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Disaster Preparedness Knowledge, Beliefs, Risk-Perceptions, and Mitigating Factors of Disaster Preparedness Behaviors of Undergraduate Students at a Large Midwest University

Stacy Goddard[1*], Meg Sheppard[2], Kip Thompson[1], Lynda Konecny[2]

[1]*Department of Health, MCHES, Missouri State University, McDonald Arena 901, S. National Ave. Springfield, MO 65897, USA*

[2]*Department of Health, PhD, CHES, A. T. Still University, USA*

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***Corresponding Author:** Stacy Goddard, Department of Health, Missouri State University, McDonald Arena 901, S. National Ave, Springfield, MO 65897, USA. E-mail. sgoddard@missouristate.edu

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Abstract

Objective: Differences were assessed in disaster preparedness levels of college students at a large Midwest university based on knowledge, risk perception, beliefs, prior enrollment in a Community Emergency Response Team (CERT) or first aid class, and self-efficacy was assessed.

Methods: College students between the ages of 18 and 24 years old were recruited from a general education class and from students who walked by a high-traffic areain the student union to complete a 27-item survey. A disaster preparedness score was calculated based on items each participant indicated he or she currently possessed at home. Participant responses were also dichotomized into knowledge (advanced vs. basic) risk perception (high vs. low), belief (strong vs. weak), CERT or first aid enrollment (yes vs. no), and self-efficacy (high vs. low) groups based on how the participant answered specific items on the survey. An independent samplest-test was used to analyze the differences in disaster preparedness levels between each dichotomized group.

Results: There was no significant difference (p=0.789) found between the strong beliefs (M=7.97, SD=3.478) and the weak beliefs group (M=7.88, SD=3.099), t(384) = -4.978.

Conclusions: Based on the findings of this study, health education programs that focus on improving knowledge, self-efficacy in preparing for a disaster, and risk perception of experiencing a disaster will increase the disaster preparedness levels of college students. Universities partnering with community emergency management agencies and offering CERT or first aid classes to college students can increase the disaster preparedness levels of college students and potentially improve response and recovery after a disaster.

Keywords: College students, disaster preparedness, knowledge, self-efficacy, risk-perception, CERT, first aid

Introduction

Disaster preparedness is a national public health concern. The risk of individuals and communities being affected by a natural disaster has increased, and unfortunately this trend is expected to continue [1]. College students are not typically considered to be an at-risk population; however, many students may not practice disaster preparedness behaviors. College students usually live in short-term housing or residence halls, have limited storage space, and may depend on dining halls for food and water, which may make them more vulnerable in disaster situations [2]. College students, either residing on or off campus, may also not be familiar with community emergency action plans, know where to seek help in case of emergency, or have the ability to evacuate [2]. College students could play a primary role in responding to and recovering from a major disaster if they have sufficiently prepared for a disaster.

Missouri is prone to several types of natural disasters including snow and ice storms, tornadoes, flooding, droughts and severe thunderstorms [3]. For example, in 2011, an EF-5 tornado killed 161 people, impacted over 13,547 people and damagedover 7,500 homes and 500 businesses in Joplin, Missouri [4]. This particular tornado caused record setting deaths and property damage costs equating to $3 billion, which is the highest ever for a U.S. tornado [5]. As another example directly impacting Springfield, Missouri, in January, 2007, an ice storm along the Interstate 44 corridor left 200,000 people in Southwest Missouri without power [6]. In Springfield alone, over 75,000 people were left without power, directly impacting students at Missouri State University, Drury University and Ozarks TechnicalCommunity College.

During the storm, McDonald Arena on the Missouri State University campus was used as a special needs shelter for 120 individuals [7]. There are consistent natural disaster risks for people in Missouri, as shown by the 35 federal major disaster declarations since 1990 [3].

Methods

A 27-item survey was distributed to college students between the ages of 18-24 years at a large Midwest university to determine differences in disaster preparedness levels based on their knowledge, risk perceptions, beliefs, prior enrollment in a Community Emergency Response Team (CERT) or first aid class, and self-efficacy. The sample was recruited through a general education class and by asking students to complete a short survey as they walked by a high traffic area on the main campus.The total undergraduate population at the university in the fall of 2015 was 18,900 students

(Office of Institutional Research [OIR], 2015). With a confidence interval of 95% and margin of error at 2.5%, the minimum desired sample size was 375 respondents. A total of 407 surveys were obtained, but undergraduate students who were not between the ages of 18-24 years old were excluded from the study because they are typically considered non-traditional students [6].

