Inequality, Social Support and Post Disaster Mental Health in Mexico

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Abstract:

Disasters highlight the vulnerability of people who have limited access to resources. However, based on research from Mexico, we seek-in the context of disasters-to qualify the generalization that mental health is associated with social inequality and individual socioeconomic status. We collected data on socioeconomic status, social support, and depression in two storm-impacted cities (n=581) and four control cities (n=2,509) in Mexico. Two years after the storms, depression symptomology remained higher for disaster cities than for the control. Social support returned to better than normal levels in one impacted city, Villahermosa, during that period, but not in the other, Teziutlán-the harder hit city. Socioeconomic status appeared to have a small effect on depression, although co-correlation with perceived support suggests that social support is a stronger and more proximate cause, such that socioeconomic status-in addition to having a minor direct affect-may also work indirectly through availability of social support to affect vulnerability.

Keywords: recovery | Latin America | depression | hurricane | class

Article:

Introduction

This study addresses three theses: (1) individual socioeconomic status negatively influences mental health outcomes directly, (2) higher levels of economic inequality in a population negatively affects mental health outcomes, and (3) social support positively influences mental health outcomes. The hypothesized contributions of individual and group-level inequality to health status are not mutually exclusive, although individual inequality has more impact in less developed countries, and group inequality has more impact in developed countries (Ram 2006). However, Ram's review and others (e.g., Nersesian 1988; Pappas et al. 1993) found a relationship between income inequality and health status only for mortality, not any specific

causes of mortality. Nor is there sufficient research on mental health and either individual or group-level economic inequality.

Regarding thesis #1, it appears that individual socioeconomic status correlates directly with individual health (see Adler et al. 1994; Blane, Davey Smith, and Bartley 1993; Carey 1990; Clark 1993; Dressier, Balieiro, and Dos Santos 1998), although it remains important to ferret out specific diseases and causal mechanisms for specific populations (Adler et al. 1994; Warren et al. 2004).

Regarding thesis #2, one argument is that health inequalities are partly due to relative deprivation, i.e., the result of the existence of social or group inequality. Although not well understood, recent efforts to understand the relationship between group-level inequality and health status implicate compromised immunity, exposure to environmental pollutants, and low access to medical care (Nguyen and Peschard 2003). Nguyen and Peschard's (2003) review of anthropological literature cites few studies confirming a relationship between generalized economic inequality and health, and does not consider mental health, the subject of our study.[1] Their primary evidence for the effect of group-level economic inequality on health is from studies that seem to confirm the McKeown hypothesis - that England's masses became healthier due to a decrease in poverty (and, thus, improved nutrition) rather than from extension of medical care. Singer's (1994) review of urban health and poverty cites only one study that found a direct relationship between group-level inequality and health status.

Regarding thesis #3, social support is often associated with both mental health and post-disaster mental health status (e.g., Norris et al. 2004). We see social support as a mitigating factor that can counteract the influence of inequality.

Individual Socioeconomic Status and Mental Health: Mechanisms of Absolute Deprivation

With respect to the relationship between individual-level socioeconomic status and mental health, Dejaríais et al. (1994) implicated absolute deprivation while Patel et al. (1999) found in an analysis of five studies in four lower-middle income countries that depression in women was associated with socioeconomic status. In a rare anthropological study on mental health and socioeconomic status, Dressier, Balieiro, and Dos Santos (1998) found depressive symptoms and globally perceived stress in a Brazilian city to be associated with locally or culturally defined socioeconomic status. In a prior paper, we found that people with lower incomes were more likely to be exposed to sexual and physical assault, while those with higher incomes experienced greater risk of exposure to accidents, traumatic bereavement, threats with weapons, and other extremely stressful events (Norris et al. 2003). Thus, the importance of distinguishing between various mechanisms and contexts should not be underestimated.

The effects of socioeconomic status on mental health might also be more indirect than direct in extreme or traumatic settings. Hamilton et al. (1990) found only a limited role for socioeconomic status in predicting both mental health and somatic/physical problems among stressed individuals. Later, Turner and Lloyd (1999) observed that the effects of socioeconomic status on distress were buffered by a number of demographic and stress-related factors that tend to predominate in lower socioeconomic groups. Lynch, Kaplan, and Salonen (1997) found higher

levels of hopelessness, depression, cynical hostility, and low sense of coherence among blue collar workers as compared to white collar workers, but also found that the pathway to these psychological problems begins with low socioeconomic status of parents (see also Gilman et al. 2002; Schoon, Sacker, and Bartley 2003), resulting in lower levels of education and greater likelihood of holding a blue collar job. Lundberg (1991) determined physical work, socioeconomic status, and childhood privation - plus weak social networks - to explain class-based differences in mental health (see also Ferriea et al. 2003)

One possible reason for indirect effects of socioeconomic status on health is that poorer individuals avoid psychological problems associated with having fewer resources. Although each culture is defined by prescribed/normal expectations and behaviors, we know that notable variation exists in any society regarding how people behave or think or are impacted health-wise by not being able to live up to those cultural expectations (e.g., Dressier, Bindon, and Neggers 1998). Parker and Kleiner (1970) showed that, controlling for ethnicity, lower goal-striving among the poor was more prevalent for non-mentally ill people than for mentally ill people - the latter of which had the same expectations as wealthier nonmentally ill people - suggesting that it is psychologically adaptive to adjust one's goals when one perceives limited access to opportunities or resources. Extremes in thoughts and behaviors provide a way to escape the prescribed/normal feelings or expectations about perceived difficulties. Lynch, Kaplan, and Salonen (1997) did not interpret their findings as such, but their results showing increased hopelessness, greater cynical hostility, and more frequent drunkenness among blue collar workers than among white collar workers might be seen as these extreme types of thoughts and behaviors that help avoid debilitating mental illnesses such as depression, anxiety, or neurosis.

