SOCIAL SOLIDARITY AND WELLBEING AFTER CRITICAL INCIDENTS: THREE CASES OF MASS SHOOTINGS

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Abstract

Critical incidents often result in amplified social solidarity among the members of a traumatized community. Some argue this solidarity accelerates recovery and supportive social environments decrease the likelihood of PTSD and other health problems after traumatic events. However, little research investigates if social solidarity influences wellbeing independent from the social support that accompanies heightened solidarity. That is, does feeling attached to a group protect one from negative events even if social support is lacking? We investigate the relationship between solidarity and wellbeing after tragedies by analyzing three mass shootings: a mall shooting in Omaha, Nebraska and two school shootings in Finland. Our results indicate that social solidarity decreases depressive symptomology in all three cases and promotes wellbeing in both the short and long-term. The influence of solidarity on wellbeing remains even when controlling for other known predictors of depression, including social support. Therefore, solidarity's influence on wellbeing appears to be substantial and enduring. Importantly, our research also demonstrates that the relationship between solidarity and wellbeing holds across cultures.

About the Authors

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Introduction

On November 7, 2007, an 18-year-old student killed eight students, staff, and faculty in Finland's Jokela High School. On December 6, 2007, a 19-year-old male fired a rifle in a shopping mall in Omaha, Nebraska, killing eight people and injuring three. On September 23, 2008, a 22-year-old student entered Seinäjoki University of Applied Sciences in Kauhajoki and committed Finland's deadliest school shooting in history, killing eight and injuring eleven others. These mass shootings shocked the communities, nation, and world. In addition to the primary victims and their families, these critical incidents adversely affected many of the members of the communities in which they occurred. Our research investigates if social solidarity, which often emerges after such tragedies, serves as a protective factor for community residents recovering from tragic critical incidents.

Previous research on dramatic events such as terrorist attacks shows the psychological effects are not limited only to the direct victims. Residents of the afflicted communities and even people living far away can become psychologically affected (Bonanno et al. 2007; Cohen Silver et al. 2002; Galea et al. 2002; Schlenger et al. 2002; Schuster et al. 2001). Major depression and anxiety are also frequently documented after terrorist attacks and natural catastrophes (Griensven et al. 2006; Miguel-Toba et al. 2006; North et al. 2004; Shalev et al. 1998). For example, after the 2007 mass murder at Virginia Tech, approximately 15 percent of community members manifested symptoms of Post-Traumatic Stress disorder (PTSD) (Hughes et al. 2011). Similarly, after the school shootings in Jokela and Kauhajoki Finland, approximately one fifth of students experienced PTSD (Haravuori et al. 2010; see also Suomalainen et al. 2010). Jokela and Kauhajoki residents were also adversely affected by these incidents (Nurmi, 2012 ; Oksanen et al. 2010).

Numerous researchers note how social solidarity increases after tragic critical incidents such as heinous crimes, natural disasters, or other mass tragedies (Barnshaw, Letukas and Oloffson 2008; Carretero and Angel 2003; Carroll et al. 2005; Collins 2004; Eyre 2007; Hawdon, Ryan, and Agnich 2010; Hawdon and Ryan 2011; Ryan and Hawdon 2008; Shrum 2007; Smelser 2004; Turkel 2002). However, there is relatively little research on how this solidarity affects the recovery of those experiencing a traumatic critical incident. We use data collected after the Jokela, Omaha, and Kauhajoki mass murders to address this fundamental question. Our data provide a unique opportunity to investigate not only if solidarity affects recovery after a traumatic experience, but also to investigate if this relationship is culturally invariant.

Theoretical Background

After the Omaha shooting, community members came together as hundreds attended funeral services and vigils for the victims (Kwon 2007). As Reverend Harry Buse said during the memorial service for one of the victims, "It's like a whole city engaged in a huge group hug, embraced you, and all grieving families, into one common heartbeat of love and support" (KETV 7 Omaha, 2007). Similarly, in Jokela, residents held vigil, created spontaneous shrines by placing candles around a pond outside the school, and "comforted each other by hugging, sitting close together, holding hands, and talking" (Nurmi, Räsänen, and Oksanen 2011: 11; also see Oksanen et al. 2010). A day after the Kauhajoki shootings, residents held a vigil, lit candles, and placed notes near the school grounds (Nurmi 2012).

The communities' response to tragedies such as these crimes is common (e.g. Collins 2004; Eyre 2007; Hawdon et al. 2010; Hawdon and Ryan 2011; Nurmi et al. 2011; Turkel 2002). As Durkheim (1964: 102) states, "crime brings together upright consciences and concentrates them." As Collins (2004) argues, the collective responses to these crimes increase solidarity because they are intensely symbolic and focus participants' attention on the act and the damage the act had on the community. It is frequently assumed that this solidarity benefits survivors and victims. For example, Hawdon and Ryan (2011: 1364) argue "These displays of solidarity provide emotional support for survivors, reaffirm that the group remains intact, and stimulate collective action that strengthen existing social networks."