The survey was previously used in a study conducted by the Centers for Disease Control and Prevention, but wasslightly modified for the use in a college student population [8]. It was administered via a paper and pencil format. Respondents received a disaster preparedness summary score based on the items they indicated they had at their current place of residence.Respondents received one point for any disaster preparedness item/behavior they indicated they did/had at home.The total points (i.e., summary score) represented the disaster preparedness level. The possible range of scores for this scale was 0 to 16. Table 1 shows the items that participants most frequently identified as having in their place of residence from the 16-item list.

Preparedness Item	Frequency n	Percent %
Flashlight or head lamp	326	83.6
Sanitation and person hygiene items	285	73.1
First-aid kit	269	69.0
Family and emergency contact information	266	68.2
Cash	253	64.9
Extra batteries	244	62.6
Multi-purpose tool	220	56.4
Copies of personal documents	218	55.9
3-day supply of nonperishable food	185	47.4
7-day supply of medicines	158	40.5
Emergency blanket	155	39.7
3-day supply of water	136	34.9
Cell phone with non-electric charger	132	33.8
Whistle	95	24.4
Map(s) of area	77	19.7
NOAA battery-powered or hand crank radio	60	15.4
Total Respondents	390	100

Table.1 Frequency Table of the Preparedness Items

In addition to the disaster preparedness score, respondents were dichotomized into five different groups based on responses to additional survey items [8]. These groups included knowledge (advanced vs. basic), risk perceptions for experiencing a disaster (high-risk vs. low-risk), beliefs that preparing for a disaster will mitigate the harmful effects of a disaster (strong vs. weak), self-efficacy regarding ability to prepare for disasters (high vs. low), and previous enrollment in a CERT or first aid class (Yes/No).

Knowledge

Advanced knowledge was indicated by participants' responses to four survey items. First, the respondents had to report they were aware of the need to assemble an emergency kit and intended to do it, or had an emergency kit, or regularly maintained an emergency kit. Second, the respondents had to report they were aware of the need to have a written emergency disaster plan and intended to create one, or already had a written emergency plan, or practiced their written emergency plan. Third, respondents had to indicate they were aware that disasters are likely to occur close by their campus, and finally, they had to report they understood what outdoor warning sirens mean. Respondents who did not meet all these criteria were classified into the basic knowledge group.

Risk Perception

To be categorized into the high risk-perception group, participants indicated they strongly agree, agree, or somewhat agree they are at risk for experiencing a disaster, and that a potential disaster will likely be serious. All other responses for the risk perception items were categorized into the low risk-perception group.

Beliefs

Participants who strongly agree, agree, or somewhat agree that assembling an emergency kit and having a written emergency plan will mitigate the harmful effects of a disaster were classified into the strong beliefs group for preparedness. Participants who did not indicate agreement on these two items were classified into the weak beliefs of preparedness group.

Self-Efficacy

Respondents in the high self-efficacy group indicated they somewhat agreed, agreed, or strongly agreed they are easily able to assemble an emergency preparedness kit and can easily develop a written emergency plan. All other responses categorized the participants into the low self-efficacy group.

CERT/First Aid

Participants were dichotomized into previously enrolled in a CERT or first aid class and not previously enrolled group.

Results

A total of 407 surveys were collected with 17 surveys being excluded due to not meeting the age criteria (i.e., 18-24 years), resulting in a final sample size of n=390. The alpha level for all statistical analyses was set a priori at 0.05. Of the 390 respondents, 134 were male (34.4%) and 256 were female (65.6%). The greater number of females in the study coincides with the greater number of females who attend the university overall.

The OIR (2016) reported 59% of undergraduate students were

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female and 41% were male at this university in fall 2016. The average age of the students in this study was 20 years old.Most of the respondents lived in residence halls (40.5%), followed by off-campus apartments (28.7%) (Table 2). This similarity in sample make up compared to university demographics indicates the convenience sampling adequately represented the student body population.

Respondent Demographics	Frequency n	Percentage %
Current housing		
On-campus residence hall	158	40.5
Off-campus apartment	112	28.7
Off-campus rented house	47	12.1
Off-campus family house	38	9.7
On-campus apartment	17	4.4
Sorority/fraternity house	17	4.4
Did not answer	1	.3
Age		
18	60	15.4
19	113	29.0
20	84	21.5
21	66	16.9
22	44	11.3
23	13	3.3
24	10	2.6
Sex		
Female	256	65.6
Male	134	34.4

Table.2 Demographics of Respondents

The difference in disaster preparedness behaviors of college students based on their knowledge of disaster preparedness was analyzed using an independent samplest-test. Participants (n=390) were dichotomized into a basic knowledge group (n=267) and advanced knowledge group (n=106).A significant difference ($p<0.001$) was found in disaster preparedness levels of those with advanced knowledge and those with basic knowledge. There was a medium effect size (d=0.48) with this difference with the advanced knowledge group having a higher disaster preparedness level (M=9.07, SD=3.45) compared to the basic knowledge group (M=7.49, SD=3.190, t(371) = -4.21.

