

Introduction

First emerging as a hot topic in public relations literature, crisis communication has been used as a buzz phrase that has been covered in a variety of models, theories, and sectors (Coombs, 2007; Fisher, Austin, & Jin, 2011; Fussell, Collins, & Zoch, 2010; Macias, Hilyard, & Freimuth, 2009). Crisis communication can be defined as the delivery of effective and efficient messaging to the relevant audiences during the course of crisis events (Freberg, Saling, Vidoloff, & Eosco, 2013). Crisis communication plays a significant role for the different audiences for which it is designed. For example, during natural disasters, the general public depends on crisis communication for warnings, information for behavioral change to cope with the crises, information for further guidance, and psychological and emotional supports throughout the event (Anthony, Cowden-hodgson, Hair, Robert, & Eosco, 2014; Dailey & Starbird, 2014; Sadri, Hasan, Ukkusuri, & Cebrian, 2018; Wang & Zhuang, 2017). Additionally, organizations use crisis communication to assist with reputation protection, efficient multi-organizational collaboration, and information dissemination related to a crisis, among other items highlighted above (Coombs, 2007).

Emergency response entities play critical roles in coordinating community response actions both during and after hurricanes (S. K. Huang, Wu, Lindell, Wei, & Samuelson, 2017). Communication is a critical part of such coordination (Pitt & Treen, 2017) and Extension services continuously play a role in keeping communities informed (Eighmy, Hall, & Sahr, 2012). Disaster literature speaks to several types of communication needs for the public during disaster situations. Leading up to an impending disaster, Extension clients may experience fear, sadness, anxiety, and dread; therefore, information to address the psychological needs of clients are highlighted as necessary (Spence, Lachlan, Lin, & Greco, 2015). Authors also speak to information on behavior change to ensure safety, visual representations of the crisis and a balance between official and conversational updates (Page, Freberg, & Saling, 2013; Spence et al., 2015).

Globally, hurricanes and other natural disasters have resulted in major economic damage and disruption of social norms for extended periods of time (Campbell & Beckford, 2009). Typhoon Mireille cost Japan approximately \$5 billion (USD) in damages in 1991 (Fujii, 1998). Similarly, the island of Dominica experienced mass destruction from Hurricane Maria (2017), after which the people of Dominica experienced significant social disruption (Kassam, 2017). About 90% of Dominica's gross domestic product (GDP) was lost previously from Hurricane Erika (2015), accounting for \$483 million USD (Elie, 2017).

Over the past two decades, states along the Gulf Coast and East Coast of the United States have experienced roughly \$300 billion in damage due to hurricanes, with the top three hurricanes in terms of costs being Katrina (2005), Harvey (2017), and Sandy (2012) (Klotzbach, Bowen, Pielke, & Bell, 2018). In Florida, the impact of hurricanes has been especially devastating. In 2004, four hurricanes made landfall within a six-week period and caused widespread destruction across all 67 counties of Florida (Acierno et al., 2007). Florida was hit again during the 2017 hurricane season, during which Irma made landfall three times at various points. As a result of Harvey, the Florida Department of Agriculture and Consumer Services (2017) estimated a total of \$2 billion in crop losses, and \$2.6 billion in total losses to production agriculture. Extension faculty are often called to take an active role in hurricane disaster preparation, response, and recovery in theirs and neighboring communities (Telg, Irani, Muegge, Kistle, & Place, 2007). As such, it is necessary to examine Extension's role and response during

hurricane preparation and recovery to help facilitate continued improvement of Extension's efforts in disaster situations.

Literature Review and Conceptual Framework

Despite the increased accuracy of hurricane forecasts, local authorities alone may not always be able to respond fully and adequately in hurricane disaster situations (Campbell & Beckford, 2009; Huang et al., 2017). State Extension services can play a key role in emergency response and supplement coordinated emergency response efforts (Downey et al., 2018; Kerr, Sanders, Moulton, & Gaffney, 2018). Local Extension offices often function as part of their local emergency management teams to provide a research base, provide relevant information, and employ faculty members to impacted areas (Angima & Stokes, 2019; Kerr et al., 2018). Community members often look to Extension offices and faculty for emergency resources and expertise (Atkinson, 2012; Extension Disaster Education Network [EDEN], 2011). This is true in the United States, as well as in other countries impacted by hurricanes. In Caribbean countries, Cooperative Extension has been deemed a critical player in strategies to address emerging issues in agriculture, including responding to hurricanes and other natural disasters (Lindner & Dolly, 2012).

