



Looking beyond the television: Variability in information seeking patterns and mitigation behaviors during Hurricane Ian

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ABSTRACT

Recent research in crisis and risk communication has examined information seeking preferences across varying audiences in the time leading up to natural disasters. Such an understanding is critical for targeting risk information messages such that they will have the maximum intended impact on those seeking to take protective actions. Until recently, these studies have largely ignored the relative importance of mediated sources alongside community groups and other grassroots organizations. To that end, the current study surveyed 1030 Florida residents in the aftermath of 2022's Hurricane Ian in the United States. In addition to replicating past findings concerning media preferences across the demographic spectrum, the current study offers evidence that marginalized and at-risk communities may be especially reliant on community resources for information about protective actions concerning an environmental hazard. The findings are discussed in terms of their implications for crisis communication researchers and emergency managers alike.

1. Introduction

A growing body of research has delved into preemptive mitigation strategies prior to natural disasters, and their associations with patterns of information-seeking behavior before, during, and after crises (e.g., [25,27]). Despite the advances in knowledge offered by this research, it has largely focused on mediated information sources, without considering them alongside community centers, schools, foodbanks, and other community and interpersonal sources that may be relevant. This, despite the fact that at risk audiences may be especially reliant on these types of sources for information, given both a general distrust of centralized sources and the perception that these community sources may have more geographically relevant and actionable information [6]. Despite insights gained into the impacts of mitigation practices, information-seeking behaviors, and media usage in different disaster scenarios, a deeper understanding of the nuances concerning this media environment and its relationship with community resources is warranted.

Given the inclination to reduce uncertainty and seek good decisions, individuals often seek information from credible media sources in the lead-up to, during, and immediately following significant natural disasters. Research in this domain has also indicated that these patterns of information seeking tend to differ across demographic groups,

geographical locations, and communities. Further, the role of social media usage during developing crises has only been recently explored [6]. Furthermore, there has been limited exploration of the potential interrelation between reliance on various information sources and corresponding mitigation practices.

Taken together, the objective of this study is to replicate and extend existing findings concerning demographic variability in information-seeking behavior, mitigation strategies, media dependencies, and the plausible connection between trusted information sources and mitigation actions within the context of a natural disaster – with extended consideration for non-mediated, community resources that may be essential in localized response. The natural laboratory of 2022's Hurricane Ian in the southeastern United States is offered as a natural testing ground for the examination of these dynamics. We will begin by discussing the factors that influence mitigation and studies that have assessed their relationship. Next, we will examine this study's theoretical perspective involving media dependency theory (MDT) along with research supporting it. Then, we will review research involving crisis information and social media.

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1.1. Factors influencing mitigation

Mitigating the effects of natural hazards is a multifaceted phenomenon, in which many factors are likely to impact whether or not, and the extent to which homeowners will safeguard their houses and other properties against damage. Depending on the nature of the risk in question, such mitigation efforts may unfold years or months before a threat arises, or they may involve active measures during an ongoing event. However, notwithstanding the evident availability of mediated and interpersonal resources aimed at assisting homeowners in their mitigation efforts, intricate obstacles exist when it comes to building individual-level resilience. A wide range of attitudinal and demographic factors may impact the willingness and capacity for individuals to mitigate; for example, past research has indicated that those of lower socioeconomic status may lack the resources to mitigate, regardless of their risk perceptions or willingness to do so. The absence of appropriate risk perceptions and/or knowledge of mitigation responses can also hamper protective actions related to natural disasters [11,13,34,35,55].

For example, in the context of wildfires, one study concerning the mitigation efforts of Colorado residents yielded mixed results [43]. While data indicated that most homeowners had adopted fundamental mitigation practices (e.g., pruning vegetation around their residences) and possessed a reasonably sound grasp of the relationship between climate change and environmental risk factors, risk perceptions were not a robust predictor of advanced mitigation efforts [43]. This implies that additional factors are at play in influencing these decisions. Extant research generally upholds the idea that age, gender, and income influence mitigation behavior. Nevertheless, these findings exhibit variations across different types of natural disasters including earthquakes [39], floods [1], hurricanes [46], and wildfires [11], thus rendering them less universally applicable or reproducible.

