. Additionally, religious participation appears to be an important protective factor against PTSD for mothers who have experienced

disaster. More specifically, these findings indicate that mothers who attend religious services frequently, tend to experience a lesser degree of posttraumatic stress regardless of the intensity of disaster exposure than those who do not attend religious services as frequently. However, the moderation of family cohesion on the relationship between the number of children and PTSD indicates that mothers with high family cohesion experience greater PTSD symptoms when they have a higher number of children. This could be explained in that those with high levels of cohesion are likely highly invested in their families and may be more stressed by the tsunami experience when caring for more children. Even so, the average levels of PTSD symptoms were lower on average among mothers in the high family cohesion group as opposed to the low family cohesion group. This suggests that family cohesion is protective against PTSD in the disaster context. Similar findings were uncovered regarding marital status. Those mothers that were married experienced less depressive and PTSD symptoms than unmarried mothers on average. Further study of disaster is warranted within the family context given that close family ties tend to protect disaster exposed mothers from PTSD. Another impetus for further study is that family problems appear to serve as a vehicle for disaster exposure to threaten mental health. It would be interesting to rearrange research questions to understand how family closeness and other family variables as outcomes are influenced and protected when controlling for mental health problems.

Using the same sample, Wickrama and Kaspar (2007) made several hypotheses regarding tsunami exposure and the family. First, they hypothesized that high levels of tsunami exposure would relate to high levels of PTSD symptoms in affected adolescents.

Secondly, the researchers hypothesized that high levels of tsunami exposure would also relate to high levels of depressive symptoms. A third hypothesis suggested that psychosocial losses (days of displacement, social losses, family losses and mother depression) would exacerbate depressive and posttraumatic stress symptoms. Fourth, it was hypothesized that parent child relationships primarily characterized as positive would associate with lower levels of tsunami related PTSD and depressive symptoms in adolescents. The fifth and final hypothesis stated that the depressive symptoms of mothers would moderate, in an amplifying fashion, the relationship between psychosocial losses and PTSD and depressive symptoms.

Measures used in Wickrama and Kaspar's 2007 study to indicate tsunami exposure (i.e. property destruction and life destruction) were the same as in Wickrama and Wickrama's 2007 study. Psychosocial losses were measured by several indicators including the number of days that the adolescent was displaced from home. Social losses were indicated by an item asking about the disruption of playgroups, and other community and peer groups. Family loss was a variable constructed ($\alpha = .62$) to indicate the level of damages incurred on families both emotionally and fiscally. Specifically, respondents were asked to rate the level of or existence of problems influencing daily activities such as increased family violence/conflicts, increased parental alcohol consumption, damage to parental occupation, and parental mental health problems. Responses were given on a 1-4 scale ranging from 1 (*not at all*) and 4 (*complete*).

Parental child relationship quality ($\alpha = .75$) was assessed by mothers' responses to five items asking about getting along with the child, understanding the child, child

obedience, child level of demand, and child insistence on having their way. This scale yielded a high internal consistency coefficient ($\alpha = .85$). Depression of mothers was measured with the CES-D and demonstrated adequate internal consistency ($\alpha = .71$) (Radloff, 1977). Ten items from the Youth Self Report (YSR) precipitating from the Child Behavior Checklist (CBCL; Achenbach) were used to assess depressive symptoms in adolescents ($\alpha = .80$). PTSD symptoms in both mothers ($\alpha = .61$) and adolescents ($\alpha = .65$) were assessed using17 items from the DSM-IV diagnostic interview (American Psychiatric Association, 1994).

Results supported hypotheses 1 and 2. Property destruction predicted variance in depressive symptoms ($\beta = .28$, $p < .01$) and PTSD symptoms ($\beta = .24$, $p < .01$). Loss of lives also contributed to adolescent PTSD symptoms ($\beta = .19$, $p < .01$) and depressive symptoms ($\beta = .13$, $p < .01$). Taken together, property destruction and loss of lives (tsunami exposure) accounted for 10% of the variance in both PTSD and depressive symptoms in affected adolescents. Hypothesis 3 was also supported. Psychosocial losses predicted variance in adolescent depressive symptoms even when controlling for tsunami exposure. Specifically, number of days displaced ($\beta = .20$, $p < .01$), social losses ($\beta = .10$, $p < .01$), family loss ($\beta = .30$, $p < .01$), and depressive symptoms of the adolescent's mother ($\beta = .23$, $p < .01$) accounted for 38% of the variance in depressive symptoms. These same predictors accounted for 26% of the variance in PTSD symptoms although only family loss ($\beta = .29$, $p < .01$) and mother's depression ($\beta = .28$, $p < .01$) significantly predicted adolescent PTSD.

Hypothesis 4 was also supported by the results of Wickrama and Kaspar's study (2007). A positive relationship between mother and adolescent was related to significantly lower PTSD ($\beta = -.10$, $p < .01$) and depressive ($\beta = -.12$, $p < .01$) symptoms. Finally, hypothesis 5 was supported in part. To test for an amplifying moderation effect of mother's depression on the relationship between psychosocial losses and adolescent depressive and PTSD symptoms, the sample of mothers was split at the mean of depression scores. In adolescents with mothers who demonstrated higher depression scores, social loss ($\beta = .16$, $p < .01$), family loss ($\beta = .36$, $p < .01$), and days of being displaced from home ($\beta = .20$, $p < .01$) related to depressive symptoms. Family loss was significantly related to PTSD symptom levels ($\beta = .35$, $p < .01$) for adolescents whose mothers had high depression scores. For adolescents with mothers who had lower depression scores, psychosocial losses didn't relate significantly to symptom levels of PTSD or depression (Wickrama & Kaspar, 2007).

Most scales in this study were adequate with regard to internal consistency and so likely yield results that indicate important patterns between tsunami exposure and mental health. Finding that adolescent symptom levels are related to the degree of disaster exposure is in keeping with other research findings regarding adult survivors of disaster (Suar et al., 2002). Family loss was found to contribute to PTSD and depression in tsunami exposed adolescents. The way this variable was conceptualized was diverse as it included consideration of family violence, and occupational disruption of parents. Indeed, the low internal consistency coefficient revealed that the items comprising this measure may be more distinct than congruent in measuring the effects of disaster on families and

should perhaps be separate constructs in research. The finding that family loss contributed to adolescent symptoms has excellent face validity. However, research literature would benefit from a deeper exploration of how these distinct troubling family losses influences positive family functioning (e.g. closeness and cohesion).

Further research studying the family context after disaster and adolescent mental health was completed two months after Hurricane Katrina ravaged the southeast United States. Researchers Vigil and Geary (2008) studied family coping styles and the influence of those styles on adolescent mental health. Specifically, the researchers wanted to know if family coping styles affect the relationship between hurricane exposure and psychological well being. They also wanted to know how family coping strategies and psychological well-being of affected and non-affected adolescent compared.

The sample consisted of 81 (59 female) adolescents aged 12-17 years (M = 14.4 years). Families living in relocation camps for about 3 weeks were recruited for study. Data from a control group (31 of the original sample) was collected almost a year after the hurricane. Initial analyses failed to detect significant demographic differences in the two samples.

In order to assess family coping style, 10 items from the Family Crisis Oriented Personal Evaluation Scale were used (McCubbin, Larsen & Olson, 1987). These items captured pieces of all five original subscales (seeking social support, reframing, seeking spiritual support, mobilization, and passive appraisal). However, Cronbach's alpha analyses revealed sub-adequate levels of reliability in this sample (between <.40 and .60) raising questions as to the utility of this scale to accurately assess family functioning in

response to disaster. Global self-esteem of adolescents was measured using the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). Its 10 items are scored on a lickert type scale ranging from 1 (*rarely or never*) to 4 (*almost always*) and demonstrated marginally adequate internal consistency (α = .69). Subjective psychological distress was assessed using the Impact of Events Scale-Revised (IES-R; Weiss & Marmar, 1997). The 22 items were revised to refer to Hurricane Katrina specifically and assess PTSD symptoms in the past week. Responses ranged from 1 (*rarely or no days*) to 5 (*almost always or 7 days*) and exhibited good internal consistency (α = .93). Anxiety symptoms were measured using Reynolds and Richmond's (1978) Revised Children's Manifest Anxiety Scale (RCMAS) with 37 yes or no questions (α = .87). Finally, depressive symptoms (in the last week) were assessed using the Center for epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The 20 questions were answered with responses ranging from 1 (*rarely or less than 1 day*) to 4 (*almost always or 5-7 days*). The scale demonstrated good internal consistency (α = .83).

To address their first question, Vigil and Geary (2008) compared the Katrina-affected and non-affected samples in terms of problem solving or coping behavior. The group affected by Katrina reported higher 'family mobilizing' coping scores than the non-affected group. Family mobilizing as a coping style involves seeking community and institutional support at higher levels than other styles. The Katrina-affected group also demonstrated significantly lower self-esteem ($t = -3.05$, $p < .01$), higher distress (avoidance) ($t = 2.14$, $p < .05$) and depressive symptoms ($t = 2.02$, $p < .05$). What this indicates is that disaster affected families in this sample coped with stress by using more

community and institutional resources to solve problems than non-affected families. Also, the teens in the affected group exhibited poorer mental health. Vigil and Geary (2008) then investigated whether the relationship between Hurricane exposure (i.e. being in the affected group) and mental health outcomes was moderated by family coping style.

In order to answer this second question, Vigil and Geary used simultaneous regression analyses and found that previously significant relationships between psychological distress scores ($b = 8.65$, $p < .05$), self-esteem scores ($b = -2.97$, $p < .01$), and depression ($b = 4.50$, $p < .05$) and group category (i.e. whether or not the adolescent was in the affected group) became insignificant when mobilizing as a family coping style was controlled for. Further analyses revealed 'mobilized' coping as a mediator of the relationship between lower self-esteem, psychological distress and having experienced Hurricane Katrina. Mediation between depression and Hurricane experience approached significance as well ($Z = 1.91$, $p = .06$) (Vigil & Geary, 2008).

These findings indicate that those families whose primary coping style involved seeking community and institutional support had adolescents with worse mental health problems. However, this could be a spurious finding as it would be safe to assume that families whose adolescents have problems are more likely to seek community and institutional support. This was manifest in a mediation effect observed of adolescent hurricane experience between lower self-esteem and higher symptoms of distress (Vigil & Geary, 2008).

Proctor et al. (2007) also studied family context in relation to disaster response in children. In an investigation of family conflict before the 1994 Northridge earthquake hit,

affective quality in family interaction was being studied. Roughly 9 months after the earthquake, participating families were mailed surveys to complete regarding disaster exposure. Most of the two parent families (117 of 144) completed the follow up assessment post-earthquake. Parents in the sample had been together for an average of 9.6 years (SD = 3.5) and lived together with the target child at the time of the pre-earthquake assessment. Children were roughly 6.5 years old (SD = .68) and ranged in age from 4-8. Pre earthquake behavioral observations afforded researchers with information regarding the affective quality of parent-child relationships. Families were filmed during a 10 minute structured play task and behaviors were coded as either negative (e.g. pressure, impatience, negative mood) or positive (responsiveness, positive reinforcement, and positive mood). Observations had high inter-rater reliability with internal consistency coefficients ranging from .84 to .90.

After the earthquake, mothers reported on earthquake impact by giving information relating to family physical injury, home damages, displacement from the home, material losses, financial expenses, changes in living conditions, lost employment, increased workload, altered commute, and children being unable to attend daycare or school. Scores on this impact index ranged from 0-17 (M = 4.8, SD = 4.4), the highest possible score being 32 (α = .80). Child distress was measured using mother report of 23 symptoms of child distress after the quake including assessment of PTSD symptoms (α = .95). Mothers reported 2 times post earthquake, once within the first month afterward, and once 8 months post quake to assess for persistence in child distress. Items were scored on a scale from 1 (*none*) to 4 (*a lot*). Scores were summed and the 8 month scores

were used in mediation and moderation analyses to represent persistent symptoms. Finally, post-earthquake parental stress was also assessed by asking mothers to respond to 72 items measuring symptoms of PTSD, depression and somatic concerns on the same scale as child distress. Mothers reported for themselves and their husbands. Indicators of relationship difficulties captured by marital conflict behavior items were also included although marital difficulties were not mentioned in the analyses. Mothers also reported on these symptoms twice, once a month after the earthquake, and again 8 months afterward ($\alpha = .94$). The researchers used mothers' one month scores in meditational analyses as they were interested in determining what effect immediate parent stress had on persistent child distress.

The researchers found that 59% of the sample reported home damage, 50% lost material possessions, 39% spent a mean of $10,298 on post disaster expenses, 33% had an altered commute after the disaster, 20% had children who were kept out of school for over a week, 12% experienced injury of a family member, 5% had to move, and 5% reported that one parent lost employment. Additionally, 26% received financial assistance from the Federal Emergency Management Agency.