The assumption that the solidarity that frequently emerges after tragic critical incidents benefits survivors seems warranted. First, the enhanced sense of group pride, resolve, and togetherness associated with heightened levels of solidarity can be a source of general social support, and the relationship between social support and individual health is well established (Granello 2001; Savage and Russell 2005; Kawachi and Berkman 2001; Smith and Christakis 2008). Those embedded in strong networks of support are more likely to develop attachments that promote a sense of wellbeing (see Berkman et al. 2000 for a discussion of the pathways linking social networks to health outcomes). Social support also provides positive affect and predictability in one's life and a sense self-worth (Cohen and Wills 1985). Thus, even in non-critical times, solidarity may strengthen victims' existing social networks and possibly expand those networks, thereby providing additional support that promotes wellbeing.

While social solidarity can be a source of support and therefore wellbeing in "normal times," it may play a more important role in promoting wellbeing after critical incidents. A stressful event such as a mass shooting can adversely affect victims' mental health by promoting maladaptive coping strategies or activating distressful physiological responses. Networks activated during times of crises can mitigate, suppress or counteract the deleterious effects of stressors by providing needed tangible and emotional resources and promoting effective coping strategies (see Cohen 2004; Cohen and Willis 1985). In addition, social support can counteract the feelings of insecurity, helplessness, and meaninglessness that those victimized by a traumatic event often experience (Walsh 2007). Similarly, the frequent post-critical incident response of amplified solidarity, the temporary disappearance of community conflicts, and a sense of altruism have "therapeutic features" that accelerates recovery (Fritz 1961: 692). It is therefore unsurprising that researchers have found that a supportive social environment decreases the likelihood of PTSD and other mental health problems after traumatic events (Drabek and Key 1984; Galea et al. 2002; Galea and Vlahov 2005; Johnson, North, & Smith, 2002; North et al. 1989; Ruzek et al, 2007; van Ommeren, Shekhar and Benedetto 2005; Vernberg, La Greca and Silverman 1996; Walsh 2007).

Yet, other studies have found that social support after disasters and critical incidents has limited or no effect on wellbeing (e.g., Joseph, 1999; Murphy 1988). Other researchers argue that the initial abundance of social support often observed after critical incidents deteriorates, often because many potential support providers were also victims of the community-wide trauma. Thus, survivors of traumatic critical incidents frequently experience a sense of disappointment that support was not forthcoming when it was expected (e.g., Kaniasty, Norris, & Murrell, 1990). This deterioration of support leads to a decline in expectations for future support and withdrawal from interpersonal relationships, which, eventually, proves detrimental to victims' wellbeing. Thus, Kaniasty and Norris (1993) found that reductions in perceived support

and social embeddedness following a disaster were related to immediate and delayed distress (also see Kaniasty 2011; Norris & Kaniasty 1996; Hwang, et al. 2007; Taft et al. 1999).

In addition to the adverse effect of support declining over time, it is conceivable that social solidarity could adversely affect recovery more directly. Researchers have noted the "dark side of solidarity" (Nurmi, et al. 2011). After the 2007 Jokela school shootings, for example, many residents reported they felt somewhat responsible for the tragedy, and the heightened levels of solidarity experienced immediately after the event may have contributed to this sense of collective guilt. In addition, the tragedy and resulting heightened levels of solidarity led to divisions within the town as many youth formed tight peer groups that excluded their parents and other adults (Nurmi et al. 2011; also see Nurmi 2012). After the mass shooting at Virginia Tech in April 2007, some of the tragedy's secondary victims (spouses, family members, etc.) also noted negative consequences resulting from the heightened levels of solidarity that emerged in their community. While they appreciated the outpouring of community support and claimed it was mostly beneficial, at times the intensive support they received became problematic. For example, a victim's spouse noted that his family had an overwhelming number of visitors the days following the tragedy, and one of these visitors began stalking him and his young daughter received a phone call from another stalker (Nowak and Veilleux 1998).

Consequently, while most researchers have found a supportive community promotes wellbeing after a tragic critical incident, others have found such support has little effect on wellbeing. Still others have found solidarity can hinder recovery, especially if this support deteriorates over time. In addition to these contradictory results in the literature, there is a lack of cross-national studies concerning the role of social solidarity and recovery from a traumatic critical incident. Is the relationship between solidarity and recovery culturally specific?

Methods

Our data are from three communities: Omaha Nebraska, Jokela Finland, and Kauhajoki Finland. In Omaha, we fielded two telephone surveys; we collected the Finnish data using mail surveys. We used telephone surveys in Omaha because of our expertise in conducting large-scale community surveys, the necessity of collecting the data quickly because of the time-sensitive nature of the topic, and because of the generally higher response rates for telephone surveys than for mail surveys. We used mail surveys in Jokela and Kauhajoki because of the tendency for mail surveys to produce high response rates in Finland (e.g. Ahola 2004). While we believe these differing collection strategies provided us with the best possible data, the use of two strategies limits our ability to compare directly the results across these sites. For example, research shows that respondents consistently provide more positive answers to scalar questions on telephone surveys than they do on mail surveys (Christian et al. 2007; Dillman et al. 2009).