Group-Level Inequality and Health: Mechanisms of Relative Deprivation

Only a few anthropological studies address the relationship between group inequality and health. Carey's (1990) comparison between villages as well as between individuals within the villages found social support to be a key variable. Although he concluded that inter-village political economic situations were crucial for predicting health status, the study did not measure the degree of inequality within a village. Dressier (1993), using ethnicity rather than socioeconomic status, examined group-level inequality impact on physical health and proposed that greater civic participation and expenditures (as efforts to reduce inequality) improved infant mortality rates for the lower status group. Since few anthropological studies directly address group-level inequality and health (Nguyen and Peschard 2003), we turn to other fields that have dealt with this.

Some studies found an inverse relationship between inequality and health status (Pappas et al. 1993; see Subramanian, Belli, and Kawachi 2002) and others contradict those findings. For example, Blakely, Lochner, and Kawachi (2002) found only a slight relationship between group inequality and health for United States urbanites - the kind of population that we studied - yet a larger effect for rural dwellers. Similarly, United States state-level inequality had no effect on alcohol consumption or depressive symptoms (Henderson et al. 2004). Post-communist countries' health was not associated with two different measures of inequality after controlling for individual deprivation and perceived control (Bobak et al. 2000). Lynch et al. (2004) found in a review of 98 studies little evidence for a direct relationship between population-level inequality

and health cross-culturally (see Deaton 2003). Wagstaff and van Doorslaer (2000) did find some impact of group-level inequality on health at the state level in the United States, which may be a result of state-level health policy directed toward low-income families.

As such, accounting for context and mechanism produces interesting results. Cobum's (2004) test of macro-societal data found that any relationship between intra-societal economic inequality and health status tends to be a function of the political economic orientation of societal contexts - neo-liberal vs. social welfare types of policies. The micro-level study of societal context by Godoy et al. (2006) - similar in focus to our study - looked at intra-village wealth and suggested that inequality in modern, rather than traditional, forms of income/wealth may affect emotions, behaviors, and mental health first, which then potentially impact physical health.

Social Support and Mental Health in Extreme Settings

The use of social relations to mobilize resources is well documented in urban Latin America. Lomnitz (1977, 1987), Vélez-Ibañez (1983), and Balmori, Voss, and Wormian (1984) stressed the importance of social networks for survival and political action among marginalized populations. Others have demonstrated how poverty places stress on the poor, compromising their ability to maintain their social and exchange networks (Gonzalez de la Rocha 1986; Morris 1991; Selby 1991; Selby, Murphy, and Lorenzen 1990; Winter 1991). The challenges to mental health and disaster recovery that result from weak or broken support systems are posed frequently to urban dwellers, as cities grow and become more vulnerable to a variety of hazards and disasters (Lavell 1994).

The proposed hypothesis that inequality - whether individual or group level - can exacerbate disaster health outcomes must be tempered by the fact that social support is important for psychological adjustment in a variety of extreme settings. Parker and Kleiner (1970) concluded that policies that are focused on mental health and social services for the poor fail without related support (see also Bogard et al. 1999). For example, employed working-class mothers who had suffered a traumatic event suffered mental health problems if social support was not available (Parry 1986; see Thoits and Hannan 1979). More directly related to the current study, the reinforcement of pre-existing social relations or promotion of additional social relations could be important for improving post-disaster adjustment (Norris et al. 2005).

Individuals in less developed countries tend to suffer greater impacts in disaster situations than do people in developed countries because of differences in infrastructure, zoning, and population density in areas affected (see Norris et al. 2002), but cultural reasons also distinguish less developed and developed countries (see Jones and Murphy 2008). One source of culturally based variation may be the higher levels of expected support that individuals in traditional communities have (Kaniasty and Norris 2000), resulting in expectations of social support that cannot be fulfilled.

Greater levels of social support may be one reason that people of higher socioeconomic levels generally report less psychological distress (Turner and Lloyd 1999; Turner and Marino 1994). Norris et al. (2004) found the most vulnerable and most affected people (women, poor, and the

least educated) were likely to experience lower levels of social support, and this disparity worsened with time.

The murkiness of the relationship between inequality and health prodded us to explore this dynamic under both normal and extreme situations in this study. We did this by comparing individuals affected by disasters with those unaffected by disasters, and consider whether vulnerability in extreme situations is exacerbated by individual inequality, group/social inequality, and/or social support.

Study Sites

Beginning in 1998, we undertook a two-part study of stress and Post-traumatic Stress Disorder in urban Mexico with the intent of: (1) establishing normative levels for stress and Post-traumatic Stress Disorder among urban populations in a cross-sectional survey and (2) using those normative data to make comparisons with a four- wave panel study of one or more urban populations that had suffered a significant natural disaster. In the end, the disaster we chose was a storm that inundated the middle portion of Mexico's Gulf Coast with floods and landslides in 1999.

Working with colleagues in Mexico, we choose four cities as representative of the range of variation in economic dynamics in urban Mexico in 1999: Hermosillo, Guadalajara, Merida, and Oaxaca.

Hermosillo, with a long history of agricultural export linkages to the United States, is the capital of the northern state of Sonora where investment - particularly in automobile manufacturing - as a result of the North American Free Trade Agreement (NAFTA) has created an economy mirroring the growth in the southwestern United States (West 1998). This has caused rapid growth in Hermosillo with in-migration from all parts of Mexico.

Guadalajara, Mexico's second largest city represents an industrializing city with major foreign investment (Arias 1985; Barba and Pozos 2000). In the colonial period, the city's relative isolation from Mexico City led to the development of a strong local entrepreneurial class. Building on its strong tradition of skilled labor, Guadalajara has seen an explosion of high-tech companies moving into the region - known as Mexico's Silicon Valley - following the General Agreement on Trade and Tariffs (GATT) and the North American Free Trade Agreement (NAFTA).

Merida, as the primary urban area in the Yucatán Peninsula, has had its economic and political fortunes closely tied to the cycles of boom and bust common to a region whose primary economic activity involves export agricultural products. More recently, export manufacturing has become a significant part of Merida 's economy. In addition, it is a region of Mexico that has long held to its own traditions and political dynamics.