More closely tied to the current research context, data collected post-Hurricane Katrina indicated an inverse association between age and crisis preparedness, potentially stemming from prior hurricane experiences and positivity bias [46]. In essence, individuals who had previously experienced hurricanes but had not evacuated or prepared were less prone to change their behavior than younger residents who had not yet encountered hurricanes. This pattern was also corroborated in the context of the 2008 Hurricane Ike, where age significantly predicted the likelihood of owning an emergency kit, with older residents less likely to possess one in comparison to their younger counterparts [47]. Outside hurricanes and the U.S., younger individuals in Turkey were more likely to take *future* precautions for earthquakes (e.g., building a safe room within the house) compared to older individuals, while age did not significantly predict *past* precautions [39]. In Pakistan, residents implemented various mitigation strategies in relation to floods. Notably, middle-aged households (25–40-year-olds) adopted a *greater* number of mitigation strategies compared to younger (less than 25 years old) and older (more than 40 years old) households [1] in two of the three districts surveyed. While this may partially stem from disparities in self-reporting behavior among participants, these mixed findings underscore a complex interplay of behaviors and attitudes that drive mitigation behavior and suggest that they may be highly variable across different crisis contexts. Drawing from these earlier studies, the following research questions are proposed:

RQ1. To what extent did individuals in areas affected by Hurricane Ian implement mitigation or evacuation measures?

RQ2. To what extent do demographic distinctions shape the ways in which individuals implemented mitigation or evacuation measures?

1.2. Disaster planning and media dependencies

Media Dependency Theory (MDT), as originally explicated by Ball-Rokeach and DeFleur [7], has enabled researchers in crisis communication to cultivate an understanding of how individuals interact with

diverse media during times of scant information and uncertainty. This theory suggests that in situations marked by threats or ambiguity, individuals tend to revert to sources of media they trust and media outlets with which they have established positive past experiences (see [15]). Lachlan, Xu, Hutter, Rainear, and Spence [28] offer that “when audiences confront ambiguity, their adherence to reliable sources and reliance on media they have had prior positive experiences with may be amplified” (p. 17). Studies exploring MDT’s role in crisis management reveal that media dependencies intensify, with media frequently serving as a tool for acquiring information in the face of natural disasters, crises, or heightened uncertainty [19,20,32,33].

MDT’s application has extended to diverse environmental crises and disasters such as hurricanes [8,27], snowstorms [29], earthquakes [22], and acts of terrorism [25]. While valuable insights have been gleaned from this body of research, much of it relies on generalized audiences and indirect accounts, lacking a focus on those who have experienced the crises firsthand; thus, while informative to both researchers and crisis managers, it overlooks non-mediated information sources such as schools, community centers, food banks, and other community and relief organizations, which are all critically important to society. Last year, 49 million Americans “turned to hunger relief programs for support” [16], while over 32 million children were enrolled in elementary school and over 17 million individuals attended high school [52]. Furthermore, community centers would more than likely be in cities around the country and can help facilitate social interactions and help develop relationships [14]. Therefore, these non-mediated information sources represent possible routes to disseminate content about an extreme weather event.

When crises approach, fast and efficient information delivery and decision making are essential for surviving and minimizing harm [21,24,36]. Individuals must determine not only which sources to rely on but also whether they can trust the information presented. Spence, Lachlan, and Burke [46] propose that information seeking serves not only to alleviate anxiety and uncertainty, but also offers individuals the opportunity to observe the actions of affected peers through media and social media: “The media serve as a bonding mechanism through the reinforcement of social norms” (p. 12). The role of self-efficacy in crisis scenarios has been well established in prior research [46].

1.3. New media and crisis information

Studies indicate that, akin to mitigation behavior, information-seeking behavior during crises and emergencies tends to vary across demographic categories. Following Hurricane Katrina, Spence, Lachlan, and Burke [46] found that African Americans exhibited a greater likelihood than others to seek information about food and water and were also more inclined than whites to seek information about shelter. These differences were attributed to structural inequalities in the distribution of information and resources, placing historically underserved communities at a disadvantage. Irrespective of ethnic identification, the data also revealed that television, followed by face-to-face communication with acquaintances, were the two most significant information sources for participants in relation to the crisis [46]. Notably, given the nascent state of social media at the time, the findings indicated that “new media were almost entirely insignificant in providing information about the storm” (p. 17). Now, 15 years later, new media are omnipresent and changing the way we consume media [17]. As of August 2022, social media are the most popular method of daily news consumption among 18–64-year old’s [37] as Facebook leads the way with over 2.95 billion monthly active users [23]. Furthermore, with an increased use of smartphones [18], mobile weather applications (MWAs) have become viable sources for obtaining weather information due to their accessibility and convenience [41].