The Samples

The first wave of Omaha data was collected in September 2008 (9/02/08 - 9/18/08), approximately nine months after the mall shooting. We collected a second wave of data from the same respondents in January 2009 (1/16/09 - 1/23/09), approximately 13 months after the shooting. We used RDD sampling and the sampling frame was all phone numbers available to Omaha residents, including both listed and unlisted numbers. We limited our respondents to adult residents of the city of Omaha. Because the available exchanges for these localities include

areas beyond the targeted geographic area, a screener question was used to determine if the potential respondent lived in the targeted area. Only Omaha residents were interviewed, and 123 respondents were eliminated from the sample because they lived outside the targeted area.

In the first wave, 405 completed surveys were obtained. The cooperation rate was 52.0 percent, and the minimum response rate was 26.7 percent (see AAPOR 2008 for a discussion of response rates and the formulas for calculating cooperation rates and minimum response rates). In the second wave, we only surveyed the same respondents who completed the initial survey. Of the 405 eligible participants, 203 completed wave-two surveys. Therefore, the minimum response rate for wave two was 53.7 percent; however, the cooperation rate for wave two was 87.1 percent. The original survey has an expected margin of error of approximately (+/-) 6 percent.

The response rates for the Omaha surveys are relatively low; however, they are similar to those reported in recent studies of general interest surveys. Moreover, response rates, while important, do not necessarily differentiate reliably between accurate and inaccurate data (see AAPOR 2008b). To test the adequacy of the sample, we compare sample statistics with U.S. Census Bureau's American Community Survey Demographic and Housing Estimates: 2005-2007 (http://factfinder.census.gov/home/saff/main.html?_lang=en&_ts=). As reported in Table 1, the sample appears to represent the Omaha population accurately.

Table 1: Comparison of Omaha Sample to Census-based Population Parameters on Key Demographic Characteristics

	Population	Sample
Percent Black or African-American	11.8	7.7
Percent Hispanic	7.5	3.2
Percent female	51.3	61.2
Percent over age who are over age 65	15.9	16.6
Percent families living below poverty	7.8	5.9

The sample statistics are well within the expected margin of error of the population parameters on a number of important demographic characteristics. The one exception is for gender. As is common in survey research (Binson, Canchola, & Catania, 2000), females are overrepresented in this sample. We weight the data to correct for this overrepresentation.[1]

For the Finnish data, we fielded a mail survey in Jokela between May 15 and June 15 2009, approximately six months after the school shooting occurred there. Jokela is a small town of approximately 5,600 residents in the northern region of the Tuusula municipality and approximately 50 kilometers from Helsinki. It is one of three administrative centers and the second largest city in Tuusula. The sampling frame for the Finish survey was Jokela residents between the ages of 18 and 74 selected from the *Population Register Database*. The minimum response rate was 47 percent.

[1] The sample figure for percent of households living below the poverty line is a crude estimate because the lowest income category on the survey is "less than $20,000." Given that the poverty rate is based on precise incomes and number of people in the family, there is no way to calculate accurately the exact percentage of households in the sample that are poor. Using the range of most conservative to most liberal criteria of poverty, we can say that between 2.7 percent and 9.1 percent of the sample lived in poor households. This range is within the population figure (+/-) five percent. Therefore, we consider the sample as being representative on this dimension.

Data to compare the Jokela sample to its population is limited because Jokela is a small town; however, comparing the age structure of the data to that of the Tuusula municipality indicates the sample represents the area well. Based on 2008 estimates, 48.5 percent of the Tuusula households are comprised of married or cohabitating parents (*Statistics Finland*, 2008); similarly, 52.4 percent of the sample is comprised of married or cohabitating parents. In addition, of the Tuusula population between the ages of 18 and 74, 45.6 percent are age 31 to 50. In our sample, 40.6 percent are between the ages of 31 and 50. These figures are within the expected margin of error for the sample. Moreover, the gender distribution (51.7% male) indicates the sample is representative on this dimension. While these numbers are encouraging, we emphasize that they are for the larger Tuusula municipality and not directly applicable to Jokela. Unfortunately, these are the most comparable data available.

We collected the second wave of Jokela data using the same procedures used to collect the first-wave data. These data were collected 18 months after the shooting in May and June 2009. For the second wave, 276 respondents returned completed surveys, and the minimum response rate was 40 percent.

Kauhajoki is in the Ostrobothnia region in Western Finland, approximately 350 kilometers from Helsinki. With a population of approximately 14,000 inhabitants, Kauhajoki is a larger community than Jokela. It is also more geographically dispersed than Jokela. Data from Kauhajoki were collected using identical techniques to those used to collect the Jokela data. The first wave Kauhajoki data were collected March–April 2009, and the second wave was collected in March–April 2010, approximately 6 and 18 months after the tragedy. The minimum response rates were 46 percent for the first wave and 48 percent for the second wave. Based on the 2009 estimates, the sample adequately represented the population (*Statistics Finland*, 2009). The most notable differences between the sample and the population was with respect to gender. While 51.8 percent of Kauhajoki' s population are male, males comprised 44.7 percent of the first-wave sample and 44.9 percent of the second-wave sample. Residents under age 30 were also slightly underrepresented in the both waves. Again, we stress that the population parameters are for the broader municipality, not the town of Kauhajoki. Therefore, these comparisons suggest the samples represent Kauhajoki, but we cannot definitively conclude they do with available data.

