Mental Health & Psychosocial Distress *Sequelae* of Katrina: An Empirical Study of Survivors[1]

Francis O. Adeola[2]
Department of Sociology
University of New Orleans
New Orleans, LA

Abstract

This study focuses on mental health and psychosocial distress sequelae of Hurricane Katrina cataclysm among survivors. The purpose of this article is to: (1) assess the variation in psychosocial distress among the survivors of Katrina by socio-demographic, structural and situational factors; (2) determine if there are significant racial and gender differences in the extent of psychological stress, especially between Black and White, male and female survivors; and (3) to evaluate the influence of resource loss or financial burden imposed, social support, and perceived victimization on psychosocial distress among survivors. The Gallup/CNN/USA Today survey data collected in 2005 and 2006 from a representative (random) sample of Katrina survivors are used. Among the results, significant racial differences were found in psychological impacts including reported symptoms of sleeplessness, anxiety, depression, and worries about the future. In a series of multivariate analyses including factor analysis and OLS regression models, residency in Orleans parish prior to the storm, older age, female gender, having dependent children, unemployment, extent of property damage, and financial impacts sustained consistently predict psychological distress among the survivors. The theoretical, methodological, and applied policy implications of these findings are discussed.

Keywords: *Hurricane Katrina, natural-technological disasters, flood, mental health, psychosocial distress, PTSD, conservation of resources model, social support deterioration hypothesis, survivors, internally displaced population, New Orleans, the Gulf Coast*

Introduction

On August 29, 2005, Hurricane Katrina made a landfall as a category 3 storm (with maximum sustained winds of 125 mph) along the Mississippi-Louisiana state border (National Weather Service 2005; Pine 2006). From early morning through mid-day, a 15ft. to 30ft. storm surge induced by high intensity hurricane winds and high tidal waves from the surrounding bodies of water, breached several levees and other structural barriers in New Orleans, culminating in the worst cataclysm ever to hit the Orleans and adjoining parishes (National Weather Service 2005; Heerden and Bryan 2006; Adeola 2008). Other communities along the Gulf Coast of Alabama, Mississippi, and Louisiana were devastated by high intensity winds and rainfall as storm devastation extended as far as 150 miles inland. The populations were displaced and dispersed for an extended period of time.

A cataclysm or disaster manifests the moment an extreme geological, meteorological, hydrological, or a technological accident, terrorism, and other non-routine event overwhelms the capacity of a community to cope on its own without external assistance, thereby necessitating an official declaration of the community as a Federal disaster area (see Lindell and Prater 2003). Similar to Katrina, the Indian Ocean tsunami in 2004, cyclone Nargis in Myanmar/Burma that killed about 130,000 people, the earthquake in China with expected death toll exceeding 50,000 both in 2008, the terrorist attacks of September 11, 2001, and the 1986 nuclear meltdown at Chernobyl in the old Soviet Union (now Ukraine) each represents the essence of cataclysm. These adverse events have been linked directly to mental health dysfunctions and psychosocial distress including Post-Traumatic Stress Disorder (PTSD) among the surviving victims (American Psychological Association 1994; Galea and Vlahov 2005).

Katrina offers a unique opportunity for empirical investigation of the psychosocial distress symptoms among the affected population in the aftermath of such a mega disaster. The purpose of this research is to assess variation in mental health and psycho-social problems among the population impacted by Hurricane Katrina. Specifically, the study will explore the extent to which the survivors (evacuees or displaced population) of Katrina exhibited psycho-social stress symptoms during the immediate impact phase and one year post-impact phase of the disaster.[3] Furthermore, it will assess the extent to which socio-economic and demographic variables predict psychosocial distress *sequelae* of Katrina. Racial differences in measures of psychosocial dysfunctions between Black and White survivors of Katrina will be examined. Also,

this research examines the extent to which resource loss, perceived victimization, and social support influence psychosocial distress among the survivors. Following the introduction, this article proceeds by presenting the background literature, conceptual and theoretical models, and subsequently, data and methods, analysis, results and conclusion are offered respectively.

Background

The Massive Flooding of New Orleans

Shortly after Katrina's landfall, the city of New Orleans was inundated from multiple directions, first from the record-breaking rainfall (14" within 24 hrs.) and pump failure and subsequently—from the Southeast, water came from the Inter-coastal Waterway and the Mississippi River, the Mississippi River Gulf Outlet (MR-GO), and from the North, water came from the Inter-coastal (Industrial) Canal and Lake Pontchartrain—breaching the 17th Street Canal, the London Avenue Canal, the Orleans Avenue Canal, and MR-GO (Heerden and Bryan 2006, 83). Within a few hours, more than 80% of the city (as shown in Photo 1), an area of about 120 square miles was submerged in 10ft. to 20ft. of brackish water (National Weather Service 2005). The mixture of salt water with heterogeneous compounds including household wastes, sewage, highly toxic industrial chemicals, petroleum products, and oil spill makes the flood water especially deadly to any organism upon prolonged contact. Death, trauma, suffering, and extended displacement followed. These are partly blamed on slow and delayed response by the Federal government following the declaration of New Orleans and the entire Gulf Coast as a Federal disaster area; and of course, on the lack of contingency planning on the parts of the city and state governments.

Throughout the Gulf Coast, about 1.5 million people heeded warnings and evacuated ahead of the storm. About one million residents of New Orleans Metropolitan Area voluntarily evacuated and more than 100,000 residents remained in the city for a wide variety of reasons—ranging from the lack of transportation, poor health conditions, to simply not willing to abandon one's property to prevent looting. Consequently in Orleans and adjoining parishes, over one thousand people drowned and several thousand stranded victims were struggling for their lives as the whole area disintegrated into a state of chaos and anarchy in the wake of the flood. What ensued were a series of horrific scenes—from roof-tops, streets, highways, and hospitals rescue to the Super Dome and Earnest Morial Convention Center tragedy where thousands of people were left stranded for days without food, water, medicine, or power and thereby exposed to death, violence, unsanitary environments, and other traumatic life-

Photo 2. Thousands of Stranded Victims of Katrina Awaiting Rescue at the Superdome, August 31, 2005.

Photo 1. Flood water due to Breached Levees Inundated 80% of New Orleans and Destroyed Thousands of Homes and Businesses, August 30, 2005.

Photo 3. A Woman Praying for Rescue among Thousands of Stranded Victims of Katrina at the Earnest Morial Convention Center, New Orleans, September 1, 2005.

threatening circumstances (see Photos 2 & 3). In New Orleans alone, an estimated 455,000 residents lived under mandatory evacuation order for at least 33 days and over 250,000 people were evacuated to unfamiliar destinations across the country. Thousands of residents of other Gulf Coast communities in Alabama, Mississippi, and Louisiana were also forced to evacuate to various destinations across the country.

Estimating the Cost of Katrina

Hurricane Katrina is considered the costliest disaster in U.S. history with an estimated 200 billion dollars in damages to properties, businesses, and infrastructures (Blake et al. 2007). Over 1,800 deaths caused by Katrina have been reported up-to-date,[4] making it the deadliest storm in 77 years, and the third deadliest in U.S. history (Blake et al. 2007). Recent assessment found that 204,737 housing units in Louisiana were destroyed in the wake of Katrina and Rita, and in other areas along the Gulf Coast, the number of housing units destroyed included 61,386 in Mississippi, 23,199 in Florida, 12,103 in Texas, and 3,684 in Alabama respectively (U.S. Department of Housing and Urban Development (USDHUD) 2006). The number of housing units destroyed by Katrina alone was estimated at about 275,000 (McCarthy et al. 2006; USDHUD 2006; Louisiana Housing Finance Agency 2008). In Louisiana, the parishes of Orleans, St. Bernard, and Jefferson within the New Orleans Metropolitan Area suffered the worst home destruction with most homes damaged beyond repair. The Twin-spans bridges on I-10 between Slidell and New Orleans and several others collapsed and roads were impassable for months after the storm.

The destruction of more than 80% of the city of New Orleans by Katrina's storm surges and technological failures involving breaches of the levees and pump stations' failure have created conditions for unparalleled levels of post-disaster stress among the victims or survivors. With massive evacuation of over 250,000 people, and thousands of stranded survivors at the Earnest Morial Convention Center and Superdome, many residents of New Orleans suffered multiple aspects of the disaster—including physical and emotional injury, loss of loved ones, loss of pets, threat to life, loss of property and other valuable resources, forced and stressful relocation, and exposure to the grotesque (i.e., dead bodies, foul odors, loud noise, gun shots, rising toxic waters, crowds, and other unpleasant scenes). Estimating the total cost of the disaster in terms of long-term health, emotional, and psychological impacts remains to be addressed.