An independent samples t-test was used to assess the difference in disaster preparedness behaviors of college students based on their risk-perception of encountering a disaster.Participants (n=390) were dichotomized into a low-risk perception group (n=215) and high-risk perception group (n=173). A significant difference (p=0.031) was found in disaster preparedness levels of those with a low-risk perception and those with a high-risk perception. However, the effect size between the groups was small (d=0.22). An independent samplest-test indicated the high-risk perception group had more disaster preparedness behaviors (M=8.38, SD=3.33) than the low-risk perception group (M=7.63, SD=3.47), t(386) = -2.17.

The difference in disaster preparedness behaviors of college students based on their belief of disaster preparedness mitigating the effects of a disaster and their disaster preparedness level was analyzed using an independent samplest-test. Participants (n=390) were dichotomized into a weak beliefs group (n=128) and strong beliefs group (n=258). There was no significant difference (p=0.79) in disaster preparedness levels of respondents with strong beliefs (M=7.97, SD=3.48) compared to those with weak beliefs (M=7.88, SD=3.17), t(384) = -0.27. The effect size between the strong belief group and the weak belief group was small (d=0.03).

The difference in disaster preparedness behaviors of college students based on their self-efficacy in their ability to prepare for a disaster was analyzed using an independent samplest-test. Participants (n=390) were dichotomized into a high-self efficacy group (n=239) and a low self-efficacy group (n=147). A significant difference ($p<.0.001$) was found in the disaster preparedness levels of those with high self-efficacy and those with low self-efficacy. A medium effect size (d=0.53) was found between the groups. The high self-efficacy group had more disaster preparedness behaviors (M=8.58, SD=3.32) than respondents in the low self-efficacy group (M=6.89, SD=3.10), t(384) = -4.98.

The difference in disaster preparedness behaviors of college students based on previous enrollment in a CERT or first aid class was analyzed using an independent samplest-test. Participants (n=390) were dichotomized into a previous enrollment in a CERT or first aid class group (n=213) and a not previously enrolled group (n=177). A significant difference (p=0.001) was found in disaster preparedness levels of participants who have previously enrolled in a CERT or first aid class and participants who have not.

A small effect size (d=0.35) was found between the groups. The previously enrolled group had more disaster preparedness behaviors (M=8.45, SD=3.39) than the not previously enrolled group (M=7.29, SD=3.27), t(388) = -3.42.

Discussion

The number of deaths and billions of dollars in economic losses due to natural disasters has made preparing for natural disasters a public health priority [9]. Understanding how prepared college students are for disasters and what factors may increase disaster preparedness among college students is key to improving disaster preparedness behaviors.Increasing disaster preparedness knowledge of college students will likely increase disaster preparedness behaviors. Students

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who had an increase in disaster preparedness knowledge had a higher disaster preparedness level, which has also been shown in a prior studyusinga different population [8].

Although 66.2% of college students in this study believed being prepared for a disaster will mitigate the negative effects of a disaster, the current study did not show a difference in disaster preparedness levels based on beliefs.However, students with a high-risk perception of experiencing a serious disaster reported a higher disaster preparedness level than students who had a lower risk-perception. Research has consistently shown people who perceive themselves to be at an increased risk for a negative event, tend to practice behaviors meant to reduce their risk of experiencing the negative event [10-12]. This study shows college students' risk perception of disasters also tends to increase behaviors meant to reduce their risk of disaster.

Students with a high self-efficacy practiced more disaster preparedness behaviors than students with a low self-efficacy. Many studies have shown that a higher self-efficacy increases the likelihood that a health behavior is practiced [13-15]. This research shows that high self-efficacy in college students' ability to prepare for a disaster increases the likeliness of students practicing disaster preparedness behaviors. Therefore, disaster preparedness education programs should include a component to increase self-efficacy.

Students who have taken a CERT or first aid class practice more disaster preparedness behaviors than students who have not had either class. This information can benefit universities and community emergency management agencies through possible partnerships in offering CERT and first aid classes to college students with the goal of improving disaster preparedness behaviors and recruiting prepared volunteers for post-disaster recovery situations.