While MWAs and social media’s societal importance are apparent today, Sutton, Palen, and Shklovski [50] conducted an early investigation of social media’s role during crises and discovered that during the

2007 southern California wildfires, although the majority of individuals relied on traditional media and mediated communication with friends and family for information, more than a *third* reported posting information or participating in discussions online about the fire. More recent studies have extended these explorations to coastal storms and other environmental risks of varying parameters (e.g. [27]), but limited work has been dedicated to investigating who turns to social media for information, the nature of the sought-after information, and the degree of trust individuals place in the information they find. Existing data on the effectiveness of social media in such contexts is somewhat outdated and often focuses more on predictors of message transmission [50] or content analysis [27], rather than querying perceptions of the usefulness of these media in acquiring the information crucial for making life-saving decisions. Consequently, the following research questions are forwarded:

- RQ3.** To what extent do demographic distinctions influence information-seeking behavior regarding Hurricane Ian?
- RQ4.** To what extent did social media play a role in information-seeking regarding Hurricane Ian?
- RQ5.** To what extent did community organizations play a role in information-seeking regarding Hurricane Ian?
- RQ6.** Is there an association between preferred information sources and mitigation behaviors?

2. Methods

Data were collected through Qualtrics, between the dates of October 26, 2022, and November 28, 2022. The sample consisted of 1030 participants living in Florida counties that were directly impacted by Hurricane Ian. Participants were compensated with \$3.00 for a fully completed and usable survey. Funding for the study was provided by the National Science Foundation, grant number 2303097.

2.1. Participant eligibility

The sampling frame for the study included residents of central Florida counties that were directly impacted by high winds, torrential rain, and/or flooding brought on by Hurricane Ian. Counties included in the sampling frame were drawn from publicly available lists of school

Table 1
Florida counties included in sample.

• Charlotte • Citrus • Collier (includes Naples) • DeSoto • Dixie • Gilchrist • Glades • Hardee • Hernando • Hillsborough • Lake County • Lee County (includes Ft. Myers metro) • Levy County • Manatee County • Marion County • Monroe County • Okeechobee • Orange (includes Orlando) • Osceola (includes Kissimmee) • Pasco (Tampa metro) • Pinellas (includes Tampa/St. Petersburg) • Polk • Putnam • Sarasota (includes city of Sarasota) • Sumter

closures and cancellations (see Table 1 for specific counties). Participants were excluded if they did not reside in one of the identified counties. They were also excluded if they took less than 1/3 of the median time to complete the survey, indicated evidence of straight-lining, or if provided nonsensical responses to the open-ended items. All identifying information was removed from the data, ensuring that the identities of individuals could not be linked to specific sets of responses.

2.2. Procedure

Participants were provided a web link that was compatible with both personal computers and mobile devices. This link led to an information sheet detailing the nature of the study and the risks involved. If the participant chose to continue, they were asked basic demographic questions. If the participant indicated that they were under 18 years of age, or that they did not reside in one of the target counties, they were dismissed from the survey.

2.3. Measurement

Instrumentation was mostly adapted from the work of the authors [4,5]. Participants were first asked basic demographic information questions regarding their age, sex (male, female, other), ethnicity (White, Black, American Indian, Asian, Native Hawaiian, other), the state they reside in, and their zip code.

2.3.1. Media dependencies and responses

A series of five items examined the relative importance of radio, television, the internet, interpersonal interactions, and social media in obtaining information about Hurricane Ian. Participants were also asked a series of questions about the importance of first responders, community centers, and public resources in learning about the hurricane, along with perceptions of responses provided by government, media, and first responders. Items are adapted from a previous study by the PI [30].

2.3.2. Mitigation and evacuation

Participants were asked what steps (if any) they took to mitigate their homes, and whether or not they were forced to evacuate. If forced to evacuate, respondents were asked to indicate what specific steps they took to protect their homes as they evacuated. Items are adapted from Spence et al. [49].

2.3.3. Time spent seeking information

Participants were asked to consider their preferred media sources for information concerning Hurricane Ian in the days leading up to landfall, and to estimate the number of hours they spent on a typical weekday, Saturday, and Sunday seeking information on the hurricane. This was then transformed mathematically into an estimate of weekly hours spent seeking information. This technique for estimating weekly use has been proven reliable in prior media research [5,44].

Finally, participants were brought to a second series of demographic questions regarding the county they live in, their highest level of education (less than high school, high school graduate, Bachelor's degree, Master's degree, Advanced graduate degree, prefer not to answer), and household income (less than \$24,999, \$25,000–\$49,999, \$50,000–\$74,999, \$75,000–\$99,999, \$100,000 or more, prefer not to answer).

3. Results

3.1. Sample characteristics

In this study, more than half of the participants identified as female (53%) followed by male (46.3%) and other (0.7%). The average age was 45.25 (*SD* = 18.05) ranging from 18 to 91 years old with nearly three quarters identifying as White (72.2%) followed by Black or African

American (11.2%), and Hispanic/Latinx (10.8%). Some college (26.1%) was the most frequent level of education and almost half (45.6%) earned less than \$49,999.