Children displayed significantly higher distress scores one month after the quake ($M = 15.40$) than 8 months afterward ($M = 7.66$) as was expected ($t\ (116) = 10.0$, $p < .001$). The researchers tested whether affective quality of interaction before the earthquake moderated the relationship between earthquake impact and persistent child distress. In all regression equations for girls and boys, earthquake impact as a main effect was a significant predictor of persistent distress. Additionally, mothers' negative behavior

significantly predicted girls' persistent distress, and taken together with earthquake impact predicted 29% of the variance in girls' persistent distress. A significant interaction was found between father negative behavior and earthquake impact in predicting girls persisting distress ($\beta = -.24$, $p < .05$). This suggests that fathers' negative interaction behavior pre-earthquake moderated the relationship between girls' persistent distress and earthquake impact. More specifically, girls' experiencing negative father behavior before the earthquake displayed higher persisting distress scores across a range of earthquake impact. Whereas those experiencing low negative behavior from fathers varied in distress more as a function of earthquake impact. This suggests that family relationships existing before disaster for girls are important in predicting mental health outcomes.

To test whether earthquake impact influenced child psychological well-being through parental stress, the researchers performed meditational analyses. Full mediation was supported for boys in that the beta coefficient was significantly reduced from a significant .42 to a non-significant .06 when controlling for parent post-earthquake stress. In fact, 86% of the effect of earthquake impact influenced boys' distress through parental stress. Partial mediation was supported for girls as well, while earthquake impact was still a significant predictor of persisting distress after controlling for parental stress, the beta coefficient was still reduced from .48 to .34. Twenty-nine percent of the effect of earthquake impact influenced girls through parental stress.

The researchers performed post hoc analysis to assess whether mothers' positive behavior with boys' and fathers' negative behavior with girls acted as a moderator for the mediator pathway between earthquake impact and post-earthquake parental stress and

child distress. There was a significant interaction between mothers' positive behavior and earthquake impact ($\beta = .28$, $p < .05$) in prediction of parenting stress which mediated the relationship between earthquake impact and child distress. This finding indicated that parents who displayed positive parenting behavior were highly stressed as a function of earthquake impact ($\beta = .72$, $p < .001$) whereas parents showing low amounts of positive parenting behavior showed no significant relationship between earthquake impact and parental stress (Proctor et al., 2007). This indicates that parents exhibiting low amounts of positive parenting did not experience stress as a function of disaster impact. What this may mean is that these parents stress levels were not proportional to the impact they experienced, but fluctuated as a function of something else.

Family responses to disaster influence persistent distress, and also, family interaction before disaster predicts adverse mental health outcomes for children afterward. Additionally, from this study it appears that the intensity of earthquake impact, including assessments of injury, influences child mental health through parental stress response to these conditions. This finding supports the need to control for mental health status in studies of disaster. Controlling for mental health will help to increase understanding of how resultant disaster conditions such as injury and illness influence not only mental health of survivors, but family dynamics after disaster. This study indicated that family interaction and parental distress affect how survivors are influenced by natural disasters. However we still need to know more about how these behavior interactions may have changed as a result of disaster. The way that families cope with stress and interact appears to be influential in predicting mental health outcomes for children. It is

also evident that parental stress and adverse mental health influences the coping ability of children and adolescents (Proctor et al., 2007; Vigil & Geary, 2008).

Disaster and Long Term Mental Health Outcomes

Researchers have documented mental health status and other variables resultant of disasters in the short term context. The data analyzed in Wickrama and Wickrama (2007) and in Wickrama and Kaspar (2007) was collected 3-4 months after the tsunami hit. The study by Suar et al. (2002) retrieved data from respondents 3 months after the Orissa, India supercyclone. Information from survivors of the Hat Yai flood (Assanangkornchai et al., 2004) was obtained even more immediately to the disaster, just 10 weeks. Catapano et al. (2001) studied psychological outcomes of landslide survivors a year after it happened and found that the degree of loss was significantly associated with negative mental health outcomes. Also, researchers studying the effects of war trauma on marriage found similar detrimental results both 3 months (Renshaw et al., 2008) and 3 decades (Dekel & Solomon, 2006) after soldiers returned home. This suggests that traumatic experiences influence long term mental health outcomes. Research has been conducted which addresses the long term mental health implications of experiencing a disaster as well (Crabbs & Heffron, 1981; Kaniasty & Norris, 1993; Lindy & Titchener, 1983; North et al., 2008; Wu et al., 2006).

Crabbs and Heffron (1981) indicated that what amount of time needs to pass to assess the long term versus the short term effects of disaster is ambiguous. However they also state that short term effects are often considered in days or weeks while long term effects are investigated after months or years. Other differences help to clarify what may

constitute short term versus long term effects of natural disaster such as what survivors need. For example, immediate needs such as food and clothing tend to represent short term needs and results of disaster while emotional responses and mental distress surrounding reminders of the event may suggest a long term effect.

North, Hong, Suris, and Spitznagel (2008) studied survivors of the Oakland/Berkeley Firestorm that took place in 1991. Their purpose was to understand the sequelae of mental health disorders sustained by survivors. The selected participants for their study by identifying residential areas in the direct path of the firestorm leaving homes damaged or destroyed. Letters of invitation to participate were sent to 191 of these homes, but as many of them were no longer habited because of evacuation, the researchers were unsure as to who of those invited actually received letters. Of the 86 households responding to their invitation, 69 individuals (one from each home) were then interviewed. These interviews were conducted 4, 16, and 39 months after the firestorm hit. For the final sample, Hong et al. (2008) used data from the 62 respondents who completed all follow up interviews.

In order to assess how the experience of this disaster influenced mental health over time of survivors, the researchers used the DSM-III-R Diagnostic Interview Schedule (Robins, Helzer, Cottler, & Goldring, 1989). They also used the disaster supplement to this schedule (DIS; Robins & Smith, 1983) this measure and its supplement was used at all interview points. Only sections of the DIS were used, the researchers based their decisions on what items to administer based on previous research to gather the most pertinent information from respondents. Sections of the DIS used

included demographic information, and several assessments of psychiatric disorders including PTSD and depression. The disaster supplement to the DIS assessed survivor exposure to the fire, danger, and family or friend exposure. It also included indicators of negative life events before and after the disaster. The Temperament and Character Inventory was used (TCI; Cloninger, 1992) at 16 months post disaster. It is a 240 item self report instrument to measure different domains of personality. These included harm avoidance, novelty seeking, reward dependence, and persistence. There were also three aspects of character measured with this instrument that included being self-directed, cooperative, and self-transcendent.

To analyze the data they collected, the researchers compared mental health outcomes in respondents based on their level of exposure to the disaster and other demographic indicators. The final respondent sample was mostly married, well-educated, older, non-ethnic females. Four months after the firestorm, the researchers noted that most respondents (with three exceptions) with psychiatric disorder diagnoses after the disaster had them before the firestorm occurred. However, there was evidence of post-traumatic symptoms and distress was wide-spread. The number of PTSD symptoms experienced was positively significantly associated with being female (M=4.8, SD=5.8 vs. M=2.1, SD=3.4; t = 3.07, df = 56, p=.003). At the three year follow up, one of those diagnosed with PTSD after disaster had recovered, but three more cases met diagnostic criteria, and one case met diagnostic criteria at the one year follow up meaning that three years after the disaster, the rate of PTSD among the sample was increased to 11%. These cases all had PTSD symptoms at the first time of measurement, but did not exceed the

diagnostic threshold, and 5 of the 7 had a psychiatric disorder pre-disaster. This suggests that perhaps disaster exacerbated mental health vulnerabilities rather than serving to produce mental health problems at the diagnosable level. A similar finding held true with major depression, with 4 additional cases being identified at the first follow-up interview. However, three of these four cases moved into remission at the three year interview, as well as the original 8 cases identified at the first interview. This suggests that depressive symptoms subsided over time in this population perhaps indicating that depressive symptoms are strongest right after a disaster. The researchers found that reports of self harm decreased a significant 32% (p=.003) over the follow up interviews, as did the report of feeling "very upset" (15% decrease; p=.007).

Survivors of the firestorm exhibited personality differences based on community comparisons. The researchers also found that certain personality characteristics were related to adverse mental health diagnoses. Those who had experienced the firestorm tended to score significantly higher on personality sub-scores of cooperation, and self-directedness. Survivors also tended to score lower on self-transcendence. The harm avoidance sub-scale was significantly related to a PTSD diagnosis.

What these findings suggest is that the survivors in this sample tended to be resilient over time with regard to mental health diagnoses, but that the experience of the disaster may have exacerbated pre-existing mental health vulnerabilities for some. Crabbs and Heffron (1981) noted that after a natural disaster, marriage partners with underdeveloped coping skills may be more likely to attend to their own needs and problems while neglecting their partners' which could reasonably be expected to create

problems in marital satisfaction. This suggests that what North et al. (2008) found suggesting that disasters may exacerbate mental health vulnerability may be true for vulnerable marriages as well.

Also, it appears that over time, depressive symptoms tended to subside in the sample suggesting that perhaps depression fluctuates as a function of chronological proximity to the disaster. The researchers made a specific point to distinguish between psychiatric diagnoses and symptoms noting that each are eased with different interventions, but both need consideration and attention in response to disaster.

With regard to personality findings, survivors of the disaster tended to be more cooperative and self-directed than their peers who had not experienced a disaster. The fire storm survivors and community sample did not differ significantly in their harm avoidance tendencies suggesting that experiencing a disaster, may not contribute to this personality characteristic. There is need to continue this line of research to learn more regarding disaster related family and marital problems long after a disaster has occurred.

While disaster may exacerbate pre-existing vulnerability in mental health status (North et al., 2008) and marital functioning (Crabbs & Heffron, 1983), other evidence suggests that experiencing a disaster may create vulnerability. A study involving 222 older adults who had survived a severe flood in Kentucky served as a test of the social support deterioration model. This model posits that psychosocial loss operates as a vehicle for disaster to influence mental health outcomes. It is in fitting with the COR (Hobfoll, 1989) model which suggests loss to be the culprit creating stress when changes occur.

Originally the sample of adults was involved in another study, and the occurrence of the flood prompted further inquisition afterwards to assess social support deterioration after the flood. The final sample was split into three sub-groups based on the level of exposure respondents had to the disaster. Thirty-seven respondents were considered primary victims because they experienced direct losses of a physical or material nature. Secondary victims of which there were 106, did not sustain direct loss, but resided in an affected area. Finally, 79 nonvictims were those respondents who lived in nearby counties and didn't experience flooding. Data was collected three months before the flood, and two times afterward. Time three was 9-12 months post flood.

Three types of social support were considered in this study, social embeddedness, perceived support from nonkin, and perceived support from kin. Social embeddedness was defined in this study as the "number of connections people have with significant others in their social environments" (Kaniasty, Norris, 1993, p. 400). Perceived social support is defined as whether or not a person thinks they are reliably connected to others, so that in the event that support is needed, it would be provided. To assess these variables, the researchers used nine items from the Louisville Social Support Scale (LSSS; Norris, Murrell, 1987). Depression was measured using the CES-D (Radloff, 1977) demonstrating an internal consistency equal to .89. Personal loss was measured on a 5 point likert scale ranging from 1 (*minimal damage*) to 5 (*total destruction*) and was subjective in nature. Community destruction was assessed by examining data from the Kentucky Division of Disaster and Emergency Services to indicate the number of homes

destroyed in relation to the population of each county. In the analyses, the researchers controlled for sex, marital status, and education.

Kaniasty and Norris hypothesized that disaster exposure would influence depression both indirectly and directly *through* the loss of social support (social embeddedness, perceived social support from nonkin, and perceived social support from kin). To test this, they employed structural equation modeling to test the relationships between these constructs. The researchers fit the first model to the data which exhibited good fit (GFI = .97). Personal loss at time 2 influenced depression at time 2 only ($t = 2.61$, $p < .01$) and community destruction at time 2 only influenced depression at time 3 ($t = 3.11$, $p < .005$). A second model was fit three times for each type of social support. For social embeddedness (GFI = .94), mediation was not supported because personal loss did not have a significant effect on embeddedness. For nonkin support (GFI = .95), mediation was supported between personal loss and depression at time2. Personal loss was positively related to nonkin support at time 2 ($\beta = .33$, $p < .001$), and nonkin support at time 2 was also significantly related to depression at time 2 ($\beta = .18$, $p < .01$). The path between personal loss to time 2 depression came close to 0 ($\beta = .03$, $p < .39$) when nonkin support (time 2) was included in the model. When it was not in the model, the relationship between personal loss and time 2 depression was $\beta = .11$, $p < .05$. For kin support (GFI = .96) mediation was not supported either. The models were refit with depression at time 3 as the outcome variable. Community destruction was used as disaster stress to predict depression. Results indicated that embeddedness mediated the relationship between community destruction and depression at time 3. Nonkin support

also mediated between community destruction and depression, kin support did not. These results suggest that community destruction led to a deterioration of social support which led to greater distress. This study evidences the need for greater understanding of how disasters influence support systems long after the disaster has taken place. This study did not indicate that a loss of kin support mediated between destruction and mental distress, but it did show that community destruction was negatively related to kin support. This suggests that the destruction caused by disaster influences family support negatively. It may be that other complications from disaster including injury and illness whose effects persist over time effect family support or other indications of family relationship functioning.

Physical complications spawned from an earthquake in Taiwan predicted a lower quality of life for survivors three years after the disaster (Wu et al., 2006). The instrument used to assess quality of life pertained to mental health and physical functioning and not relational outcomes. However, if physical problems influence mental health, it is reasonable to expect that family and marital relationships may be affected as well. To confirm or refute this expectation, studies including variables of marital and family functioning long term after disasters need to be performed.

