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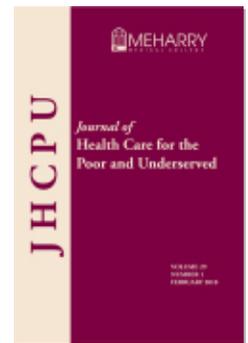
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Post-Disaster: A Mixed Methods Approach

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## Examining Long-Term Mental Health in a Rural Community Post-Disaster: A Mixed Methods Approach

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*Abstract:* Psychological stressors have been observed immediately following disasters, yet less is known about the long-term effects on the mental health of vulnerable communities. In 2005, Graniteville, S.C. was ravaged by a train derailment that leaked approximately 60 tons of chlorine gas and left several people dead in the small community. The purpose of this study was to examine the mental health of Graniteville-area residents in the nine years following the train disaster using a mixed methods approach. Using the photovoice method, participants reported compromised mental health with symptoms consistent with depression, post-traumatic stress disorder, fear, and anxiety. Medical records analysis indicated that mental health-related hospital encounters generally increased post-disaster. Mental health concerns should be anticipated in the long-term aftermath of disasters. Addressing these concerns is particularly vital in resource-poor communities. Our findings can be useful in developing mental health disaster management protocols and policies for communities in the long-term post-disaster period.

*Key words:* Rural, mental health, disaster, mixed methods, photovoice.

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A growing body of literature identifies the mental and emotional impacts of both natural and technological disasters.<sup>1-3</sup> Post-traumatic stress disorder (PTSD), depression, anxiety, and other psychological problems have been observed in the immediate aftermath of such disasters.<sup>4-6</sup> Grattan and colleagues<sup>7</sup> examined the early mental health impacts of the 2010 Deepwater Horizon oil platform explosion and spill and found elevated levels of anxiety and depression among Gulf Coast residents, with significantly higher levels of anxiety and depression among those who suffered income losses as a result of the disaster. In Japan, in the days following the earthquake of 2011, assessments with survivors in 73 evacuation centers indicated that psychological support was a priority need, which prompted the dispatch of mental health teams to address these needs.<sup>8</sup> As part of the disaster response efforts in Haiti after the earthquake of 2010, a national mental health response effort was initiated and coordinated by Haiti's Ministry of Health and the global health organization, Partners in Health, to meet the mental health demand of earthquake victims.<sup>5</sup> These examples illustrate both the need and demand for mental health services for survivors post disaster.

While initial disaster response has yielded a focus on acute mental health concerns, studies have also associated disasters with long-term mental health consequences. One example is the Chernobyl nuclear power plant disaster whereby researchers documented elevated rates of depression and PTSD, particularly among first responders, over two decades after the disaster.<sup>9</sup> Similarly, Brackbill and colleagues<sup>10</sup> identified high rates of PTSD among victims of the World Trade Center collapse six years post-disaster. Mee-wisse et al.<sup>11</sup> found mixed mental disorder trajectories in survivors of a huge fireworks factory explosion in the Netherlands; though prevalence of psychiatric disorders had declined by Year 4 post-disaster, there were still notable numbers of individuals with PTSD, major depression, and specific phobias. It is clear that the long-term mental health demands following disasters present challenges in terms of sustained response to meet the needs of those affected. In fact, Runkle et al.<sup>12</sup> propose that long-term impacts of disasters result in a secondary surge, with increases in long-term health needs that compel health care systems to address these needs.

In January 2005, the 7,000 residents of Graniteville, S.C., a small, rural, unincorporated town in South Carolina, were victims of one of the worst exposures to chlorine gas in U.S. history.<sup>13</sup> A freight train derailment and subsequent tank car eruption resulted in the release of approximately 60 tons of chlorine gas into this small rural community. As a result, nine people died, and at least 550 residents sought immediate medical assistance due to direct exposure to the chlorine gas.<sup>14-16</sup> Additionally, an estimated 5,400 residents were evacuated the day after the accident, and schools were closed for up to three weeks.<sup>14-16</sup> Chlorine releases are particularly hazardous and toxic, and the chemical has been used as a weapon of terrorism in some settings.<sup>17-21</sup> Prior to the disaster, Graniteville was already an under-resourced community. Graniteville is located near the Georgia border, and the closest city (approximately 138,000 people) is nearly 15 miles southwest. At the time of the accident, the socioeconomic landscape of Graniteville resembled that of many small rural towns. Residents depended upon local textile manufacturing as a primary source of employment and, beyond this, there was limited access to resources. The Gregg division plant, one of several Avondale Mills plants, had a 160-year history of employing generations of families in the town

