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ORIGINAL ARTICLE

Physical and Mental Health Consequences of Katrina on Vietnamese Immigrants in New Orleans: A Pre- and Post-Disaster Assessment

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Abstract We assessed the health impacts of a natural disaster upon a major immigrant community by comparing pre- and post-event measures for identical individuals. We collected standard health measures for a population-based sample of working-age Vietnamese-Americans living in New Orleans in 2005, just weeks before Katrina occurred. Near the first- and second-year anniversaries of the event, we located and re-assessed more than two-thirds of this original pre-Katrina cohort. We found statistically significant declines in health status for seven of the eight standard SF-36 subscales and for both the physical and mental health component summaries at the first anniversary of the disaster. By the second anniversary, recovery of the health dimensions assessed by these measures was substantial and significant. Most of the SF-36 mental and physical health subscales returned to their original pre-Katrina levels. Being in middle-age, being engaged in professional or self-employed occupations, being unmarried, being less acculturated, and having extensive post-Katrina property damage have statistically significant negative effects on post-Katrina health status, and several of these factors continued to impede recovery by the second anniversary. Hurricane Katrina had significant negative impacts on the mental and physical health of Vietnamese New Orleanians. Several factors present clear opportunities for targeted interventions.

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Introduction

We know little about how immigrants respond to the shock of subsequent displacement and other disruptions following a disaster in their destination country. The changes brought about by Hurricane Katrina are likely to affect Vietnamese-American New Orleanians in ways that are quite distinct from the impacts on the majority and long-term resident population groups—i.e., African-Americans and whites.

A wide range of standard health measures collected for a population-based sample of working-age Vietnamese immigrants living in the greater New Orleans area just weeks before Hurricane Katrina provides an extraordinary opportunity to investigate in a scientifically valid manner how immigrants fare after such disasters. We assess the short-term (1 year) and medium-term (2 years) effects of a major natural disaster upon the health of a significant immigrant population by comparing pre-event and post-event physical and mental health assessments for the same individuals.

Background

On August 29, 2005, Hurricane Katrina struck the coastal areas of Louisiana, Mississippi, Alabama, and Florida, resulting in over 1,000 deaths in Louisiana alone. Hundreds of thousands of homes and businesses were destroyed, and even larger numbers of families were displaced. Media attention has been especially intense on the devastation of the city's lower ninth ward, which suffered heavy damage near one of the major levee breaks. But little attention has

focused on the substantial population of first-generation Vietnamese immigrants living in metropolitan New Orleans, many of whom live in this same heavily damaged eastern section of the city.

This population of Vietnamese-Americans settled in New Orleans during the past 30 years after fleeing and seeking refuge from the turmoil of war and government collapse in South Vietnam during the 1970s. Vietnamese-Americans total around 1.2 million [1]. Approximately 12,000 Vietnamese-Americans lived in the New Orleans area pre-Katrina [1]. The levee failures occurring just after Katrina's landfall flooded the major Vietnamese enclave in eastern New Orleans, resulting in the evacuation and dislocation of this entire immigrant community.

A major theme within the disaster-research literature is that some populations are much more affected than others [2–7]. Despite this consensus, a weakness of this literature is its almost exclusive focus on the welfare of mainstream populations, with an occasional special focus on the poor. Work underway on the effects of Katrina in the greater metropolitan New Orleans area maintains this trend by focusing on the majority African-American and white populations living there [8–13]. This study helps expand this literature by focusing on the physical and mental health consequences of Hurricane Katrina upon New Orleans's largest immigrant population.

Potential Impacts of Katrina on Vietnamese-American New Orleanians

Immigrants are thought to be among the most at risk for negative sociopsychological consequences after a disaster [7, 14–16]. The empirical evidence supporting this contention is quite limited, but Webster et al. [17] found that after the 1989 Newcastle earthquake, immigrants from non-English-speaking backgrounds (NESB) had higher levels of both general and event-related psychological morbidity than the native born. Moreover, NESB females had the highest levels of distress, particularly those who were older on arrival in Australia [18].