Extension's unique position in local communities allows the service to (a) readily assess disaster situations (b) better provide strategies for developing issues, (c) give direct support for those affected by hurricanes, (d) estimate damage caused to food and fiber sectors, (e) assist with disaster recovery by way of clean-up and animal supply coordination, (f) charting plans for the immediate future, and (g) prepare homes and businesses before and after an event (Boteler, 2007; Edgar et al., 2012; Eighmy et al., 2012; Fannin & Guidry, 2010; Long et al., 2015; Lutz & Lindell, 2008; Schattenberg, 2018). People depend on receiving information to make decisions; the more sources of accurate information provided, the more likely information will reach dependent audiences (West & Orr, 2007). Extension can be particularly helpful in communicating information to the public and other audiences during disaster situations (Telg et al., 2007).

Communication technologies, methods, and channels have been identified as major factors in effective emergency response (Cathey, Coreil, Schexnayder, & White, 2007; Pinellas County Florida Emergency Management, 2018; Pitt & Treen, 2017). The general public has been cited as using traditional media like television, radio, and newspaper for information regarding disasters (Anthony et al., 2014; Muegge, 2005; Telg et al., 2007). Face-to-face communication, otherwise called "word of mouth", was cited to be most accepted form of communication when the information came from the organization (Fisher et al., 2011). Additionally, the use of internet-based platforms like email, social media, blogs, and websites have burgeoned in the area of disaster communication (Fisher et al., 2011; Macias et al., 2009; Page et al., 2013; Sadri et al., 2018; Spence et al., 2015). Many researchers have also highlighted various situational combinations of communication which Extension agents use during hurricane disasters. Following the 2004 hurricane season, researchers identified the top three tools used for information dissemination by Florida's Extension agents as flyers, newspapers, and web-based material (Telg et al., 2007). Personal delivery of information by Extension agents and other real-time information tools (e.g. radio and text messaging) were also found to be effective during Florida's hurricane emergency response (Muegge, 2005). During Hurricane Irma (2017), county officials used the county website, call centers, and social media platforms as the primary

information conduits, as well as resorted to using land lines and radios as back-up communication methods (Pinellas County Florida Emergency Management, 2018).

In other states, television was identified as a major communication tool used by individuals during hurricanes because of the immediacy of the service (Gordon, 2009). In Hawaii, frequently used emergency communication channels including the Hawaii Emergency Management Agency (HiEMA) website, mobile emergency response via satellite, land line, and desktop devices where applicable (Federal Emergency Management Agency [FEMA], 2015). The Louisiana Cooperative Extension Services (LCES) also used many of the aforementioned communication channels during the devastation of hurricanes Katrina and Rita (Cathey et al., 2007). Text messaging was perceived as a viable tool since the text messaging services continued to function during Hurricane Katrina, as well as allowed for messages to be queued for sending if the service became temporarily unavailable (Garnett & Kouzmin, 2007). Similarly, text messaging services were the most popular communication tool during Typhoon Haiyan in the Philippines, due to other resources being too damaged to function. However, after the typhoon subsided and when social network platforms were functioning again, social media platforms were a high source of communication activity (Longboan, 2018; Tandoc & Takahashi, 2017; Yi & Kuri, 2016). During Typhoon Morakot in Taiwan in 2009, social media networks filled in where traditional communication channels like telephone, radio, and television were overloaded or inaccessible (Huang, Chan, & Hyder, 2010).

In practice, communication channels can be disrupted due to the devastating effects of hurricanes or other natural disasters, and it is also difficult to anticipate disruptions (Pitt & Treen, 2017; Tandoc & Takahashi, 2017). These disruptions can limit the effectiveness of Extension agents to communicate to their target audience and deliver important information to their clients. Dominica was described as “incommunicado” after Hurricane Maria, due to the destruction of nearly all communication channels (Semple & Ahmed, 2017). In disaster situations, landline connections and cellular networks likely will not work for at least the first day after a disaster, due to system damage, power failure, and a variety of other reasons (FEMA, 2015). Moreover, panic reactions by the general population may lead to overloaded residual systems and congested communication networks (FEMA, 2015). On the other hand, the lowered credibility and inherent biases of media outlets may lead to a lower dependence on television as a reliable source of information (West & Orr, 2007).

Theory of Planned Behavior

The Theory of Planned Behavior (TPB), as proposed by Ajzen (1991), attempts to predict behaviors of individuals with respect to four main factors; behavioral beliefs, attitude towards the behavior, subjective norms, and perceived behavioral control (Ajzen, 1991). The Theory of Planned Behavior, as a framework for this study, speaks to the perceived behavioral control to engage in communication with clients affected by hurricanes. Hurricanes create an environment where communication norms may be altered due to the emergency, as well as by changes in the communication environment. One such change is the destruction of communication facilities like phone lines, internet connections and cellular relay poles. Extension agents may use the facility that is deemed to produce the best communication results. The subjective norm of Extension faculty engaging in communication during hurricanes is an approved behavior as part of their profession. Perceived behavioral control, a third element in the theory, looks at the ease or difficulty of engaging in a specific behavior. In this study, the perceived ease of using specific channels and methods to communicate with clients can lead to a preference of those channels.