Last of the cities chosen for the normative sample, Oaxaca, several hours south of Mexico City, represents a poor city (INEGI 2001) in the poorest region of the country, with low opportunity indices (Selby et al. 1994). As part of the original *Marquesado* (land allotted to a ruler) granted

to Cortez, Oaxaca has long served as a governmental and commercial center for the southern region of Mexico, providing considerable wealth and political power to a select few people in the city (Murphy and Stepick 1991). Today, national and international tourism serves as the third leg of its economy.

Two coastal cities affected by disasters were chosen for the post-disaster panel study: Teziutlán, in the state of Puebla, and Villahermosa, in the state of Tabasco. In October of 1999, a series of weather fronts stalled along the east coast of Mexico resulting in torrential rains. In a period of a few days, the eastern mountains of Mexico received the equivalent of a year's worth of precipitation. In Villahermosa, a city accustomed to flooding, unprecedented floods resulted in the temporary abandonment of several regions of the city that had never experienced flooding (Antonio 2000).

Teziutlán is located approximately 250 km northeast of the city of Puebla, Mexico, on the eastern slopes of the Sierra Madre. A local labor force accustomed to factory work (i.e., mining and smelting) made it an ideal location for the development of Mexico's exploding *maquiladora* (assembly plant) industry (Nolasco 1989; Pozos 2003). Over 300 small sewing plants (300 or fewer employees per shift) shot up after the signing of NAFTA, resulting in thousands of immigrants from the surrounding rural area looking for work and building housing on the precarious slopes of the mountains in which the city is nestled. In October of 1999, rains resulted in flooding and landslides in many of these communities culminating in the loss of homes and several hundred lives (Garcia 2000). As part of the recovery, over 200 families were relocated to a *colonia* (colony) many km from their former residences. This relocated community became the focus of our research (e.g., Norris et al. 2004). We did not include non-relocated victims because of the logistics (i.e., increased n) and because of the difficulty of differentiating between non-affected and non-relocated - for the latter, we found it theoretically appropriate to consider the relocation as part of the traumatic event.

Villahermosa is the capital city of the state of Tabasco. Until the discovery of oil in the Bay of Campeche, Villahermosa's primary economic role in the region was that of a state capital and transportation hub. The oil boom beginning in the 1970s resulted in a population influx of two classes of citizens - first, employees of Petróleos Mexicanos (PEMEX), a state-owned petroleum company, the elite of the Mexican middle and working classes (Garza 1987). On average, they have the best housing in Villahermosa, and the fact that their housing flooded in October of 1999 is one of the reasons the flooding made headlines throughout the nation. The second group that flowed into Villahermosa, or the majority of the population boom, was non-PEMEX workers who came to fill the low-wage service positions in the city. The poor majority has built housing in the more vulnerable regions of the city - along the banks of the two major rivers and on land reclaimed from the swamps surrounding the city core. Despite a preponderance of low-wage jobs, per capita gross production for Villahermosa was three times that of Teziutlán in 1998 (see INEGI 1999a, 1999b).

Comparability of cities is based on similarities in various demographic variables (e.g., gender, age, family structure) and in average levels of ecological well-being (significant, but very minor difference) across the six cities, although levels of education and wealth were pronouncedly lower for Teziutlán than the other five cities.

Methodology

The research design compared two Mexican cities exposed to flooding and landslides to explore the effect of socioeconomic status and social support on post-disaster depression. These disaster cities samples were also compared to samples from four cities in Mexico used as a normative sample.

Sampling

Interviews with households in the selected urban core areas of Mexico provided data on psychological distress, social support, and material possessions in all six cities (i.e., both the normative sample and the disaster sample). The exclusion of suburban households allowed for a more ethnically homogeneous sample of urban-dwelling mestizo (mixed race) people. Cross-sectional surveys were administered in four cities of Guadalajara (n=713; 82% response rate), Hermosillo (n=618; 76% response rate), Merida (n=602; 70% response rate), and Oaxaca (n=574; 79% response rate) between 1999 and 2001 (see Norris et al. 2003). In the two cities hit by floods and mudslides in 1999, four waves of questionnaires (at 6, 12, 18 and 24 months post-disaster) provided longitudinal data (Norris et al. 2004). In this paper, wave 4 data from the disaster cities are compared to the data from the cross-sectional normative sample. The only data from wave 1 are the levels of disaster exposure.

For the cross-sectional survey, a multi-stage probability sampling design was used to draw samples of individuals over 18. By using Mexican census data, we randomly selected 10 percent of the total number of census tracts in each city. Households were sampled proportionate to the tract's population size for a sociodemographic interview. Then, among household residents, one adult was selected randomly and asked to participate in a psychological interview. Interviews were completed by trained, local interviewers in each city. Fieldwork managers checked all interviews for accuracy of selection procedures, completeness, and quality.

From affected census tracts in Villahermosa, 530 households were successfully contacted out of 653 randomly selected, with 385 randomly selected individuals completing all four waves of the psychological interview. In Tezuitlán, all 235 households provided with plots in the new community were selected and, of these, 209 participants were successfully contacted and completed the psychological interview, with 176 participants completing all four psychological interviews.

Variable Measurement

The independent variable (wealth, for measures of inequality) was measured using the Guttman scaling technique (minimized errors option) of Anthropac 3.2 (Borgatti 1992), as described by Guest (2000) for ownership of household items, since income is a less reliable indicator of status in Mexico than are possessions due to intermittent employment and household pooling of resources. A robust scale with high reproducibility (0.90) and high scalability (0.60) would indicate that people add items in a certain order as they accrue resources, thus, suggesting a

cultural tradition of depicting one's status predictably through consumption. Values for reproducibility in the six cities varied from 0.83 to 0.92 and scalability from 0.30 to 0.47.

We grouped cases to approximate the dynamics of the poor, working, and middle classes by creating three levels of socioeconomic status from the results of the Guttman scale.[2] This grouping of classes also reduces concerns resulting from scalability scores less than .60.