There are several possible reasons for this apparent increased risk of negative outcomes among immigrants generally and among Vietnamese in particular. First, immigrants often live in more marginal areas of the city [19]; this is certainly true in the case of the enclave studied here, which is on the far edge of land reclaimed from the swamp surrounding New Orleans after World War II. Second, although social mobility among Vietnamese-Americans has received much attention, the fact that many of them—especially in this enclave in eastern New Orleans—still occupy fairly vulnerable and low-wage positions of social status will make these Katrina-related losses quite acute [20]. Third, being nonnative speakers of English, access to information and services for self-protection and recovery will be less available (or attractive) to many of them relative to other groups [20]. Some hypothesized barriers to such information and services include language, isolation and other cultural obstacles [21–23]. Fourth, some of the social characteristics that contribute to the adaptation of the Vietnamese under normal circumstances may also become sources of stress after a disaster. For example, if living in an ethnic neighborhood provides important sources of sociopsychological support [24], sudden displacement from that neighborhood abruptly removes many of these sources. Related to this, a strong cultural orientation toward Vietnamese ways of doing things may well leave members of this community ill prepared for negotiating the post-disaster environment.

Other cultural features characteristic of Vietnamese-Americans may mitigate some post-Katrina impacts relative to other groups. First is a strong sense of ethnic identity and strong family, social, and economic ties to other Vietnamese living outside the affected area. As news of Katrina's devastation spread, Vietnamese-Americans across the country contributed to relief work via NGOs and religious organizations [25, 26]. Second, the experience of Vietnamese-Americans with war and its aftermath may make this group more resilient to the effects of Katrina than it otherwise would have been, an effect sometimes described as an "inoculation hypothesis [27]." Several of our respondents noted in conversation that the hardships imposed by Katrina were small compared with what they had experienced during their exodus from Vietnam; similar observations were noted by another team working in this community during the first few months post-Katrina [28].

Recent empirical work focusing on the effects of Katrina also supports such a hypothesis. Two studies focusing on English-speaking pre-hurricane residents in Alabama, Louisiana, and Mississippi documented a high prevalence of anxiety-mood disorder and significant levels of mental health distress during the first 2 years post-disaster [9, 12]. Specifically, Galea et al. [12] estimated that between a quarter and a third of pre-Katrina residents of New Orleans suffered from post-traumatic stress disorder (PTSD) after the disaster. In contrast, in work related to the study reported here, we find a prevalence of PTSD of less than 5% among Vietnamese New Orleanians during the year after the disaster [29].

Methodology

Sampling

A population register of Vietnamese-American households in the greater New Orleans area that had been updated in May 2005 was employed to draw the sample during the

summer of 2005. This register was compiled jointly by the principal NGO and the largest Catholic Church serving the area at the time; it includes both Catholic and non-Catholic Vietnamese families and lists household members by name. We selected a representative sample of all households that appeared to contain at least one eligible respondent—i.e., someone who was between the ages of 20 and 54 at the time of the original interview in 2005, was born in Vietnam, had arrived in the United States between 1975 and 1990, and was over 5 years old when he or she arrived in the United States. These original criteria were chosen because the main objective of the original research was to examine the impact of international migration upon the health of working-age Vietnamese immigrants who had lived significant portions of their lives both in Vietnam and in the United States.

We interviewed 128 people during the summer of 2005, a wave of data collection later designated as the baseline wave (T_0) when we recognized its potential as a pre-disaster cohort. In fall 2006 (T_1), we were able to re-interview 82 members of this original cohort. We lost 46 participants due to the chaotic situation after the hurricane that sent this community's residents to all corners of the country. In fall 2007 (T_2), we successfully interviewed 80 out of the 82 participants that we had previously re-interviewed at T_1. At T_2, we were also able to re-interview 11 of the 46 from the original (2005) cohort that we had lost at T_1, for a total of 91 respondents out of our original 128.

Measures

Our main set of standard health outcomes is based upon the SF-36 [30]. The SF-36 instrument has been well validated, is widely used, and has been successfully implemented in a number of different languages, including Vietnamese [31–33]. Four physical and four mental health dimensions are constructed from its 36 questions. We use standardized scores ranging from 0 to 100; higher scores indicate better health outcomes. The four mental health dimensions are general mental health (MH), social functioning (SF), role limitation due to emotional problems (RE), and vitality (VT). Physical health dimensions include physical functioning (PF), general heath perception (GH), role limitation due to physical health problems (RP), and bodily pain (BP).