and after the accident, over 1,600 of the 4,000 jobs lost were held by Graniteville area residents.<sup>22</sup> According to the U.S. Department of Health and Human Services Health Resources and Services Administration's Index of Medical Underservice, Graniteville qualifies as a medically underserved area (MUA)<sup>23</sup> and has been formally designated as a Health Professional Shortage Area.<sup>24</sup> Such a designation is an indication of the location's limited health resources including few medical facilities, providers, specialty practices, and lack of technological innovations, which contribute to the insufficient provision of basic health care services.<sup>24</sup> More specifically, MUAs have a shortage of primary care health services for residents within a defined geographic area. Given that rural areas are often isolated geographically, residents are required to travel greater distances to receive medical care, including follow-up care for chronic diseases, and specialty care such as mental health services.<sup>25-27</sup> The burden of inadequate health care faced by individuals residing in Graniteville was even more apparent during the recovery phase immediately following the chlorine spill. The additional demands created by the occurrence of this disaster in an MUA may have also created greater long-term health risks,<sup>28</sup> particularly mental health risks, for local residents.

While researchers have noted the immediate impact that disasters can have on the mental health of survivors, less is known about the longer-term aftermath, with even less information about the impact of such events on the most vulnerable, poorly-resourced communities. The aim of this study was to gather information concerning the mental health of Graniteville area residents in the nine years following the train disaster of 2005 from two sources: qualitative data obtained from community residents and quantitative data obtained from medical records. We used a mixed methods approach in order to capture multiple perspectives about the mental health status of the Graniteville community post-disaster.

## Methods

**Overview.** Mixed methods research involves the collection of data from multiple sources using qualitative and quantitative methods whereby important inferences can be drawn from analyzing and interpreting the findings from both methods in a single study.<sup>29</sup> This approach allows for a more comprehensive, robust analysis than either single approach could offer alone, often yielding important nuances of a phenomenon to be investigated.<sup>30,31</sup> For this study, we used the qualitative method photovoice, a method of inquiry wherein a photograph provides the researcher with valuable insights into the cultural practices and lived experiences of individuals and communities.<sup>32-35</sup> Our quantitative analysis was performed using hospital discharge data collected for a 13-year period (including three years pre-disaster and nine years post-disaster) for residents living in Graniteville and neighboring areas at the time of the disaster to ascertain the annual occurrence of notable mental health events (hospital admissions and emergency room visits) pre- and post-disaster. Each approach is described in more detail below. All study procedures were reviewed and approved by the principal investigator's Institutional Review Board (IRB).

**Photovoice.** *Study sample.* A purposive sample of Graniteville and surrounding area residents was invited to participate in a photovoice project. Persons were eligible to

participate if they were residents of the Graniteville and surrounding areas who were 18 years of age or older at the time of the study, lived in the area at the time of the 2005 train disaster, and were interested in talking about how the disaster affected their health and the health of their community. Participants were recruited between January and October of 2012 via announcements at community events, local print media, mailed recruitment flyers to community residents, and posted recruitment flyers in frequented locations in the community.

*Procedure.* From February to October 2012, we convened five photovoice cohort groups with 3–10 participants in each cohort. Before taking any photos, each participant received an overview of the project which included information about the purpose of the project (to elicit information about the long-term impact of the Graniteville train disaster), the ethics of photography, and instruction on using a digital camera (later loaned to them for project use). Additionally, participants completed a brief demographic survey. Items included age, gender, race, educational level, employment status, and perceived level of chlorine exposure.

A photovoice protocol was developed by the research team detailing activities to aid facilitators in implementing the sessions. Each participant attended at least three 90-minute sessions and learned of the project research questions in the form of three photo assignments. Participants were asked to take photos in response to the following questions: 1) How has the train disaster affected your health and the health of your community? 2) How has the train disaster affected your access to health care? and 3) How has the train disaster affected your quality of life?