Measures

We analyze two dependent variables: emotional wellbeing and depressive symptoms. Examining depressive symptoms is a standard procedure in trauma-related studies, since signs of depression are strongly linked to post-traumatic stress disorders (Bonanno et al. 2007; Shalev et al. 1998). In the Omaha sample, we use items from the DSM modified screener for depression (see CDC 1998, p. 78) to assess respondents' wellbeing. The four items are five-point Likert items. The moods and behaviors included, (1) feel very sad, (2) have difficulty sleeping, (3) have difficulty concentrating on work, and (4) feel like they are less productive at doing their daily activities than they would like to be. These items were factor analyzed, and the one-factor solution accounted for approximately 44 percent of the variance in the four items in the Omaha sample. Table 2 reports the factor loading scores for these four items.

Table 2: Factor Loadings for Emotional Wellbeing Items

	Factor Loading
Feel very sad	.769
Have difficulty sleeping	.607
Have difficulty concentrating on work	.753
Feel less productive at doing daily activities	.483

We also measure depressive symptoms using the Finnish modification of the 13-item *Beck Depression Inventory (BDI).* The RBDI (Kaltiala-Heino et al. 1999; Raitasalo 2007) includes items concerning the respondent's mood at the time of the interview. The inventory includes items measuring respondent feelings about the future and meeting new people, and it includes items about respondent's suicidal thoughts. Many of these items are also commonly used in the PTSD screeners. The items and responses are included in Appendix A. The alpha reliabilities for the depression inventory are .848, .881, and .879 in Omaha, Jokela, and Kauhajoki, respectively.

Our central predictor variable is social solidarity. Solidarity is an index of six five-point Likert questions that range from 1 "strongly disagree" to 5 "strongly agree." The six items are: (1) I am proud to be a member of my community; (2) I feel I am part of the community; (3) People in my neighborhood share the same values; (4) My neighborhood is a good place to live; (5) I trust my neighbors; and, (6) People work together to get things done for this community. In the Omaha sample, the alpha reliability for the solidarity measure at $time_1$ is .795 and at $time_2$ is .780; for the first Jokela sample, the alpha reliability is .847, and it was .871 in the second sample. The reliability is .892 and .823 in the first and second Kauhajoki samples, respectively.

In addition to our measure of solidarity, we include a measure of "general support." We include this measure so we can isolate the influence of feeling attached to a community from the feeling of being embedded in private networks of support that can exist independent from the larger community. Researchers frequently focuses on individuals directly receiving various types of support such as emotional support (communicating to a person that he or she is valued and accepted), informational support (helping an individual define, understand, and ultimately cope with a stress-inducing event), social companionship (contact with others), and material resources (see Cohen 2004; Cohen and Willis 1985). Individuals, groups, or organizations provide these types of support to specific individuals. Community solidarity, by contrast, is the sense of belonging to a community and a sense of attachment to that community. These feelings may or may not be related to expectations of receiving direct support, and they may or may not be related to actually receiving support. Indeed, most support that victims receive after tragic critical incidents is from family members and close friends (see, for example, Harden and Vedantam 2005; Klinenberg 2002; Morrow 1997); thus, those who are embedded in tight primary networks typically fair better after tragedies than those who lack strong, stable primary networks. Yet, individuals embedded in tight networks can become detached from her or his community, which can isolate blocs of individuals and reduce community-level action and social solidarity (see, for example, Granovetter 1983). Thus, it is important to control for "private networks of support" when trying to determine if social solidarity influences wellbeing after critical incidents. We therefore include a measure of "strength of private networks" that is used as a proxy measure of general support received from private relations.

We also include a measure for involvement in parochial relations. Parochial relations are the local interpersonal networks and interlocking institutions that serve the community and its members, including the networks of stores, schools, religious institutions, and voluntary associations (see Hunter 1985). Involvement in parochial-realm activities are related to social solidarity (Hawdon and Ryan 2011). We therefore control for parochial relations to disentangle the effects of solidarity on wellbeing from potential spurious relationships.

We measure strength of private networks with three items that ask respondents in a typical week how often they visit with (1) friends, (2) family members, and (3) visit neighbors who are not family members. For involvement in parochial relations, we ask respondents in a typical week how often they (1) attend a meeting of a local club or organization, (2) shop at a local store, and (3) eat at a local restaurant. These six items range from 1 "almost never" to 6 "several times a day." The variables were combined using factor analysis. The items measuring private relations loaded on one factor that accounted for 56.4 percent of the variance in the three items. Similarly, the analysis for parochial relations produced a one-factor solution that explained 44.6 percent of the variance in the three items. Table 3 reports the results of these analyses for Omaha.

Table 3: Factor Loadings on Private Networks and Parochial Relations (Omaha)

	Factor Loading Strength of Private Networks	Factor Loading Involvement in Parochial Relations
How often do you visit friends	.830	
How often do you visit family members	.699	
How often do you visit neighbors	.718	
How often do you attend local meetings		.472
How often do you shop in local stores		.760
How often do you eat at local restaurants		.734

In the Jokela and Kauhajoki data, the operationalization of these concepts do not meet standard reliability criterion. The items that reflect private and parochial in the Omaha data do not load on one-factor in the Jokela data. Therefore, the constructs may be culturally bound. We therefore use single items to reflect private and parochial relations in the Jokela and Kauhajoki analyses. We use how often the respondent visits with friends to measure private relations and how frequently the respondent attends meetings of local clubs or organizations to measure parochial relations.