Mental and physical health component summaries (MCS and PCS) are employed as main outcome variables. These two component scores incorporate all 36 questions, increasing reliability, and also range from 0 to 100, with higher scores indicating better health outcomes [34].

Depression is assessed by the 18-item Vietnamese depression scale (VDS) developed by Kinzie et al. [35]. This instrument has been widely used and is highly regarded as a culturally sensitive measure of this complex mental health outcome [36–38]. Each item was coded as 0 = have no symptoms and 1 = have symptoms. The composite score was computed and dichotomized at the median (0 = $\leq$4 symptoms; 1 = $\geq$5 symptoms). The scale had high internal validity (Cronbach's alpha = 0.87).

Our measure of acculturation was developed specifically for Southeast Asian populations [39]. It includes assessments of language proficiency for both Vietnamese and English as well as preferences regarding language, food, and social contacts with friends, neighbors, and co-workers. The overall language, social, and food preference (LSFP) scale had high internal validity (Cronbach's alpha = 0.80).

Results

Table 1 summarizes the characteristics of the original sample of 128 Vietnamese New Orleanians. Study participants had a mean age of 42 (28–52). About two-thirds of the sample was male; one-third was female. Average educational attainment was 11 years, and 84% of the sample was married. The average length of time that these Vietnamese had resided in the United States by the baseline (2005) wave was 25 years. The proportion of people having high-skill jobs (e.g., business person, professional) was 43%. The rest had lower-skill jobs such as factory worker, construction worker, or laborer (57%). Just over three-quarters of our sample owned their home, and just over two-thirds reported that they had at least one relationship

Table 1 Sample characteristics at T_0 (n = 128)

Characteristics	Mean (SD) or % (n)
Age (years: 28–52)	42.0 (5.0)
Sex	
Male	66.4% (85)
Female	33.6% (43)
Education (years)	11.1 (5.0)
Marital status	
Currently married	83.5% (107)
Single/divorced/widowed	16.5% (20)
Occupation	
Low skill	57.1% (68)
High skill	42.9% (51)
Home ownership	
Own	75.8% (97)
Rent	24.2% (31)
Length of stay in the US (years)	25.3 (5.0)
Have a helpful relationship (SRS)	
No	32.8% (42)
Yes	67.2% (46)

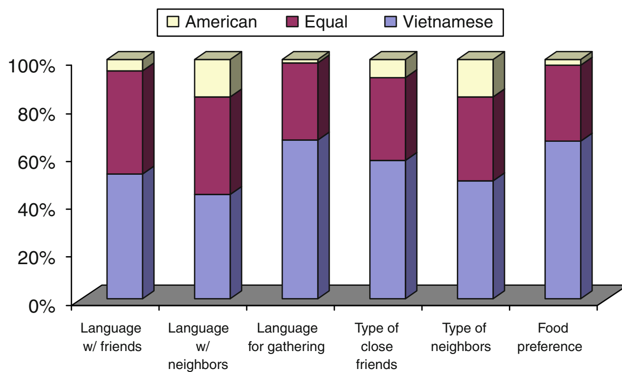

Fig. 1 Dimensions of acculturation

that was helpful to them when they needed to discuss family or/and personal issues.

Regarding acculturation, our data suggest that very few in this population could be described as "primarily American" in cultural orientation (Fig. 1). Ninety percent of the sample was fluent in Vietnamese, while only a bit over one-third (36%) was fluent in both English and Vietnamese. Similarly, about one-third (34%) had approximately equal numbers of Vietnamese and American close friends and neighbors. Less than 10% of the respondents reported that they had only or mostly American close friends, and less than 3% reported that they preferred mostly American food. Thus, the actual range of acculturation for the bulk of this population is best described as "primary Vietnamese" on one end of the spectrum and "bicultural" on the other.