3.2. Source importance and media time

On a scale from 1 (*very important*) to 3 (*not important*), the importance of various information sources about Hurricane Ian was assessed including the internet ($M = 1.33$, $SD = 0.59$), radio ($M = 1.92$, $SD = 0.81$), social media ($M = 1.95$, $SD = 0.84$), and television ($M = 1.41$, $SD = 0.66$). Participants were also asked grass roots information sources in the form of community centers ($M = 2.05$, $SD = 0.80$), religious organizations, senior centers, social service organizations, libraries, food banks, health clinics ($M = 2.02$, $SD = 0.86$), and public schools ($M = 1.88$, $SD = 0.83$). An additional measure of information seeking was assessed: media time ($M = 67.01$, $SD = 47.55$).

In terms of the relationship between demographic distinctions and information-seeking behavior regarding Hurricane Ian, bivariate correlations were conducted to assess age's relationship with sources of information about Hurricane Ian and yielded multiple, significant relationships. Given the inverse scoring of the measure, age negatively predicted use of the internet, $r(1030) = 0.16$, $p < .001$, radio, $r(1030) = 0.08$, $p = .007$, and social media, $r(1030) = 0.38$, $p < .001$. Notably, and consistent with past research on similar events, older audiences were more likely to rely on television, $r(1030) = -0.11$, $p < .001$. Interestingly, older audiences were less likely to rely on community resources across the board; they indicated lower reliance on community centers, $r(1030) = 0.21$, $p < .001$, religious organizations, $r(1030) = 0.18$, $p < .001$, senior centers, $r(1030) = 0.16$, $p < .001$, social service organizations, $r(1030) = 0.20$, $p < .001$, libraries, $r(1030) = 0.29$, $p < .001$, food banks, $r(1030) = 0.29$, $p < .001$, schools, $r(1030) = 0.31$, $p < .001$ and health clinics, $r(1030) = 0.28$, $p < .001$.

To determine if there were differences across additional demographics (education, ethnicity, income, sex) and source importance, one-way ANOVAs were conducted with lower mean scores indicating *greater* importance. For ethnicity, statistically significant differences emerged with Hurricane Ian sources including social media and at least two ethnic groups, $F(3, 1026) = 13.28$, $p < .001$, $\eta^2 = 0.04$. Tukey's HSD Test for multiple comparisons found that the mean value of social media importance was significantly different between participants identifying as White ($M = 2.04$, $SD = 0.84$) and Black or African American ($M = 1.65$, $SD = 0.71$), $p < .001$, as well as those identifying as White and Latinx ($M = 1.64$, $SD = 0.80$), $p < .001$. In addition, differences emerged between conversations with other people and at least two ethnic groups, $F(3, 1026) = 8.67$, $p < .001$, $\eta^2 = 0.03$. Tukey's HSD Test for multiple comparisons found that the mean value of conversations with other people was significantly different between participants identifying as White ($M = 1.81$, $SD = 0.73$) and Black or African American ($M = 1.55$, $SD = 0.64$), $p = .001$, as well as those identifying as White and Latinx ($M = 1.57$, $SD = 0.68$), $p = .004$. Given the reverse scoring of the dependent variable, the results suggest that white respondents were less likely than Blacks or Latinos to rely on social media and interpersonal sources of information, consistent with past research in the area.

Similar differences were detected for community centers, $F(3, 1026) = 11.93$, $p < .001$, $\eta^2 = 0.03$. Tukey's HSD Test for multiple comparisons found that the mean value of community centers was significantly different between participants identifying as White ($M = 2.14$, $SD = 0.79$) and Black or African American ($M = 1.79$, $SD = 0.76$), $p < .001$, as well as those identifying as White and Latinx ($M = 1.64$, $SD = 0.80$), $p < .001$. In addition, differences emerged concerning religious organizations, $F(3, 1026) = 18.74$, $p < .001$, $\eta^2 = 0.05$. Tukey's HSD Test for multiple comparisons found that the mean value of religious organizations was significantly different between participants identifying as White ($M = 2.45$, $SD = 0.73$) and Black or African American ($M = 1.96$, $SD = 0.83$), $p < .001$, as well as those identifying as White and Latinx

($M = 2.02$, $SD = 0.86$), $p < .001$. Once again, these community-based information sources were seen as more important by members of the Black and Latino community.