It is clear that natural disasters often invoke major changes on the lives of those who experience them, both immediately (Suar et al., 2002; Wickrama & Wickrama, 2007) and long term (North et al., 2006; Wu et al., 2006). Findings evidencing both the rise and decline of mental health distress after disaster (North et al., 2006) and make it difficult to conclude how disasters affect mental health long after the disaster, to say

nothing of physical health, or family relationships. However, findings indicate that circumstances inflicted by disaster (e.g. physical health problems) do influence life quality long after the disaster (Wu et al., 2006). Also, even mental health distress symptoms appear to both rise and fall over time after disaster, it seems that generally, symptom distress eases over time (North et al., 2006). Studies investigating cross-sectional samples of survivors of disasters some time after their occurrence, and continued longitudinal study will help to fill in the gaps regarding how disaster exposure relates to families long after disasters happen.

Religious coping

Disasters leave destruction as they occur, such that family relationships, physical health, and mental health of those affected are disturbed (Catapano et al., 2001; Suar et al., 2002; Wickrama & Wickrama, 2007). Problems resulting from these losses would be expected when considering natural disasters from the lens of the COR model (Hobfoll, 1989). The losses that accompany disaster tend to provoke stress, and it is safe to assume that they do so through the changes that precipitated them.

The way that those affected by disasters make sense of losing resources influences their ability to cope with the stress those losses invoke (Assanangkornchai et al., 2004). The efficacy of religion as a facilitator of coping appears to depend on the way it is used to explain negative events. Some religious attitudes may aid survivors through a reframe of disaster events and by providing hope for the future, although others may invoke doubt or anger (Smith et al., 2000).

Reframing loss, and changing the way one thinks about valued resources are some of the ways that people cope with stress. These cognitive shifts are used to minimize loss in addition to attempts to replace lost resources or expecting a net gain of resources through continued endurance. One may choose to lessen the value of the resource(s) they have lost (Hobfoll, 1989)

. The population considered in the present study is unique with regard to value system. The Sri Lankan mothers studied are largely Buddhist. Devaluing resources may not require a change in fundamental values as a major tenet of Buddhism is the inherent devaluation of all things. In fact, in order to create a sense of wellbeing, one has to abandon wants and lusts, and overcome them (Thera, 1993). This orientation may place the current study population at an interesting advantage in terms of their ability to use this method of managing resource loss. So although it has been suggested that changing values to deal with loss can become problematic (Hobfoll, 1989), this may be a moot point in a Buddhist population as putting little value on things is an inherent value.

Unfortunately, we do not know much about how Buddhist philosophy is applied or how those applications influence coping with the tsunami. In fact "…there have been no systematic evaluations of the relevance of Buddhist ideas and strategies to the understanding and management of trauma reactions following the tsunami…" (De Silva, 2006 p. 284). However, more recent research has begun to include basic measurements of frequency of religious activity in tsunami studies (Wickrama, & Wickrama, 2007). It is important to give attention to the ways in which non-theistic philosophies operate in times of stress, especially with regard to the tsunami given the massive amount of people

it affected (Anderson, 2007; Wickrama & Wickrama, 2007). This is especially true since Buddhism is a largely influential religious tradition in the Eastern world (Hsu, O'Connor, & Lee, 2009). Much of what we know regarding religion and stress focuses around a Judeo-Christian perspective (Ai, Peterson & Huang, 2003; Grame et al., 1999; Shaw, Joseph & Linley, 2005). There is research providing evidence of the workings of theistic faiths in the natural disaster context (Menzel Baker, Hunt & Rittenburg, 2007; Smith et al., 2000). Findings indicate that religious activities may show an investment that many may make for an expected return of a deeper closeness with God, an increased closeness with one's congregation or church, or an increase in spirituality. For example, prayer and church attendance were related to positive religious outcomes after a natural disaster in the American Midwest (Smith et al., 2000). Buddhist philosophy is largely ritualistic (De Silva, 2006), and there is a need for studies to investigate how Buddhist religious activities relate to disaster outcomes in addition to Judeo-Christian religious activities.

It is paramount to understand differences in outcomes regarding the application of religious beliefs (in addition to religious activities) to disaster losses, as different philosophies may relate to different outcomes. Also, it is clear that intra-faith differences exist depending on how one chooses to fit their beliefs to make sense of a given situation. For example, an attitude of blaming God for losses has been shown to relate negatively to mental health outcomes following disaster (Smith et al., 2000). This indicates a need to understand how religion is used to cognitively construct meaning of events in addition to knowing about respondent religious affiliation.

A study by Davidson, Connor, and Lee (2005) attempted to understand how the use of karma and reincarnation related to resilience. The sample was taken from the United States and included 1,969 respondents who offered information regarding traumatic experiences, religious beliefs and resilience via internet. The sample was contacted through a random digit dialing procedure. The sample was adjusted using post stratification weights so as to render the sample nationally representative.

General health was assessed using respondent rating of their physical and mental health as excellent, good, fair, or poor. Most respondents rated themselves as excellent or good, so two level variables were created by combining excellent and good to be "good" and fair and poor to be "poor." Resilience was measured using 11 of 25 original items from the Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003). Control, commitment, challenge, goal-orientation, self-esteem, adaptability, social skills, humor, strengthening through stress, and endurance of pain are the concepts captured within the selected items. Using a 5 point lickert scale, respondents indicated how true each statement was in the last month ranging from 1 (*not at all*) to 4 (*true nearly all of the time*). The maximum score was 44, and the mean score in the sample was 33.7.

Respondents' history of traumatic events and trauma related distress was assessed by asking respondents to identify whether they had experienced a range of traumatic events including rape, physical harm caused by another person, incest etc. Respondents were then asked about whether the event was still bothersome, if the perpetrator had been forgiven, and if feelings of anger or hatred were present. Participants rated these options from 0 (*not at all*) to 4 (*very much*). PTSD symptom severity was measured for the

previous week using items 1-8 of the Davidson Trauma Scale (DTS; Davidson, 1996). Spirituality was assessed using a 13 item questionnaire asking about general spiritual beliefs of a Western orientation, and beliefs regarding reincarnation and karma. Participants were asked to agree or disagree with each statement about these beliefs on a 6 point scale.

The researchers performed bivariate analyses with t-tests as well as Pearson Chi Square tests to illuminate differences between those who agreed and disagreed with karmic belief. Significant predictors of karmic belief were discovered using multivariate logistic regression. In all only 5% of the total sample endorsed a belief in karma. This is not surprising given that the study was conducted in the United States. Those who reported a karmic belief were more likely to be non-white than those who did not (Pearson Chi square = 17.63, df = 1, $p = 0.000$). They were also more likely to be unmarried (Pearson Chi square = 4.10, df = 1, $p = 0.043$) and to indicate that they had poor health (Pearson Chi square = 4.91, df = 1, $p = 0.027$) physically, and mentally (Pearson Chi square = 5.39, df = 1, $p = 0.020$). Those who held karmic beliefs reported more traumatic experiences ($t = -2.85$, $p = 0.004$). Physical and emotional abuse was more likely among the group endorsing karma (Pearson Chi square = 5.72, $p = 0.017$), and that group was also more likely to have experienced the violent death of a family member (Pearson Chi square = 4.41, df = 1, $p = 0.036$). Rape was also more prevalent among those who reported a belief in karma (Pearson Chi square = 13.62, df = 1, $p = 0.000$).

The researchers fit a logistic regression model to detect if the number of traumas experienced was predictive of karmic beliefs. Davidson et al. (2005) controlled for race, marital status, physical and mental health and found that the only significant predictor of karmic belief that remained was race (Odds Ratio = 2.14, 95% Confidence Interval 1.48, 3.92). The researchers found that non-white respondents were over twice as likely to believe in karma than were white respondents in this sample. A final logistic regression model was fit to determine the relationship between PTSD severity and karmic belief. The researchers found that race was still the only significant predictor of karmic belief after controlling for marital status, physical health, and mental health (Odds Ratio = 2.05, 95% Confidence Interval 1.09, 3.86) (Davidson et al., 2005).

The researchers found that karmic belief related significantly to poor physical and mental health. Further research is needed to understand why this relationship exists. This study was done in the United States where Buddhism is minority religion, and researchers have documented findings which connect minority religious membership with negative outcomes (Assanangkornchai et al., 2004). Davidson et al. (2005) found that race was the most significant predictor of karmic belief in their study, this makes sense since Buddhism is a prominent religion in the Eastern world and is not dominant in Western culture. Still, the research literature needs to move beyond connecting what factors are associated with karmic belief to understand how other Buddhist beliefs and practices interact with trauma outcomes. Research regarding Buddhist belief and resilience would be incomplete without similar studies conducted in populations where Buddhism is more

prevalent. Studies with predominantly Buddhist populations to detect intra-faith variance in practice, belief and resilience through trauma are needed.

De Silva (2006) wrote concerning cultural observations after the 2004 tsunami hit with regard to Buddhist belief and practice. Specifically, relief efforts were noted to have stemmed from several Buddhist monks who offered humanitarian aid by providing shelter and supplies to the needy. These demonstrations embody *karuna* or compassion from loving kindness and equality. Buddhists affected by the tsunami also held varying explanations and sense-making strategies regarding the tsunami. Some held to the Buddhist concept of *anicca* or the notion of the impermanence of all things and allowed this concept to guide their construction meaning around the tsunami. Others felt that the tsunami and the losses which trailed behind it were due to karma, a reaping of consequences for one's actions. De Silva calls for further investigation of disaster impact, religious belief and subsequent mental health outcomes of survivors (De Silva, 2006). Research does exist which has considered disaster impact and the psychological and religious outcomes of positive and negative religious coping in Western populations (Smith et al., 2000).

In 1993, a large flood hit the Midwestern United States. Smith et al. (2000) distributed questionnaires among affected communities in Illinois and Missouri 6 weeks and 6 months after the flood. Participants included 209 adults, the majority of which were white (95.7%), married (76.6%), and female (62.2%). Religious groups represented included Protestant (75% of the sample) and Catholic (25% of the sample). Of the original 209 respondents, 131 responded to the follow-up questionnaire.

Religious dispositions of survivors were measured by assessing average church attendance, frequency of prayer and the salience religion held in respondent lives. Each of these was measured with a single item question utilized in previous research (Pargament et al., 1990; Pargament et al., 1994). Religious attributions were assessed using three items to understand to what cause respondents attributed the flood. They were asked if survivors felt the flood was due to "God's anger or punishment," "God's love or reward," or "God's Will or Purpose" responses ranged from 1 (*not at all*) to 5 (*completely*) (Pargament & Hahn, 1986). Religious coping activities were measured using a 35 item scale developed by Pargament et al. (1990) to assess 6 types of religious coping. The discontent subscale, ($\alpha = .76$) involved being angry with and distant from God and the church. The good deeds subscale ($\alpha = .81$) measured attempts to live a more religious life, while the plead subscale ($\alpha = .76$) entailed praying for miracles and bargaining with God. The religious focus subscale indicated whether respondents used religion as a diversion from problems ($\alpha = .69$), and the subscale capturing religious support ($\alpha = .77$) measured support seeking from clergy or other church members in one's congregation. Finally, the spiritually based subscale ($\alpha = .89$) was comprised of items focused on the existence of an intimate partnering with God. Respondents answered these subscale questions on a 4-point scale ranging from 1 (*not at all*) to 4 (*a great deal*). Internal consistency for the scale at time 1 was $\alpha = .81$ and $\alpha = .83$ for time 2.

Psychological outcome of survivors was measured using the 12-item General Health Questionnaire (GHQ-12; Goldberg, & Williams, 1988). This measure was used to detect psychological distress symptoms in the last month using a 4 point lickert scale

from 1 (*less so than usual*) to 4 (*much more than usual*). Religious outcomes were measured using a 3 item scale developed by Pargament et al., (1990) to ask about relationship changes with God, and one's church post flooding, and also about spiritual growth post disaster. Responses were scored on a 5-point scale from 1 (*not at all*) to 5 (*greatly*). Alpha levels at times 1 and 2 were $\alpha = .78, .76$ respectively.

Finally, flood exposure was measured using a scale developed primarily for Smith et al.'s (2000) study assess the degree of home displacement, property damage and personal injury sustained by survivors. The scale also assessed secondary flood exposure by asking about respondents' inconvenience experienced, how much family members had been affected and how much the community had been affected. These indicators were assessed by asking respondents to detail on a scale from 1 (*none at all*) to 5 (*a great deal*) the extent to which they were exposed in each of these six ways. Internal consistency was $\alpha = .82$. Demographic information was gathered including age, gender, education, income, marital status and race.

Multiple regression models were fit by the researchers to detect the influence of religious variables in predicting religious and psychological outcomes while controlling for demographic characteristics and flood exposure. Religious and Psychological outcomes at times one and two were dependent variables in the regression models. Results indicated that flood exposure explained 9% of the variance in psychological outcome at time 1, and 13% at time 2. Demographic variables were not significant predictors of any outcomes, and flood exposure was not predictive of any significant

variance in Religious outcome at times 1 or 2. The religious predictor variables accounted for 17% of the variance at time 1 and 15% of variance at time 2 of psychological outcomes. A general trend revealed that positive attributions regarding the flood (God's love or reward) combined with positive religious coping (indicated by the spiritually based, religious focus, good deeds and religious support subscales) was associated with better psychological outcomes. Alternatively, attribution of the flood to God's anger or punishment and negative religious coping (indicated by the plead and discontent subscales) were associated with poorer psychological outcomes.