Near the first anniversary of the Katrina disaster, we re-interviewed 82 of the original pre-Katrina participants. Near the second anniversary, we re-interviewed 91 of the original participants. With one exception, there are no significant differences between the individuals we re-interviewed for the two post-Katrina waves and those we did not re-interview with regard to socioeconomic status, acculturation, or our outcome measures of physical and mental health status. The one exception is marital status: individuals who were never married before Katrina were less likely to return to the New Orleans area (and thus less likely to be re-interviewed) than individuals who were married before Katrina ($P < 0.001$).[1]

Changes in Health Outcomes over Time

Table 2 describes the changes in health outcomes across the three waves: T_0 (summer 2005; pre-Katrina), T_1 (fall 2006; near the first anniversary of the disaster), and T_2 (fall 2007; near the second anniversary of the disaster). The statistical test compares the values in the post- and pre-Katrina columns and is a repeated-measures test of difference between means. Five of the eight SF-36 health subscales and both the physical and mental health component summary scores declined at a statistically significant level between T_0 and T_1 for the 80 individuals who were measured in all three waves. The subscales measuring physical health, social functioning, and mental health declined as well, but the size of the decline does not reach statistical significance. Between T_1 and T_2, physical and mental health status *increased* (improved) at a statistically significant level for six of the eight subscales and for the mental health component summary score.[2] Even more remarkably, the improvements between T_1 and T_2 brought most of these measures to a level that is statistically indistinguishable from their original levels pre-Katrina; the only exceptions were RP and GH, which remained depressed at statistically significant levels compared with their pre-Katrina values.

Our measure of depression—a scale dichotomized at the median value (four symptoms or fewer versus five or more symptoms)—increased significantly between T_0 and T_1 but by T_2 had decreased to a level indistinguishable from the level observed before Katrina (T_0).

Factors Affecting Mental and Physical Health at Baseline (T_0)

Our models predicting MCS, PCS, and depression symptoms at baseline do not perform well (see Table 3). This is likely due to the fact that our baseline sample consists mostly of adults at ages that generally experience little serious morbidity. The only significant predictor in our model for MCS is social support, which performs as expected: those with better social support were more likely to have better MCS pre-Katrina ($P = 0.02$). Our model for PCS at baseline had only two significant predictors, both of which performed as expected. Men and those who were bicultural had better PCS pre-Katrina than did women and those who were more Vietnamese in cultural orientation ($P < 0.01$).Our model for depression had no significant predictors.

Factors Affecting Mental and Physical Health at 1 Year Post-Katrina (T_1)

Table 4 describes our multivariate analyses predicting MCS, PCS, and depression symptoms for our respondents 1 year after Katrina. Our model predicting post-Katrina MCS performs very well, explaining 36% of the variance. The middle-aged ($P = 0.01$), those who held professional/

[1] See Vu et al. [40] for specific results regarding these comparisons.

[2] In fact, *all* the scores indicated improvement, but given the small sample size, the improvement did not reach statistical significance for two subscales and the physical summary scale.

Table 2 Health outcomes comparing T_0, T_1, and T_2 for complete cases ($n = 80$)

	T_0 ($n = 80$) Mean (SD)	T_1 ($n = 80$) Mean (SD)	T_2 ($n = 80$) Mean (SD)
Physical functioning	86.2 (18.9)	81.8 (22.1)[b]	88.8 (16.1)
Physical role	89.7 (26.0)[aa]	74.4 (41.1)	79.7 (37.4)[c]
Bodily pain	77.3 (15.2)[a]	69.9 (23.0)[b]	77.5 (19.5)
General health	66.9 (13.1)[aaa]	52.0 (15.5)	55.8 (21.5)[ccc]
Vitality/energy	62.2 (11.0)[aaa]	54.8 (16.0)[bb]	61.7 (17.5)
Social functioning	82.7 (19.0)	78.0 (26.0)[b]	86.3 (22.6)
Emotional role	92.1 (23.4)[aaa]	74.6 (41.5)[b]	85.8 (32.6)
Mental health	69.9 (11.8)	68.3 (15.1)[b]	74.1 (18.3)
PCS	52.1 (6.9)[aaa]	48.1 (9.8)	49.9 (9.1)
MCS	49.0 (7.0)[aa]	45.1 (11.4)[b]	49.5 (11.6)
Depression			
% (n) 1–4 symptoms	66.3% (53)[a]	51.3% (41)	61.3% (49)
% (n) $\geq$ 5 symptoms	33.7% (27)	48.7% (39)	38.7% (31)
Depression (cutoff point of 13)	4.7% (6)	8.5% (7)	6.6% (6)