In relation to education, numerous sources for extreme weather information emerged including food banks and at least two educational levels, $F(7, 1022) = 5.62$, $p < .001$, $\eta^2 = 0.04$. Tukey's HSD Test for multiple comparisons found that the mean value of food banks was significantly different between less than high school ($M = 1.76$, $SD = 0.90$) and bachelor's degree ($M = 2.33$, $SD = 0.81$), $p = .006$, less than high school and advanced graduate degree ($M = 2.47$, $SD = 0.76$), $p = .016$, high school graduate ($M = 1.96$, $SD = 0.86$) and bachelor's degree, $p < .001$, high school graduate and advanced graduate degree, $p = .029$, as well as high school graduate and some college ($M = 2.20$, $SD = 0.85$), $p = .031$.

When assessing household income, significant differences emerged between television and two levels of income, $F(5, 1024) = 2.37$, $p = .04$, $\eta^2 = 0.01$. Tukey's HSD Test for multiple comparisons found that the mean value of television was significantly different between \$25,000–\$49,999 ($M = 1.47$, $SD = 0.68$) and \$75,000–\$99,999 ($M = 1.26$, $SD = 0.56$), $p = .019$.

Four significant sources emerged for extreme weather including religious organizations and at least two levels of income, $F(5, 1024) = 3.32$, $p = .006$, $\eta^2 = 0.02$. Tukey's HSD Test for multiple comparisons found that the mean value of religious organizations was significantly different between less than \$24,999 ($M = 2.16$, $SD = 0.82$) and \$25,000–\$49,999 ($M = 2.39$, $SD = 0.75$), $p = .021$, as well as less than \$24,999 and \$50,000–\$74,999 ($M = 2.45$, $SD = 0.73$), $p = .002$. In addition, differences emerged between senior centers and at least two levels of income, $F(5, 1024) = 3.52$, $p = .004$, $\eta^2 = 0.02$. Tukey's HSD Test for multiple comparisons found that the mean value of senior centers was significantly different between less than \$24,999 ($M = 2.09$, $SD = 0.83$) and \$50,000–\$74,999 ($M = 2.39$, $SD = 0.76$), $p = .004$, as well as less than \$24,999 and \$100,000 or more ($M = 2.35$, $SD = 0.84$), $p = .042$.

In terms of source importance for Hurricane Ian information, there were significant differences between males and females in relation to conversations with other people and social media. For social media, it was less important for males ($M = 2.03$, $SD = 0.86$) than females ($M = 1.88$, $SD = 0.81$), $t(1021) = 2.84$, $p = .002$, while for conversations with other people, it was less important for males ($M = 1.81$, $SD = 0.74$) than females ($M = 1.69$, $SD = 0.71$), $t(1021) = 2.75$, $p = .003$. Additionally, significant differences were found for libraries and public schools. Libraries were more important for males ($M = 2.37$, $SD = 0.77$) than females ($M = 2.47$, $SD = 0.72$), $t(978.63) = -2.16$, $p = .015$, while public schools were less important for males ($M = 1.95$, $SD = 0.83$) than females ($M = 1.82$, $SD = 0.82$), $t(1021) = 2.54$, $p = .006$.

In terms of household mitigation, more than one-third of residents mitigated their home against Hurricane Ian ($yes = 34.2\%$) and less than one-fifth of residents evacuated ahead of the hurricane ($yes = 19.9\%$). Crosstabulation analyses failed to reveal differences between men and women in terms of propensity to evacuate, $X^2(2) = 3.76$, *n.s.*, or evacuate, $X^2(2) = 0.66$, *n.s.* White respondents were less likely to evacuate (17.5%) than were Black (30.7%), Native American (38.5%), or Latinx (21.6%) respondents, $X^2(6) = 15.80$, $p = .02$. Conversely, Black respondents were less likely to mitigate their homes (19.1%) than were White (37.2%), Native American (30.8%) and Latinx (32.4%) respondents, $X^2(6) = 19.12$, $p = .004$. Evacuation did not vary across education level, while those with a high school diploma (27.0%) or less (21.2%) were less likely to mitigate than all other categories, $X^2(7) = 31.81$, $p < .001$. Similarly, no relationship was found between income and evacuation, while those making less than \$25,000 annually (16.5%) were less likely to mitigate than all other categories, $X^2(5) = 20.13$, $p < .001$. Finally, one average those who reported evacuating ($M = 41.24$) were slightly younger than those who did not ($M = 46.20$), $t(1023) = -3.52$, $p < .001$, while those who mitigated ($M = 47.60$) were on average slightly older than those who did not, ($M = 43.97$), $t(1026) = 3.07$, $p < .001$.

0.001.