Disaster, Physical and Mental Health

Catastrophes of natural and technological etiologies are known to trigger physical, emotional, psycho-social, and PTSD among the victims (American Psychiatric Association 1994; Moore and Friedsam 1959; Freedy et al. 1992; Smith and Freedy 2000; Suar et al. 2002; Shultz et al. 2005; Bourque et al. 2006; Liu et al. 2006; Kumar et al. 2007). According to Kaiser and associates (1996), natural catastrophes are cataclysmic stressors that often overtaxed survivors' capacity to adapt or cope thereby disrupting their sense of safety, control, predictability, and trust (cf. Folkman and Lazarus 1991; Weisath 1993). Natural disasters such as high magnitude earthquakes, tornadoes, and high intensity hurricanes and floods are among adverse events that have been linked to elevated stress, PTSD, depression, alcohol and drug abuse, suicidal symptoms, and somatic problems among the population impacted (Adeola 2003; Ahern et al. 2005; Sattler et al. 2000; Connor and Butterfield 2003; Boscarino 2004; Galea et al. 2005; Freedy et al. 1993; Bourque et al. 2006).

Analyzing the National Co-morbidity Survey (NCS) replication conducted in Census Divisions affected by Katrina, Kessler and colleagues (2006) found that post-Katrina respondents had significantly higher estimated prevalence of mental illness than pre-Katrina subjects. In a government survey of 800 Katrina survivors in Louisiana, Mississippi, and Alabama, PTSD increased from 16% in 2006 to 21% in 2007, two years after the disaster; and about 14% of the sample exhibited symptoms of serious mental illness with an additional 20% having mild to moderate mental disorder. The state and local public health and mental health agencies in collaboration with the Center for Disease Control and Prevention (CDC) conducted an assessment of living conditions seven weeks after Katrina's landfall in Orleans and Jefferson parishes (counties) and found almost 50% of adult residents with high levels of emotional distress, suggesting the potential need for mental health services (CDC 2006, 38). For Orleans and other surrounding parishes, 8% of the subjects sampled were considered suicidal (Elias 2007, 01A).

As reported in the *New York Times* by Nossiter (2005) and Saulny (2006), at least seven residents of New Orleans had committed suicide within four months after the storm.[5] The suicide rate in the New Orleans Metropolitan Area tripled within 10 months post-Katrina and remains significantly higher than the pre-storm rate and state and national rates. Indeed, New Orleans is faced with a near epidemic of depression and PTSDs unprecedented in modern disaster history. Persistent feelings of sadness, hopelessness, despair, stress-related illnesses, depression and alcohol and substance abuse are ubiquitous. These seem beyond the impacts of 9/11, Oklahoma City bombing, Hurricanes Andrew, Hugo, and Ivan (Nossiter 2005; Saulny 2006; Kessler et al. 2006).

In the literature, traumatized survivors of mega disasters such as category 3-5 hurricanes, floods, major earthquakes, nuclear power plant accidents, and terrorist attacks such as

September 11, 2001, have been found to experience a wide range of problems encompassing adverse physical health consequences, PTSD, emotional problems, anxiety, depression, anti-social behavior, substance abuse, domestic violence and divorce (see Canino et al. 1990; Phifer and Norris 1989; Freedy et al. 1992; see Boscarino 2004; Kessler et al. 2006). After the Katrina flood, a series of other natural disasters occurred within the city of New Orleans and other communities in the Gulf Coast. These have further exposed many survivors to unprecedented levels of physical, health, emotional, and psychosocial problems. Beside the trauma recently unleashed by hurricanes, floods, and tornadoes in New Orleans, the lack of prompt response by the government, a lack of security, and the lethargic recovery due to inadequate and untimely settlement of insurance claims and gross mismanagement of the Road Home funds in Louisiana, may have created elevated levels of mental health and socio-psychological problems including PTSD and suicidality among the survivors (or victims) of Katrina.

Unlike other regions of the Gulf Coast impacted by Katrina, New Orleans' catastrophes are the products of both natural and technological agents—the powerful hurricane forced winds and storm surges induced by nature on the one hand, and the technological failures involving levee breaches and bureaucratic dysfunctions in the wake of Katrina on the other. Blaming the U.S. Army Corps of Engineers (USACE) for levee breaches that flooded the city, approximately 350,000 homeowners filed claims against USACE and about 65,000 filed a civil action law suit against this federal agency in the U.S. District Court. While acknowledging the gross negligence and incompetence exhibited by the USACE in maintaining the levees and other flood barriers in Orleans parish, this case was dismissed on the ground that the Flood Control Act of 1928 granted legal immunity to the Federal government in the event of failure of flood control projects such as levees (Nossiter 2008).

Previous studies have indicated that PTSD prevalence is generally higher after man-made or technological disasters relative to natural disasters (see Galea et al. 2005; Kaiser et al. 1996; Gill and Picou 1998). One reason for variation in PTSD outcome of these disasters is the fact that natural disasters are typically viewed as beyond human control and without anyone to blame, whereas technological disasters are considered preventable adverse events involving a specific culpable entity—e.g. individuals, group, bureaucracy, agency, or government (see Quarantelli 1993; Baum and Fleming 1993; Baum et al. 1992; Gill 2007). Research has also identified other stressful events such as exposure to war, violent conflict, terrorism, violent crime, sexual assault, and displacement or becoming a refugee, as precursors to PTSD symptoms (see Guay et al. 2006; Galea et al. 2005). Studies conducted after natural disasters reported a PTSD prevalence ranging from about 5% to 60% in the first two years after a disaster whereas PTSD prevalence in the first year after a technological disaster was reported as ranging from 25% to 75% (Galea et al. 2005, 81). With a complex of both natural and anthropogenic elements in the Katrina flood, a PTSD prevalence range of 5% to 75% within the first three to five years could be expected.

As noted by Kessler et al. (2006), based on previous studies and in light of the magnitude of the array of stressors that accompanied Hurricane Katrina (e.g., bereavement, exposure to toxic waters, dead bodies, live birth, people dying, large crowds, loud noise, gun shots, massive destruction, and threats to life), one could expect a much higher influence of Katrina catastrophe on survivors' mental health. Studies examining PTSD prevalence following a catastrophe involving both natural and technological factors are rare. Thus, as mentioned earlier, the surviving population of New Orleans and other Gulf Coast areas impacted by Katrina offers an ideal opportunity for exploring the psychosocial and PTSD symptoms *sequelae* of a natural-technological disaster.[6]

Desalvo and colleagues (2007) conducted a web-based online survey of Tulane University workforce to determine the rates and predictors of PTSD. In a multivariate analysis, they found female gender, non-black race, knowing someone who died in the storm, lack of property insurance, longer evacuation and longer commuting distance to work in the post-Katrina period, and new residence as important predictors of PTSD symptoms. Among the limitations of this study is the non-representative nature of the sample—conspicuously under-sampling African American and low-income residents most exposed to the wrath of Katrina and therefore with higher likelihood of presenting PTSD symptoms.

In a sample of 132 Katrina evacuees at the Austin Convention Center, Austin, Texas, Mills et al. (2007) found female sex, positive psychiatric history, storm-related injury, increased perception of threat to life, and decreased sense of personal control to be significantly related to acute stress disorder (ASD). Furthermore, Blacks reported greater ASD symptom severity than any other group. Given the non-probability design and small sample of this study, extreme caution must be exercised in any attempt at generalization of its results.

Socio-Demographic Factors in Disaster-Related Psychosocial Distress

In the U.S. population, the PTSD prevalence rate is 8% to 12% and about 20% of adult Americans suffer from some type of diagnosable mental disorder annually (see Cockerham 2006, 1; Connor and Butterfiled 2003). Recent empirical studies suggest that approximately 5% of men and 10% of

women under 55 years old in the country have experienced PTSD due to exposure to traumatic events (Boscarino 2004). The impact of traumatic events on individual mental health seems to be determined by a host of factors—including prior history of mental disorder, the degree of exposure to a stressful event, severity of trauma, racial/ethnic minority status, female gender, family separation, and low socio-economic status (see Connor and Butterfield 2003, 251). Severity of exposure and previous mental health problems consistently predict distress.

The disaster literature shows the correlates of disaster vulnerability to include prior distress, social class, race, gender, and linguistic or social isolation as found among minority immigrants and the elderly. These are also important factors to consider in PTSD and other psychological effects of disasters. A number of studies have shown female gender, racial and ethnic minority status, lack of education, younger age, and residency in poor neighborhood as important correlates of vulnerability to adverse impacts of disaster and PTSD outcome (see Fothergill et al. 1999; Morrow 1999; Sattler et al. 2000; Bonanno 2004; Palinkas et al. 2004; Bonanno et al. 2007; Mills et al. 2007).