Finally, we control for the typical demographic factors of age, education, income, gender (female is the reference category), and marital status (single is the reference category and compared to married or cohabitating). We also control for race (white versus non-white, with white as the reference category) in the Omaha data. Race does not vary in the Jokela data. Moreover, for the Omaha analysis where we have two waves of panel data, we predict levels of depressive symptoms at $time_2$ while controlling for levels of depressive symptoms at $time_1$. We hypothesize that solidarity will increase emotional well-being.

Results

We conduct a series of analyses to determine if social solidarity promotes "recovery" from a tragedy. We use two measures of "recovery:" the RBDI and items from the *Emotional and Psychological Distress Scale*. We hypothesize that solidarity will increase wellbeing and decrease depressive symptomology. We anticipate solidarity's effect on recovery will be evident both nine months and thirteen months after the tragedy.

Omaha

We begin by analyzing the Omaha data and investigating if solidarity promotes emotional wellbeing after a tragedy by conducting five analyses. The first analysis predicts depressive symptoms nine-months after the tragedy using the RBDI measure, while the second uses the *Emotional and Psychological Distress Scale*. We then consider solidarity's effect on longer-term wellbeing by analyzing depression thirteen months after the tragedy.

Solidarity's Influence on Depression

As predicted and reported in Table 4, solidarity significantly reduces the likelihood of experiencing depressive symptoms as measured by the RBDI (B = -.210; odds ration = 0.81; $p < .001$). As solidarity increases, there is approximately a 20% reduction in the likelihood of experiencing depressive symptoms. In addition, those who spend substantial time engaged in private relations are less likely to be depressed than are those who do not have these primary networks of support (B = -.523; odds ratio = 0.593; p = .027). The other variables in the model failed to achieve statistical significance at conventional standards. The model predicting the RBDI measure of depression accounted for approximately 30 percent of the variance in the RBDI measure.

Table 4: Logistic Regression of Depressive Symptoms (RBDI) 9-months Post Tragedy (Omaha)

	Coefficient	Standard Error	Wald
Time 1 Solidarity	-.210 ***	.048	19.32
Strength of Private Relations	-.523 *	.236	4.91
Involvement in Parochial Activities	-.168	.235	0.51
Watch local news	-.220	.148	2.19
Age	.000	.001	0.19
Ethnic Minority	-1.264	.728	0.69
Female	.718	.420	0.27
Income	.001	.001	1.56
Married	-.810	.447	3.29
Education	-.129	.116	1.25
Constant	4.89 ***	1.563	9.82

* $p < .05$; ** $p < .01$; *** $p < .001$
Nagelkerke $R^2 = .302$

The analysis using the DSM modified screener produces similar results as the analysis using the RDBI. Solidarity again serves as a protective factor, and again it produces the strongest effect on depression (B = -.291; p < .001). However, having strong private networks is unrelated to depression when measured using the DSM modified screener. Minorities are significantly less likely to experience depressive symptoms than are Whites (B = -.118; p = .028), and females are significantly more likely to score high on the depression screener than are males (B = .121; p = .022). Also, watching local news significantly reduces depressive symptoms (B = -.110; p = .041). The other variables in the model were not statistically significant. The model explains 15.9 percent of the variance in depression when measured using the DSM modified screener. The overall model is statistically significant ($F_{10, 314} = 5.93$; p < .001). The results of this model are presented in Table 5.

Table 5: OLS Regression of Depression (DSM Screener) 9-months Post Tragedy (Omaha)

	Coefficient	Standard Error	Standardized Coefficient
Time 1 Solidarity	-.082 ***	.016	-.291
Strength of Private Relations	-.086	.060	-.084
Involvement in Parochial Activities	-.004	.058	-.003
Watch local news	-.085 *	.041	-.110
Education	.014	.032	.025
Income	-8.99^{-8}	.000	-.003
Age	.000	.000	-.051
Minority	-.356 *	.161	-.118
Female	.245 *	.107	.121
Married	-.075	.126	-.035
Constant	2.451 ***	.454	

* p < .05; ** p < .01; *** p < .001
F = 5.93; p < .001
R^2 = .159

Based on these analyses, our hypotheses find strong support. However, all of these variables are measured using first-wave data. The fact that these data were collected in the same survey makes establishing temporal ordering impossible. It is therefore possible that the causal order is misspecified. That is, it is possible that depression "causes" solidarity instead of solidarity "causing" these factors. We therefore extend the analysis using solidarity measured nine months after the tragedy to predict emotional wellbeing measured four months later. In this analysis, we control for the respondents' initial wellbeing. We are able to conduct this analysis because we have panel data; however, given the sample attrition between waves 1 and 2, the analysis of depression over time is for a sample of 158 respondents.