PCS physical health component summary score; higher score = better health outcomes, *MCS* mental health component summary score; higher score = better health outcomes

[a] Compares T_0 and T_1

[b] Compares T_1 and T_2

[c] Compares T_0 and T_2

[a] Significant at $P < 0.05$

[aa] Significant at $P < 0.01$

[aaa] Significant at $P < 0.001$

(Similar notations are used for b and c)

business jobs before Katrina ($P = 0.01$), and those who reported severe Katrina-related property damage ($P = 0.001$) all suffered significant post-Katrina mental health declines relative to the reference categories. We also find that those who were best described as "primarily Vietnamese" in cultural orientation before Katrina fared worse than those who were categorized by our instrument as bicultural ($P < 0.01$). Pre-Katrina mental health was predictive of post-Katrina mental health at the first anniversary at a borderline statistically significant level ($P = 0.08$).

In our model for post-Katrina PCS, only one predictor is statistically significant, and only at a marginal level: those who were bicultural in cultural orientation pre-Katrina had better PCS at the 1-year anniversary ($P = 0.06$).

With regard to depression symptoms at the one-year anniversary, the middle-aged were over four times more likely to be in the "high symptoms" category than were young adults ($P = 0.03$), and those who were assessed as being less acculturated (more Vietnamese) in cultural orientation pre-Katrina were five times more likely to be in the "high symptoms" category than those categorized as bicultural ($P = 0.01$). Females were three times more likely than males to be in the worst depression category ($P = 0.06$), and those suffering severe property damage were nearly four times more likely to be in the worst depression category than those who escaped these high losses ($P = 0.01$). Being married may have had a large protective effect (OR = 0.2) against depression, but this factor was statistically significant at only a borderline level ($P = 0.08$).

Factors Affecting Mental and Physical Health at 2 Years Post-Katrina (T_2)

Multivariate analyses focusing on mental and physical health at T_2 are presented in Table 5. Focusing first on MCS, Katrina-related property damage continues to predict low MCS scores ($P = 0.01$), although the size of the penalty is slightly less than it was at T_1. Reporting a helpful relationship before Katrina predicts a higher MCS score at T_2 ($P = 0.05$). The point estimate suggests that the middle-aged may continue to fare worse than young adults on MCS scores at T_2, but the significance level becomes only borderline significant ($P = 0.13$). None of the factors in Model 2 predicts PCS at T_2. But the final model predicting depression symptoms at T_2 indicates that property damage has long-lasting effects. Those who reported severe losses

Table 3 Factors affecting MCS, PCS, and depression at T_0—multivariate analysis; $n = 128$

	Model 1 MCS		Model 2 PCS		Model 3 Depression	
	β (SE)	*P*-value	β (SE)	*P*-value	OR (95% CI)	*P*-value
Age (28–39 as ref)	0.8 (1.4)	0.57	1.2 (1.3)	0.35	0.7 (0.3–1.8)	0.49
Sex (male as ref)	−0.8 (1.3)	0.54	−3.2 (1.2)	0.008	1.7 (0.8–3.9)	0.17
Pre-K occupation (low skill as ref)	0.7 (1.3)	0.62	−1.3 (1.2)	0.27	0.8 (0.4–1.9)	0.65
Pre-K marital status (single/divorced/widowed as ref)	0.7 (1.7)	0.68	0.7 (1.6)	0.67	0.6 (0.2–1.7)	0.33
Pre-K LSFP (Vietnamese preference as ref)	1.5 (1.3)	0.26	2.3 (1.2)	0.008	0.9 (0.4–2.1)	0.79
Pre-K social support (no helpful relationship as ref)	3.3 (1.3)	0.02	−0.5 (1.2)	0.72	0.9 (0.4–2.0)	0.75
Constant	45.3 (2.4)	0.00	54.5 (2.2)	0.00	–	
R^2	0.08		0.13		–	