Attitude towards communication and the chosen mechanisms will influence how and how much Extension agents communicate with their clients. In an emergency situation, agents may be motivated by ensuring the safety of their clients through information dissemination.

Purpose and Objectives

The prior research supports the idea that Extension offices and faculty members serve as information conduits and situationally rely on various communication mechanisms to deliver information to their clients and the general public depending on the disaster (Cathey et al., 2007; Pitt & Treen, 2017; Sadri et al., 2018; Telg et al., 2007). Florida has been impacted significantly by hurricanes and is likely to be impacted by hurricanes in the future. Therefore, research is needed to identify the communication mechanisms used by Extension offices and faculty members in hurricane disaster situations, as well as to examine the effectiveness of those methods to inform future practice in hurricane preparation, response, and recovery.

This descriptive study was conducted to examine Florida Extension offices' and Extension faculty members' communication efforts and messages employed during the 2017 hurricane season. Three objectives guided this study:

1. Identify the extent to which individual Florida Extension faculty, as well as Extension offices, used select communication methods (including technology/app use) to convey information to clientele and the general public during the 2017 hurricane season;
2. Identify the communication methods most effective in conveying information to clientele and the general public during the 2017 hurricane season in Florida;
3. Describe Florida Extension faculty members' perceptions of the extent to which clientele and members of the public were aware of Florida Extension's efforts during the 2017 hurricane season.

Methodology

Population and Sample

The targeted population for this study included all Florida Extension faculty (i.e. Extension agents, county directors, and district directors) who had a viable email address as of October 2017 ($N = 358$). Useable responses were collected from 137 of the 358 Extension faculty members for a 38% response rate. Nonresponse bias was assessed by comparing early to late respondents (Miller & Smith, 1983). This method has been used frequently in agricultural education research (Lindner et al., 2003; Johnson & Shoulders, 2017), as well as been identified as appropriate for addressing nonresponse based on the assumption that late respondents are similar to non-respondents (Burkell, 2003; Lindner et al., 2003). Two-tailed independent *t*-tests were used to determine if statistically significant differences existed between early respondents (those responding prior to the third reminder email) and late respondents (those responding after the third reminder email) on the variables of interest in this study. No significant differences were found between early and late respondents on any variable.

Instrument

A survey questionnaire was developed for data collection following the 2004 hurricane season in Florida (Telg et al., 2007). This questionnaire was assessed by a panel of experts including faculty members specializing in agricultural communication and disaster management and modified to include additional questions to better identify Florida Extension's role in 2017's

hurricane season's preparation and recovery. This questionnaire was used as the instrument for this study. The 2004 and 2017 survey are similar in content. However, the 2017 survey was updated to consider social media and internet-based communication platforms.

Specific sections of the 2017 questionnaire were used for analysis in this study. The first section concerned the extent to which Extension faculty members made use of select communication methods to communicate to Extension clientele during the 2017 hurricane season. The internal reliability of this scale was $\alpha = .78$. The same items and response scale were used in the next section of the instrument to examine Extension faculty's perceptions of the extent to which the communications were used by their Extension offices to communicate to clientele. The internal reliability of this scale was $\alpha = .79$. The instrument also examined Extension faculty members' perceptions of the extent to which their Extension offices utilized select communication channels to convey information to the general public during the 2017 hurricane season. The internal reliability of this scale was $\alpha = .81$.

Lastly, the instrument examined by Florida Extension faculty members' perceptions of the extent to which the public and clientele were aware of Extension's efforts during the 2017 hurricane season. The responses for each of these sections were collected using a four-point Likert-type item: 1 = *not at all*; 2 = *slight extent*; 3 = *moderate extent*; and 4 = *great extent*. Real limits were used for the interpretation of responses: 1.00 to 1.49 = *not at all*; 1.50 to 2.49 = *slight extent*; 2.50 to 3.49 = *moderate extent*; and 3.50 to 4.00 = *great extent*.

Additionally, the instrument assessed Extension faculty members' perceptions of the effectiveness of select communication sources in conveying information to clientele and the general public during the 2017 hurricane season. Respondents were asked to indicate which of the communication methods used by them and their Extension offices were most effective in conveying information to clientele, and then for conveying information to the general public.