Religious outcome variables were predicted in large part (43%) by the religious predictor variables at time one, and 26% of the variance in religious outcomes was explained by the religious predictor variables at time two. Positive religious coping was associated with better religious outcomes than negative religious coping. Attribution of the flood to God's love or reward and positive religious coping related to better religious outcomes.

Mediation was supported in that positive religious coping when controlled yielded the relationship between religion prior to the flood and religious outcomes null at times 1 and 2. Religion before the flood and religious outcomes were significantly correlated (r = .32, .26 $p < .01$) but the beta relationship in the multiple regression model shifted to a non significant $\beta = 0, .04$ when controlling for positive religious coping at times 1 and 2 respectively. A similar result was shown for the relationship between pre-flood religion and psychological outcomes at time 1.

There was partial support for mediation between pre-flood religion, and psychological outcomes at time 1 by attribution of the flood to God's love or reward. This was shown in that pre-flood religion and psychological outcomes at time 1 were correlated (although not significantly; $r = .12$) but the beta coefficient after controlling for positive attribution decreased to $\beta = .09$ (Smith et al., 2000).

The results of Smith et al.'s work (2000) indicates that using positive attributions to explain trauma and religious coping methods involving social activity predict better outcomes religiously and psychologically. Also, the results of the study by Smith et al. (2000) indicate that one's religiosity prior to a disaster may influence religious and psychological outcomes through the coping mechanisms used after the disaster. If this is actually the case, further investigation of religious behavior is warranted in the aftermath of disaster as it may be that those actions predict religious outcomes and psychological welfare. Attributing the flood positively to God's love or reward partially mediated between pre-flood religion and psychological outcomes. This suggests that the research literature would benefit from understanding more about religiously based cognitive constructions employed to explain disaster. It would be beneficial also to explore these same questions and paths of influence with other religious faiths and populations beyond majority culture in the Western world.

Some research has been conducted to understand the effects of different religious attributions in non-Western culture. Research findings of a study in El Salvador gives some information about how survivors outside the Western world used religious

attribution to make sense of a disaster. Perez-Sales, Cervellon, Vazquez, Vidales and Gaborit (2005) conducted a study with a disaster displaced population after the earthquakes in El Salvador in 2001 to investigate what conditions post-disaster related to resilience.

Of the 115 survivors interviewed, roughly 75% had some explanation for what had occurred. Of those, 57% attributed the earthquakes as a punishment from God. This punishment was thought to be catalyzed by poor behavior, violence, or a lack of prayer and respect. Not many survivors felt that the quakes were the result of natural causes (31.4%) (Perez-Sales et al., 2005). The main focus of this study was not to investigate the effects of these attributions. As such, the results did not focus on how these attributions related to mental health or other outcomes post disaster. Knowing that survivors had these assumptions and had made meaning this way is important. However, the research literature needs to expand these findings to understand what outcomes these attributions may influence.

Understanding the tenets of multiple religious philosophies and their cognitive application to disaster deserves further attention. Buddhism is comprised of concepts which likely shape the way Buddhists view the world and life events. Buddhist philosophy is one of the major traditions of world religion. It was founded in the 6th century B.C. by Siddhartha Gautama (Hsu, O'Connor & Lee, 2009). Known for its promotion for an abdication of desire, a sense of well being is established by abandonment of burning desires, and an overcoming of wants within Buddhist philosophy. Thusly, misery generates from a proliferation of lusts and unbridled desires.

Refusing to subscribe to the notion of victory or defeat is also prized (Thera, 1993). The concepts of samsara, nirvana, and karma are the most basic beliefs within Buddhism. Samsara means "wheel of life" and references varying levels of realms of existence passed through in a sequence of reincarnation. Nirvana refers to a final releasing from these phases of reincarnation (i.e. a series of birth-death-birth). Karma indicates the consequences of the chosen behavior that one ascribes to while in one or another phase of life or samsara. Good deeds and actions tend to produce a higher level of existence in the life to come and vice versa (See Hsu, O'Connor, & Lee, 2009 for summary).

Doing good includes the directive to those of Buddhist faith to be service oriented and willing to help and support one another (Rahula, 1996). This tenet was found enacted in reaction to the tsunami in that Buddhist monks took in several who were made homeless by the disaster and were provided with food and shelter regardless of religious denomination (De Silva, 2006). This display of service was likely a great help as previous research has indicated the important role religious leader have in helping to encourage the natural tendency toward resilience through support (Carballo et al., 2005).

As part of the religious assessment included indications of various religious activities, a brief explanation of them is pertinent. Jataka stories, similar to parables in that they teach difficult principles with stories, are literary depictions of the former lives of the Buddha being reincarnated as human and animal, originally passed down orally for generations (Wickremeratne & Bond, 2006). Seth-Kavi, or a "blessing verse" is essentially a religious poem for recitation in a benedictory fashion (Guruge, 2003). Bodhi Puja consists of offerings made to the Bo tree and aid in mind development (Bond, 1992).

Dana, is a ceremonial offering of food to Buddhist monks, and Bana refers to the deliverance of sermons (Seneviratne, 1999). The context in which Buddhists participate in these rituals may influence the way they respond to disaster. Mental health responses to trauma have been explained in part by a variety of predictors, including religion (Smith et al., 2000). However, variance in disaster outcomes, including family problems is not fully understood. Continued examination of disaster outcomes including physical health problems may help to explain the emergence of family problems after a disaster. Furthermore, continued study of Buddhist practice and may further explain family relationship outcomes after a disaster.

Based on this literature review, I present the following 3 hypotheses for this study:

Hypothesis 1: Physical health problems from the tsunami that continue to affect daily activities will be negatively related to marital satisfaction and family closeness.

Hypothesis 2: Physical health problems from the tsunami that continue to affect daily activities will be negatively related to marital satisfaction and family closeness controlling for the effects of PTSD and depression.

Hypothesis 3: Religious attributions and religious family activities will moderate the relationship between physical health problems from the tsunami that continue to affect daily activities and marital satisfaction and family closeness controlling for PTSD and depression.

METHOD

Sample

Participants were mothers living in Southern Sri Lanka who were affected by the 2004 Tsunami. The data used in the present study were obtained from another study entitled Health Risk and Resiliency in Tsunami Affected Mothers and Adolescents conducted in 2008. Secondary analyses were performed to answer the questions addressed in the present study. Women were identified using voter registration records which are updated annually by an officer in the village-who is supervised by the district officer. From these records, which are publicly available, eligible participants were identified by their having an adolescent child in the home. Trained, recruited, native, female interviewers conducted in-home interviews and administered translated 8th grade level (English to Sinhalese) questionnaires. This convenience sample consists of 170 Sri Lankan mothers living in Polhena in Southern Sri Lanka. This village that was exposed to the devastating effects of the 2004 tsunami is located in the Matara district.

Measures

Marital Satisfaction was conceptualized by two items on the Tsunami Mental Health Study—ADULT Questionnaire (Wickrama & Kaspar, 2007). The first item asked, "Overall, how happy are you with your relationship?" This question was answered on a 6-point Likert scale with responses ranging from "Extremely unhappy" to "Extremely happy." The other item was, "Overall, how satisfied are you with your relationship?

This question was also answered on a 6-point Likert scale ranging from "Not at all satisfied" to "Completely satisfied." The mean composite of these items demonstrated an adequate Cronbach's alpha (α=.75) in this sample.

Family Closeness was measured by a scale used in previous research to assess support and cohesion in family members (Portes & Rumbaut, 2001). These items created a latent construct, "familism," which was deemed a resilience factor for mothers' mental health after the tsunami (Wickrama & Wickrama, 2007). The participants were asked to rank the validity of a series of 14 statements about their family with a range of 5 responses from "strongly disagree" to "strongly agree." Examples of items include "We help each other in times of trouble," "There are lots of bad feelings in our family," "We get along well together." Cronbach's alpha was α=.82 in the sample.

Persisting physical health problems resulting from the Tsunami were assessed by asking respondents to rank the applicability of three statements with responses ranging on a 5-point Likert scale from "strongly disagree" to "strongly agree." The statements were "Tsunami related physical health problems interfere with my daily activities, even today," "My spouse's Tsunami related physical health problems interfere with my daily activities, even today," and "My children's Tsunami related physical health problems interfere with my daily activities, even today." Cronbach's alpha for these items was marginally adequate α=.58.

To measure current symptoms of PTSD, 16 items derived from the DSM-IV (American Psychiatric Association, 1994) diagnostic interview were administered. This scale has been used in previous research relating to trauma and marital variables

(Renshaw, Rodrigues & Jones, 2008). Use of these items in previous research with a similar sample (Wickrama & Wickrama, 2007) omitted two of the original PTSD items. They were as follows: "Since the event, have you ever felt you have no future" and "Have you been unusually irritable or did you have outbursts of anger." This was done to improve internal consistency of the measure in a study using a Sri Lankan study of tsunami survivors (Wickrama & Wickrama, 2007). Given the sample similarity in this study, the same steps were taken in the current study. Remaining items asked about symptoms occurring in the last 4 months of respondents and included such questions as "Did you feel distant or cut off from others?" "Did you feel a lot worse when you were reminded of the event?" Respondents were asked to give a yes or no answer to each question. Internal consistency for the sample in the present study was α=.81.

To assess current depressive symptoms within the sample, 20 items from the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) were used. This measure has been used previously in research relating to traumatic experiences and marital functioning (Renshaw, Rodrigues & Jones, 2008). Previous use of this measure, translated in cross-cultural examinations of mental health, indicates this as a viable measure of depression in terms of its psychometric properties (Wickrama & Kaspar, 2007). The responses to the 20 items were averaged to indicate levels of depression in respondents. Scores over 16 points indicate clinical cut-off (Radloff, 1977). Questions asked about respondent experiences in the past week such as "I had trouble keeping my mind on what I was doing" and "I felt depressed." Answers ranged on a 4-point Likert

scale from “rarely, or none of the time” to “most or all of the time.” Cronbach’s alpha for the current sample was α=.84.

Religiosity was examined in terms of two aspects of religiosity. First the use of religious attribution to make sense of the tsunami was be assessed by the following yes or no questions “Do you believe the tsunami occurred due to Karma?” “Do you believe the tsunami consequences were unavoidable due to your Karma?” and “Were you not effected or surprised by the tsunami because it is one instance of Samsara?” (α=68). Also, items to assess the frequency of religious activity in a relational context (i.e. with family, spouse) were included. These items included, “How often do you go to the temple with your husband?” and “How often do you go to the temple with other members of your family?” Responses to these items ranged from “almost never” to “almost daily” on a 5-point Likert scale (α=.67).

Plan of Analysis

Three hypotheses were tested. The hypotheses of this study were:

1. Physical health problems from the tsunami that continue to affect daily activities will be negatively related to marital satisfaction and family closeness.

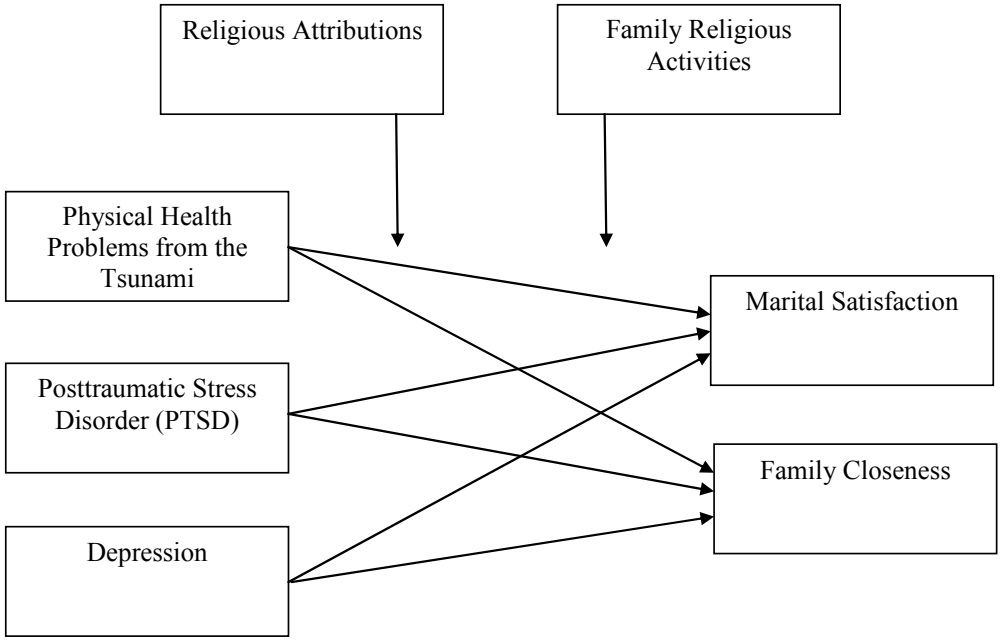
2. Physical health problems from the tsunami that continue to affect daily activities will be negatively related to marital satisfaction and family closeness controlling for the effects of PTSD and depression.

3. Religious attributions and religious family activities will moderate the relationship between physical health problems from the tsunami that continue to

affect daily activities and marital satisfaction and family closeness controlling for PTSD and depression (see Figure 1).