The three levels of socioeconomic status were created with two cutoff points in the ordinal scale of items possessed. Below "microwave oven" was the cutoff between the high and medium wealth levels. Below "washing machine" was the cutoff between the medium and low levels. Even with the ratification of NAFTA, household appliances designed to alleviate household chores had not dropped in price enough relative to the value of time for the poor to justify household durable goods such as washing machines. At the same time, the middle group finds itself in the position of being able to purchase such items and reduce their reliance on what they see as a servant class of dubious reliability and honesty. However, an item such as a microwave oven was still a luxury good in most of Mexico, mostly because of the level of disposable income necessary to buy value-added food items designed for use with a microwave. Dressier, Balieiro, and Dos Santos (1998) used a similar measure of accumulation of consumer goods to understand behaviors associated with socioeconomic status in Brazil and argued such measures can be more reliable than are other measures of socioeconomic status (see also Wildman 2003).

We also created a modified Gini coefficient for each city via the degree of ownership of the 26 household goods across individuals in order to help test the group-level inequality hypothesis. Lower scores indicate lower levels of inequality or less average divergence in ownership of those household goods within each city.

The larger part of the survey questionnaire employed throughout the study was a Spanish language version of the Composite International Diagnostic Interview, Version 2.1 (WHO 1997). We did a trial run of the questionnaire in Oaxaca City to make sure that participants understood the questions and gave us quality answers.

The dependent variable analyzed in this article is recent depression, defined as whether or not a person was depressed in the past week, and is calculated as the mean of a 20-item scale of the CES-D in which answers included "rarely," "once in a while," "regularly," and "almost all the time." In this study, we did not focus on gender (similar gender ratios in each city) or education, which has often been used as a proxy for socioeconomic status. Education level, which does vary between the cities, was correlated (Pearson's r) with socioeconomic status for all six cities but explains only a relatively small amount of variation ($r^2 = 0.081$, $p = 0.000$).

Intervening or co-correlated variables included perceived support and social embeddedness. Perceived support - broken down into the constituents of family, friend, and partner support and the modes of informational, material, and emotional support - is defined as the belief that help would be available if and when help is needed (Barrera 1986) based on closeness, willingness to talk with the respondent, expression of worth, ability to relax when together, and confidence in the respondent. It is calculated as the mean of a 22-item Provisions of Social Relations Scale

(Turner and Marino 1994, α =0.92). A 5-point scale ranging from not at all true to extremely true was used to score items.

Social embeddedness was measured using the mean of a 10-item scale created by the investigators (α = 0.71; see Norris et al. 2005) and includes the reported number and kinds of social activities a person has engaged in recently. Initially open-ended response options were recoded into a 4-point scale (0, 1, 2-3, and 4+). Received support was not predictive of recent depression (see also Norris et al. 2005) and, thus, not included.

Results

Hypothesis 1: Individual Socioeconomic Status and Depression

The 4-variable model in Table 1 confirms that socioeconomic status, social embeddedness, and city of residence are direct predictors of depression, seeming to support hypothesis #1, although impacting depression in relatively few people. When perceived support is run before socioeconomic status, perceived support achieves an $r^2=0.11$, and socioeconomic status only adds .015 to the r^2, making it a relatively unimportant factor in this model.

Table 1. Model Summary, Effect of Variables on Recent Depression

Model	R-squared	Significance
Socioeconomic Status	.039	.000
Socioeconomic Status	.125	.000
Perceived Support		.000
Socioeconomic Status	.129	.000
Perceived Support		.000
City (all six separated)		.012
Socioeconomic Status	.132	.000
Perceived Support		.000
City (all six separated)		.017
Social Embeddedness		.001

Social embeddedness and perceived support have similar levels of correlation to recent depression, plus there is a strong relationship between social embeddedness and perceived support (Pearson's r=0.577, two tailed p<0.0l) that potentially hides the effect of social embeddedness on recent depression (Pearson's r= -0.250, p<0.01); however, the effect of perceived support on recent depression appears greater (Pearson's r= -0.332, p<0.01), lending support to hypothesis #3 addressed further below.

When the city variable is recoded into three groups to serve as proxies for population-level disaster impact (normative sample vs. Villahermosa with moderate impact vs. Teziutlán with high impact), city-level disaster exposure contributes no significant explanation to the effect on recent depression, and the overall R-squared then decreases to 0.128 (not shown in Table 1). Thus, differences between the four cities in the normative sample are now lost. Because prior studies have found the degree of disaster exposure to be important for various mental health problems (e.g., Norris et al. 2002; Van Atta 1999), we also analyzed the influence of three ordinal impact variables on depression (injuries to family, damage to household goods, and

damage to goods of non-household family) based on sum of answers to 29 questions and found little effect.[3]

Looking more closely at socioeconomic status in the disaster cities, we created a new variable by splitting people into five groups - three in Villahermosa and two in Teziutlán - since Teziutlán does not have any individuals in the high group. The middle group in Teziutlán shows the lowest level of depression (11.9) and, as expected, the lower economic group in Teziutlán shows the highest level (16.7). The high, medium, and low socioeconomic strata in Villahermosa are inversely correlated with depression levels, as expected (12.9, 13.6, 14.9, respectively). The 2-factor ANOVA for depression scores for those five groups was significant (p=.004, F=3.837). A Tukey's multiple comparison test found significant differences between the Teziutlán Low group and the Villahermosa middle (p=.018) and high groups (p=.0l 1), although the lack of a difference between Teziutlán Low and Teziutlán Middle may be due to the low subsample size for the latter.

Hypothesis 2: Group Inequality and Depression

Based on the Tukey's-b multiple comparison procedure for conducting pair-wise comparisons (see Table 2), the wealthiest city of Hermosillo is at one end of the depression spectrum by itself. Merida, Guadalajara, Villahermosa, and Oaxaca comprise a loose middle subset (p=.073; at p=.05, these would no longer hold together as a subset). The final homogeneous subset (with highest average depression score) is the poorest city of Teziutlán by itself. Also in support of the group inequality thesis, the highest Gini coefficients are associated with the highest recent depression scores and the lowest Gini coefficients with the lowest recent depression scores.