Many communities of color are disproportionately affected by disasters as they tend to experience higher disaster-related deaths than any other communities experiencing the same event (see Morrow 1999; Forthergill et al. 1999; Passerini 2000). Just like the previous disasters such as Hurricanes Audrey and Andrew, Katrina devastated Black communities in New Orleans more severely than any other racial groups. Sharkey (2007) reveals a staggering disparity in death tolls between Black and White, male and female, and elderly and non-elderly populations; the death rates for Blacks were almost twice as high as those for Whites and the death rate for Blacks aged 65 years and above was 74.2 per 10,000 relative to 52.4 per 10,000 for Whites. Contrary to previous literature, the Katrina flood took the highest toll on Black males with elderly Black males having the highest death rate compared to any other demographic group (Sharkey 2007, 489). Therefore, psychosocial consequences among the surviving population both in the short-run and long-run may reflect the patterns of impacts across age, race, and sex.

It has been indicated that cultural factors such as family structure, religious beliefs, and political environment, may condition the genesis and manifestation of posttraumatic stress symptoms (Suar et al. 2002). Limited empirical studies of racial and ethnic differences in emotional and psychosocial outcome of exposure to natural disasters have produced mixed results. While Mills et al. (2007) found a substantial correlation between African American (Black) race and severity of ASD symptoms, Kessler et al. (2006) using larger and more representative samples found non-Hispanic White race, being single (unmarried), and unemployment status before the storm as significant correlates of mental illness. Similarly, DeSalvo et al. (2007) reported non-Black race, female sex, knowing someone who died in the storm, lack of property insurance, and protracted evacuation as significant predictors of PTSD. Other factors associated with adverse mental health outcomes of disaster include lower socio-economic status, being a parent, and large family size. Given the contradictory research findings on socio-demographic factors and psychosocial impacts of disasters, it is important to analyze and examine these variables more closely.

Theoretical & Conceptual Models

The common explanatory models of disaster vulnerability and psychosocial distress basically focus on four critical elements including the characteristics of the stressor, cognitive processing of the traumatic event, individual characteristics, and qualities of the environment. The existing models differ in their emphasis on various factors, but they attempt to describe the interrelationships between the characteristics of the event and the resources available to the individual for adjusting to stressful events. These models include: (1) the Conservation of Resources (COR) model and (2) the social support deterioration theory (see Freedy et al. 1992; Norris and Kaniasty 1996; Bourque et al. 2006). Each of these models is further elaborated in the following sections.

The Conservation of Resources (COR) Stress Approach

The Conservation of Resources (COR) stress model explains the impact of adverse experiences on individual psychosocial functioning after exposure to natural or technological disasters (Hobfoll 1989). As articulated by Hobfoll (1989), Freedy et al. (1992, 444; 1993, 55), and Smith and Freedy (2000, 350), the COR model asserts that the real loss or threatened/potential loss of resources leads to diminution of coping capacity and elevated psychological dysfunctions. Psychological stress is viewed as a reaction to adverse environmental conditions in which there is a net loss or threat of a net loss of resources. In other words, resource change (i.e., loss or gain) following a disaster tend to play a vital role in the elevation or reduction of stress level and psychosocial disposition of the survivors. This model further suggests that replacing lost or diminished resources would strengthen coping ability and thereby decrease stress level.

Four categories of critical resources identified include: (1) material or object resources—such as automobile, home, household items; (2) condition resources—encompassing a number of social roles such as job, marriage, organizational membership; (3) energy resources—such as time, money or

income, and information valued as tools for obtaining other resources, availability of insurance (homeowner, flood, and health insurance); and (4) personal characteristic resources—including self-esteem and worldviews such as a sense of purpose or meaning and self-efficacy. According to the COR model, environmental shocks may threaten people's status, position, economic stability, loved ones, basic beliefs, or self-esteem (see Palinkas et al. 2004, 103). Thus, it is hypothesized that the higher the extent of replenishment of lost resources, the less the degree of psychological distress (*ceteris paribus*). Also, the higher the financial burden imposed on disaster survivors, the higher the psychological distress.

The Social Support Deterioration (SSD) Model

Social capital encompassing interpersonal resources such as availability of social support and social networks has also been identified in the literature as an important correlate of coping with stressful life experiences (Bonanno et al. 2007). Social support is defined as social interactions or associations that provide individuals in distress with actual help or that encapsulate such individuals within a social system providing love, caring, or a sense of bonding to a valued social group (Hobfoll 1988; Norris and Kaniasty 1996). Lin et al. (1979, 109) define it as *any* assistance accessible to an individual (*in distress due to adverse uncontrollable event*) through social ties to other individuals, groups, and the larger communities. Receiving needed social support has been described as pivotal to maintaining psychological equilibrium by the victims of disasters and other stressful life events (Hobfoll et al. 1990). Seeking social support in the environment has been defined as an active stress management strategy (Guay et al. 2006). The social support deterioration (SSD) model asserts that diminished actual or perceived social support accounts for mental health deterioration among the survivors of a disaster.

Social support is considered an important asset in as much as it helps to enhance the preservation or recovery of other valued resources from the disaster. Empirical studies emphasize the functions of social support as a provider of emotional comfort, material resources, information sources, and psychological balance (see Kaniasty and Norris 1993; Hobfoll 1988; Barrera 1986). Thus, an inverse relationship between social support and mental health dysfunctions can be expected (Lin et al. 1979). Based on the SSD model, it is hypothesized that the more social support a disaster survivor receives, the less his/her chance of mental breakdown or psychosocial dysfunctions. Adverse effects of social support received on individual's psychological well-being have also been reported in the literature (Norris and Kaniasty 1996).

As noted by Freedy et al. (1993), natural disasters may impact the availability of social support. For instance, on the one hand a disaster may cause members of families or other community groups to rally around and provide mutually beneficial emotional and material support to the victims immediately during the disaster impact phase. But on the other hand, social capital may be over-expended leading to strained or severed social ties, especially if the disaster affects an entire community or multiple communities simultaneously as occurred with Hurricane Katrina. According to David et al. (1999, 13), even though families, friends, and neighbors often come together in the immediate aftermath of a disaster, as the days turned into weeks, and weeks turned into months, persistent physical, material, and emotional overloads are most likely to break social bonds. Katrina represents an excellent example of a disaster event that over time moves from initial pouring of spontaneous assistance to now a long-term depletion of social support—with the earlier Good Samaritans now telling the survivors: "Sorry that happened to you. The whole world is over it, so you have got to get over it and move on." Unfortunately, it is difficult for the people without a first-hand experience of the disaster to fully comprehend its emotional, psychological, and economic toll on the survivors.

According to Guay et al. (2006, 330), supportive, receptive, and nonjudgmental responses by significant others tend to help in alleviating PTSD while unsupportive, unreceptive, unsympathetic, and critical responses tend to have a negative effect on the emotional adjustment of the victims of traumatic events, thus exacerbating their psychosocial dysfunctions. The care, social, and material support offered by the authorities are also important factors attenuating psychological distress. Thus, empirical research suggests that low levels of social and material support will lead to elevated psychological distress among the survivors of a disaster; and high levels of social support will attenuate mental health dysfunctions among them. Acierno and colleagues (2007, S106) found high levels of social support in the six months preceding Hurricanes Charley, Frances, Ivan, and Jeanne in Florida in 2004 guarded against PTSD, generalized anxiety disorder, and major depressive episode. The perception of being victimized by "opportunists" or people who took advantage of the vulnerable situation of the survivors is also a critical factor elevating psychosocial dysfunctions.

The key hypotheses derived from the theoretical and empirical literature reviewed hitherto are summarized as follows:

Demographic Hypotheses:

H1 (a): Significant racial differences exist in psychosocial distress symptoms associated with Hurricane Katrina; and Katrina-induced psychosocial distress is higher among Blacks than among Whites.

H1 (b): Females are more likely to present Katrina-induced psychosocial distress than their male counterparts.

H1 (c): Families with dependent children are more likely to display higher Katrina-induced psychosocial distress relative to families with no dependent children.

H1 (d): Residency in the New Orleans Metropolitan Area prior to the storm is a direct function of Katrina-induced psychosocial distress.

Conservation of Resources & Social Support Hypotheses:

H2: The higher the financial burden on disaster survivors, the higher the extent of psychological distress.

H3: The greater the level of social support received by Katrina survivors, the lower the chance of psychosocial distress.

H4: The higher the perception of being victimized by opportunists, the greater the chance of psychosocial distress among Katrina survivors.

These hypotheses are tested in the subsequent sections of this article using the most comprehensive and representative dataset currently available on Katrina survivors.

Data and Methods

The data employed in this study came from the Gallup/CNN/USA Today/Red Cross Hurricane Katrina Survivors Surveys. The first survey was conducted between September 30 and October 9, 2005 during the immediate post-impact phase of the disaster. Approximately one year later, a follow-up survey of the same subjects was carried out from August 3 to 17, 2006. Both data sets were based on a random sample of 1,510 subjects aged 18 and above drawn from a sampling frame of approximately 460,000 Hurricane Katrina survivors. A few days after Katrina, Gallup in collaboration with CNN/USA Today and American Red Cross, conducted a random digit dialing telephone poll of Katrina victims who requested aid from the Red Cross. The help requested and received by the survivors included FEMA registration, debit card, food and water, temporary shelter, medical screening, rental assistance, mental health services, unemployment, social security and food stamp filings, legal assistance and other support services such as survivor registration and family reunification.[7]

To ensure the representativeness of the sample, Gallup conducted a pilot survey to determine how useful the sampling frame is and also obtained updated contact information for the survivors including their cell phone numbers, and allowed up to nine contact attempts during the period of the survey. Also, for sampled subjects with missing phone numbers, reverse number searches on the addresses provided were carried out. The final response rate was above 90%.