Mitigation responses were also assessed in relation to *media time* and source importance using independent samples *t*-tests. In terms of evacuation, those who chose to evacuate ($M = 76.01$, $SD = 45.89$) reported spending more time in the aggregate seeking information than those who did not, ($M = 64.87$, $SD = 47.81$), $t(1023) = 3.00$, $p = .001$. For every source variable in the analysis, those who chose to evacuate placed greater importance on it than those who did not (see Table 2).

Research question six sought to understand if there was an association between preferred information sources and mitigation behaviors, and no significant differences were detected in terms of media time, $t(1026) = -0.29$ *n.s.* Three sources of information about Hurricane Ian were significantly different including radio, television, and conversations with other people. Notably, radio was more important for individuals who mitigated their home ($M = 1.86$, $SD = 0.82$) than those who did not ($M = 1.96$, $SD = 0.81$), $t(1026) = -1.94$, $p = .03$. Similar findings were detected for television, $t(1026) = -2.05$, $p = .02$, and conversations with others, $t(1026) = -1.69$, $p = .04$, both of which were more important for those who had mitigated their homes. When obtaining information about extreme weather, multiple significant sources emerged including public schools, which were less important for those who mitigated their home ($M = 1.94$, $SD = 0.86$) than those who did not ($M = 1.85$, $SD = 0.80$), $t(668.33) = 1.70$, $p = .05$. Similar findings were detected for religious organizations, $t(1026) = 1.67$, $p = .05$, senior centers, $t(1026) = 2.54$, $p = .006$, and food banks, $t(1026) = 2.31$, $p = .01$, all of which were less important for those who had mitigated their homes. The previously stated results help answer research question five, which sought to discover the role social media played in information-seeking regarding Hurricane Ian. Social media were reported as more important for residents identifying as Black or Latino compared to White residents, and more important for females than males.

Table 2
Mean scores for reliance by evacuation.

Mean scores for source reliance (reverse coded; lower means = greater reliance)					
	Did you choose to evacuate ahead of Hurricane Ian?	N	Mean	Std. deviation	Std. error mean
Radio	Yes	204	1.69	0.793	0.055
	No	821	1.98	0.811	0.028
TV	Yes	204	1.29	0.527	0.037
	No	821	1.44	0.683	0.024
Internet	Yes	204	1.27	0.526	0.037
	No	821	1.35	0.604	0.021
Other People	Yes	204	1.56	0.660	0.046
	No	821	1.79	0.731	0.025
Social Media	Yes	204	1.69	0.775	0.054
	No	821	2.01	0.837	0.029
Community Centers	Yes	204	1.80	0.776	0.054
	No	821	2.11	0.790	0.028
Religious Organizations	Yes	204	2.19	0.809	0.057
	No	821	2.39	0.764	0.027
Senior Centers	Yes	204	2.06	0.828	0.058
	No	821	2.34	0.797	0.028
Social Services	Yes	204	1.89	0.768	0.054
	No	821	2.18	0.788	0.027
Libraries	Yes	204	2.15	0.823	0.058
	No	821	2.49	0.708	0.025
Food Banks	Yes	204	1.93	0.828	0.058
	No	821	2.19	0.856	0.030
Schools	Yes	204	1.79	0.823	0.058
	No	821	1.90	0.826	0.029
Health Clinics	Yes	204	1.85	0.829	0.058
	No	821	2.06	0.866	0.030

All $p = .001$ except Internet ($p = .04$).

4. Discussion

The purpose of this study was to understand the information-seeking behaviors of individuals directly impacted by Hurricane Ian, while learning how these preferences impacted their mitigation behaviors and decision to evacuate before Hurricane Ian made landfall. Instead of analyzing specific sources (e.g., Breitbart, CNN, NBC, Wall Street Journal), this study assessed the medium (e.g., radio, the internet). Further, it extended previous research by considering the role of grass roots sources, such as religious organizations, food banks, community centers, and schools in learning about the crisis.

For obtaining information about Hurricane Ian, multiple demographic distinctions emerged, which suggests some media affected how different population groups learned of its impact and possibly influenced their subsequent behaviors. When assessing age, it positively predicted the importance of television while negative relationships emerged with the internet and social media importance. This aligns with past research on internet and social media use [54] while suggesting that television is an important medium during a time of uncertainty. Television stations in the impacted area would more than likely provide continuous updates about the hurricane and show individuals how their neighborhood is being impacted. However, utilizing the internet or social media would require decisions such as what platform or website to use and what account to search for while also being mindful of misinformation. Therefore, television could be an easier and more efficient medium to navigate when time is of the essence, especially for older audiences. Notably, age had a negative relationship with radio, which suggests individuals may have preferred to visually see what was happening and track the hurricane's trajectory instead of hearing about it.