Participants were asked to take 2–10 photos for each photo assignment. After each assignment, photos were processed and printed by project staff and given to participants during each session to allow for discussion. Participants discussed their photos using the SHOWeD method which is guided by five questions: (1) What do you See in the photograph?, (2) What is Happening in the photograph?, (3) How does this photograph relate to Our lives or other members in the community?, (4) Why do these issues currently exist within the Graniteville community?, and (5) What can we Do about these issues?<sup>36–38</sup> After each participant discussed his/her photos, the entire group discussed the themes that emerged during the photo presentation. Each theme was noted and linked back to participant photos for verification by the group before the end of the session. Participants received a \$60 incentive (incrementally dispersed at each session) for their time. Photovoice sessions were video- and audio-recorded, with audio recordings transcribed verbatim. Additional details about the photovoice methods used have been published elsewhere.<sup>35</sup>

*Data analysis.* After each photovoice session, the digital audio recordings were transcribed verbatim. Video recordings were reviewed in order to link photos with participant descriptions. Afterward, team members reviewed the data to identify dominant themes. After identifying themes, data were coded within and across the different sessions. Mental health-oriented themes are presented in this paper.

**Hospital discharge records.** *Study sample.* The study data for this component included inpatient and emergency room discharges (2002–2014) for patients from area health care facilities in Graniteville (ZIP code 29829) and neighboring areas (ZIP codes 29801, 29816, 29828, 29834, 29850, and 29851). The *exposed group*, that is, those

individuals residing in areas closest to the spill and the resultant plume, contains people residing in ZIP codes of 29829, 29851, 29801 and 29850, while the neighboring areas—a comparatively less exposed group (hereafter referred to as *less exposed*)—contain those residing in ZIP codes of 29816, 29828, and 29834.

We used Uniform Billing-92 data in the conduct of our analysis, which includes hospital discharge data collected by the state of South Carolina. Hospitals in the state (with the exception of Veterans Administration and Military Hospitals) are legislatively mandated to submit all hospital encounter information to the South Carolina State government. The legislation also requires at least 97% accuracy which ensures the quality of the data. Regardless of where the hospitalization occurred, individuals can be linked to their ZIP code of residence. We examined hospital discharge data for a total of 13 years: three years prior to the disaster, the year of the disaster, and nine years after the disaster. No personal health information or identifying data were given to the investigators.

The dataset includes patient characteristics, diagnoses, services received, and provider information. Target diagnoses included in the assessment of hospital discharge records were chlorine-related, respiratory, and mental health conditions; however, for the purposes of this study we only present the mental health findings. The mental health diagnoses were for diverse conditions including schizophrenic disorder, major depressive disorder, other psychoses, anxiety states, neurotic depression, alcohol dependence syndrome, drug dependence and nondependent use of drugs, acute reaction to stress and adjustment reaction, depressive disorder not elsewhere classified, attention deficit disorder, and other mental disorders. South Carolina has agreements with North Carolina and Georgia, so that if a South Carolina resident visited a Georgia or North Carolina hospital, those data were included as well. This is particularly relevant for the current study because of Graniteville's proximity to Augusta, Georgia, which is a major health care service provider in the area.

*Data analysis.* Descriptive statistics were calculated and bivariate and multivariate analyses were performed. As the variables were categorical, chi-square tests were conducted to study the association and difference between variables. To model the hospital discharges which were count data, the multivariate Poisson model was used, where the generalized estimating equation (GEE) method was used for parameter estimation which marginalized the repeated measures (hospital discharges) for each patient over years. The over-dispersion was tested to ensure the appropriateness of using a Poisson model. All data analysis was performed using SAS Version 9.4 software. Copyright © 2013 SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, N.C., U.S. The significance level was set at .05.

## Results

**Photovoice.** *Demographic characteristics.* Table 1 highlights the demographic characteristics of the photovoice participants. The mean age of participants was 50 years and the majority were female (68.0%) and Black (72.0%). The highest level of education achieved ranged from elementary school through bachelor's degree, with nearly half

**Table 1.****DEMOGRAPHIC CHARACTERISTICS OF PHOTOVOICE PARTICIPANTS (N=25)**

Characteristic	N (%)
Age	
Mean Age (Years)	50
Age Range (Years)	18–87
Gender	
Male	8 (32.0)
Female	17 (68.0)
Race	
Black	18 (72.0)
White	4 (16.0)
Other	3 (12.0)
Education Level	
High School (No Diploma) or less	2 (8.0)
High School Diploma	12 (48.0)
Some College, No Degree	8 (32.0)
College Degree	3 (12.0)
Current Employment Status	
Employed	8 (32.0)
Unemployed	12 (48.0)
Retired	5 (20.0)
Perceived Level of Exposure	
Not Exposed	5 (20.0)
Exposed	20 (80.0)

having earned a high school diploma (48.0%). Participants were primarily unemployed (48.0%). When asked their perceived level of exposure to the accident, most residents reported being exposed in some way (80.0%).