In the survey, each respondent was told by the interviewer that:

> *We are conducting a survey of individuals affected by Hurricane Katrina and your name has been randomly selected as part of a sample of all individuals who have contacted the Red Cross since Hurricane Katrina. Your responses to this survey will help to determine the personal experiences of those most affected by Hurricane Katrina. This survey is not related to your Red Cross assistance in any way—your decision to participate in the survey is purely voluntary and will have no impact on your access to services or assistance offered by the Red Cross.*

In the follow-up survey, the respondents were also told by the interviewers that: "we are conducting a survey of individuals affected by Hurricane Katrina whom we spoke with last year . . . We are conducting a follow-up survey this year and are interested in learning how people are doing one year after Katrina."

As Elliot and Pais (2006, 303) note, the Gallup/CNN/USA Today survey over sampled women by 5%, and African Americans, senior citizens, and non-homeowners by about 15%. Also, household income among respondents of the survey is about 14% lower than the 2000 census figure. Thus, it appears that African Americans and the poor were more likely to be included in the Gallup samples relative to white and affluent survivors of the storm. Nevertheless, the fact that the sampling bias is not extreme and the sheer number and diversity of subjects included imply that the survey is sufficient to accurately assess the variation in human responses to Hurricane Katrina.

Table 1 presents the socio-demographic characteristics of the sample. The racial composition consists of 39.9% Whites, 53.5% Blacks/African Americans, and 6.6% Hispanic, Asians and others. Given the small percentage of the latter groups, they are excluded in the subsequent analyses. Thus, only Black and White survivors of Katrina are used in the present analyses. The gender distribution is 39.5% male relative to 60.5% female. The majority (57.2%) of respondents were homeowners prior to the storm while 39.1% were renters and 3.1% reported living with someone (relatives or friends). Consistent with media reports, more than one-third of the sample reported total annual household income of less than $20,000, which is below the U.S. official poverty line.[8] Another 43.3% reported annual household income of $20,000 to less than $50,000 and only 14.7% reported total household income above $50,000. Overall, slightly over 54% of the sample can be classified as low-income with total an-

nual household income of less than $30,000. The age distribution is also displayed in the table with the majority falling within the range of 18 to 58 years, 9.6% in 58-68 years age bracket, and 5.7% aged 69 years and above.

Table 1. Socio-demographic Characteristics of the Sample

Variable	Percent (%)
Race:	
White	39.9
Black	53.5
Hispanic	1.5
Asian	1.7
Other	2.7
Ref./DK	0.7
Gender:	
Male	39.5
Female	60.5
Age:	
18 - 28	21.4
29 - 38	22.9
39 - 48	21.6
49 - 58	18.6
59 - 68	9.6
69 - and up	5.7
Income:	
Less than $20K	33.5
$20K - Less than $30K	20.9
$30K - Less than $50K	22.4
$50K - Less than $75K	10.2
$75K and above	7.2
Missing	5.8
Home Ownership Status:	
Home Owner	57.2
Renters	39.1
Others	3.7

N = 1,510

Analytical Strategy, Variables and Measures

Multiple analytical strategies were used in this study to test the stated hypotheses and address the research questions. First, the percentage distributions in univariate analysis serve the purpose of sample description (see Table 1). Next, bivariate and multivariate analyses—including factor analysis and Ordinary Least Squares (OLS) regression analysis were performed. To assess the acute impacts of Katrina on survivors, a CNN/USA Today/Gallup poll questionnaire item asked:

> *We would like to get some . . . specific information about your experiences in the aftermath of Hurricane Katrina. Which, if any of the following happened to you, personally, as a result of Hurricane Katrina? Please indicate "Yes, happened," "No, did not," or "I don't know," to each of the following 10 items.*

The ten items presented to the respondents are displayed in Table 2. The largest percentage of respondents (73.0%) indicated their major distress was their concern about elderly members of the family in the path of Hurricane Katrina, followed by fear for one's life (52.7%), being separated from family members (50.7%), having a damaged vehicle or material loss (40.7%), and surviving without food for at least one day (40.1%). About one-third of the respondents indicated that they did not have drinking water for at least one day and 25.2% indicated that they spent at least one night in an emergency shelter. Approximately 20% indicated that they lost a pet or had to abandon one while 7% said they were victims of a crime. Another 6.4% reported physical injury due to Katrina. There are significant racial differences in six of these acute distressful experiences with African Americans indicating that they went without food and water for at least a day, spent at least one night in an emergency shelter, had a vehicle damaged, and feared for their lives while their white counterparts were more worried about elderly family members in the path of the storm.

Table 2. Respondents' Acute Personal Experiences of Katrina

Acute Condition	Percent (%) who experienced it
Worried about elderly members in path of Katrina	73.0
Feared for my life	52.7
Were separated for at least a day from family members	50.7
Had a vehicle damaged	40.7
Went without food for at least one day	40.1
Went without drinking water for at least a day	34.3
Spent at least one night in an emergency shelter	25.2
Lost a pet or had to abandon one	19.5
Were a victim of a crime	7.0
Were physically injured or hurt	6.4

N = 1,510

Measures of Psychosocial Distress

Psychosocial distress following disasters has been conceptualized by several theoretical models (see Hobfoll 1989; Kaniasty and Norris 1993; Kaiser et al. 1996; Hobfoll et al. 1990). As aforementioned, disasters are stressful events that often result in psychosocial disequilibrium. In this study, questionnaire items that tap acute (short-term) and chronic (long-term) psychosocial distress among individual survivors of Hurricane Katrina are used.

In the first wave of the survey, respondents were presented three items (including trouble sleeping, feelings of anxiety, and feelings of depression) and were asked: "As a result of Hurricane Katrina, to what extent are you currently ex-

periencing each of these conditions, would you say (1) "a great deal," (2) "quite a bit," (3) "some," (4) "very little," or (5) "none?"" These were re-coded into "5 = a great deal," "4 = quite a bit," "3 = some," "2 = very little," and "1 = none." These items were retained in the questionnaire for the follow-up survey in 2006 with an addition of one item—"the extent to which a respondent is having difficulties in his/her marriage or other family relationships."

Two other items in the questionnaire ask respondents "Now looking ahead, how worried are you about what will happen to you (1) in the next few months and (2) in the next five years?" The response categories are: 1 = very worried, 2 = somewhat worried, 3 = not too worried, or 4 = not worried at all; once again for ease of interpretation, the coding schemes were reversed (into positive scores) with a range of 4 = very worried to 0 = not worried at all.

Factor analysis was conducted on six psychosocial distress items described above—i.e., extent to which respondents were having trouble sleeping, feelings of anxiety, depression, difficulties in family relationships, and worrying about what will happen in the next few months and in the next five years. Through principal component analysis and varimax rotation which converged in three iterations, two major components emerged with the first four items loading strongly on the first component which accounts for 54.02% of the variance and the last two items loaded strongly on the second component with 19.38% of variance explained (see Table 3). Thus, component 1, which consists of the items—"trouble sleeping, anxiety, and depression (with factor loadings of .802, .847, and .848 respectively) form the composite measure of psychosocial distress for 2005 data and one other item "difficulty in family relationships" (with factor loading of .769) was added to achieve four items to measure psychosocial distress for 2006 data. Crombach's α for these measures are .79 and .86 respectively. The composite measure of psychosocial distress was used as the dependent variable in a series of Ordinary Least Squares (OLS) multiple regression analysis conducted.

To assess Black and White differences in psychosocial distress, the means and standard deviations of the scores for each group were computed and displayed in Table 4.

Table 3. Factor Analysis of Psychosocial Distress Items

Variables	Factor Loadings Factor 1	Factor 2
Psychosocial Distress Scores*:		
Trouble sleeping	.802	——
Feelings of anxiety	.847	——
Feelings of depression	.848	——
Difficulties in family relationships	.769	——
Worried about the next few months	——	.810
Worried about the next 5 years	——	.920
Eigenvalues	3.241	1.163
Variance explained	54.02%	19.38%

*Note: The first three measures of psychosocial distress as a composite has Cronbach's α of .79 and .86 with all the four measures in factor 1 above.