Solidarity's Influence on Depressive Symptoms Using Longitudinal Data

We regress the DSM modified screener from the wave-2 data on solidarity and our other predictor variables from the wave-1 data. The model was statistically significant ($F_{10, 154} = 2.15$; p = .024) and accounts for 12.3 percent of the variance in emotional wellbeing at $time_2$. Only

solidarity significant predicts emotional wellbeing. As predicted, solidarity significantly reduces emotional distress (B = -.400; p < .001). Thus, heightened solidarity shortly after a tragedy appears to enhance emotional well-being both in the short and long term. Solidarity alone accounts for approximately 10 percent of the variance in levels of depression 13 months following a tragedy. Although not statistically significant, it is interesting to note that engaging in parochial-realm activities shortly after a tragedy decreases long-term emotional stress, at least in this sample (B = -.129; p = .172). While we cannot generalize this finding to other tragedies or disasters, the relationship deserves further study. Table 6 reports the results of this analysis.

Table 6: OLS Regression of Depression (DSS screener) 13-months Post Tragedy (Omaha)

	Coefficient	Standard Error	Standardized Coefficient
Time 1 Solidarity	-.084**	.026	-.272
Strength of Private Relations	.068	.092	.069
Involvement in Parochial Activities	-.129	.094	-.129
Watch local news	-.022	.065	-.028
Education	.011	.046	.021
Income	-5.186E-7	.000	-.020
Age	-.004	.005	-.058
Minority	-.189	.251	-.062
Female	.041	.155	.020
Married	-.262	.187	-.126
Constant	2.700 **	.782	

* p < .05; ** p < .01; *** p < .001
F = 2.15; p = .024
R^2 = .123

Jokela

Unlike in Omaha were we have panel data, the Jokela samples are independent. We therefore we can only investigate if solidarity influences "recovery" using a cross-sectional analysis on the two waves of data.

Using the dichotomized RBDI as our dependent variable and a binary logistic regression, we see that solidarity significantly reduces depressive symptoms six months after the shooting (B = -.194; p < .001). Similar to the Omaha analysis, an increase in solidarity is related to approximately a 19 percent decrease in the likelihood of suffering depressive symptoms. However, contrary to our prediction, engaging in private relations is unrelated to depression (p = .140). No other variables significantly predict experiencing depressive symptoms. The model explains approximately 20.7 percent of the variation in RDBI. The results of this analysis are reported in Table 7.

Table 7: Logistic Regression of Depressive Symptoms 6-months Post Tragedy (Jokela)

	Coefficient	Standard Error	Wald
Solidarity	-.194 ***	.049	15.928
Strength of Private Relations	-.410	.277	2.182
Involvement in Parochial Activities	.671	.493	1.848
Watch local news	-.028	.185	0.024
Education	.055	.130	0.178
Income	-1.726^{-4}	.0001	1.184
Age	-.026	.017	2.496
Knew a victim of the tragedy	-.339	.445	0.579
Female	.229	.410	0.312
Married	.060	.443	0.018
Constant	4.374 *	1.728	6.408

* $p < .05$; ** $p < .01$; *** $p < .001$
Nagelkerke $R^2 = .207$

We re-conduct the analysis while including if the respondents knew one of the victims, but the inclusion of this variable did not alter the equation in any meaningful way. None of the significant coefficients changed, nor did the equation explain additional variation in the dependent variable. Thus, knowing a victim apparently does not influence our variable of interest, at least after holding other factors constant.

Solidarity's Influence on Depressive Symptoms Eighteen-month Post Tragedy

Using the data collected 18 months after the tragedy, we investigate if solidarity is related to depression using a binary logistic regression. Results of this analysis, presented in Table 8, reveal that solidarity significantly lowers the likelihood of suffering depressive symptoms. Once again, increases in solidarity are associated with an approximately 20 percent decrease in the likelihood of being depressed. This finding replicates that of the earlier analyses. However, unlike in the first-wave data, having strong private networks also significantly reduces the odds of suffering from depressive symptoms. The effect of private relations on depression is pronounced: a one-unit increase on this variable is associated with approximately a 65 percent decrease in the likelihood of suffering depressive symptoms. No other variables, including involvement in parochial activities, significantly predict depressive symptoms. The model accounts for approximately 32 percent of the variance in the dichotomized RBDI measure.

Kauhajoki

Finally, as in Jokela, our Kauhajoki samples are independent. We therefore analyze the relationship between levels of solidarity and recovery using cross-sectional analyses at two different times. Since the Kauhajoki and Jokela critical incidents were similar, we anticipate similar results.

Table 8: Logistic Regression of Depressive Symptoms 18-months Post Tragedy (Jokela)

	Coefficient	Standard Error	Wald
Solidarity	-.215 ***	.051	17.431
Strength of Private Relations	-1.065 **	.306	12.088
Involvement in Parochial Activities	.211	.673	0.098
Watch local news	.254	.208	1.490
Education	-.087	.141	0.379
Income	-8.543^{-6}	.000007	1.184
Age	-.020	.020	0.958
Knew a victim of the tragedy	.162	.519	0.097
Female	.008	.471	0.001
Married	-.676	.513	1.737
Constant	5.873 **	2.008	8.555

* $p < .05$; ** $p < .01$; *** $p < .001$
Nagelkerke $R^2 = .322$

Solidarity's Influence on Depressive Symptoms Six-month Post Tragedy

First, we examined the effects of solidarity on recovery six months after the tragedy. Table 9 reports the results of our binary logistic model with dichotomized RBDI as our dependent variable. As seen in Table 9, solidarity significantly reduces depressive symptoms ($B = -.147$; $p < .001$). Although the effect of solidarity is slightly weaker in Kauhajoki than in Omaha or Jokela, there an increase of one on the solidarity index is associated with a 15 percent decrease in the likelihood of suffering depressive symptoms. Again, engaging in private or parochial relations are unrelated to depression ($p = .417$ and $p = .160$). None of the variables other than solidarity significantly predicts experiencing depressive symptoms. Despite this, the model explains approximately 18 percent of the variation in RDBI.