*Photovoice themes.* One of the most prominent themes regarding how the train disaster continued to affect community residents in the seven years post-disaster was their ill health, and in particular their compromised mental health. Participants noted symptoms consistent with depression, PTSD, and anxiety, all of which are illustrated in the following paragraphs. Most often, these were linked to grief as a result of the death of family and friends, the loss of employment associated with the subsequent closing of the textile mill that was the site of the accident, and the overall traumatic nature of the event.

*Mourning death of loved ones.* Several of the participants either had family members, close friends, or acquaintances who died as a result of the accident. For example, one participant's cousin died in the accident. She described how she mourned her cousin's death in the immediate aftermath, yet it was seeing an image from the accident site shown on a national television news report that re-awakened many of those emotions.



Figure 1. Photo taken outside of the abandoned mill, site of the train accident.

Figure 1 is a photo taken by the participant. In describing the photo, she stated, “Out of everything that I saw, I think probably the very worst thing that I saw after all of this was when *Dateline* did their little piece. I had kind of rocked on through it after the initial craziness, and I saw my cousin’s body, they had pictures, and I saw his body laying there at the bottom of the thing to crawl through, and they had blotted out his face. Then they showed his wristwatch, and I think that will always . . . [*Cries*] What a hell of a way to die.”

As a tribute to those who lost their lives in the accident, a monument was placed at the site of the accident with the victims’ names. While this serves as a fitting memorial to some, some community residents expressed concern that there were victims of the accident whose names were not represented. These are people who may not have taken their last breath at the site of the accident, yet whose health was so severely compromised as a result of the chlorine exposure that they met their demise as a result. As one participant noted: “Those are the ones that lost their lives, minus one. There should be another one up there and I am forever going to holler about, I don’t care where we at or what time we show up . . . because he was the last one to pass away from that.”

*Devastation associated with loss of employment.* The train derailment occurred near the Avondale Mills textile plant in Graniteville. Many participants described the mill as the heart of the community. Not only was it a source of employment for over 160 years for generations of families in the area, it was cherished as a source of opportunity and enhanced quality of life for those in the town. While it was rumored that plans

for closing the mill had already begun prior to the accident, the disaster was the final death knell and the plant closed its doors soon after. One participant photographed a former major thoroughfare that flanked several service buildings of Avondale Mills (Figure 2). As he described: "It's very depressing. I know for me, I don't have all the years that a lot of people have in the mills, but like I said, when I drove over the hill the first time and I saw the mill, because I had just left the military, I came up here from Charleston, and I was making \$7.68 an hour. And I was like, man, I've really got a good job now and I'm working for a good company. And now when I drive down that street today, it's kind of sad, it really is sad."

One participant photographed a former entryway at the mill (Figure 3). He vividly described the feeling that he had while working there and how the accident and subsequent mill closing was a loss. He stated: "And this right here, this is where you start off into the company. When you walk through that door right there, you're looking for a job. That door is always open, and the people were friendly. And when they left, it just seemed like the whole place . . . I go by there now and I stand and look at that. The picture right here, it was my gateway to a real job. Before I went in the army I was working here. Then when I came back I went through these same gates, to the same people, and they welcomed me back to a job and everything. They were nice. But somehow or another, when Graniteville company went down, it was just like you know, it didn't feel right."



Figure 2. Photo taken from a former major thoroughfare adjacent to the service buildings of the Avondale Mills, site of the accident.



Figure 3. Former entryway of Avondale Mills.

*Enduring trauma.* Death and loss of employment can be tangible facets of a traumatic event, but there were impacts felt in other less visible but no less significant ways. One participant photographed her wedding rings and described how she felt that the accident affected her marriage (Figure 4). She stated: “I took a picture of this because my husband and I had only been married four months at the time of the train incident and so basically our whole first year of our marriage was very stressful and difficult. He wasn’t in town during the train accident so because I was so upset at first about everything that was going on, he actually handled a lot of things for me. But as you can imagine, if you ever go through something like this in the first six months of when you’re married to somebody it changes how you know the—your marriage. It changes how you—how you are and who you’re with. You should have a pretty happy-go-lucky first year just wanting to live with each other but we had to deal with this.”