Table 4. Means, Standard Deviations, & Mean Differences in Measures of Psychosocial Problems among Black and White Survivors, 2005-2006

Predictor Variables	2005 White Means (Std. dev)	Black Means (Std. dev)	2006 White Means (Std. dev)	Black Means (Std. dev)
Trouble sleeping	2.71 (1.44)	3.15*** (1.49)	2.22 (1.43)	2.80*** (1.53)
Feelings of anxiety	2.99 (1.35)	3.09 (1.38)	2.54 (1.35)	2.79** (1.38)
Feelings of depression	2.71 (1.34)	3.20*** (1.39)	2.37 (1.40)	2.73*** (1.46)
Having difficulties in family relationships	— —	— —	1.88 (1.26)	2.53*** (1.57)
Worried about what'll happen in the next few months	2.68 (1.03)	3.01*** (1.05)	2.42 (1.04)	2.60** (1.11)
Worried about what'll happen in the next 5 years	2.51 (1.00)	2.70*** (1.15)	2.45 (1.01)	2.44 (1.11)
N	602	808	602	808

The scale for the first 4 items is: 5 = a great deal, 4 = quite a bit, 3 = some, 2 = very little, and 1 = none, and 0 = I don't know; and the scale for the last 2 items is: 4 = very worried, 3 = somewhat worried, 2 = not too worried, 1 = not worried at all, and 0 = I don't know after reversed coding. ***P < .001, **p < .05 significance.

Independent Variables

Consistent with the theoretical and conceptual models reviewed, the independent variables in the OLS regression equations include residency status prior to Hurricane Katrina (New Orleans residency coded as 1, 0 otherwise), timing of evacuation (recoded as 1 = evacuated, 0 = did not evacuate), house condition at the time of the survey reversed-coded as 5 = completely destroyed, 4 = damaged so badly that you can't live in it, 3 = damaged, but you can still live in it, 2 = not damaged at all, 1 = unaware of the condition. Among the socio-demographic variables used as independent and control variables are home ownership status (dummy coded), age

measured in years from birth, total annual household income in 2004, impact of Katrina on personal finances (coded as 0 = don't know to 4 = lost everything), gender (1 = male, 0 = female), race (black = 1, white = 0), household with dependent children (dummy coded), and separation from family members (dummy coded). The social/economic support received from family members, state or local government, and persons, business or organization who went out of their ways to help (dummy coded 1 = yes, 0 = no), mental health aid received from Red Cross (dummy coded), and victimization (dummy coded as 1 = yes, 0 = no) are also included as independent variables.

Findings

The results of the OLS regression analysis and differences of the means are presented in tables 4 to 6. Starting with Table 4, African Americans are found with higher levels of psychosocial problems including trouble sleeping, having feelings of depression, anxiety, and worrying about immediate and nearest futures than their White counterparts. They also have a higher score on reported difficulties in family relationships. Thus, H1(a), which states that Katrina-induced psychosocial distress would be higher among Blacks than among Whites, is strongly supported. These findings are consistent with those reported in previous studies (see Kessler 1979; Fothergill et al. 1999; Morrow 1999; Elliot and Pais 2006; Bonanno et al. 2007).

In Table 5(a), the composite measure of psychosocial distress was regressed on several socio-demographic variables in each of the two models estimated, including New Orleans residency status prior to Katrina, evacuation timing, condition of house/apartment after the storm, home ownership status, job status, age, income, race, gender, household with dependent children, and separation from family members at any time during the disaster. The un-standardized and βeta coefficients, standard errors, and tolerance statistics calculated for each model are presented. Judging from the values of R^2 and tolerance statistics, multi-collinearity does not pose a serious threat in the analysis (see Allison 1999; Warner 2008).

Hypotheses H1(b) to H1(d) were tested with the OLS regression models in Table 5(a). New Orleans residency prior to Hurricane Katrina, being evacuated to temporary shelter, condition of the house/apartment after the devastation, and having dependent children in the household are significant positive predictors of psychosocial distress as expected. Being employed and male gender both have a negative effect on psychosocial distress as predicted. In other words, female gender has the hypothesized effect, directly predicting psychosocial distress and having a job reduces the level of psychosocial distress among the survivors. In model 2 of Table 5(a), the variable "being separated from family members" has the strongest influence (b = .512; β = .195, p < .001) on psychosocial distress and the effect of race (Black) becomes significant (b = .083, β = .015, p < .10).

Table 5(a). OLS Regression of Psychosocial Distress on Socio-Demographic Variables, 2005

	Parameters					
	Model 1			Model 2		
Independent Variables	b (βeta)	S.E.	Tol.	b (βeta)	S.E.	Tol.
New Orleans residency	.752*** (.122)	.175	.803	.621*** (.101)	.172	.795
Evacuated house/apartment	.683*** (.088)	.205	.926	.479** (.062)	.203	.909
House condition	.443*** (.060)	.195	.935	.483** (.065)	.191	.934
Home ownership	-.013 (-.014)	.028	.720	-.002 (-.014)	.027	.718
Job status (job = 1, no job = 0)	-.574*** (-.121)	.128	.881	-.522*** (-.110)	.126	.878
Age	.023*** (.123)	.005	.750	.022*** (.120)	.005	.750
Income	-.021 (-.045)	.042	.766	-.016 (-.011)	.041	.766
Gender (male = 1, female = 0)	-.752*** (-.134)	.145	.971	-.841*** (-.150)	.142	.964
Dependent children	.432*** (.079)	.156	.803	.420*** (.065)	.153	.803
Race (Black = 1, White = 0)	.221 (.040)	.157	.796	.083* (.015)	.155	.785
Separation from family	— —	—	—	.512*** (.195)	.069	.908
Intercept	5.289***	.390		4.578***	.395	
R^2	9.1%			12.6%		
F	14.144***			18.440***		
Durbin-Watson	1.986			2.006		
N	1,419			1,419		

Note: ***p < .001, **p < .05, *p < .10 significance respectively

The hypotheses derived from the COR and SSD models—i.e., H2 and H3 are tested with the OLS regression equations in Tables 5(b) and 6 respectively. In Table 5(b), the extent to which respondents are worried about what will happen to them in the next five years was regressed on socio-demographic and social support variables. The results are displayed in models 1 and 2 of the table. The results of model 1 seem consistent with those reported earlier in Table 5(a) with evacuation timing (b = .402, β = .137), male gender (b = -.182, β = -.134), New Orleans residency (b = .305, β = .131), house condition (b = .100, β = .097), household with dependent children (b = .149; β = .072), and Black race (b = .063,

Table 5(b). OLS Regression of Acute and Chronic Psychosocial Distress on Socio-Demographic Variables, 2005

	Parameters					
	Model 1 (Acute Stress)			Model 2 (Chronic Stress)		
Independent Variables	b (βeta)	S.E.	Tol.	b (βeta)	S.E.	Tol.
New Orleans residency	.305*** (.131)	.063	.865	.356*** (.114)	.085	.884
Evacuated house/apartment	.402*** (.137)	.076	.926	.567*** (.144)	.104	.933
House condition	.100*** (.097)	.097	.941	.130*** (.094)	.036	.947
Home ownership	.032 (.017)	.052	.845	.040 (.016)	.071	.851
Job status (job = 1, no job = 0)	-.066*** (-.112)	.016	.845	-.001 (-.000)	.080	.866
Age	-.003 (-.044)	.002	.786	.001 (-.008)	.003	.765
Income	-.026* (-.049)	.015	.850	-.056*** (-.076)	.020	.848
Gender (male = 1, female = 0)	-.182*** (-.134)	.054	.972	-.290*** (-.150)	.074	.974
Dependent children	.149*** (.072)	.058	.816	.211*** (.075)	.079	.816
Race (Black = 1, White = 0)	.063*** (.067)	.024	.967	.074** (.059)	.033	.967
Social support (help received)	-.166 (-.032)	.130	.989	-.274 (-.039)	.178	.988
Intercept	1.875***	.272		3.168***	.385	
R^2	12.0%			9.1%		
F	17.389***		12.749***			
Durbin-Watson	1.982		1.975			
N	1,419		1,419			

Note: ***p < .001, **p < .05, *p < .10 significance respectively

β = .067), significantly predicting psychosocial distress (p. < .001). Having a job, (b = -.066, β = -.112) and income (b = -.026, β = .049) have inverse effects on psychosocial distress. All the demographic hypotheses (H1(a) to H1(d)) are strongly supported in the model.

Model 2 of Table 5(b) uses "the extent to which respondents are worried about what will happen to them in the next five years as a dependent variable while retaining all the independent variables in model 1. With the exception of job status, the effects of all the independent and control variables remain consistent with the findings in model 1. Although social support has a negative effect on psychosocial distress, it failed to achieve any appreciable level of significance in the models. The R^2s in the two models are 12.0% and 9.1% respectively and based upon the regression diagnostics including tolerance and Durbin-Watson statistics, these models conform to the basic assumptions of OLS regression (see Allison 1999; Tabachnick and Fidell 2007; Warner 2008).