Pre-K prior to Hurricane Katrina, *LSFP* language, social, and food preference (acculturation scale)

Table 4 Factors affecting MCS, PCS, and depression at T_1—multivariate analysis; $n = 82$

	Model 1 MCS		Model 2 PCS		Model 3 Depression	
	β (SE)	*P*-value	β (SE)	*P*-value	OR (95% CI)	*P*-value
Age (28–39 as ref)	−6.5 (2.5)	0.01	−2.7 (2.6)	0.31	4.1 (1.1–15.3)	0.03
Sex (male as ref)	1.1 (2.3)	0.64	−3.1 (2.4)	0.21	3.0 (1.0–9.2)	0.06
Pre-K occupation (low skill as ref)	−6.1 (2.4)	0.01	−0.7 (2.5)	0.78	2.7 (0.8–9.4)	0.12
Pre-K marital status (single/separated/widowed as ref)	5.6 (4.0)	0.16	−0.5 (4.1)	0.90	0.2 (0.02–1.3)	0.08
Pre-K MCS (continuous)	0.3 (.2)	0.08	0.01 (.2)	0.96	1.0 (0.9–1.1)	0.82
Post-K housing damage (minimal as ref)	−8.0 (2.2)	0.001	−1.3 (2.3)	0.56	3.8 (1.3–11.2)	0.01
Pre-K LSFP (Vietnamese preference as ref)	7.0 (2.4)	0.005	4.7 (2.5)	0.06	0.2 (0.1–0.8)	0.01
Pre-K social support (no helpful relationship as ref)	1.2 (2.6)	0.65	−0.1 (2.6)	0.97	0.6 (0.2–2.3)	0.43
Constant	32.0 (9.6)	0.001	52.3 (10.5)	0.00	–	–
R^2	0.36		0.11		–	

were three times more likely to belong to the "high symptoms" depression category by the second anniversary of the event.

Discussion

Hurricane Katrina had significant negative impacts upon the health of Vietnamese New Orleanians. Statistically significant declines were found for five out of eight health subscales from the SF-36: role limitations due to physical health problems, bodily pain, general health, vitality, and role limitations due to emotional problems. Both of the SF-36 physical and mental health component summaries (MCS and PCS) for this population also showed statistically significant declines during the first year post-Katrina, and the variability in these summary scales was higher after the disaster than it was pre-Katrina. The prevalence of five or more depression symptoms also significantly increased by the one-year anniversary of the hurricane compared with baseline, rising from 34% at baseline to 49% at the one-year mark ($P = 0.01$).

By the second anniversary, the health recovery of this population was remarkable. All but two of the eight SF-36 mental and physical health subscales returned to levels that are statistically indistinguishable from their original pre-Katrina averages. PCS, MCS, and depression followed the same patterns. These findings are both impressive and surprising, because while many previous studies have found that mental distress was significantly elevated at 1 year post-disaster, they also found that after 2 years the recovery was still far from complete. Norris and Murrell [27], in their study of the impact of Hurricane Andrew in Dade County, Florida, found that depression symptoms remained almost unchanged after two full years post-disaster, compared with 1 year post-disaster. Not only does the rebound appear to be faster among the Vietnamese, the prevalence of common post-disaster ailments also appears to be much lower. PTSD was about 5% at the one-year mark for our sample [29]. The Vietnamese were also much

Table 5 Factors affecting MCS, PCS and depression at T_2—multivariate analysis; $n = 91$