Some participants expressed concerns about the mental health of their children and the impact that the accident would have on them. One participant stated: “I had to take *Thomas the Train* down out of his room when we finally got back home. My son loved trains. He had five train sets. I had to get rid of all the train sets. When that train come through the first time, my son nearly—he was like five. He literally ran through the house screaming, shaking. He’s scared to death of trains now.”

Another participant described an effect of the accident manifesting as a sensitivity to certain smells that are triggered when she least expects. She stated: “I’m pretty blessed. Most of my effects passed after about three years. The one that lasted with me



Figure 4. Engagement and wedding rings of photovoice participant.

the longest, however . . . was I was very sensitive to strong smelling things whether it was good or bad and . . . even now I don't clean with products that have bleach in it because I can't handle the smell. And you wouldn't think normally that would be a big deal, but if you get in an elevator with someone with a lot of perfume, you can actually start having symptoms of anxiety just from smelling. I don't really know how to treat that. I don't know if that's psychological or what. I'm not really sure. It's not as bad with me as it used to be, but it's still there."

**Hospital discharge records.** Demographic characteristics for hospital discharge records for years 2002 through 2014 are presented in Table 2. In total, there were 2,882 hospital discharges for all major mental disorders among 2,421 people within the seven selected ZIP codes in Graniteville and the neighboring areas spanning from year 2002 to year 2014.

During the observation period, there was a general increase in the number of hospital discharges. Females consistently had a slightly higher percentage of discharges than did males, with the exception of the years 2005–2007. The race percentages were consistent over time, with about one-third of the discharges occurring among African Americans, slightly less than two-thirds among Whites, and the remainder occurring among those of other racial/ethnic origins. Discharges among the four age categories changed somewhat over the time period, with a decrease in 2005 and thereafter in discharges for those age 5–17 years, and an increase in discharges for those 65 years and older in 2012 and thereafter. Most discharges occurred among those aged 18–64 years. Insurance status changed dramatically pre-disaster (2002–2004) compared with post-disaster (2005–2014), with a decrease among those insured by employer or on Medicaid, and an increase among those who were indigent or self-paid.