Other measures of social support were introduced along with the impact of Katrina on respondents' personal finances, and perception of being victimized during the disaster, Red Cross mental health assistance, and socio-demographic variables to predict psychosocial distress in Table 6. The composite measure derived from component 1 of the factor analysis was used as the dependent variable for model 1 and the composite measure from component 2 of the factor scores were used in model 2. Essentially, models 1 and 2 each represent acute distress and long-term distress models respectively. The results of the analysis are displayed in Table 6. Focusing on un-standardized and βeta coefficients, the most powerful and significant predictor of psychosocial distress in model 1 (column 1) of Table 6 is the impact of Katrina on personal finances (b = 1.058, β = .268), followed by perceived victimization (b = 1.723, β = .186), and financial support from family and friends (b = 1.038, β = .125), respectively significant at p < .001.

The positive effect of financial support from family and friends on psychosocial distress is open to several interpretations. First, since most family members and friends especially from the Gulf Coast or New Orleans Metropolitan area may be virtually in the same boat as any other survivors, relying on them solely during the crisis may elevate psychosocial distress. Second, as pointed out by one anonymous external reviewer, this measure may also be tapping into financial desperation, poverty, or the fact that people generally are uncomfortable taking money from friends and relatives. Nevertheless, the COR and SSD hypotheses found substantial support in the model; that is, the higher the impact of Katrina on personal finances, the higher the level of psychosocial distress; and the higher the social support received from non-family members, the less will be the level of psychosocial distress, controlling for socio-demographic factors. Mental health assistance from the Red Cross used as a proxy of prior mental health also directly affects psychosocial distress as expected (p < .05).

Among socio-demographic variables in the model, employment, income, and male gender are significant inverse predictors of psychosocial distress while age and timing of evacuation are positive but inconsistent predictors across models. The inverse relationship between income and psychosocial distress is a well-established empirical generalization in the field of mental health research (see Thoits and Hannan 1979). It is noteworthy both in models 1 and 2, that while social support from non-family members has a negative effect on psychosocial distress, financial support from family and friends tends to exacerbate psychosocial distress. Prior mental health implies a need to seek prompt mental health aid

Table 6. OLS Regression of Acute and Chronic Psychosocial Distress on Social Support, Controlling for Socio-Demographic Variables, 2006

	Parameters					
	Model 1 (Acute Stress)			Model 2 (Chronic Stress)		
Independent Variables	b (βeta)	S.E.	Tol.	b (βeta)	S.E.	Tol.
Socio-Demographic Variables:						
New Orleans residency	.677 (.072)	.398	.699	-.018 (-.013)	.149	.699
Evacuated house/apartment	.222 (.020)	.413	.885	.343** (.088)	.155	.885
Current condition of house	-.161 (-.037)	.165	.861	-.155** (-.102)	.062	.861
Job status (unemployed)	-.545*** (-.104)	.190	.959	-.028 (-.015)	.071	.959
Age	.040*** (.146)	.010	.939	-.001 (-.013)	.004	.939
Income	-.122* (-.067)	.068	.901	-.041 (-.062)	.026	.901
Gender (male = 1, female =0)	-.797*** (-.096)	.298	.967	-.347*** (-.118)	.112	.967
Race (Black = 1, White =0)	.027 (.023)	.046	.803	-.012 (-.029)	.017	.803
Financial Impact:						
Impact of Katrina on finances	1.058*** (.268)	.175	.638	.334*** (.238)	.066	.638
Social support:						
Helped by persons who went out of their way to assist	.022 (.003)	.320	.949	-.232* (-.074)	.120	.949
Financial support from family & friends	1.038*** (.125)	.310	.908	.239** (.081)	.116	.908
Aid from State & Local government	-.415 (-.042)	.357	.944	.042 (.012)	.134	.944
Red Cross mental health aid	.936** (.079)	.431	.956	.404** (.096)	.162	.956
Victimization Effect:						
Victimized by persons taking advantage of your situation	1.723*** (.186)	.347	.921	.235* (.071)	.130	.921
Intercept	3.841***	.964		3.583***	.362	
R^2	26.2%			17.3%		
F	14.889***			8.780***		
Durbin-Watson	1.946			2.040		
N	602			602		

Note: ***p < .001, **p < .05, *p < .10 significance respectively

from the Red Cross, which explains the positive influence of this variable on psychosocial distress.

To further explore the similarities or differences in sources of emotional and social support, one item in the survey which asked respondents "What if anything has helped you get through this difficult emotional time?" and which allowed them up to three open-ended responses was used. The percentage responses to each source of support and coping were calculated by race and displayed in Table 7. Also, significant racial disparities were established for each item by the chi-square calculated. Blacks were more likely to depend on prayer, faith, spirituality, church, worship, talking with others, community and neighbors as sources of emotional and social support than their white counterparts who mostly relied upon family, friends, jobs, and co-workers. Clearly, these differential sources of emotional and social support reflect differential impacts of Katrina by race as well as cultural differences between Blacks and Whites. There is no significant difference among the groups in the use of FEMA/Red Cross, private insurance, and keeping busy or getting back to routine as sources of emotional support and coping.

Table 7. Sources of Emotional and Social Support among Black and White Survivors of Katrina

Race Sources of Support & Coping	% White	%Black	%Others
Community & neighbors	42.7	54.9***	2.4
Family	49.2	45.2	5.6
Faith, spirituality, worship, Jesus, God	27.9	69.1***	3.0
FEMA/Red Cross	40.9	40.9	18.2
Friends	48.7**	41.0	10.1
Job and Co-workers	61.0***	29.3	9.8
Insurance	50.0	50.0	0.0
Keeping busy & getting back to routine	45.2	47.6	7.1
Prayer	22.1	75.5***	5.3
Talking with others	28.9	65.8***	5.3
Various organizations	40.0	55.0***	5.0
Volunteers from church	26.3	57.9***	15.8
Some other sources	36.6	53.7***	9.7

Chi-square = 103.038***. Note: *p < .001

Discussion and Conclusions

Hurricane Katrina devastation of the Gulf Coast has left its indelible imprints at various levels—from individuals to groups, social organizations, communities, culture, to government at the local, state, and federal levels. Severe emotional and psychosocial distress triggered by Hurricane Katrina occurred among the survivors—including those directly exposed to the grotesque (i.e., chaos, loud noise, exposed

dead bodies, toxic waters, gun shots, oil spills, etc.), or who experienced involuntary evacuation and relocation, loss of job, and those with indirect or secondary exposure to the devastation of their homes and communities.

As aforementioned, Katrina offers a unique opportunity to study the mental health and psychosocial distress outcome of a disaster of both natural and technological etiologies. The geographical scope of the disaster, the huge number of affected populations, the magnitude of the impacts, and representations by race, gender, class, and age make the analysis of Katrina effects on people a rare opportunity for sociological inquiry. This study explores the influence of resource loss/financial burden, social support, victimization, and socio-demographic characteristics on Katrina-induced psychosocial distress (a component of PTSD) among the survivors. Race, gender, and income differences in mental health and psychosocial distress were found. The Conservation of Resources Stress (COR) model and social support deprivation perspective shed some light on factors contributing to elevated levels of distress among the survivors in the immediate aftermath of the disaster and one year later. Using the most comprehensive and representative data set available up-to-date, hypotheses derived from the aforementioned theories were tested and substantial empirical supports were found in this study.

Among the key findings, there are significant racial and gender differences in psychosocial distress attributed to Katrina, with Blacks exhibiting a higher level of emotional and psychological distress than their White counterparts. The observation that Blacks of various characteristics (i.e., gender, age, income, etc.) were more traumatized than non-Blacks seems accurate and constitutes a valid explanation as to why the level of emotional and psychosocial distress is much higher among this group. With respect to gender, females were found to be more predisposed to psychosocial distress than males. Findings for other demographic variables also show that older age (especially elderly status), family with dependent children, loss of job or unemployment due to Katrina, poor condition of house, and being a resident of New Orleans Metropolitan area prior to the storm directly predict psychosocial distress. The positive and significant effect of victimization on psychosocial distress is also quite remarkable, with females more prone to being victimized than males. It was widely reported in the mass media that some females were victims of sexual assault, rape, and other traumas during the crisis, which further explains the higher level of psychosocial distress or PTSD among women.

Consistent with the COR perspective, the results of the analysis confirmed that the higher the impact of Katrina on personal finances, the higher the level of psychosocial distress. Also, it was established that the higher the level of income, the less the psychosocial/emotional distress (holding all other factors constant). Thus, consistent with previous studies, affluent survivors of Katrina are more able to cope and weather the storm than non-affluent individuals (Fothergill et al. 1999; Morrow 1999; Galea et al. 2005). Racial minorities with low income, in particular, were more devastated due to lack of adequate social support and hence more prone to psychosocial distress symptoms.

Among the policy implications of the findings is the need to incorporate mental health programs accessible to low-income members of the Gulf Coast in the course of rebuilding the communities. As Bolin and Stanford (1991) suggested more than a decade ago, economic recovery and social support are among the critical preconditions for emotional and psychosocial recovery. In other words, economic and social supports are absolutely required to help individual survivors achieve a healthy mental state of being. Assistance in the form of housing, employment, and counseling will help reduce the level of psychosocial distress from a clinical standpoint.