Table 9: Logistic Regression of Depressive Symptoms 6-months Post Tragedy (Kauhajoki)

	Coefficient	Standard Error	Wald
Solidarity	-.147***	.038	15.203
Strength of Private Relations	.192	.237	0.658
Involvement in Parochial Activities	-.546	.338	2.611
Watch local news	.056	.191	0.084
Education	.032	.137	0.056
Income	.000	.000	3.007
Age	-.004	.015	0.070
Knew a victim of the tragedy	.440	.491	0.804
Female	-.057	.404	0.020
Married	.523	.435	1.446
Constant	4.138**	1.615	6.561

* $p < .05$; ** $p < .01$; *** $p < .001$

Nagelkerke $R^2 = .179$

Solidarity's Influence on Depressive Symptoms Eighteen-month Post Tragedy

Regarding six-months post-tragedy situation, our findings were basically similar between Kauhajoki and Jokela. Using the data collected one year after the first survey, we investigated if solidarity was still related to depressive symptoms in Kauhajoki. Results of this analysis are reported in Table 10. Once again, solidarity significantly reduces the likelihood of suffering depressive symptoms ($B = -.106$; $p < .005$). The effect is clearly weaker here, with an approximate decrease in the likelihood of suffering depressive symptoms of only 11 percent. Next, having strong private networks also reduces the odds of suffering from depressive symptoms. A one-unit increase on this variable is associated with approximately a 50 percent decrease in the likelihood of suffering depressive symptoms. As in Jokela, having strong private networks are unrelated to depressive symptomology in wave-one, but the importance of these networks becomes apparent in wave-two. No other variables approach statistical significance. The model explains approximately 18 percent of the variance in the dichotomized RBDI measure.

Table 10: Logistic Regression of Depressive Symptoms 18-months Post Tragedy (Kauhajoki)

	Coefficient	Standard Error	Wald
Solidarity	-.106*	.044	5.838
Strength of Private Relations	-.691*	.326	4.497
Involvement in Parochial Activities	-.237	.400	0.351
Watch local news	-.126	.234	0.287
Education	.347	.182	3.626
Income	.000	.000	0.070
Age	.006	.017	0.150
Knew a victim of the tragedy	-.296	.700	0.179
Female	-.025	.472	0.003
Married	.106	.484	0.048
Constant	5.863**	2.262	6.721

* $p < .05$; ** $p < .01$; *** $p < .001$

Nagelkerke $R^2 = .177$

Overall, our findings indicate several similarities across Omaha, Jokela and Kauhajoki despite the difference among these communities. Most importantly, there is a positive influence of solidarity on recovery and emotional wellbeing. What are the broader interpretations of these results suggest?

Discussion

The results of the current analysis are encouraging: in Omaha and in Jokela and Kauhajoki, solidarity was positively related to emotional wellbeing. In Omaha, where longitudinal data were available, we found evidence of solidarity's protective forces in both the short and long term. Approximately nine months after the Omaha mall shooting, those who expressed high levels of solidarity were less depressed than those who expressed lower levels of solidarity. This relationship emerged regardless of the measure of depression used. More impressively, those with high levels of solidarity nine months after the tragedy were less emotionally distressed one year after the tragedy. This relationship held even when controlling for the respondents' initial levels of emotional wellbeing. Although longitudinal data were not available in Jokela and Kauhajoki, the protective nature of solidarity was evident using two cross-sectional analyses. Jokela residents with higher levels of solidarity were less depressed in a sample selected approximately 6 months after the tragedy and in a sample selected approximately 18 months after the tragedy. While solidarity did not account for as much of the variation in depressive symptoms in Jokela as it did in Omaha, we nevertheless see its positive influence on both of our indicators of recovery.

We are therefore confident that solidarity can play a vital role in helping a community recover from a tragedy or disaster. The relationship between solidarity and wellbeing holds over time, across types of tragedies, and cross-culturally. It also holds when controlling for other factors known to influence wellbeing and when initial levels of wellbeing are held constant. The tragedies that afflicted Omaha and Jokela are different in many ways. In addition to the obvious cultural differences, the Finnish towns and Omaha are very different in size and the heterogeneity of their members. Omaha is a large, relatively heterogeneous, fluid community where community membership is frequently changing as "outsiders" in-migrate and "one-time insiders" leave. Jokela and Kauhajoki are much smaller towns than Omaha and it is highly likely that a greater percentage of Jokela and Kauhajoki residents know each other than do Omaha residents. Despite these differences, solidarity consistently promotes wellbeing. It therefore appears that the relationship between solidarity and wellbeing is not context specific.