Table 2. Mean Level of Recent Depression of Six Mexican Cities

City	Mean Level of Recent Depression	Homogeneous Subset	Economic Inequality (modified Gini coefficient)
Hermosillo	10.3	1 (p=1.000)	.18
Merida	12.4	2 (p=.073)	.18
Guadalajara	12.6		.18
Villahermosa	13.7		.22
Oaxaca	14.1		.27
Teziutlán	16.2	3 (p=1.000)	.43

Hypothesis 3: The Role of Social Support in Mitigating Inequality in Extreme Settings

We found in a 2-factor ANOVA that perceived support was predicted by both population-level exposure (normative sample vs. Villahermosa vs. Teziutlán; p=0.025) and individual socioeconomic status (p=0.000), and that there is an interaction effect between exposure and socioeconomic status (p=0.014). Similarly, both socioeconomic status (p=0.000) and exposure/non-exposure (p=0.000) predict levels of social embeddedness. However, for social embeddedness, there is not an interaction effect between socioeconomic status and exposure level (p=0.157).

Table 3 is a comparison of social support variables across both the normative sample and the cities affected by floods. Villahermosa displays the highest mean ranks for perceived support and social embeddedness two years after the floods, compared with Teziutlán, and normative sample

fell between them. However, the scores for Villahermosa and the normative sample are similar to one another.

Table 3. Social Support Measures, By City-Based Intensity of Recent Exposure to Disaster

City / Exposure Level	Perceived Support* (p=.000)	Social Embeddedness** (p=.000)
Villahermosa / med exposure (n=2509)	4.0	1589
Control Cities / low exposure (n=385)	3.9	1554
Teziutlán / high exposure (n=176)	3.4	1153

*Actual averages were calculated for perceived support.
**Mean rank of social embeddedness was produced by a Kruskai Wallis test of differences.

To understand the extent to which difference in social support depends on socioeconomic differences, we compared the disaster cities to the normative sample. There were significant differences between the three socioeconomic statuses regarding both mean rank for perceived support (p<.001, x^2= 140 for normative sample; p<.001, x^2=57 for disaster cities) and mean rank for social embeddedness (p<.001, x^2=105 for normative sample; p<.001, x^2=58 for disaster cities), with highest socioeconomic status having the highest support and the lowest socioeconomic status the lowest support. However, the much lower Chi-square values for disaster cities indicates that socioeconomic status tends to have a greater influence in the normative sample than in the disaster cities (measured two years after the floods).

The disaster cities' lower Chi-square value for both forms of social support is a result of putting these two cities together when they each actually have very different results for relationship between socioeconomic status and social support. Specifically, in a Kruskal Wallis test, there was no variation in perceived support in Villahermosa based on socioeconomic status, while in Teziutlán some variation existed for perceived support (mean of 3.3 for Teziutlán poorest and 3.5 for Teziutlán middle group). For social embeddedness, the three Villahermosa groups were 2.5 or 2.6, the Teziutlán middle group had a mean score of 2.4, and the low Teziutlán group considerably lower at 1.9.

Discussion

The results present some evidence for the effects of group inequality and individual socioeconomic status on mental health, as well as the influence of social support. Social inequality (i.e., relative deprivation) may produce different mean levels of recent depression in the six cities, with the wealthiest city having lowest depression, the poorest city having the highest depression, and the other four cities forming a middle subset. The Gini coefficient similarly showed these Mexican cities with higher recent depression scores to have greater relative deprivation, suggesting perhaps that it is urban vs. rural living that highlights relative deprivation rather than developed vs. less developed countries. Such a finding would question the wisdom of state-level studies of inequality and instead focus on contexts in which inequality is likely to make a difference, such as urban vs. rural living. To investigate further the hypothesis that economic inequality affects health, we think it makes sense to differentiate mental health from physical health, because relative deprivation and resultant perception of inequality can be a very considerable part of mental health (see Godoy et al. 2006), while absolute deprivation may have a more direct impact on *physical* health.

The independent variable of socioeconomic status (proxy for absolute deprivation) did predict a small amount of the incidence of depression although much less than was predicted by the perceived support variable. In terms of social support, absolute deprivation seems to be a major factor in how much and what kind of social support is available to people, based on the fact that the poorest in Teziutlán had a lower social support scores than the middle group in Teziutlán and all three groups in Villahermosa.

The greater effect of social support and minor direct effect of socioeconomic status and disaster impact prodded us to consider that individual socioeconomic status and individual disaster impact may act indirectly through forms of social support in predicting depression for some individuals. For example, people in Teziutlán were uprooted for relocation, and, thus, their social support may be less available to them due to limited economic ability to maintain and access relationships.[3]

It is also important to ethnograpically consider the exposure differences between Teziutlán and Villahermosa. The Teziutlán population is a resettlement community made up of people that could not afford to rebuild. Their neighbors, family, and friends who had access to more resources and social support were able to rebuild or buy anew in the city. However, analyses for Teziutlán show no relationship between impact and recent depression. Perhaps impact was too narrowly measured, or the impact in Teziutlán is more from the relocation and isolation than from the event, or perhaps too little variation was captured by the independent and/or dependent variables. In Villahermosa, floods commonly affect poorer neighborhoods, but the flood of 1 999 also reached many middle-class neighborhoods. Thus, an event that was typically watched from a comfortable yet intimate distance by the middle classes had now directly impacted people of that economic level. Perhaps this is why two years after the floods, Villahermosa seems to maintain a relationship between disaster-related impact (household goods, goods of non-resident family, and family injuries) and recent depression. Nonetheless, Villahermosa appears to have achieved levels of perceived support and social embeddedness equal or superior to those of the control cities. In other words, Villahermosa "bounces back" to have relatively high levels of social support, perhaps due to its frequent flood experiences (and related adaptation), or due to higher level of perceived support (i.e., the expectation of social support) that is common in coastal Mexico (cf. Legorreta 1983) as compared to Teziutlán in the mountains.