While the current research extends the body of knowledge in the field of disaster studies by presenting, analyzing, and designating a wide range of covariates for the models of disaster-induced psychosocial distress, there are some limitations that must be acknowledged. First, as it is often the case in many disaster studies, generalization of the findings across time and space beyond Katrina must be made with extreme caution. Hurricane Katrina is unique to the Gulf Coast region and Katrina flood in particular is a New Orleans and adjoining parishes' phenomenon which may be impossible to replicate somewhere else. Methodologically, the use of the PTSD scale would have been preferred to the composite measure of psychosocial distress used as the dependent variable, however, data limitation precluded the use of this measure. Nevertheless, the results of the present analysis are consistent with those that used the PTSD scale (see Palinkas et al. 2004; Galea et al. 2005; Boscarino 2004). The low percent of variance explained (i.e., R^2 of 9% to 26.2%) in the models estimated suggest the need to further the exploration of other variables that may offer more stronger and powerful explanation of either the psychosocial distress or PTSD *sequelae* of both natural and technological disasters. Data limitation also precluded sorting out the differential effects of the natural and technological components of Hurricane Katrina on respondents' psychosocial stress disposition. Future studies to overcome these limitations are strongly encouraged.

Endnotes

1. An earlier version of this paper was delivered at the 33rd Annual Meeting of the Mid-South Sociological Association, Mobile, Alabama (October 24-27, 2007).

2. E-mail: fadeola@uno.edu
3. Labeling the people forced out of New Orleans by Katrina remains problematic. For instance, the use of the terms "survivors," "victims," "evacuees," "refugees," or "displaced people" are controversial in the literature. It has been argued that labeling them as "survivors" carries too much positive connotation and does not separate those who evacuated (either voluntarily or involuntarily) from those who rode out the storm. Likewise, there are definitional problems with the use of the terms "victims," "refugees," and "evacuees," due to negative connotations attached to these terms (see Spence et al. 2007, 655). Nevertheless, the term "survivors of Katrina" was used by the CNN/USA Today/Gallup Poll in their data set used in this analysis. Thus, the terms "survivors" and "Katrina's displaced population," and "evacuees" are used interchangeably throughout this article to refer to people who evacuated their homes due to Katrina either ahead of, in the middle of, or after the storm.
4. People who committed suicide or died as a result of Katrina-related accidents are not included in the official counts of Katrina deaths.
5. Data on Katrina-induced suicides in other adjoining parishes are not readily available at the time of writing this article.
6. The natural-technological classification only applies to New Orleans Metropolitan Area; in other regions of the Gulf Coast such as Mississippi, Alabama, and Texas, Hurricane Katrina was considered a natural disaster.
7. The data set is the best currently available for the present purpose, even though it is not immune to a potential bias, especially when generalizing from Red Cross population to the universe of the population of the entire region affected. For instance, one could argue that more affluent individuals who suffered minor damage to their property may have been less likely to go to Red Cross or FEMA to register to avoid the hassle and stigma associated with charitable assistance. However, as already pointed out by Elliot and Pais (2006, 303), two important factors that helped to minimize any systematic bias include: (a) the fact that both poor and affluent survivors or evacuees registered with the Red Cross not for the purpose of receiving material assistance only but also to let families and friends know about their where-about and safety, especially when regional communication systems were down; and (b) the fact that many affluent survivors/evacuees registered with the Red Cross to give help rather than to seek material benefits. Thus, any bias due to over-representation of non-affluent groups in the sample is most likely to be negligible.
8. The U.S. official poverty threshold for a family of four was set at $20, 614 in 2006. For details, see http://www.census.gov/hhes/www/poverty/threshld/thresh06.html.

Acknowledgments

I would like to thank Professor Linda Kalof, the Editor, and the anonymous reviewers for their constructive comments and suggestions on an earlier draft of this article. All credits, interpretations, shortcomings, ambiguities and errors are my sole responsibility. This article is dedicated to all survivors of Katrina many of whom are still in a state of limbo.

References

Acierno, R., K.J. Ruggiero, S. Galea, H.S. Resnick, K. Koenen, J. Roitzsch, M. Arellano, J. Boyle, and D.G. Kilpatrick. 2007. Psychological sequelae resulting from the 2004 Florida hurricanes: Implications for post-disaster intervention. *American Journal of Public Health* 97, S1, S103-108.

Adeola, F.O. 2008. Katrina cataclysm: Does duration of residency and prior experience affect impacts, evacuation and adaptation behavior among survivors? *Environment and Behavior, Online First*, May, 1-31.

Adeola, F.O. 2003. Flood hazard vulnerability: A study of tropical storm Allison. *Flood Impacts and Adaptation Modes in Louisiana, Quick Response Research Report #162*, Natural Hazards Center: Boulder, CO. Available at: http://www.colorado.edu/hazards/qr/qr162/qr162.html.

Ahern, M., R.S Kovats, P. Wilkinson, R. Few, and F. Mathies. 2005. Global health impacts of floods: Epidemiologic evidence." *Epidemiologic Reviews* 27, 1, 36-46.

Allison, P.D. 1999. *Multiple Regression: A Primer*. Thousand Oaks, CA: Pine Forge Press.

American Psychological Association. 1994. Post-traumatic stress disorder. In *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edition, 424-429. Washington, DC: American Psychiatric Association.

Barerra, M. 1986. Distinction between social support concepts, measures, and models. *American Journal of Community Psychology* 14, 4, 413-445.

Baum, A. and I. Fleming. 1993. Implications of psychological research on stress and technological accidents. *American Psychologist* 48, 6, 665-672.

Baum, A., I. Fleming, A. Israel, and M.K. O'Keeffe. 1992. Symptoms of chronic stress following a natural disaster and discovery of a human-made hazard. *Environment and Behavior* 24, 3, 347-365.

Blake, E.S., E.N. Rappaport, and C.W. Landsea. 2007. The deadliest, costliest, and most intense United States tropical cyclones from 1851 to 2006 (and other frequently requested hurricane facts). National Weather Service, National Hurricane Center, Miami, Florida. Available at http://www.nhc.noaa.gov/pdf/NWS-TPC-5.pdf. Accessed on March 17, 2008.

Bolin, R. and L. Stanford. 1991. Shelter, housing and recovery: A comparison of U.S. disasters. *Disasters* 15, 1, 24-34.

Bonanno, G.A., S. Galea, A. Bucciarelli, and D. Vlahov. 2007. What predicts psychological resilience after disaster? The role of demographics, resources, and life stress. *Journal of Consulting and Clinical Psychology* 75, 5, 671-682.

Bonanno, G.A. 2004. Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist* 59, 20-28.

Boscarino, J.A. 2004. Posttraumatic stress disorder and physical illness: Results from clinical and epidemiologic studies. *Annals of N.Y. Academy of Science* 1032, 141-153.

Bourque, L.B., J.M. Siegel, M. Kano, and M.M. Wood. 2006. Weathering the storm: The impact of hurricanes on physical and mental health. *Annals of the American Academy* 604, 129-151.

Caldera, T., L. Palma, U. Penayo, and G. Kullgren. 2001. Psychological impact of the hurricane Mitch in Nicaragua in a one-year perspective. *Social Psychiatry & Psychiatric Epidemiology* 36, 3, 108-114.

Canino, G., M. Bravo, M. Rubio-Stipec, and M. Woodbury. 1990. The impact of disaster on mental health: Prospective analyses. *International Journal of Mental Health* 19, 51-69.

Center for Disease Control and Prevention (CDC). 2006. Assessment of health-related needs after Hurricanes Katrina and Rita—Orleans and Jefferson Parishes, New Orleans area, Louisiana, October 17-22, 2005. *MMWR* 55, 2, 38-41.

Cockerham, W.C. 2006. *Sociology of Mental Disorder.* Upper Saddle River, NJ: Pearson/Prentice Hall.

Connor, K.M. and M.I. Butterfield. 2003. Posttraumatic stress disorder. *Focus* 1, 3, 247-262.

David, S.D., S. Baish, and B.H. Morrow. 1999. Uncovering the hidden costs of coastal hazards. *Environment* 41, 8, 11-19.

DeSalvo, K.B., A.D. Hyre, D.C. Ompad, A. Menke, L.L. Tynes, and P. Muntner. 2007. Symptoms of posttraumatic stress disorder in a New Orleans workforce following Hurricane Katrina. *Journal of Urban Health: Bulletin of the New York Academy of Medicine* 84, 2, 142-152.

Elias, M. 2007. Katrina victims struggle mentally. *USA Today*. August 16, 01A.

Elliot, J.R. and J. Pais. 2006. Race, class, and Hurricane Katrina: Social differences in human responses to disaster. *Social Science Research* 35, 295-321.