To test the first hypothesis, marital satisfaction and family closeness were regressed on physical health problems (see Figure 2). To test the second hypothesis, marital satisfaction and family closeness were regressed on physical health problems controlling for PTSD and depression (see Figure 3). To test the third hypothesis, marital satisfaction, family closeness, and religious attributions were regressed on physical health problems controlling PTSD and depression (see Figure 4). Then the same regression model was fit including religious family activities (see Figure 5). Religious attributions were not kept in that model because it did not relate significantly to any of the outcomes (see figure 4). Finally, a multiplicative interaction term between physical health problems and religious family activities was added to test whether family religious activities moderated the relationships between physical health problems and family outcomes (see Figure 6).

Figure 1: Hypothesized path model of physical health problems, PTSD, depression, marital satisfaction, family closeness, religious attributions and family religious activities.



In order to assess the relationships among the predictors, outcomes, and moderators, the statistical software, SPSS, was used. The data were then fit to five different path models using the statistical software, Mplus. Mplus was selected to fit these models because using path analysis allows for simultaneous estimations of the relationships between multiple variables.

RESULTS

Univariate Analysis

After reverse coding selected items within the measures of marital satisfaction, family closeness, PTSD, and depression, mean composites of the variables were created. This was done by summing the items in each scale and then dividing by the total number of items. Cronbach's alpha for the scales were then estimated (see Table 1).

Table 1
Estimated Cronbach Alphas for Sample (N=170)

Measure	Cronbach Alpha
Marital Satisfaction	.75
Family Closeness	.82
Physical Health Problems from the Tsunami	.58
PTSD	.81
Depression	.84
Religious Attributions	.68
Religious Family Activities	.67

Inspection of histograms of each variable, revealed that all of the variables appear symmetric and to be roughly normal in their distribution, although the PTSD scale revealed one outlying respondent. The average scale scores, and other univariate statistics are presented in Table 2.

Table 2
Univariate Statistics for Marital Satisfaction (MS), Family Closeness (FAMILY), Physical Health Problems from the Tsunami (PHYSHTH), PTSD, Depression (CESD), Religious Attributions (ATTR), and Religious Family Activities (FAMACT)

Scales	*N*	*M*	*SD*	Median	Skewness	Range	Kurtosis
MS	160	4.10	.87	4.00	-.81	1-6	2.11
FAMILY	170	4.21	.53	4.29	-.71	2.8-5	-.13
PHYSHTH	170	2.65	.87	2.67	.15	1-4.7	-.53
PTSD	163	1.45	.25	1.44	.39	1-2.5	.99
CESD	170	.98	.49	.85	.78	.35-2.4	-.22
ATTR	170	1.42	.39	1.33	.33	1-2	-1.36
FAMACT	168	3.72	.93	4.00	-.93	1-6	1.20

Bivariate Analysis

To determine what relationships the variables had with one another, a bivariate analysis was performed. Pearson correlations were computed between study variables and are presented in Table 3. These calculations indicated 11 significant relationships (see Table 3). The strongest of these included physical health problems with PTSD (r=.27, p=.001), physical health problems with depression (r=.41, p<.001), PTSD and depression (r=.47, p<.001), religious attributions and PTSD (r= -.35, p<.001), and religious attributions and depression (r= -.21, p=.010). It is expected that PTSD and depression would be related as these disorders tend to have high comorbidity in previous research (Suar et al., 2002). Also, physical health problems correlating with PTSD and depression is not surprising given past studies (Catapano et al., 2001). Finally, these preliminary correlations imply that religious attributions will be significantly negatively related to PTSD and depression. This hypothesis will be tested with the fitting of path analyses to the proposed models.

Table 3
Pearson Correlation Coefficients for Marital Satisfaction (MS), Family Closeness (FAMILY), Physical Health Problems from the Tsunami (PHYSHTH), PTSD, Depression (CESD), Religious Attributions (ATTR), and Religious Family Activities (FAMACT) (N=170)

	MS	FAMILY	PHYSHTH	PTSD	CESD	ATTR	FAMACT
MS	1.00						
FAMILY	.16*	1.00					
PHYSHTH	-.18*	- .20*	1.00				
PTSD	.07	-.06	.27**	1.00			
CESD	.07	-.18*	.41**	.47**	1.00		
ATTR	-.15~	.10	.00	-.35**	-.21**	1.00	
FAMACT	.10	.16*	.05	.13	-.07	.03	1.00

~p<.10 *p<.05 ** p<.01

Multivariate Analysis

To address the hypotheses, a series of path models were fit using Mplus software. In the first model, marital satisfaction, and family closeness were regressed on physical health problems from the tsunami. In the second model, marital satisfaction and family closeness were regressed on physical health problems controlling for the presence of posttraumatic stress disorder (PTSD) and depression simultaneously. In the third model, marital satisfaction and family closeness were regressed on physical health problems, PTSD, depression, and religious activities participated in with family members. In the next model, religious family activities were included among the predictors. Religious attributions was dropped from further analysis because it did not reveal any significant relationships in model 3 (see Figure 4). In the fifth and final model, a multiplicative interaction term was added to the regression equation to detect possible moderation of religious family activities on the relationship between physical health problems,

controlling for PTSD, and depression. In other words, in the fifth model (see Figure 6), marital satisfaction and family closeness were regressed on physical health problems, PTSD, depression, religious activities participated in with family members and the interaction between physical health and family religious activities.

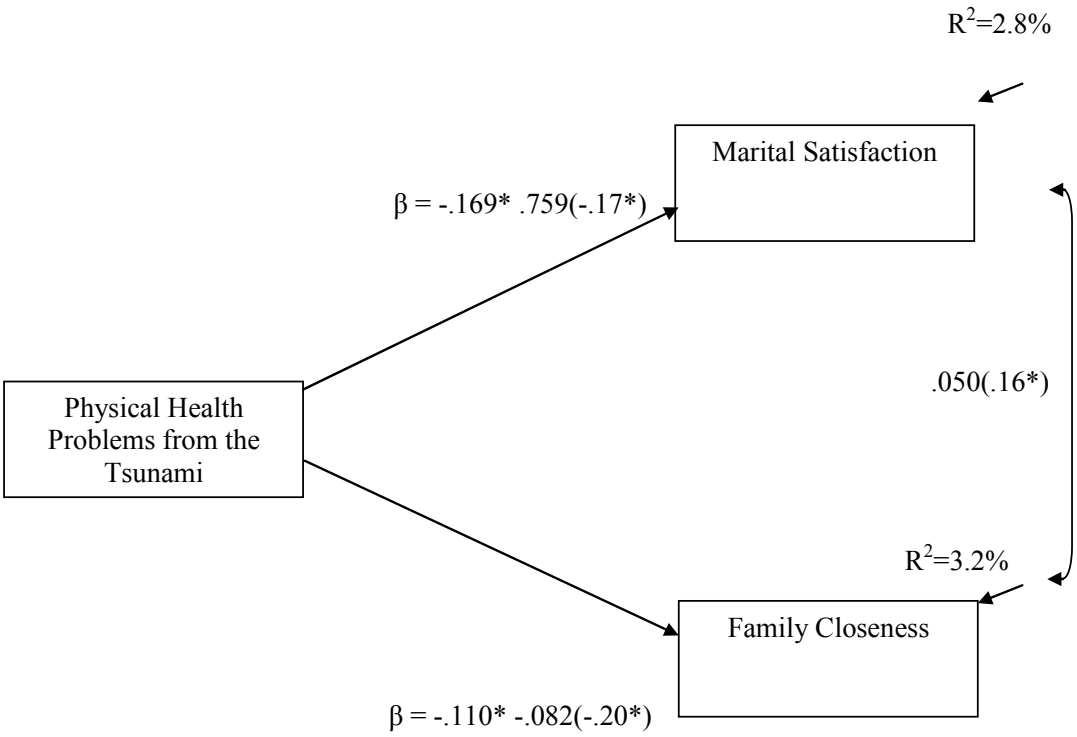
Before examining model results, test of model fit were considered to assess whether the models fit the data. The fit indices consulted included the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), Chi-Square (χ^2) with its accompanying degrees of freedom (df) and p-value, and finally the Root Mean Square Error of Approximation (RMSEA). Because all of the models had 0 degrees of freedom, they all had a chi-square value of 0, TLI and CFI values of 1, and RMSEA values of 0 (p =0.00) indicating perfect fit of the models to the data.

Hypothesis 1

The first hypothesis was formulated to suggest that physical health problems would predict significant variance in marital satisfaction and family closeness even four years after the tsunami. Specifically, given the literature review, I hypothesized that physical health problems would relate negatively to marital satisfaction and family closeness. The variable, physical health problems from the tsunami, was simultaneously regressed on marital satisfaction and family closeness (see Figure 2). Results showed that physical health problems from the tsunami had a significant negative relationship with marital satisfaction (β = -0.17, p<.05). This indicates that high levels of physical health problems 4 years after the tsunami associate with low levels of marital satisfaction

controlling for all else in the model. Also, physical health problems from the tsunami related negatively to family closeness ($\beta = -0.11$, $p<.05$). In other words, high levels of physical health problems from the tsunami associate with low levels of family closeness controlling for all else in the model. Hypothesis 1 was supported by the model. Physical health problems from the tsunami accounted for 2.8% of the variance in marital satisfaction, and 3.2% of the variance in family closeness.

Figure 2: Path model of non-standardized parameter estimates of physical health problems from the Tsunami and marital satisfaction and family closeness (Model 1) (*N*=170)



*$p < .05$

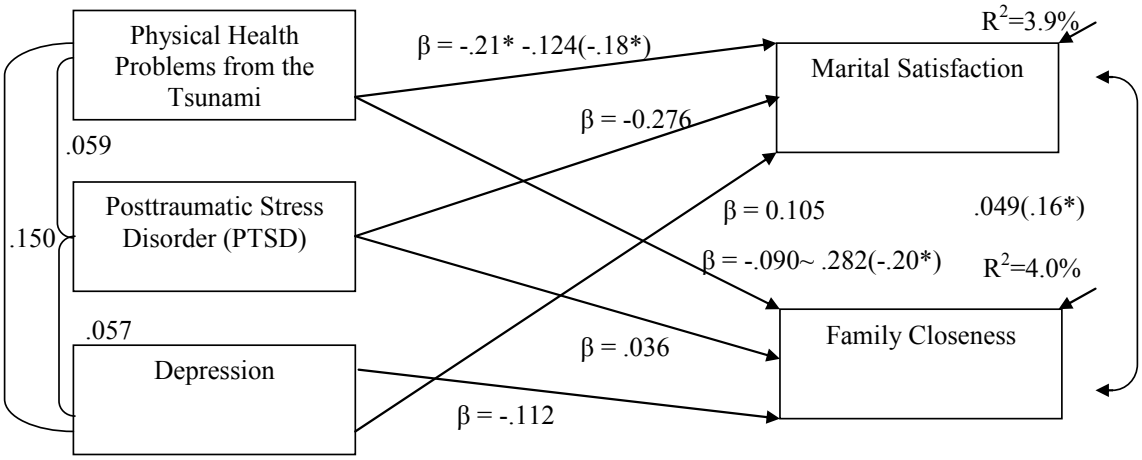
Note: Estimates in parentheses are correlations, estimates outside parentheses are covariances

Hypothesis 2

The second hypothesis suggested that physical health problems persisting four years after the tsunami would be negatively related to marital satisfaction and family closeness even when controlling for PTSD and depressive symptoms. To test this hypothesis, physical health problems from the tsunami, PTSD, and depression were

regressed on marital satisfaction and family closeness simultaneously (Figure 3). The negative relationship between physical health problems and marital satisfaction was stronger when PTSD and depression were controlled ($\beta = -.21$ $p<.05$). This suggests that even when accounting for PTSD and depression, physical health problems still relates negatively to marital satisfaction 4 years after the occurrence of the tsunami. When controlling for PTSD and depression, physical health problems still related marginally significantly to family closeness ($\beta = -.09$ $p<.10$) although the relationship was not as significant or as high in magnitude in model one. Even so, model two supported the second hypothesis. In other words, high levels of physical health problems are related to low levels of marital satisfaction and family closeness controlling for all else in the model. Depression, PTSD, physical health problems from the tsunami account for 3.9% of the variance in marital satisfaction, and 4.0% of the variance in family closeness.