Since socioeconomic status generally was not associated with degree of disaster exposure in the affected cities (only in the case of injuries to family in Villahermosa), it was not through degree of exposure that individual inequality produces different outcomes among the people residing in the paths of those particular disasters.[4] Rather, socioeconomic status may have affected the way that people perceive the amount and kinds of support available to them subsequently, which, in turn, has an influence on mental health. This low level of direct involvement of socioeconomic status may, in part, have been because the aftermath of disaster involves a liminal period, plus provokes a long-term readjustment to the new settings, such that vertical social structures like socioeconomic status may cease to play a strong role for a while (cf. Jencson 2001).

Conclusion

This research intends to understand the effect of both individual wealth inequality and group-level inequality on depression in post-disaster and control settings and the extent to which social support mediates that relationship. The implication for understanding other disasters is that socioeconomic status may not always be a useful predictor of long-term psychological or physical health problems experienced by individuals, perhaps contrary to common academic and popular wisdom. Greater attention should be paid to mechanisms by which mental health and physical health might be more responsive to relative deprivation or absolute deprivation. Also, it is possible that frequent exposure to hazards - as in Villahermosa - may alter expectations, with the result that people may find workarounds or adjust in various ways to obtain social support and to protect mental health, rather than continue to be highly vulnerable to every event.

Notes

1. Whitehead, Dahigren, and Evans (2001) argue that evidence exists for an "illness poverty trap" in which poor individuals, especially in less developed countries, become poorer because of the cost of health care and, thus, have worse health because of that poverty. However, in relation to the current paper, the illness poverty trap does not account for social distribution of disease cross-culturally independent of health policy and health care costs.

2. We understand that the term socioeconomic status is more appropriate than class, because class refers to a structural position determined by relations to the means of production - data which we did not collect. Thus, socioeconomic status is typically throughout the rest of the manuscript.

3. We used the Kruskal Wallis test of difference due to lack of normality and tested each measure of impact against recent depression in each of the two disaster cities (six separate tests in total), with results as follows: Damage to Household Goods in Teziutlán ($p=.089$), Damage to Household Goods of Non-Family in Villahermosa ($p=.020$), Injury to Family in Villahermosa ($p=.072$), Damage to Household Goods in Teziutlán ($p=.9S2$), Damage to Household Goods of Non-Family in Teziutlán ($p=.656$), Injury to Family in Teziutlán ($p=.572$). Thus, Villahermosa appears to exhibit a relationship between impact and mental health, while Teziutlán does not. Additionally, in an attempt to control for socioeconomic status, we found that within each of the two disaster cities, there was only one significant relationship between socioeconomic status and these three ordinal impact variables (Injury to Family in Villahermosa $p=.025$), based on six separate Kruskal Wallis tests in each of the two disaster cities.

4. We found no significant relationship between the individual social support variables and individual disaster exposure measures after taking socioeconomic status into account.

References

Adler, Nancy E., Thomas Boyce, Margaret A Chesney, Sheldon Cohen, Susan Folkman, Robert L. Kahn and S. Leonard Syme. 1994 Socioeconomic Status and Health: The Challenge of the Grathent. American Psychologist 49(l):15-24.

Antonio, Elias. Balcazar. 2000 Villahermosa: Crónicas y Remembranzas Siglo XX. Villahermosa, Mexico: Universidad Juárez Autònoma de Tabasco.

Arias, Patricia. 1985 Guadalajara, la Gran ciudad de la Peqeueña Industria. Zamora, Spain: El Colegio de Michoacan.

Balmori, Diana, Stuart F. Voss, and Miles Wortman. 1984 Notable Family Networks in Latin America. Chicago, IU.: University of Chicago Press.

Barba, Carlos, and Fernando Pozos. 2000 Paradojas Sociales de Jalisco y Sus Regiones. Guadalajara, Mexico: Universida de Guadalajara.

Barrera, Manuel. 1986 Distinctions Between Social Support Concepts, Measures, and Models. American Journal of Community Psychology 14(4):413-445.

Blakely, Tony A., Kimberly Lochner, and Ichiro Kawachi. 2002 Metropolitan Area Income Inequality and Self-rated Health: A Multi-Level Study. Social Science and Medicine 54(l):65-77.

Blane, David, George Davey Smith, and Mel Bartley. 1993 Social Selection: What Does It Contribute to Social Class Differences in Health? Sociology of Health and Illness 15(1): 1 - 1 5.

Bobak, Martin, Hynek Pikhart, Richard Rose, Clyde Hertzman, and Michael Marmot. 2000 Socioeconomic Factors, Material Inequalities, and Perceived Control in Self-Rated Health: Cross-Sectional Data From Seven Post-Communist Countries. Social Science and Medicine 51(9):1342-1350.

Bogard, Cynthia J., J. Jeff McConnell, Naomi Gerstel, and Michael Schwartz. 1999 Homeless Mothers and Depression: Misdirected Policy. Journal of Health and Social Behavior 40(l):46-62.

Borgatti, Stephen Peter. 1992 AnthroPac Methods Guide. Columbia, S.C.: Analytic Technologies.

Carey, James W. 1990 Social System Effects on Local Morbidity and Adaptation in the Rural Peruvian Andes. Medical Anthropology Quarterly 4(3):266-295.

Clark, Lauren. 1993 Gender and Generation in Poor Women 's Household Health Production Experiences. Medical Anthropology Quarterly 7(4):386-402.

Coburn, David. 2004 Beyond the Income Inequality Hypothesis: Class, Neo-Liberalism, and Health Inequalities. Social Science and Medicine 58(l):41-56.

Deaton, Angus. 2003 Health, Inequality, and Economic Development. Journal of Economic Literature 41 (1):1 13-158.

Desjarlais, Robert., Leon Eisenberg, Byron Good, and Arthur Kleinman. 1994 World Mental Health: Problems and Priorities in Low-Income Countries. Oxford, United Kingdom: Oxford University Press.