College students, as well as colleges and universities, are just as vulnerable to disasters while at school as they are at home. Natural disasters can interrupt classes, disrupt campus life, damage campuses, and leave students stranded with nowhere to go [16]. Hurricane Matthew hit North Carolina in 2016 and caused serious flooding on the coast, affecting five University of North Carolina campuses including East Carolina University and UNC Prembroke, which were closed for over a week after the storm [17]. The campuses were flooded, had power outages, and sustained damage to buildings. Students who could not evacuate were assisted by campus police and were brought meals from North Carolina CentralUniversity [17]. In 2011 a tornado went through Tuscaloosa, Alabama where the University of Alabama is located. The tornado killed three university students, destroyed rental houses and apartments near campus, and students were advised to leave campus as soon as possible because of power outages and unsafe drinking water [18]. The Loma Prieta earthquake in 1989 damaged buildings at Stanford University, which led to closing 11 buildings. It took 10 years and $300 million in repairs to reopen the buildings [16]. In 1992, Hurricane Andrew caused $17 million in damage to the University of Miami, which had to close for a month because the university did not have water or electricity [16]. There are many examples of universities needing to close their campuses due to the devastating effects of natural disasters with a myriad of consequences for the university, faculty, staff, andstudents. The best method for dealing with natural disaster situations is to be prepared for them before they strike [19].

Watson, Loffredo, and McKee [18] researched students' perceptions related to evacuating and returning to campus at the University of Texas Medical Branch (UTMB) when the campus was hit by a hurricane. Watson et al. found that students believed they would have been better prepared for the hurricane and known what they should have done if they had been given information related to disaster preparedness at their orientation. Students also suggested it would have been beneficial to have a disaster preparedness package with a checklist of what to do when evacuating [18].

College administrators should work closely with local emergency management systems to improve preparedness for both the campus and the larger community as a whole. Healthy, able-bodied college students who are prepared for disasters can also serve as resources for community emergency management systems to help in responding to disasters on the college campus and the community where the university is located. Emergency managers and public health preparedness officials recognize that any disasterresponse primarily lies at the local level and relationships between community partners are instrumental in a community's preparedness and ability to recover from a disaster [20].

Institutions of higher learning have many resources relevant to the resilience of a community, which make them ideal partners with emergency managers and public health officials. In 1994, the U. S. Department of Housing and Urban Development established the Office of University Partnerships to encourage and expand partnerships between colleges and universities and communities [21]. There is evidence to support the advantages of universities partnering with community emergency management organizations [20] to benefit both the community and university in disaster recovery as well as the students in community engagement and volunteerism. Fulmer et al. (2007) found 59.2% of college students' report they would stay on site and volunteer during a disaster. However, for students to have the ability to volunteer after a disaster, they need to have adequately prepared for a disaster themselves.

While this research indicates the need for better emergency planning and education for college students at a large Midwest university, there are limitations. First, all results were based on self-reported responses and could have included participant bias and dishonesty. However, responses were similar to those given in a previous study atthe same university [2]. Second, the psychometric properties of the research instrument had been studied on the Center for Disease Control and Prevention employees, but not the undergraduate college student population. Third, a convenience sample was used because of time and resources, which limited the study population to one large Midwest university, therefore the results have limited generalizability. Additionally, data collection was conducted between 12pm and 2pm at the student union building two days a week for two weeks, and it was only administered one time in each lab section of the Fitness for Living general education class. Therefore, students who were absent on the day it was administered or did not walk through the student union did not have an opportunity to complete the survey. However, with the number of students sampled, and the similar distribution of students in the sample compared to the general student body demographics, any effect is most likely negligible.

Conclusions

Based on the outcomes of the study, it is evident that undergraduate students who have more disaster preparedness knowledge practice more disaster preparedness behaviors. Therefore, providing disaster preparedness education programs to incoming undergraduate students may increase the number of undergraduate students who practice disaster preparedness behaviors. Other findings from the study show that increasing risk-perceptions of experiencing a disaster and increasing self-efficacy in preparing for a disaster will improve disaster preparedness behaviors in undergraduate students. A disaster preparedness education program focusing on increasing these factors will likely improve these behaviors. Better-prepared college students can benefit the university and the community where the university is located. Students who are prepared and therefore are not victims of the disaster themselves could be valuable resources to help the university and community in disaster recovery efforts.

Students who have taken CERT or first aid practice more disaster preparedness behaviors than students who have not taken either of these classes. Based on this evidence, training students early in their college careers seems to be a logical step. Educating incoming

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freshmen about the risks associated with geographically-specific natural disasters and teaching preparedness behaviors could improve self-efficacy and possibly begin a lifestyle of disaster preparedness. A disaster preparedness education plan could be incorporated into an Introduction to University Life general education class that all incoming freshmen are required to take or implemented into the freshmen summer orientation and registration program. When natural disasters occur, they often affect the entire community. A college campus is a community of its own within a larger community and has many resources relevant to the resilience of a community, including healthy able-bodied students.

Conflict of interests: The authors declare no conflict of interest.

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