Figure 3: Path model of non-standardized parameter estimates of physical health problems from the Tsunami, PTSD, Depression, and marital satisfaction and family closeness (Model 2) (*N*=170)



~*p* < .10 **p* < .05

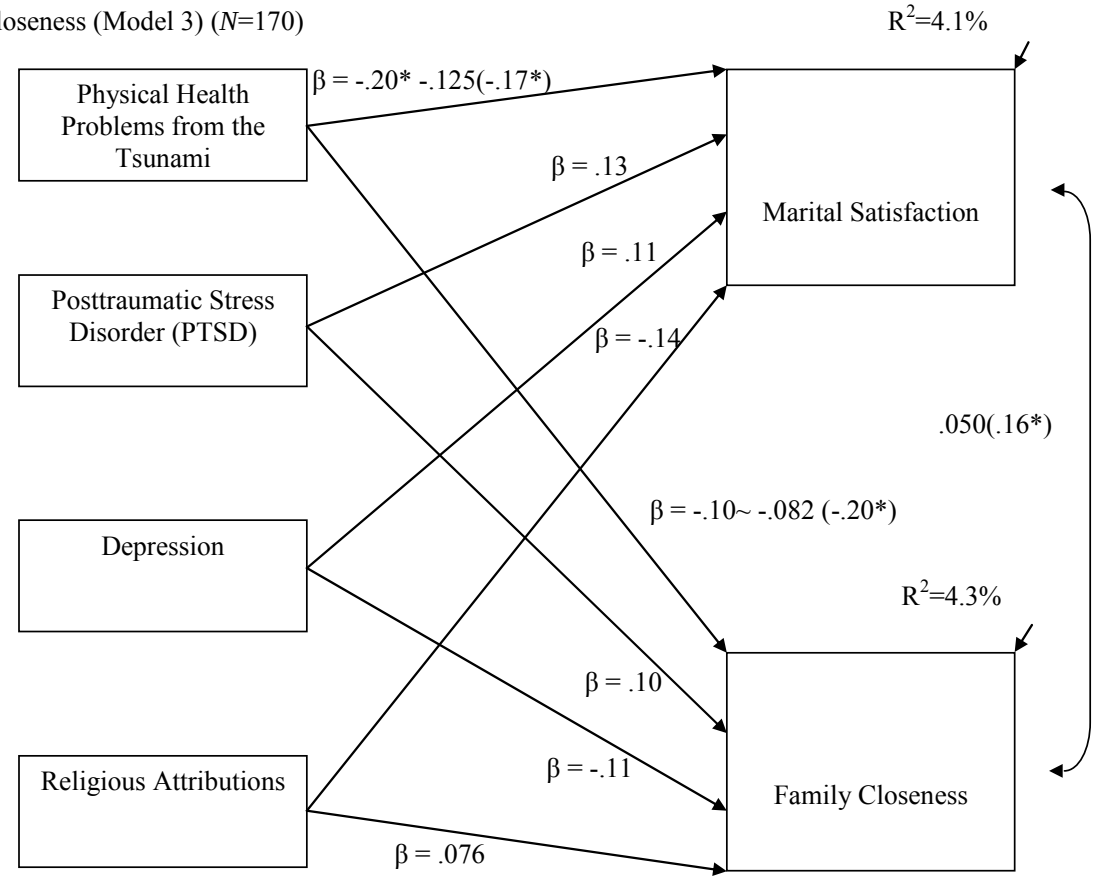
Note: Estimates in parentheses are correlations, estimates outside parentheses are covariances

Hypothesis 3

Hypothesis three posited that religious attributions or religious family activities would moderate the relationships between physical health problems from the tsunami and marital satisfaction and family closeness. To test this hypothesis, incremental models needed to be fit. First, physical health problems from the tsunami, PTSD, depression, and religious attributions were regressed on marital satisfaction and family closeness simultaneously (Figure 4). Results of this model indicated that physical health problems were negatively related to marital satisfaction (β = -.20 *p*<.05) and marginally related to family closeness (β = -.10 *p*<.10) controlling for all else in the model. No other paths in

the model had slopes reaching significance, including religious attributions. In order to assess if family religious activities was significantly related to the outcomes, it was added in the next model (see Figure 5), but religious attributions was not included. Taken together, physical health problems from the tsunami, PTSD, depression, and religious attributions explained 4.1% of the variance in marital satisfaction, and 4.3% of the variance in family closeness (see Figure 4).

Figure 4: Path model of non-standardized parameter estimates of physical health problems from the Tsunami, PTSD, depression, religious attributions, and marital satisfaction and family closeness (Model 3) (*N*=170)



~$p < .10$

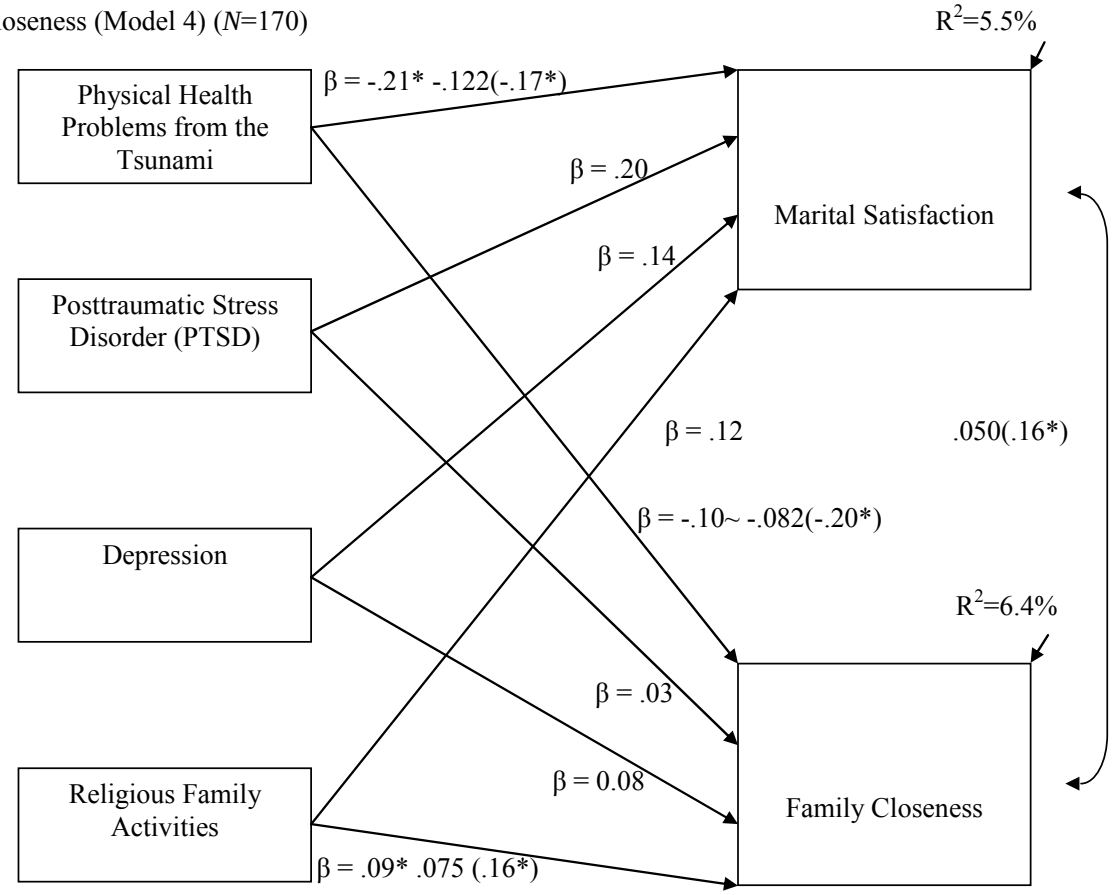
*$p < .05$

Note: Estimates in parentheses are correlations, estimates outside parentheses are covariances

Next, a model was fit to determine if religious family activities related significantly to the outcome variables (see Figure 5). Results of the model indicated that physical health problems were still negatively related to marital satisfaction (β = -.21 p<.05) and marginally related to family closeness as well (β = -.10 p<.10) controlling for all else in

the model. Additionally, model results showed that family religious activities was significantly related to family closeness ($\beta = .09$ $p<.05$), although not related to marital satisfaction. What this indicates is that high levels of family religious activities relate to high levels of family closeness controlling for all else in the model. Also, high levels of physical health problems relate to lower levels of marital satisfaction and family closeness controlling for all else in the model (see Figure 5). Taken together, physical health problems from the tsunami, PTSD, depression, and family religious activities account for 5.5% of the variance in marital satisfaction, and 6.4% of the variance in family closeness.

Figure 5: Path model of non-standardized parameter estimates of physical health problems from the Tsunami, PTSD, depression, religious family activities, and marital satisfaction and family closeness (Model 4) (*N*=170)



~$p < .10$

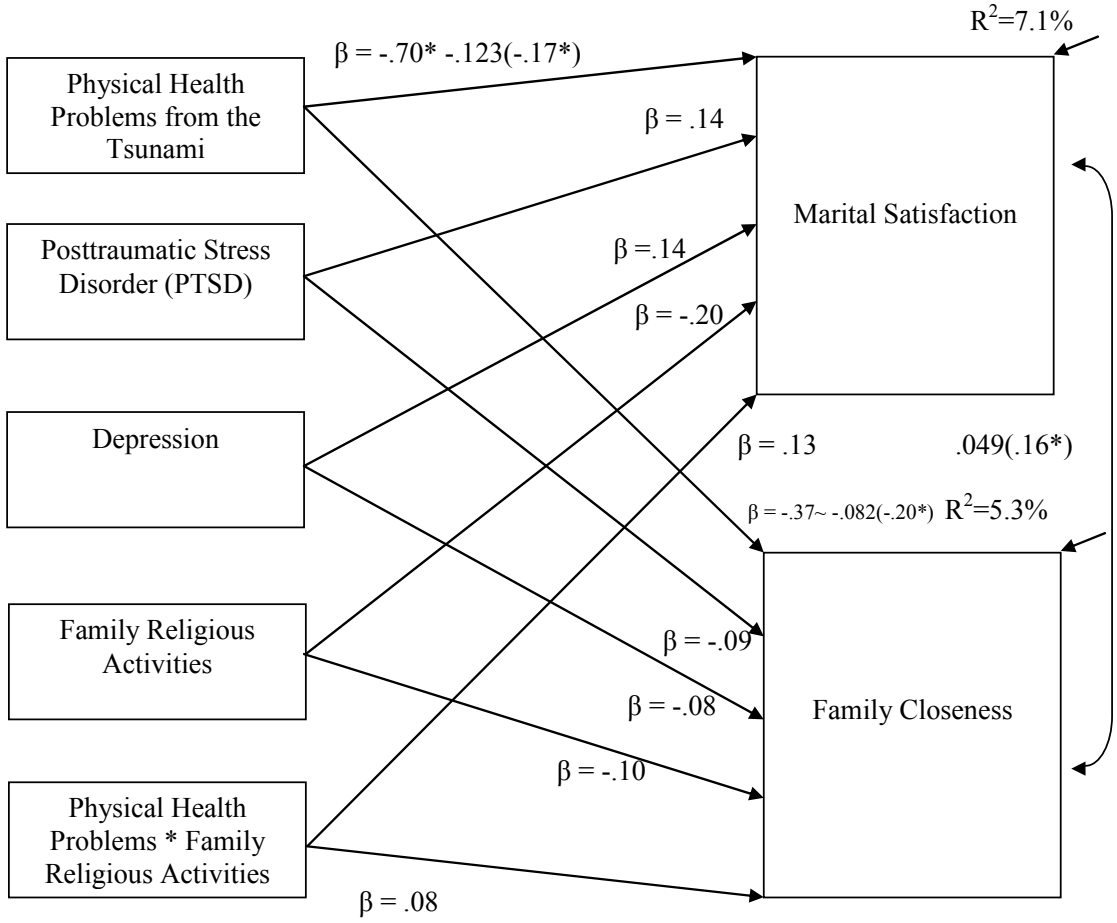
*$p < .05$

Note: Estimates in parentheses are correlations, estimates outside parentheses are covariances

A final model was fit to see if family religious activities moderated the relationship between physical health problems, PTSD, depression and the outcome variables. In order to test this, a multiplicative interaction term between physical health

problems and religious family activities was created and added to the model as a predictor. In this final model, it was found that physical health problems related negatively to marital satisfaction ($\beta = -.70$ $p < .05$), and related marginally to family closeness as well ($\beta = -.37$ $p < .10$). This indicates that high levels of physical health problems relate to low levels of family closeness and marital satisfaction controlling for all else in the model. Because the interaction term did not significantly relate to marital satisfaction or family closeness, family religious activities did not moderate the relationship between physical health problems and marital satisfaction and family closeness controlling for all else in the model. Taken together, the model results indicated that physical health problems from the tsunami, PTSD, depression, family religious activities and the interaction between family religious activities and physical health problems explained 7.1% of the variance in marital satisfaction, and 5.3% of the variance in family closeness four years after the tsunami (see Figure 6).

Figure 6: Path model of non-standardized parameter estimates of physical health problems from the Tsunami, PTSD, depression, religious family activities, physical health problems*religious family activities, and marital satisfaction and family closeness (Model 5)



~$p < .10$
*$p < .05$

Note: Estimates in parentheses are correlations, estimates outside parentheses are covariances

DISCUSSION

The most interesting findings yielded by the analysis include the persistence of physical health problems being significantly related to the family outcomes as the incremental models progressed and included more control variables. Secondly, although family religious activities did not moderate the relationship between physical health problems and marital satisfaction and family closeness, it was still a significant predictor. Specifically, family religious activities were positively related to family closeness controlling for PTSD and depression, while physical health problems were negatively related to both family outcomes in the same model. What this indicates is that even four years after the tsunami, physical health problems relate negatively to family relationship outcomes in disaster survivors. Also, even when accounting for the negative influence of physical health problems, family religious activities relate positively to family closeness. What this may implicate is that even though 4 years have passed since the devastating tsunami, there are still existing problems with family relationships. Also, there are factors that appear protective of family relationships. This speaks to the need for continued intervention efforts for families of survivors.

Research ought to continue to discover further what disaster circumstances relate to negative relational outcomes, and what relates positively to those outcomes. Although it does not appear that religious family activities buffer the relationship between physical

health problems, it may be that family religion buffer against other disaster outcomes. While these are the most interesting findings of this study, other findings are summarized below.