Demographic factors were also predictive of information seeking and mitigation patterns. Consistent with numerous prior studies, females found conversations with other people and social media as more important sources of information than males, while non-white identifying participants expressed similar preferences for interpersonal sources of information. Therefore, this suggests that Hurricane Ian could have been a communal experience such that these individuals relied on friends, family, or community members and vice-versa. Information could have been shared in person, or on a platform like Facebook with the possibility of feedback, thus bolstering understanding of how to navigate this natural disaster and increasing confidence in the information received. Another significant distinction emerged between participants identifying as Latinx and White such that radio was more important for Latinx participants, which indicates they may have had limited internet access and experience a correspondingly elevated reliance on legacy media; the latter being a distinct possibility given the nearly 2000 Spanish-formatted radio stations in the U.S. [10] as well as radio's reach among Hispanic adults (94%) compared to the general population (90%) in 2023 [38]. In terms of income, a distinction emerged such that television was more important for participants making \$75,000–\$99,999 than those making \$25,000–\$49,999. These individuals may have desired more detailed information to mitigate their home against Hurricane Ian and before evacuating since their return date would have been unknown. Overall, information-seeking behavior varied across demographics, thus all types of media can be used to reach various groups, a desirable outcome when individuals need information during a time of uncertainty.

When it came to the predominant sources of information seeking, conversations with other people and social media emerged across multiple demographics. With an extreme weather event like a hurricane, news can change rapidly, and it would be critical for individuals to stay up to date on the storm, so they can respond accordingly. Past researchers have established the importance of social media during extreme weather events [3,12] including on Facebook and WhatsApp [9] as well as Twitter [45]. In the former, both platforms were used during the 2015 Chennai floods in India to help find missing people,

mobilize volunteers, and share updates. In the latter, Canadian residents used Twitter during Hurricane Dorian in 2019 because it was accessible and the information was up to date, while the most desired information pertained to storm conditions (e.g., wind speed). Therefore, in this study, participants may have sought out social media because they could seek out information from a range of accounts including journalists, meteorologists, and television stations. Furthermore, through common features of social media like hashtags, they could assess aggregate information on the hurricane and gain clarity on what has happened, what is happening, and what could happen. The similar could occur when having conversations with other people except that it would take place in person, over the phone, or through a text. By engaging in these conversations, participants could interact with family, friends, or neighbors. These are personal relationships with individuals who could offer comfort and guidance when faced with an event that produces a range of high consequence outcomes. Notably, Armstrong et al. [3] learned that *social media* and *friends* were the most important mediated and non-mediated sources for obtaining information about a potential severe weather event, thus further demonstrating their importance during times of uncertainty.

When assessing the relationships between information sources, mitigation behaviors, and evacuating, encouraging results emerged, especially in relation to evacuating ahead of Hurricane Ian. Since all sources were more important for those who evacuated, this suggests that different media types effectively disseminated information about the hurricane's impact. Furthermore, participants who utilized digital media or engaged in interpersonal communication could have acquired a greater understanding of how the hurricane will affect their community, thus increasing a desire to evacuate. This would explain the significant difference in relation to media time as those who spent more time seeking information could have realized that evacuating would be the best course of action. In terms of mitigation behaviors, no differences emerged with social media and the internet. However, for those who mitigated their home against Hurricane Ian, significant differences emerged with radio, television, and conversations with other people. Participants may have sought out legacy media because of their reliability. While any person can post information on social media and the internet, greater control is present on radio and television as content dissemination is limited to certain individuals, thus informing viewers that each individual has knowledge on how to prepare for an impending hurricane. Furthermore, radio and television could continually disseminate information on the hurricane's severity while presenting live shots from different neighborhoods, so residents can alter their behaviors as necessary. As seen with various demographics, conversations with other people offer feedback and personalization. If a hurricane is approaching where you live, it would behoove individuals to speak with neighbors to learn how to best mitigate their homes since they may have experienced them before. Neighbors could tell you what to buy, where to buy it, and how to apply it to your home. Furthermore, by engaging in conversations with other people, individuals could have been reassured that the actions they took were appropriate and the best way to prepare for Hurricane Ian; mitigation efforts are by their very nature time consuming and costly, and as higher consequence endeavors may require a higher level of confidence in the veracity of the guidance provided. As our media options continually increase, legacy media such as radio and television are still sought out by various demographic groups, while digital media and conversations with other people influence information seeking, mitigation behaviors, and choosing to evacuate.