We also find support for the importance of having strong private networks in promoting wellbeing. At least when we used the RBDI measure of depression, strong private networks increased wellbeing in all three communities. While the effects were not significant across the first waves of each data, they become significant in the second waves. This finding should not be surprising since the importance of strong, intimate networks of friends and family for promoting general wellbeing (e.g., Savage and Russell 2005; Smith and Christakis 2008) and wellbeing after a tragedy (e.g., Galea and Vlahov 2005; Johnson et al., 2002) is well established. On an individual level, recovering from trauma, regardless of the nature of that trauma, likely requires strong support networks, and this research further supports that claim. The effect of these networks, however, appears to be limited to shortly after the tragedy. In the Omaha sample where longitudinal data were available, strong private networks was not a significant predictor of wellbeing 13 months after the tragedy. This finding offers tentative support to the deterioration of support model that argues that reductions in perceived support and social embeddedness following a disaster are related to emotional distress (Kaniasty 2011; Kaniasty and Norris 2009; Norris & Kaniasty 1996; Norris et al. 2005; Hwang, et al. 2007; Taft et al. 1999).

The positive short-term effects of participating in strong family and friendship networks were evident in the second wave of both the Jokela and Kauhajoki data (18 months after the tragedy. However, because these are not panel data, we are unable to test if these effects remain when wellbeing immediately following the tragedy is accounted for in the model. Given that our findings are consistent with previous research, we are confident that the relationship between strong private networks and wellbeing is not context specific, at least in the American setting. Given the findings from Jokela and Kauhajoki, it appears that this relationship holds cross-culturally as well; however, we still need to verify the relationship with longitudinal data before we can confidently conclude the relationship holds across all contexts.

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Appendix A

Finnish modification of the short form of the *Beck Depression Inventory*

We would like to ask you about your mood. Please select the alternative that best describes how you are feeling at present.

1. How are you feeling?
   - 1 I am feeling quite optimistic and good
   - 2 I do not feel sad
   - 3 I feel sad or blue
   - 4 I am blue or sad all the time and I can't snap out of it
   - 5 I am so sad or unhappy that I can't stand it

2. How do you see your future?
   - 1 I am full of hope about my future
   - 2 I am not particularly pessimistic or discouraged about the future
   - 3 I feel discouraged about the future
   - 4 I feel I have nothing to look forward to
   - 5 I feel that the future is hopeless and that things cannot improve

3. How would you describe your life?
   - 1 my life has been generally successful
   - 2 I do not feel like a failure
   - 3 I feel I have failed more than the average person
   - 4 as I look back on my life, all I can see is a lot of failures
   - 5 I feel I am a complete failure as a person

4. How satisfied or dissatisfied are you with your life?
   - 1 I am quite satisfied with my life
   - 2 I am not particularly dissatisfied
   - 3 I don't enjoy things the way I used to
   - 4 I don't get satisfaction out of anything anymore
   - 5 I am dissatisfied with everything

5. How do you feel about yourself?
   - 1 I feel quite good about myself
   - 2 I don't feel particularly guilty
   - 3 I feel bad or unworthy a good part of the time
   - 4 I feel quite guilty
   - 5 I feel as though I am very bad or worthless

6. Are you disappointed in yourself?
   - 1 I am happy with myself and with what I have achieved
   - 2 I don't feel disappointed in myself
   - 3 I am disappointed in myself
   - 4 I am disgusted with myself
   - 5 I hate myself

7. Do you have thoughts of harming yourself?
   - 1 I have never thought about suicide
   - 2 I don't have any thoughts of harming myself
   - 3 I feel I would be better off dead
   - 4 I have definite plans about committing suicide
   - 5 I would kill myself if I had the chance

8. How do you feel about meeting new people?
   - 1 I enjoy meeting people and talking with them
   - 2 I have not lost interest in other people
   - 3 I am less interested in other people than I used to be
   - 4 I have lost most of my interest in other people and have little feeling for them
   - 5 I have lost all my interest in other people and don't care about them at all

9. What are your feelings about making decisions?
   - 1 making decisions is easy for me
   - 2 I make decisions about as well as ever
   - 3 I try to put off making decisions
   - 4 I have great difficulty in making decisions
   - 5 I can't make any decisions at all anymore

10. How do you feel about your appearance?
    - 1 I am quite happy with my appearance
    - 2 I don't feel that I look any worse than I used to
    - 3 I am worried that I am looking old or unattractive
    - 4 I feel that there are permanent changes in my appearance and they make me look unattractive
    - 5 I feel that I am ugly or repulsive-looking

11. Do you have problems with sleep?
    - 1 I don't have any problems with sleeping
    - 2 I can sleep as well as usual
    - 3 I wake up more tired in the morning than I used to
    - 4 I suffer from sleeplessness
    - 5 I suffer from sleeplessness, difficulties in getting to sleep or too early awakening

12. Do you ever feel tired or exhausted?
    - 1 I almost never feel tired
    - 2 I don't get any more tired than usual
    - 3 I get tired more easily than I used to
    - 4 I get tired from doing anything
    - 5 I get too tired to do anything

13. How is your appetite?
    - 1 my appetite is very good
    - 2 my appetite is no worse than usual
    - 3 my appetite is not as good as it used to be
    - 4 my appetite is much worse now
    - 5 I have no appetite at all anymore