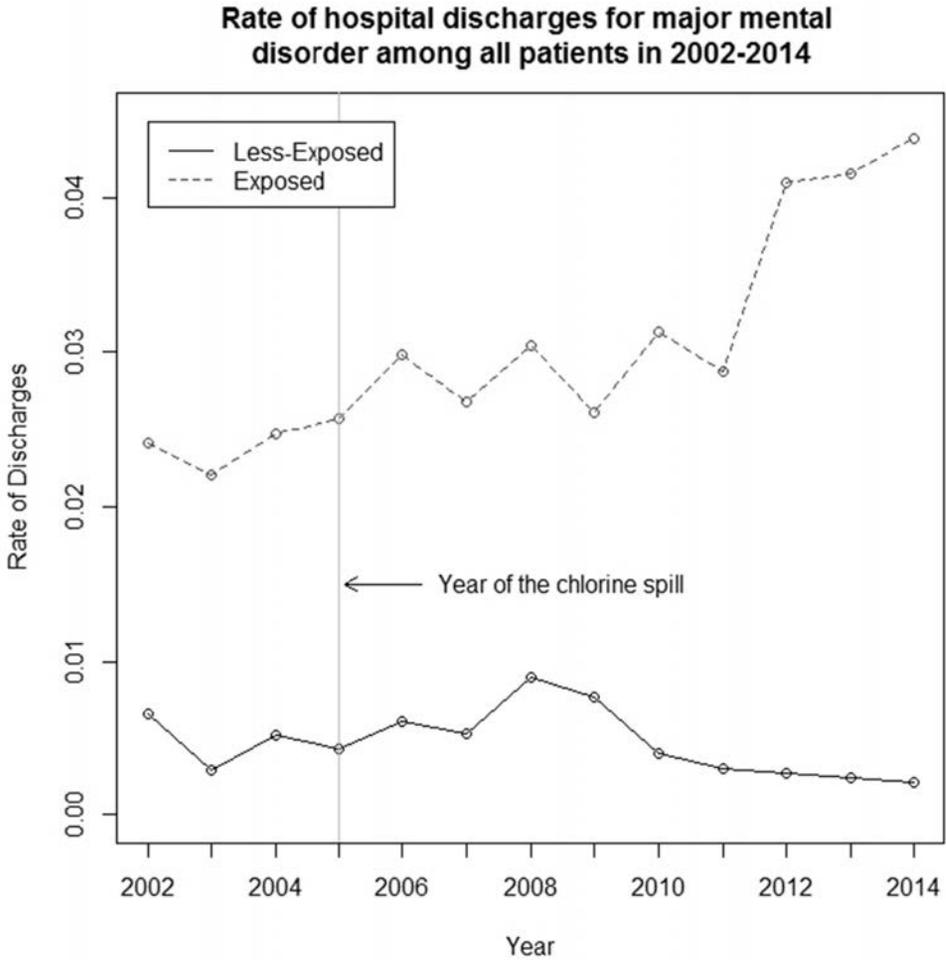


Figure 5.

For each year, the overwhelming majority of mental health hospital discharges originated in the exposed group. Figure 5 shows the comparison between exposed and less exposed groups regarding the rates of hospital discharges for all major mental health disorders among all hospital discharges from 2002 to 2014. The rate of mental health disorder hospital discharges for patients from the exposed ZIP codes had a linear increase over the years, starting from approximately 2% in 2002 to over 4% in 2014. In contrast, for patients from the less exposed ZIP codes, the rate slightly increased to 1% from 2002 to 2008, and then gradually declined until 2014.

Table 3 presents the GEE estimation results from the multivariable Poisson model. There were significant differences between categories within each predictor except gender. The z test used for comparing the two slopes (pre-2005 versus 2005 and after) was not significant ( $p\text{-value}=.35$ ). This indicates that even though there are differences in mental health hospital admission rates by exposure, this is not attributable to the chlorine spill event since the slope did not change significantly after that event. In

**Table 3.**

**GEE PARAMETER ESTIMATES FROM THE MULTIVARIABLE POISSON MODEL**

Parameter	Estimate	Standard Error	95% C.I.		Hazard Ratio with 95% C.	Z	Pr >  Z
Gender							
Female	0.05	0.04	-0.03	0.13	1.05(0.97, 1.14)	1.27	0.204
Male	—	—	—	—	—	—	—
Race							
Black	0.45	0.09	0.27	0.62	1.56(1.31, 1.86)	5.01	<.0001
White	0.51	0.09	0.33	0.69	1.66(1.38, 1.98)	5.57	<.0001
Other	—	—	—	—	—	—	—
Age group							
5-17	-0.24	0.10	-0.44	-0.05	0.78(0.65, 0.95)	-2.49	0.013
18-34	0.26	0.10	0.07	0.45	1.30(1.07, 1.57)	2.71	0.007
35-64	0.19	0.08	0.03	0.36	1.08(1.03, 1.43)	2.24	0.025
65+	—	—	—	—	—	—	—
Insurance							
Employer	0.17	0.06	0.07	0.28	1.19(1.07, 1.32)	3.15	0.002
Medicaid	0.45	0.05	0.35	0.55	1.57(1.42, 1.74)	8.78	<.0001
Medicare	0.50	0.07	0.36	0.64	1.65(1.43, 1.89)	7.08	<.0001
Selfpay/Indigent	—	—	—	—	—	—	—
Exposed							
Yes	0.21	0.07	0.07	0.36	1.23(1.07,1.44)	2.87	0.005
No	—	—	—	—	—	—	—

addition, there was no significant interaction effect between the exposure status and each of the demographic characteristics.

**Discussion**

This research provides insight into the long-term mental health status of survivors of the Graniteville train disaster of 2005. The photovoice findings indicate ongoing emotional concerns, while the hospitalization discharge data indicate no significant differences (though there is a clear trend) due to the spill. Although the findings from the photovoice and hospital discharge analyses are seemingly at odds, they actually address different levels of concern. The photovoice project represents community concerns that may not rise to the severity of seeking mental health care or even meeting criteria for a psychiatric diagnosis. While feelings of loss, depression, and anxiety may have an effect on overall functioning, they are not likely to create a crisis situation that may result in hospitalization. In contrast, most psychiatric hospitalizations reflect severe levels of symptomatology for which stability can only be achieved during an inpatient stay. Thus, each of our methods reflect different levels along a continuum of severity,

and not surprisingly, it is the underlying moderate level of concern (as reflected in photovoice) rather than the severe dysfunction (as reflected in hospitalizations) that is more evident.