Summary of Results

Hypothesis 1: Physical health problems from the tsunami that continue to affect daily activities will be negatively related to marital satisfaction and family closeness. Results from model 1 indicate that this hypothesis was supported. It was found that physical health problems related negatively to marital satisfaction and to family closeness. In other words, high levels of physical health problems were related to low levels of marital satisfaction and family closeness. Physical health problems were also correlated negatively with both family closeness and marital satisfaction in the sample. However, the levels of family closeness and marital satisfaction are unknown previous to the disaster, so it would be spurious to suggest any causal link from physical health problems to the family outcomes.

The COR model (Hobfoll, 1989) is also supported by this finding which dictates that stress is evoked from loss of resources. The loss of physical health has been shown in previous studies to relate negatively to relationship functioning (Booth & Johnson, 1994). Physical health problems lingering from the 2004 tsunami may influence marital satisfaction because of the limitations that such health problems may introduce. Booth and Johnson (1994) noted that physical health problems took their toll on marital relationships in part through an increase of problem behaviors within the marriage, and a

decrease in positive interaction. It could also be that the presence of health problems and marital problems together affect the severity of health problems.

The relationship between physical health problems persisting from the tsunami and marital satisfaction is also in keeping with Trief et al. (2006) who found that heightened marital stress was related to higher symptom distress. Trief et al. (2006) also found that higher rates of marital problems were related to lower ability to cope with physical illness. This relationship suggests that perhaps not only do physical health problems contribute to marital problems, but marital problems may contribute a weakened ability to manage the stress and losses accompanying physical health problems.

High family differentiation was associated with higher levels of coping ability, and lower symptom severity as found by Murray et al. (2007). This suggests that those who cope positively with physical health problems have appropriate family boundaries. The finding that health problems were related negatively to family closeness makes since considering Murray et al.'s (2007) findings. This suggests that problems with family closeness, or low cohesion is associated with physical health problems or health problem influences on daily activities. Murray et al. (2007) also found that higher levels of differentiation were associated with lower amounts of stressful life events outside physical illness. Survivors of the tsunami may be at greater risk for family closeness problems then because they are more likely to have experienced multiple stressful life events as a result of the tsunami. This may further explain why the negative relationship exists between physical health problems from the tsunami and lower family cohesion.

Catapano et al. (2001) reported that that majority of respondents who were highly exposed to disaster destruction (including personal and family member injury) experienced family tensions (52%). Assangkornchai et al. (2004) reported a smaller incidence of family problems post disaster, but did find that some survivors reported increased family quarrels nonetheless (8%). These tensions could perhaps be due to a lessened tolerance for normative inconvenience and stress. This lessened tolerance could come from the fact that those exposed severely to disaster are more likely to have lost resources that would normally be utilized to buffer against stress.

A basic assumption of the COR model is that stress stems from resource loss, so people do what they can to avoid resource loss, in other words, to conserve resources. This happens by compensating for lost resources, or building up reserves in times when resources are not taxed. When resources are taxed, either the actual lack or resources, or the perception that one cannot meet challenges because of a lack of resources creates stress (Hobfoll, 1989). It is this taxing that perhaps explains the rise of tensions and quarrels within the family. One possible source of contention is rearranging and reorganizing family functioning with fewer resources. Physical health problems stemming from the tsunami represent such a tax of resources. Those with persisting physical limitations may become unable to contribute to the family in the way they used to. The responsibility for household tasks or earning money may have to be redistributed to adjust. The fact that physical health problems from the tsunami creating problems in daily activities persisted over four years afterward may signify that this adjustment may take longer than would be assumed.

Hypothesis 2: Physical health problems from the tsunami that continue to affect daily activities will be negatively related to marital satisfaction and family closeness controlling for the effects of PTSD and depression. Model 2 was fit to address this hypothesis and was found to support it. When PTSD and depression were added to the path model as predictors of marital satisfaction and family closeness, the influence of physical health problems was still significant. Depression and PTSD were not found to significantly relate to marital satisfaction controlling for all else in the model. This finding implies that when controlling for physical health problems, PTSD and depression do not significantly predict marital satisfaction or depression. I did not test for a possible mediation by physical health problems in the relationship between mental health problems and marital satisfaction and family closeness. This was because PTSD and depression were not significantly correlated with marital satisfaction, and PTSD was not significantly correlated with family cohesion. However, depression was correlated with family closeness ($r = -.18$, $p < .05$).

Wickrama and Wickrama (2007) found that family problems mediated the relationship between property destruction and mental health problems. What Wickrama and Wickrama found is that family problems tended to be a vehicle for property destruction to influence mental health. They found that family problems did not mediate between life destruction (injury and death) and mental health problems. Perhaps this is because mental health status relates to family relationships through physical health problems. However, this mediation was not investigated in the present study.

Trief et al. (2006) found that marital problems were related to increased depression in a sample with diabetes. This suggests that even when controlling for physical health problems, depression and marital problems were negatively related. This opposes the findings of the present study, but perhaps the relationships between physical health problems, mental health status and family relationships are uniquely influenced by the disaster or other highly stressful context. This idea finds possible support in that respondents in Dekel and Solomon's (2006) study who were former POW's, regardless of mental health status, on average demonstrated a greater likelihood to have low martial adjustment than those who were not POW's. This suggests that controlling for mental health, the traumatic experiences of being a POW (which may have included physical health complications) relate to lower marital adjustment.

Respondents in Wickrama and Wickrama's (2007) study had lower mental health problems on average when they had high levels of family cohesion. From the current study findings, we do not know how PTSD and depression relate to marital satisfaction and family closeness without controlling for physical health problems, but Wickrama and Wickrama (2007) suggest that family cohesion is protective of tsunami survivors against mental health problems. Wickrama and Kaspar (2007) found that positive mother-child relationships were related to better child mental health outcomes after a disaster, as was mothers' mental health. Proctor et al. (2007) noted that poor parenting behaviors pre-disaster related to increased distress in children after the disaster, and that disaster impact related to child persisting distress through parental stress. This suggests that family member reactions to disaster and family relationships before the disaster that are positive

tend to protect survivors from mental health struggles. This means that research findings suggest that perhaps family closeness is a resource that buffers against mental health problems in disaster, but results of the present study suggest that family closeness may be depleted by resource losses at the same time.

No previous studies have been conducted which specifically analyze the relationship between physical injury and family outcomes after a disaster. While this relationship needs further investigation with regard to mental health status, it seems that physical health problems are an important predictor of family relationship problems after a disaster.

It is also clear that physical health problems predict family relationship problems long after disaster given that this sample was taken almost 4 years after the tsunami. This is in support of other pre-existing research suggesting that physical health problems do indeed persist after disasters and relate to lower quality of life assessed physically and mentally (Wu et al., 2006). North et al. (2008) also found that while the intensity of symptoms may decrease over time after disaster, those symptoms may still exist long afterward.

Hypothesis 3: Religious attributions and religious family activities will moderate the relationship between physical health problems from the tsunami that continue to affect daily activities and marital satisfaction and family closeness controlling for PTSD and depression.

The COR model (Hobfoll, 1989) suggests that there are ways to minimize resource loss that involve cognitive reframing strategies as well. Religious attributions used to explain losses tend to have mixed relationships with mental health and religious outcomes. Participation in religious activities with family, friends and religious leaders may also be a way that disaster survivors mobilize social resources to help offset resource loss (Smith et al., 2000).

Before testing for moderation, Model 3 was fit to determine if religious attributions related to family closeness and marital satisfaction. The results of Model 3 indicate that religious attributions did not relate significantly to marital satisfaction or family closeness. As such, moderation by religious attribution was not tested. Model 4 was fit to determine if family religious activities related to the relational outcomes. Family religious activity significantly related to family closeness such that higher levels of family religious activity related positively to family closeness. Controlling for all else in the model, physical health problems from the tsunami had a significant negative relationship with marital satisfaction and marginally significant negative relationship with family closeness.

The finding that religious family activity was positively related to marital satisfaction and family closeness makes sense in light of Wickrama and Wickrama's (2007) results that those participating in religious activity had lower levels on average of depression and PTSD post disaster. It could be that participating with one's family in religious activity provides an element of social support that could be protective. In reference to the COR model, this family support may represent a compensatory resource.

The importance of social support is manifest in that Wickrama and Kaspar (2007) found that disruption of social support was related to higher levels of depression in adolescents after the tsunami.

Religious attributions were not found to be significantly related to marital satisfaction or family closeness controlling for all else in model 3. As such, religious attributions were excluded from further analysis. Previous research has connected the quality of religious attribution to religious and mental health outcomes (Smith et al., 2000), but no studies exists to my knowledge that examine the connection between religious attributions and relational outcomes in the disaster context. However, model 3 yielded results indicating physical health as relating significantly to marital satisfaction and marginally to family closeness even when controlling for mental health status, and religious attributions.

Models 5 and 6 were fit to test the possible moderation of religious family activity. Neither of the paths from the interaction term were significant, leaving the third hypothesis unsupported. Religious participation has been found in previous research (Wickrama & Wickrama, 2007) to moderate the relationship between PTSD and tsunami exposure (which includes family and personal injury). However, Wickrama and Wickrama (2007) did not find that religious participation moderated between depression and tsunami exposure. Even so, mental health outcomes appeared to be buffered by religious participation (Wickrama & Wickrama, 2007). Also, adverse mental health outcomes coexist with family problems post disaster (Catapano et al., 2001) so perhaps what is protective of mental health may also be protective of family outcomes. It was also

found that Buddhists in one study were less likely than non-Buddhists to exhibit PTSD symptoms after disaster (Assanangkornchai et al., 2004) although that may have had to do with being part of a majority religion and obtaining social support as a result. Given these relationships, it was hypothesized that religious attributions or family religious activity would buffer family outcomes against the incidence of lingering physical health problems post-tsunami. The fact that model 3 found religious attributions to be an insignificant predictor, and that moderation was not supported by Model 6 suggests perhaps that the constructs of religiosity were not measured with adequate detail. For instance, religious attribution may have been captured with a greater complexity by including statements that, while in keeping with Buddhism, exhibited a greater sense of inner locus of control. The statements used to measure religious attribution (see Appendix F) tended toward a conceptualization of external locus of control. Respondents affirming these statements not only endorsed religious attributions concerning the tsunami, but carried the sentiment of externalization. This externalization was exhibited by attributing the tsunami as "unavoidable" or "due to samsara." A greater external locus of control when constructing attributions around disaster has been shown to relate to higher mental distress (Suar et al., 2002). The response option asking respondents to indicate whether they attributed the incidence of the tsunami to karma may suggest more control of the respondent in their life consequences. However, a sentiment of consignment is still implied that is in keeping with an externalized locus of control.

Another possible reason for moderation not being supported in Model 6 could also be that religiosity moderates between other aspects of disaster exposure and not

physical health problems. Disaster exposure has been measured in more comprehensive ways in the past to include such experiences as the death of a family member or loved one (Assanangkornchai et al., 2004), or home damage and loss (Suar et al., 2002). This may mean that even though physical health problems appear to be important in their relation to marital satisfaction and family closeness problems, religiosity may not moderate or buffer that particular relationship in this sample. Even so, it appear that family religious activities are beneficial to family relationships in tsunami survivors.

Implications of Research Findings

Physical health problems were found to be significantly related to marital satisfaction and family functioning years after the tsunami. This suggests that disaster survivors experience the results of disaster not only emotionally, but physically and for years afterward. Special attention to the long term daily interferences of physical health problems in survivor families is needed for those seeking to assist in disaster recovery. While efforts in disaster recovery are often focused on meeting the immediate physical needs of survivors (De Silva, 2006), and debriefing survivors emotionally and mentally (Bronish et al., 2006) it appears that attention to family relationships, and chronic health problems is also needed. The emergence of tensions and quarrels among family members has been documented (Assanangkornchai et al., 2004; Catapano et al., 2001). Even so, it appears that research efforts post disaster, are often mainly focused at the individual (Assanangkornchai et al., 2004) and community levels (Catapano et al., 2001) rather than at the family level. Emerging research focusing more intently on family relationship

outcomes and risks (Wickrama & Wickrama et al. 2007) may begin to shift the focus of intervention development post disaster toward families which appears to be warranted.

Perhaps the most significant implication of this study is the large amount of variance still left unexplained within marital satisfaction and family closeness after the tsunami. Well over 90% of the variance in these outcomes after disaster still needs explaining. It is likely that many other factors contribute to family outcomes after a disaster. Even though attention ought to be given to physical health problems, when attempting to assist families in their adjustment after a disaster, a thorough assessment of all the challenges faced by families will need to be considered. This is especially the case since physical health problems relate to adverse family outcomes 4 years after the disaster. The fact that this substantial amount of time has passed since the disaster may in part explain the small amount of variance in family outcomes by physical health problems. As previous research indicates, chronological proximity to disaster tends to relate to more intense adverse mental health symptoms (North et al., 2006). It could be then that physical health problems may explain a greater amount of variance in family closeness and marital satisfaction if assessed closer to the time of the disaster.

The COR model was generally supported in that disruption of the resource of physical health tends to relate negatively with family outcomes. However, other resources that are lost and potentially used to buffer losses by disaster survivors need to be investigated.