Folkman, S. and R.S. Lazarus. 1991. Coping and emotion. In A. Monat and R.S. Lazarus (eds), *Stress and Coping: An Anthology*, 207-227. New York: Columbia University Press.

Fothergill, A., E.G.M. Maester and J.D. Darlington. 1999. Race, ethnicity and disaster in the United States: A review of the literature. *Disasters* 23, 2, 156-173.

Freedy, J.R., D.G. Kilpatrick, and H.S. Resnick. 1993. Natural disasters and mental health: Theory, assessment, and intervention. *Journal of Social Behavior and Personality* 8, 5, 49-103.

Freedy, J.R., D.L. Shaw, M.P. Jarrell and C.R. Masters. 1992. Towards an understanding of the psychological impact of natural disasters: An application of the conservation of resources stress model. *Journal of Traumatic Stress* 5, 3, 441-454.

Galea, S. A. Nandi, and D. Vlahov. 2005. The epidemiology of post-traumatic stress disorder after disasters. *Epidemiologic Reviews* 27, 1, 78-91.

Gill, D.A. 2007. Secondary trauma or secondary disaster? Insights from Hurricane Katrina. *Sociological Spectrum* 27, 6, 613-632.

Gill, D.A. and J.S. Picou. 1998. Technological disaster and chronic community stress. *Society and Natural Resources* 11, 795-815.

Guay, S., V. Billet, and A. Marchand. 2006. Exploring the links between post-traumatic stress disorder and social support: Processes and potential research avenues. *Journal of Traumatic Stress* 19, 3, 327-338.

Heerden, I.V. and M. Bryan. 2006. *The Storm: What Went Wrong and Why during Hurricane Katrina*. New York: Viking.

Hobfoll, S.E. 1988. *The Ecology of Stress*. New York, NY: Hemisphere Press.

Hobfoll, S.E. 1989. Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist* 44, 3, 513-524.

Hobfoll, S.E., J. Freedy, C. Lane, and P. Geller. 1990. Conservation of social resources: Social support resource theory. *Journal of Social and Personal Relationships* 7, 465-478.

Kaiser, C.F., D.N. Sattler, D.R. Bellack, and J. Desin. 1996. A conservation of resources approach to a natural disaster: Sense of coherence and psychological distress. *Journal of Social Behavior and Personality* 11, 3, 459-476.

Kaniasty, K. and F.H. Norris. 1993. A test of the social support deterioration model in the context of natural disaster. *Journal of Personality and Social Psychology* 64, 3, 395-408.

Kessler, R.C. 1979. A strategy for studying differential vulnerability to psychological consequences of stress. *Journal of Health and Social Behavior* 20, 2, 100-108.

Kessler, R.C., S. Galea, R.T. Jones, and H.A. Parker. 2006. Mental illness and suicidality after Hurricane Katrina. *Bulletin of the World Health Organization* 84, 12, 930-939.

Kumar, M.S., M.V. Murhekar, Y. Huttin, T. Subramanian, V. Ramachandran, and M.D. Gupte. 2007. Prevalence of post-traumatic stress disorder in a coastal fishing village in Tamil Nadu, India, after the December 2004 Tsunami. *American Journal of Public Health* 97, 1, 99-101.

Lin, N., R.S. Simeone, W.M. Ensel, and W. Kuo. 1979. Social support, stressful life events, and illness: A model and an empirical test. *Journal of Health and Social Behavior* 20, 2, 109-119.

Lindell, M.K. and C.S. Prater. 2003. Assessing community impacts of natural disasters. *Natural Hazards Review* 4, 4, 176-185.

Liu, A., H. Tan, J. Zhou, S. Li, T. Yang, J. Wang, J. Liu, X. Tang, Z. Sun, and S.W. Wen. 2006. An epidemiologic study of post-traumatic stress disorder in flood victims in Hunan China. *Canadian Journal of Psychiatry* 51, 6, 350-354.

Louisiana Housing Finance Agency (LHFA). 2008. *Louisiana and New Orleans Metro Housing Needs Assessment*. New Orleans, LA: GCR & Associates.

McCarthy, K., D.J. Peterson, N. Sastry, and M. Pollard. 2006. *The Repopulation of New Orleans after Hurricane Katrina*. Technical Report, RAND Gulf States Policy Institute, Santa Monica, CA: RAND. Available at: http://www.rand.org/pubs/technical_reports/2006/RAND_TR369.pdf.

Mills, M.A., D. Edmondson, and C.L. Park. 2007. Trauma and stress response among Hurricane Katrina evacuees. *American Journal of Public Health* 97, S1, S116-123.

Moore, H.E. and H.J. Friedsam. 1959. Reported emotional stress following a disaster. *Social Forces* 38, 2, 135-139.

Morrow, B.H. 1999. Identifying and mapping community vulnerability. *Disasters* 23, 1, 1-18.

National Weather Service (NWS). 2005. *Post Storm Data Acquisition Aerial Wind Analysis and Samage Assessment Hurricane Katrina*. Available at: http://www.nws.noaa.gov/om/data/pdfs/katrinaPSDA.pdf. Accessed on March 17, 2008.

Norris, F.H. and K. Kaniasty. 1996. Received and perceived social support in times of stress: A test of the social support deterioration deterrence model. *Journal of Personality and Social Psychology* 71, 3, 498-511.

Nossiter, A. 2008. In court ruling on floods, more pain for New Orleans. *The New York Times*. Available at: http://www.nytimes.com/2008/02/01/us/01corps.html. Accessed on February 1, 2008.

Nossiter, A. 2005. Hurricane takes a further toll: Suicides up in New Orleans. *The New York Times*. Available at: http://www.nytimes.com/2005/12/27/nationalspecial/27suicides.html. Accessed on April 3, 2008.

Palinkas, L.A., J.S. Petterson, J.C. Russell, and M.A. Downs. 2004. Ethnic differences in symptoms of posttraumatic stress after the Exxon Valdez oil spill. *Prehospital and Disaster Medicine* 19, 1, 102-112.

Passerini, E. 2000. Disasters as agent of social change in recovery and reconstruction. *Natural Hazards Review* 1, 2, 67-72.

Phifer, J.F. and F.H. Norris. 1989. Psychological symptoms in older adults following natural disaster: Nature, timing, duration, and course. *Journal of Gerontology* 44, 207-217.

Pine, J.C. 2006. Hurricane Katrina and oil spills: Impact on coastal and ocean environments. *Oceanography* 10, 2, 37-39.

Quarantelli, E.L. 1993. Technological and natural disasters and ecological problems: Similarities and differences in planning for and managing them. Paper Presented at the Colloquium on Challenges of Technological and Ecological Disasters, May 11, Mexico City, Mexico.

Sattler, D.N., C.F. Kaiser, and J.B. Hittner. 2000. Disaster preparedness: Relationship among prior experience, personal characteristics, and distress. *Journal of Applied Psychology* 30, 7, 1396-1420.

Saulny, S. 2006. A legacy of the storm: Depression and suicide. *The New York Times*. Available at http://www.nytimes.com/2006/06/21/us/21depress.html. Accessed April 3, 2008.

Schultz, J.M., J. Russell, and Z. Espinel. 2005. Epidemiology of tropical cyclones: The dynamics of disaster, disease, and development. *Epidemiologic Reviews* 27, 21-35.

Sharkey, P. 2007. Survival and death in New Orleans: An empirical look at the human impact of Katrina. *Journal of Black Studies* 37, 4, 482-501.

Smith, B.W. and J.R. Freedy. 2000. Psychosocial resource loss as a mediator of the effects of flood exposure on psychological distress and physical symptoms. *Journal of Traumatic Stress* 13, 2, 349-357.

Spence, P.R., K.A. Lachlan, and J.M. Burke. 2007. Adjusting to uncertainty: Coping strategies among the displaced after Hurricane Katrina. *Sociological Spectrum* 27, 6, 653-678.

Suar, D., M.K. Mandal, and R. Khuntia. 2002. Supercyclone in Orissa: An assessment of psychological status of survivors. *Journal of Traumatic Stress* 15, 4, 313-319.

Tabachnick, B.G. and L.S. Fidell. 2007. *Using Multivariate Statistics*. New York, NY: Allyn & Bacon/Pearson.

Thoits, P. and M. Hannan. 1979. Income and psychological distress: The impact of an income-maintenance experiment. *Journal of Health and Social Behavior* 20, 2, 120-138.

U.S. Department of Housing and Urban Development. 2006. Funding for recovery in the hurricanes' wake, Part I. *Research Works* 3, 9, 1-7.

Warner, R.M. 2008. *Applied Statistics: From Bivariate Through Multivariate Techniques*. Los Angeles, CA: Sage Publications.

Weisath, D.S. 1993. Disasters: Psychological and psychiatric aspects. In L. Golberger and S. Breznitz (eds.), *Handbook of Stress: Theoretical and Clinical Aspects*, 591-616. New York: Free Press.