Dressier, William W. 1993 Health in the African American Community : Accounting for Health. Medical Anthropology Quarterly 7(4):325-345.

Dressler, William W, Mauro Campos Balieiro, and Jose Ernesto Dos Santos. 1998 Culture, Socioeconomic Status, and Physical and Mental Health in Brazil . Medical Anthropology Quarterly 12(4):424-446.

Dressler, William W., James R. Bindon, and Yasmin H. Neggers. 1998 Culture, Socioeconomic Status, and Coronary Heart Disease Risk Factors in an African American Community. Journal of Behavioral Medicine 21(6):527-544.

Ferriea, Jane E., Martin J. Shipley, Stephen A. Stansfeld, George Davie Smith, and Michael Marmot. 2003 Future Uncertainty and Socioeconomic Inequalities in Health: The Whitehall U Study. Social Science and Medicine 57(4):637-646.

Garcia, José Luis Olazo. 2000 Teziutlán: Historia y Tragedia. Puebla, Mexico: Ecretaria de Cultura.

Garza, Gustavo. 1987 Condiciones generales de la producción y concentración espacial de la industria. El Caso de los hidrocarburos. In Mexico: Problemas Urbano Regionales. Guillermos Boils, ed. Pp. 243-287. Mexico City: G.V. Editores y Instituto de Investigaciones Sociales de la UNAM.

Gilman, Stephen E., Ichiro Kawachi, Garrett M. Fitzmaurice, and Stephen L. Buka. 2002 Socioeconomic Status in Childhood and the Lifetime Risk of Major Depression. International Journal of Epidemiology 31(2):359-367.

Godoy, Ricardo A., V. Reyes-García, T. McDade, T. Huanca, W. R. Leonard, S. Tanner, and V. Vadez. 2006 Does Village Inequality in Modern Income Harm the Psyche? Anger, Fear, Sadness, and Alcohol Consumption in a Pre-Industrial society. Social Science and Medicine 63(2):359-372.

González de la Rocha, Mercedes. 1986 Los Recursos de la Pobreza: Familias de Bajos Ingresos en Guadalajara. Guadalajara, Mexico: El Colegio de Jalisco and CIESAS.

Guest, Greg. 2000 Using Guttman Scaling to Rank Wealth: Integrating Qualitative and Quantitative data. Field Methods 12(4):346-357.

Hamilton, V. Lee, Clifford L. Broman, William S. Hoffman, and Deborah S. Renner. 1990 Hard Times and Vulnerable People: Initial Effects on Plant Closing on Autoworkers' Mental Health. Journal of Health and Social Behavior 31(2):123-140.

Henderson, Claire, Xinhua Liu, Ana V. Diez Roux, B. G. Link, and Deborah Hasin. 2004 The Effects of United States State Income Inequality and Alcohol Policies on Symptoms of Depression and Alcohol Dependence. Social Science and Medicine 58(3):565-575.

Instituto Nacional de Estadística, Geografia e Informatica (INEGI). 1999a Puebla: Censos Económicos 1999, Tomo I. Mexico City, Mexico: Instituto Nacional de Estadística, Geografia e Informatica.

1999b Tabasco: Censos Económicos 1999. Mexico City, Mexico: Instituto Nacional de Estadística, Geografia e Informatica.

2001 Anuario Estadístico. Mexico City, Mexico: Instituto Nacional de Estadística, Geografia e Informatica.

Jencson, Linda J. 2001 Disastrous Rites: Liminality and Communitas in a Flood Crisis. Anthropology of Humanism 26(l):46-58.

Jones, Eric C, and Arthur D. Murphy. 2008 Review of Cross-Cultural Disaster Studies, with Focus on Latin American Populations. In Haciendo las Ciencias Sociales: Libro Homenaje a Fernando Pozos. Fernando Leal, ed. Pp. 317-345. Guadalajara, Mexico: University of Guadalajara.

Kaniasty, Krzysztof Z., and Fran H. Norris. 2000 Help-Seeking Comfort and Receiving Social Support: The Role of Ethnicity and Context of Need. American Journal of Community Psychology 28(4):545-581.

Lavell, Allan T, ed. 1994 Viviendo en Riesgo: Comunidades Vulnerables y Prevención de Desastres en America Latina. Bogota, Colombia: Tercer Mundo Editores.

Legorreta, Jorge. 1983 El Proceso de Urbanización en Ciudades Petroleras. Mexico City: Centro de Ecodesarrollo.

Lomnitz, Larissa. 1977 Networks and Marginality: Life in a Mexican Shantytown. New York: Academic Press.

1982 Horizontal and Vertical Relations and the Social Structure of Urban Mexico. Latin American Research Review 17(2):5 1 -74.

1987 A Mexican Elite Family, 1820-1980: Kinship, Class, and Culture. Princeton, N.J.: Princeton University Press.

Lundberg, Olle. 1991 Causal Explanations for Class Inequality in Health: An Empirical Analysis. Social Science and Medicine 32(4):385-393.

Lynch, John W, George A. Kaplan, and Jukka T Salonen. 1997 Why Do Poor People Behave Poorly? Variation in Adult Health Behaviors and Psychosocial Characteristics by Stages of the Socioeconomic Lifecourse. Social Science and Medicine 44(6):809-819.

Lynch, John W., George D. Smith, Sam Harper, Marianne Hillemeier, Nancy Ross, George A. Kaplan, and Michael Wolfson. 2004 Is Income Inequality a Determinant of Population Health? Part I. A Systematic Review. Milbank Quarterly 82(l):5-99.

Morris, Earl W. 1991 Household, Kin, and Non-Kin Sources of Assistance in Home Building: The Case of the City of Oaxaca. Urban Anthropology 20(l):49-66.

Murphy, Arthur, and Alex Stepick. 1991 Social Inequality in Oaxaca: A History of Resistance and Change. Philadelphia, Pa.: Temple University Press.