Future Research

In addition to considering what other resources besides physical health are disturbed by disaster, perhaps the first step in expanding the research on family outcomes of natural disaster outcomes would be to include other family members as respondents. The current study included only women (mothers). This sample was constructed in this way due to the 'familistic' or cohesive nature of Sinhalese families. Health problems of respondents, their husbands, and their children which influence daily activities years after the tsunami appear relate negatively to their marital satisfaction and family closeness. In order to better understand how having a physical health problem differs from having a spouse or child with a physical health problem, future research would benefit from distinguishing who has the physical health problem in the family. Asking all family members to report on family outcomes would also give a more complete perspective of how family closeness and marital satisfaction relate to the outcomes of disaster. For now, the results of the present study simply indicate that health problems within the family tend to have an adverse relationship with marital satisfaction and family closeness after disaster.

Further research on the construct of physical health problems from natural disasters as well as other resource losses such as home damage, occupation disruption need to be considered in more detail with regard to family outcomes. Previous disaster studies often are concerned with injury from disasters (Wickrama & Wickrama, 2007), and occasionally address illness (Assanangkornchai et al., 2004). However, there is

limited work on the physical limitations which may accompany injuries and illnesses of disaster and complicate the daily lives of survivors for years afterward (Wu et al. 2006). It is possible that physical health limitations may interact with other disaster outcomes to synergize losses. For example, physical health problems may contribute to occupational disruptions and compound the difficulties presented by challenges such as home damage and destruction. However, this synergy may be more easily detected in the short term after disaster since the passage of 4 years may have allowed some survivors to adjust or compensate for some of their resource losses. Research focusing on how these losses relate to family outcomes will be an important contribution, especially as studies also include considerations of how physical health problems relate to family outcomes post disaster.

Previous research has shown that often the most reliable predictors of adverse mental health outcomes after a disaster, are mental health outcomes before a disaster (North et al., 2006). Future research should continue to assess pre-disaster mental health status as accurately as possible. Furthermore, if pre-existing mental morbidity predicts adverse mental health outcomes post-disaster, an inclusion of pre-disaster family closeness and marital satisfaction may reveal whether disasters create family problems or perhaps exacerbate pre-existing vulnerability. While asking respondents to self report on retrospection of family functioning and marital satisfaction may be spurious, it may provide a preliminary baseline level to be compared. Religious activity before a disaster has been shown to be connected with religious and mental health outcomes afterward

(Smith et al.). Although religious attributions and family religious activity didn't moderate between physical health problems from the tsunami and family outcomes, moderation ought to be investigated with other losses that may predict variance in family outcomes after disasters.

Existing studies of the effects of religious attributions in Western culture included attributions of a positive and negative nature (Smith et al., 2000). It was found that the quality of attribution (which often signified either an internal or external locus of control) influenced the relationship these attributions had with mental health outcomes. Future research with Buddhist populations should include more varied attributions than the present study offered for consideration. Believing the tsunami to have been unavoidable due to karma may be an indication of an external locus of control, which has been shown to relate to higher PTSD symptom levels (Suar et al., 2002). An inclusion of a more neutral or positive attribution, such as that regarding the tsunami being due to anicca, or the impermanence of all things (De Silva, 2006) may yield important results for relational outcomes. This is especially important because previous research has connected the quality of religious attribution to religious and mental health outcomes (Smith et al., 2000), but no studies exists to my knowledge that examine the connection between religious attributions and relational outcomes in the disaster context.

Strengths

One strength of this study is that physical health problems from the tsunami was used as the main predictor. This is a strong point because physical injuries and financial losses are regularly composited to construct measures of disaster exposure (Proctor et al.,

2007; Suar et al., 2002; Wickrama & Kaspar, 2007; Wickrama & Wickrama, 2007). It may be that physical health problems and financial losses could have similar relationships with family outcomes. However, separating physical health challenges and financial challenges from disaster may evidence distinct relationships with family outcomes which still need investigation. This investigation is just beginning as family relationships have not been studied recently as main outcomes in disaster research although family outcomes are peripherally included at times (Catapano et al., 2001; Wickrama & Wickrama et al., 2007). Also, conducting this study 4 years after the tsunami, revealed that physical health problems exist which continue disturb daily activities, and explain variance in family relationships. This finding is a strength of the current study because it prompts further investigation of what other circumstances persist years after disaster. The fact that physical health problems continue to influence daily activities and related negatively to relational outcomes highlights the fact that intervention is still likely warranted at this time for survivors.

This study contributed to a greater understanding of the effects of disaster in that it considered marital satisfaction as an outcome which has not been done before although some studies have included information on marital status in their consideration of disaster outcomes and a status of being married has been shown to be protective against adverse mental health outcomes (Wickrama & Wickrama, 2007). It appears that physical health problems from the tsunami related negatively to marital satisfaction, and further research would benefit from further consideration of what other disaster circumstances relate to marital satisfaction.

Another strength of this study is that it used a more detailed conceptualization of religiosity than some other disaster studies. While Western religious attributions and activities have been studied in the disaster context (Smith et al., 2000), studies with Eastern populations where Buddhism is the majority religion had not been previously conducted in response to the tsunami. Religiosity of tsunami survivors has been assessed, and found to be a protective factor against mental health problems in tsunami survivors (Wickrama & Wickrama et al., 2007) but religious attributions were not addressed, and neither was family religious activity.

Limitations

One of the main limitations of this study is that it relied on the self report of respondents. While the measures used to assess depression (CESD; Radloff, 1977), and PTSD (DSM-IV diagnostic interview) (American Psychiatric Association, 1994) were reliable in this sample, the measures of some other study constructs were not as reliable. Particularly the religious scales which were not pre-established measures were lower in internal consistency.

Another limitation of this study is found in some of the sample characteristics. This sample was comprised of only women, and was relatively small. Given that all respondents lived in the same village, the results give a picture of the tsunami experience for these respondents, but may not be generalizable to other populations. There was also no information available regarding basic demographic characteristics such as education levels, age etc. so it is not possible to know what populations these results may be compared to.

The data was cross-sectional and didn't include measures of retrospective family functioning or marital satisfaction. This rendered me unable to differentiate between family functioning and marital satisfaction, mental health or religiosity prior to the tsunami so changes were not detectable.

Conclusion

Even given the limitations of this study, some conclusions are able to be drawn with regard to the tsunami. It appears that physical health problems from the tsunami relate negatively to marital satisfaction and family functioning, even when controlling for mental health status, family religious activity and the interaction between family religious activity and physical health problems in this sample. It is likely physical health problems play an important role in understanding how families and marriages function and vice versa after a disaster. Religious attributions were not a significant predictor, and religious family activities didn't moderate these relationships in this sample which could be due to measurement error, or underdeveloped instruments. However, family religious activities related positively to family closeness. As such, it may be concluded that religious activities participated in with family members contribute positively to family outcomes, or the reverse may be true.

Fitting path models to the data allowed for an exploration of the relationships between these constructs controlling for all else in the models, and the findings may have important implications for those assisting disaster survivors. Attention to family relationships may allow for helpers to identify new and useful points of intervention at the family level. Considering physical health problems when working with families after

a disaster may also open other avenues by which to understand the effects of disaster exposure on marriages and families. Even when considering these findings, there is still an enormous amount of variance in marital satisfaction and family closeness left to be explained after disaster strikes, especially years afterward. Future studies should continue to investigate marital satisfaction, family closeness and other indications of family functioning as they seek to understand how physical injury and other disaster outcomes relate to families long term after disaster.

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APPENDIX A

Marital Satisfaction

We would like to know overall how happy or satisfied you are with your marital relationship

p19a. Overall, how happy are you with your relationship? (circle one)

1. Extremely unhappy
2. Very unhappy
3. Unhappy
4. Happy
5. Very happy
6. Extremely happy

p19b. Overall, how satisfied are you with your relationship? (circle one)

1. Not at all satisfied
2. Not very satisfied
3. Somewhat dissatisfied
4. Somewhat satisfied
5. Very satisfied
6. Completely satisfied

APPENDIX B

Family Functioning

Please indicate by circling the number that best reflects how strongly you agree or disagree with these statements about your family during the past 4 years.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
p18a.	We help each other in times of trouble	1	2	3	4	5
p18b.	We can talk to each other about sad feelings	1	2	3	4	5
p18c.	We talk to each other about how we feel	1	2	3	4	5
p18d.	We tell each other how we feel about one another	1	2	3	4	5
p18e.	Each person in the family is accepted for who they are	1	2	3	4	5
p18f.	There are lots of bad feelings in our family	1	2	3	4	5
p18g.	We are able to solve problems in our family	1	2	3	4	5
p18h.	We get along well together	1	2	3	4	5
p18i.	We confide in each other	1	2	3	4	5
p18j.	In times of crisis, we can turn to each other for support	1	2	3	4	5
p18k.	We avoid discussing our fears and concerns	1	2	3	4	5
p18l.	We feel accepted for what we are	1	2	3	4	5
p18m.	Making decisions is a problem for our family	1	2	3	4	5
p18n.	We laugh, joke, and have good times together	1	2	3	4	5

APPENDIX C

Physical Health Problems from the tsunami
Scale=1strongly disagree 2 disagree 3 neutral 4 agree 5 strongly agree

p9f. Tsunami related physical health problems interfere
with my daily activities, even today 1 2 3 4 5
p9i. My spouse's Tsunami related physical health problems interfere
with my daily activities, even today 1 2 3 4 5
p9j. My children's Tsunami related physical health problems interfere
with my daily activities, even today 1 2 3 4 5

APPENDIX D

DSM-IV Diagnostic Interview for PTSD

Instructions: Sometimes things happen to people that would upset or frighten almost anyone. Many such things like being injured, seeing other people hurt or killed, becoming lost or separated from people you know, or seeing houses destroyed happened to people during the Tsunami. We are NOT going to ask you to describe these events, but we are interested in the effect such events might have had on you, recently.

Did you experience any of the above or similar events that upset or frightened you? If yes, please continue; if not, thank you for participating in this study.

Recently (during the past four months): circle one

p12a. Did you find that traumatic events kept coming back to you in some way?
NO(2) YES(1)

p12b. Did you keep thinking about the event even when you did not want to?
NO(2) YES(1)

p12c. Did you have bad dreams about the event?
NO(2) YES(1)

p12d. Did you find yourself acting or feeling as though you were back at that time?
NO(2) YES(1)

p12e. Did you feel a lot worse when you were reminded of the event?
NO(2) YES(1)

Recently, (during the past four months): circle one

p12g. Did you make a special effort to avoid thinking (or talking) about what happened, or getting upset about it?
NO(2) YES(1)

p12h. Did you stay away from things that would remind you of the event?
NO(2) YES(1)

p12i. Did you have trouble remembering some important part of what happened?
NO(2) YES(1)

p12j. Were you much less interested in things that used to be important to you, like sports, hobbies, social activities?
NO(2) YES(1)

p12k. Did you feel distant or cut off from others?

NO(2) YES(1)

p12l. Were you unable to feel strong emotions or were you emotionally numb (e.g., couldn't feel happy, sad, or excited about things)?
NO(2) YES(1)

p12m. Have you ever felt that you have no future?
NO(2) YES(1)

p12n. Did you have trouble sleeping?
NO(2) YES(1)

p12o. Were you unusually irritable or did you have outbursts of anger?
NO(2) YES(1)

p12p. Did you have trouble concentrating?
NO(2) YES(1)

p12q. Were you watchful or on guard even when there was no reason to be?
NO(2) YES(1)

APPENDIX E

Center for epidemiological Studies Depression Scale (CESD)

Instructions: In this section, we are going to present to you some sentences that say something about how people sometimes feel. Please read each sentence and indicate the number that best reflects how often you have felt this way IN THE PAST 7 DAYS.

0	1	2	3
Rarely or none of the time (less than 1 day)	Some or a little of the time (1 to 2 days)	Occasionally or a moderate amount of the time (3 to 4 days)	Most or all of the time (5 to 7 days)

p11a. I was bothered by things that usually don't bother me.

p11b. I did not feel like eating; my appetite was poor.

p11c. I felt that I could not shake off the blues even with help from my family and friends.

p11d. I felt that I was just as good as other people.

p11e. I had trouble keeping my mind on what I was doing.

p11f. I felt depressed.

p11g. I felt that everything I did was an effort.

p11h. I felt hopeful about the future.

p11i. I thought my life had been a failure.

p11j. I felt fearful.

p11k. My sleep was restless.

p11l. I was happy.

p11m. I talked less than usual.

p11n. I felt lonely.

p11o. People were unfriendly.

p11p. I enjoyed life.

p11q. I had crying spells.

p11r. I felt sad.

p11s. I felt that people disliked me.

p11t. I could not “get going.”

APPENDIX F

Religious Attributions

p14s. Do you believe the tsunami occurred due to Karma?
1 NO 2 YES

p14t. Do you believe the tsunami consequences were unavoidable due to your Karma?
1 NO 2 YES

p14u. Were you not effected or surprised by the tsunami because it is one instance of Samsara?
1 NO 2 YES

APPENDIX G

Family Religious Activities

14f. How often do you go to the temple with your husband?

1 almost never 2 monthly 3 weekly 4 more than once a week 5 almost daily

14g. How often do you go to the temple with other members of your family?

1 almost never 2 monthly 3 weekly 4 more than once a week 5 almost daily