Our photovoice findings are comparable to those of extant literature that similarly reveal enduring mental health concerns following disasters.<sup>1-3,9,10</sup> Participants' concerns were multifaceted and multidimensional and reflected intrapersonal level needs and interpersonal relationships. Further, the disaster had even broader community level impact as evidenced by the closing of the mill and resultant economic hardships and challenges to quality of life. While the presence of economic distress post-disaster is not a particularly unique finding,<sup>7</sup> Graniteville represents an increasing number of communities that experience enduring adverse post-disaster impact on top of an already vulnerable, under-resourced, and underserved state. Given that the 160-year old textile mill that employed generations of families in the area was the site of the accident, the anxieties and distress of thousands in the small town and surrounding area arose from a complex interaction among the loss of loved ones, loss of economic stability, and overall trauma of the disaster events.

While the analysis of hospital records indicated that mental health-related hospital encounters generally increased post-disaster, this trend did not reach statistical significance. This is not surprising given that a search of the literature revealed only one study which showed an increase in hospitalizations for people with schizophrenia in the first two years post-earthquake in China.<sup>39</sup> As previously noted, many researchers have cited the post-disaster increase in mental health symptoms and diagnoses,<sup>1-7</sup> but this apparently does not translate to increased psychiatric hospitalizations. This is consistent with the trend in the United States for greater use of ambulatory services and reduced use of inpatient care. Unfortunately, we could not capture mental health outpatient utilization, as that may have more accurately reflected the correct level of intensity of the mental health concerns noted in the photovoice findings.

The mixed methods approach of this study allowed for a longitudinal and multi-layered perspective on the post-disaster mental health status of survivors of an underserved, rural community, and thus is a major strength. There are, however, some study limitations. Our categorization of *exposed* and *less exposed* ZIP codes was based on a plume dispersion model which provided an exposure estimate for the areas affected by the chlorine gas release. While we acknowledge that this is imprecise, we are confident that this is the best quantitative estimate for measuring the reach of the chlorine gas. Additionally, while the study findings are an important contribution to the body of research on long-term mental health outcomes post-disaster, particularly those in vulnerable communities, our examination of mental health-related hospital discharges included a variety of mental health events. Future research should aim to determine if there are differences in post-disaster impact by various mental health diagnoses which may indicate a more nuanced approach to understanding the impact of disasters. Lastly, we acknowledge that, given the nature of the disaster, persons who elected to participate in the photovoice project may have been those who felt particularly affected by the disaster and thus wanted an opportunity to voice their concerns. Nevertheless, we hear these voices as a significant representation of community perspectives that would not have been captured by the quantitative data alone.

Despite these limitations, the combined perspectives of the qualitative findings and the quantitative trends are informative and can be useful in developing protocols for disaster response that anticipate needs, establish resources to address and minimize those needs, and institute structural capacity for long-term mental health management following disasters. Had only the hospitalization data been assessed, we would have missed the emotional concerns that were apparent in the photovoice findings. Similarly, had we only conducted the photovoice analysis we would not have known if these concerns were indicative of more serious problems requiring psychiatric hospitalization.

After a disaster event, survivors require long-term attention to address their multi-level mental health needs. Technological disasters, such as the Graniteville train derailment and chlorine spill, are occurring more frequently prompting efforts to improve disaster prevention and response efforts.<sup>40,41</sup> While it is understandable that most disaster planning efforts emphasize attending to the immediate medical and physical needs of survivors, the mental health sequelae of disasters should not be overlooked and should be integrated into disaster and emergency preparedness activities.<sup>42</sup> State and local communities can benefit from using vetted planning guidance to prepare for disasters (e.g., SAMHSA 2003<sup>43</sup>) that recommends inclusion of a wide variety of community participants (e.g., Red Cross, childcare centers, large employers, community members) in the planning process. More difficult is dealing with the long-term mental health issues that may be compounded (as in the case of Graniteville) by related losses.<sup>44</sup> Lack of resources, interest, and attention during this long-term phase are problematic, and response efforts are particularly vital in resource-poor towns and communities in which any additional demands can depress the quality of life of residents for years to come. Understanding the impact of this disaster has even broader reaching global implications due to the release of chlorine gas, a highly toxic substance that has been used previously as a means for chemical warfare and weapon of terrorism.<sup>17-21</sup> Our study findings can be useful in the development of mental health disaster management protocols for communities in the long-term post-disaster period.

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