Nersesian, William S. 1988 Infant Mortality in Socially Vulnerable Populations. Annual Review of Public Health 9:361-377.

Nguyen, Vinh-Kim, and Karine Peschard. 2003 Anthropology, Inequality, and Disease: A Review. Annual Review of Anthropology 32:447-474.

Nolasco, Margarita. 1989 Los Municipios de las Fronteras de Mexico. Mexico City: Centro de Ecodesarrollo.

Norris Fran H., Matthew J. Friedman, Patricia J. Watson, Christopher M. Byrne, Eolia Diaz, and Krzysztof Kaniasty. 2002 60,000 Disaster Victims Speak: Part I. An Empirical Review of the Empirical Literature, 1981-2001. Psychiatry 65(3):207239.

Norris Fran, Charlene Baker, Arthur D. Murphy, and Krzysztof Kaniasty. 2005 Social Support Mobilization and Deterioration After Mexico's 1999 Flood: Effects of Context, Gender, and Time. American Journal of Community Psychology 36(1-2): 15-28.

Norris, Fran, Arthur Murphy, Charlene Baker, and Julia Perilla. 2004 Post-Disaster PTSD Over Four Waves of a Panel Study of Mexico's 1999 Flood. Journal of Traumatic Stress 17(4):283292.

Norris, Fran H., Arthur D. Murphy, Charlene. K. Baker, J. L. Perilla, Francisco G. Rodriguez, and José G. Rodriguez. 2003 Epidemiology of Trauma and Post-Traumatic Stress Disorder in Mexico. Journal of Abnormal Psychology 112(4):646-656.

Pappas, Gregory, Susan Queen, Wilbur Hadden, and Gail Fisher. 1993 The Increasing Disparity in Mortality Between Socioeconomic Groups in the United States, 1960 and 1986. The New England Journal of Medicine 329(2):103-109.

Parker, Seymour, and Robert J. Kleiner. 1970 The Culture of Poverty: An Adjustive Dimension. American Anthropologist 72(3):5 16-527.

Parry, Glenys. 1986 Paid Employment, Life Events, Social Support, and Mental Health in Working-Class Mothers. Journal of Health and Social Behavior 27(2): 193-208.

Patel, Vikram, Ricardo Araya, Mauricio de Lima, Ana Ludermir, and Charles Todd. 1999 Women, Poverty, and Common Mental Disorders in Four Restructuring Societies. Social Science and Medicine 49(11):1461-1471.

Pozos, Fernando. 2003 La Vulnerabilidad Laboral del Modelo Exportador en Mexico. Guadalajara, Mexico: Universidad de Guadalajara.

Ram, Rati. 2006 Further Examination of the Cross-Country Association Between Income Inequality and Population Health. Social Science and Medicine 62(3) 779-791.

Schoon, Ingrid, Amanda Sacker, and Mel Bartley. 2003 Socioeconomic Adversity and Psychosocial Adjustment: A Developmental-Contextual Perspective. Social Science and Medicine 57(6):1001-1015.

Selby, Henry A. 1991 The Oaxacan Urban Household and the Crisis. Urban Anthropology 20(l):87-98.

Selby, Henry A., Arthur D. Murphy, and Stephen A. Lorenzen. 1990 The Mexican Urban Household: Organizing for Self-Defense. Austin: The University of Texas Press.

Selby, Henry A., Arthur D. Murphy, Stephen A. Lorenzen, Ignacio Cabrera, Aida Castañeda, and Ignacio Ruiz. 1994 La Familia en el México Urbano: Mecanismos de Defense Frente a la Crisis (1978-1992). Mexico City: Consejo Nacional para la Cultura y las Artes.

Singer, Merrill. 1994 AIDS and the Health Crisis of the United States Urban Poor: The Perspective of Critical Medical Anthropology. Social Science and Medicine 39(7):931-948.

Subramanian, S. V., Pablo Belli, and Ichiro Kawachi. 2002 The Macroeconomic Determinants of Health. Annual Review of Public Health 23(l):287-302.

Thoits, Peggy, and Michael Hannan. 1979 Income and Psychological Distress: The Impact of an IncomeMaintenance Experiment. Journal of Health and Social Behavior 20(2): 120-138.

Turner, R. Jay, and Donald A. Lloyd. 1999 The Stress Process and the Social Distribution of Depression. Journal of Health and Social Behavior 40(4):374-404.

Turner, R. Jay, and Franco Marino. 1994 Social Support and Social Structure: A Descriptive Epidemiology. Journal of Health and Social Behavior 35(3): 193-212.

Van Atta, Ralph E. 1999 A Study of the Validity of the MMPI. Post-Traumatic Stress Disorder Scale: Implications for Forensic Clinicians. Forensic Examiner 8(7-8):20-23.

Vélez-Ibañez, Carlos. 1983 Rituals of Marginality. Berkeley: University of California Press.

Wagstaff, Adam, and E. van Doorslaer. 2000 Income Inequality and Health: What Does the Literature Tell Us? Annual Review of Public Health 21s:543-567.

Warren, John Robert, Peter Hoonakker, Pascale Carayon, and Jennie Brand. 2004 Job Characteristics as Mediators in SES-Health Relationships. Social Science and Medicine 59(7): 1367-1378.

West, Robert C. 1998 Sonora: Its Geographical Personality. Austin: University of Texas Press.

Whitehead, Margaret, Goran Dahlgren, and Timothy Evans. 2001 Equity and Health Sector Reforms: Can Low-Income Countries Escape the Medical Poverty Trap? The Lancet 358(9284):833-836.

Wildman, John. 2003 Income Related Inequalities in Mental Health in Great Britain: Analyzing the Causes of Health Inequality Over Time. Journal of Health Economics 22(2):295-312.

Winter, Mary. 1991 Interhousehold Exchange in Foods and Services in the City of Oaxaca. Urban Anthropology 20(l):67-86.

World Health Organization (WHO). 1997 Composite International Diagnostic Inventory, Version 2.1. Geneva, Switzerland: World Health Organization.