4.1. Implications

This study offers numerous theoretical and practical implications for future researchers, emergency personnel, and weather communicators. For theoretical implications, this study extends the use of MDT in relation to crises and natural disasters with the focus on Florida residents

directly impacted by Hurricane Ian. Furthermore, results supported core theoretical components with individuals seeking out a range of sources, specifically mediated sources, to acquire information during a time of uncertainty. This reflects a growing trend in the U.S. with half of adults in 2022 obtaining their news from social media at least sometimes [40]. Additionally, the second theoretical implication involves the use of mediated sources to assess individuals' information-seeking behaviors during times of heightened uncertainty [46]. Social media and the internet were more important for those who evacuated than those who chose not to while differences did not emerge when assessing mitigation behaviors.

From podcasts to platforms, the media landscape has grown exponentially over the past few decades with consumers living in a cluttered world of media, and in this study, community organizations and the media impacted residents' information seeking as well as their evacuation and mitigation behaviors. Therefore, practical implications involve the previously mentioned variables and *source importance for information*. First, when a storm is about to make landfall, emergency personnel should prioritize legacy media when disseminating information pertaining to mitigation behaviors and make themselves available to radio and television stations. While society is moving away from legacy media to social media [17], legacy media still fulfill a vital role in society by helping residents prepare for impending storms. Notably, all source variables were more important for those who chose to evacuate ahead of Hurricane Ian. Therefore, cities and emergency managers should consider both online *and* offline sources when disseminating information about an impending storm – an ideal situation given that some may prefer offline communication compared to online. Additionally, as society's access to information evolves so does technology, which can enable efficient responses to a natural disaster. Through alerts [2], an early warning system (EWS) can save "jobs, land and infrastructures" ([51], para. 1) with Al-Wathinani et al. [2] detailing their adoption for earthquakes, extreme heat, and flash floods. They have also helped save lives in relation to a tornado in Louisiana [42] and notified California residents of an impending earthquake [53]. As a result, it would be advantageous to utilize such technology and subsequently share the information within a community or on various media outlets, given their impact during a time of uncertainty.

The second practical implication revolves around the importance of community organizations, specifically community centers and religious organizations, for members of the Black and Latino community. Given this, it would be advantageous for emergency managers to go directly to the source and disseminate their message. This could include town halls and workshops where community members learn more about extreme weather, their potential impact, and how best to respond. In addition, when a storm is approaching, these organizations could serve as an *information hub* where residents obtain accurate and timely information from city officials and emergency personnel. By enacting these steps, municipalities would be taking "a bottom-up approach to disaster preparedness" ([2], p. 13) and empower residents to confidently respond to an approaching storm. The third practical implication revolves around the importance of social media, which were more important for members of the Black and Latino community compared to participants identifying as White. Therefore, it would behoove emergency managers to target these communities through one of the many social media platforms that exist. For example, they could disseminate information through Facebook groups or subreddits on Reddit while using a common feature of social media: hashtags. All would enable them to reach community members with information tailored to their neighborhood, thus furthering members' understanding of an impending storm's impact. Similarly, they could follow the work of Saudi Arabia who created an app that offers advice on disaster preparedness as well as continuous updates on disaster risks [2]. In 2023, the most common way adults in the U.S. *often* got their news was through digital devices (e.g., apps, news websites, social media) [31]; therefore, utilizing social media or creating a mobile app would reflect society's current news

consumption habits and align with past research from Phan et al. [41] who learned MWAs were most frequently used by college students for obtaining weather information. Ultimately, for emergency managers and weather communicators, it is critical to consider these different sources when crafting and distributing risk and ultimately, crisis communication messages. Particularly in our media rich environment, knowing how your audience is consuming information is crucial in mitigating poor outcomes following a weather crisis.

5. Conclusion

The study's findings can be used as further evidence of the variability in crisis information seeking documented in prior research, along with new consideration for the relative importance of community organizations for particular communities and alongside mediated and interpersonal resources. The findings largely suggest that marginalized communities are more likely to be reliant on the sources. Across the board, non-White, lower SES, and less educated respondents were more likely to seek out information from schools, food banks, and community service organizations. Further, these resources were relied upon less by older audiences, suggesting that isolation and/or mobility issues may impact the ability for seniors to access and utilize these sources. While these relationships have been speculated in past research (see [26,48]), this is one of the first direct tests of their relative importance to members of different communities and across the lifecycle. Crisis communication practitioners and first responders would do well to consider the viability of these information conduits when working with environmental disasters that impact highly specific, at-risk, and marginalized communities. Future research should also serve to investigate the underlying causes of these differences, including the moderating effect of financial resources, variability in risk perceptions, and trust in government agencies that may vary from hazard to hazard, and from community to community.

CRedit authorship contribution statement

Kenneth A. Lachlan: Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **James DiCairano:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Patric R. Spence:** Writing – review & editing, Writing – original draft, Visualization, Resources.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data available at osf.io/atuq6

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