	Model 1 MCS		Model 2 PCS		Model 3 Depression	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Age (28–39 as ref)	−4.2 (2.7)	0.13	−3.3 (2.1)	0.13	1.8 (0.6–5.4)	0.27
Sex (male as ref)	1.4 (2.6)	0.61	−2.6 (2.1)	0.20	2.2 (0.8–5.8)	0.12
Pre-K occupation (low skill as ref)	−1.3 (2.7)	0.63	0.5 (2.1)	0.81	0.5 (0.2–1.5)	0.25
Pre-K marital status (single/separated/widowed as ref)	−0.7 (4.2)	0.87	1.9 (3.2)	0.55	0.8 (0.2–3.4	0.72
Pre-K MCS (continuous)	−0.2 (.2)	0.19	0.2 (.1)	0.12	1.0 (0.9–1.1)	0.97
Post-K housing damage (minimal as ref)	−6.5 (2.4)	0.01	1.5 (1.9)	0.43	3.0 (1.2–7.8)	0.02
Pre-K LSFP (Vietnamese preference as ref)	2.6 (2.7)	0.34	2.1 (2.1)	0.31	0.5 (0.2–1.3)	0.15
Pre-K social support (no helpful relationship as ref)	5.8 (2.9)	0.05	1.0 (2.1)	0.66	0.6 (0.2–1.9)	0.39
Constant	61.7 (10.7)	0.00	40.0 (9.1)	0.00	–	
R^2	0.14		0.12		–	

faster in their return to their community post-Katrina than were whites or blacks [40].

Their rapid return, the strikingly low prevalence of PTSD, and the quick rebound in mental and physical health at 2 years post-disaster might be due to factors conducive to resilience among the Vietnamese. One source of resilience is a shared common history. The Vietnamese have experienced several dislocations during their recent history, and these hardships may well have strengthened key social relationships [24]. While the measures of social relations perform poorly in our analyses, this may be due to the small amount of variance within our population. Strong and numerous community-based organizations—religious and otherwise—may also be a source of resilience because they provide structured opportunities for interactions among the newly arrived [24, 41, 42]. The Vietnamese also show strong ties to other Vietnamese communities outside the New Orleans area [24]. Vietnamese communities in the United States have shown impressive support for the New Orleans-based Vietnamese community during the period of post-Katrina displacement. Our analyses found that more than 50% of the sample of Vietnamese New Orleanians stayed with their relatives [40] and about 50% of them evacuated to Houston, which has the second-largest Vietnamese population in the United States [40].

Our multivariate models provide important insights regarding the distribution of post-Katrina *mental* health impacts in this population.[3] The middle-aged, professionals and business owners, the unmarried, those with high Katrina-related property losses, and those who are more Vietnamese in orientation suffered poorer mental health status at the one-year anniversary of Katrina than did the comparison groups. These mental health declines are statistically significant, substantial in size, and attributable to Katrina. The latter conclusion is made possible because we have high-quality measures of health status from our respondents just prior to the event, making it possible for us to effectively rule out selection biases, i.e., the possibility that these health disadvantages already existed before the disaster. It is this possibility that plagues post hoc assessments of the health consequences of disasters. Although we were not able to re-interview 100% of the original members of our pre-Katrina cohort, we benefit from pre-Katrina assessments that can tell us to what extent their omission potentially biases our results. Fortunately, we find that those we were unable to re-interview do not differ on pre-Katrina health status compared with those we did re-interview, and this conclusion holds across our very wide range of pre-Katrina measures.

Even with the limitations imposed by a small sample size ($n = 128$), we are able to discern key risk factors in our sample for post-Katrina mental health, factors that can help target effective responses by clinicians and community leaders. As this is a tight-knit community, it is widely known who suffered the highest property losses. Targeted outreach to such individuals and families could help identify those who may need counseling, financial assistance and planning, or other services. One of the primary NGOs serving the community includes a large number of professionals and business owners; a presentation by a psychologist or social worker on how to watch for—or deal with—post-Katrina mental stress for those suffering business or career disruption could be helpful. Making families aware of the special burdens shouldered by the middle-aged members of their households could help distribute some responsibilities and duties to other members. Finally, renewed efforts to improve English language skills and to

[3] Our models predicting post-Katrina physical health status performed less well, surely due in large part to the fact that the Katrina disaster introduced a lot more variance into the post-disaster mental health outcomes than it did for the post-Katrina physical health outcomes.

help these immigrants adapt to American culture and forge closer ties with other communities—without sacrificing what is unique about their enclave and their status as Vietnamese Americans—will prepare this community for other challenges that surely lie ahead.

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