Data Collection and Analysis

An online link to the survey questionnaire was distributed via Qualtrics to all Florida Extension faculty (i.e. Extension agents, county directors, and district directors) who had a viable email address as of October 2017. Responses were collected using a modified version of Dillman, Smith, and Christian's (2009) tailored design method. An initial invitation and three follow-up reminders were distributed to members of the targeted population. Data for all objectives were analyzed using descriptive statistics (i.e. means, standard deviations, frequencies, and percentages).

Results

Objective One

Objective one sought to identify the extent to which individual Florida Extension faculty members, as well as Extension offices, utilized select communication channels to convey information to their clientele and the general public during the 2017 hurricane season. The communication methods used to the greatest extent by individual faculty members were email ($M = 2.76$; $SD = 1.05$), face-to-face communication ($M = 2.70$; $SD = 1.04$), and phone ($M = 2.70$; $SD = 1.03$). The communication channels used to the least extent were Twitter ($M = 1.35$; $SD = 0.85$) and Instagram ($M = 1.18$; $SD = 0.50$; see Table 1).

Table 1

Extent to which Florida Extension faculty members used select communication channels to communicate with clientele during the 2017 hurricane season

Item	<i>N</i>	<i>M</i>	<i>SD</i>	Interpretation
Email	123	2.76	1.05	Moderate extent
Face-to-face	122	2.70	1.04	Moderate extent
Phone	128	2.70	1.03	Moderate extent
Facebook	124	2.56	1.21	Moderate extent
Internet	121	2.49	1.09	Slight extent
On-site visits	121	2.26	1.20	Slight extent
Text messaging	123	2.15	1.24	Slight extent
Twitter	119	1.35	0.85	Not at all
Instagram	118	1.18	0.50	Not at all

Note: Real Limits: 1.00 to 1.49 = *Not at all*, 1.50 to 2.49 = *Slight extent*, 2.50 to 3.49 = *Moderate extent*, 3.50 to 4.00 = *Great extent*.

The communication channels used by Extension offices to the greatest extent to convey information to clientele included email ($M = 2.80$; $SD = 1.01$), phone ($M = 2.73$; $SD = 1.02$), and Facebook ($M = 2.72$; $SD = 1.07$). The communication channels used to the least extent were Twitter ($M = 1.40$; $SD = 0.82$) and Instagram ($M = 1.17$; $SD = 0.43$; see Table 2).

Table 2

Extent to which Florida Extension offices used select communication channels to communicate with clientele during the 2017 hurricane season.

Item	<i>N</i>	<i>M</i>	<i>SD</i>	Interpretation
Email	115	2.80	1.01	Moderate extent
Phone*	116	2.73	1.03	Moderate extent
Facebook	116	2.72	1.07	Moderate extent
Face-to-face	115	2.72	1.01	Moderate extent
Internet	116	2.54	1.03	Moderate extent
On-site visits	116	2.42	1.11	Slight extent
Text messaging	115	2.00	1.06	Slight extent
Twitter	111	1.40	0.82	Not at all
Instagram	109	1.17	0.43	Not at all

Note: Real Limits: 1.00 to 1.49 = *Not at all*, 1.50 to 2.49 = *Slight extent*, 2.50 to 3.49 = *Moderate extent*, 3.50 to 4.00 = *Great extent*.

*"Phone" refers to the use of a telephone for audio connection and verbal communication.

**"Text messaging" refers to the use of digital messages through a telephone's messaging app or a similar app.

The mass communication channel used by Extension offices to the greatest extent to convey information to clientele was the internet/web ($M = 2.91$; $SD = 0.93$). The mass communication channels used the least were live radio ($M = 1.45$; $SD = 0.86$), television public service announcements (TV PSA's) ($M = 1.29$; $SD = 0.69$), and live TV ($M = 1.29$; $SD = 0.71$; see Table 3).

Table 3

Extent to which Florida Extension offices used select mass communication channels to convey information to the general public during the 2017 hurricane season

Item	<i>N</i>	<i>M</i>	<i>SD</i>	Interpretation
Internet/Web	129	2.91	0.93	Moderate Extent
Flyers/Print Materials	130	2.03	0.91	Slight Extent
Newspaper	127	1.77	0.93	Slight Extent
Radio PSA	127	1.57	0.91	Slight Extent
Live radio	127	1.45	0.86	Not at All
TV PSA	126	1.29	0.69	Not at All
Live TV	127	1.29	0.71	Not at All

Note: Real Limits: 1.00 to 1.49 = Not at all, 1.50 to 2.49 = Slight extent, 2.50 to 3.49 = Moderate extent, 3.50 to 4.00 = Great extent.

Concerning Extension offices' communication with the general public, respondents reported that their local Extension offices used mass communication channels to a *slight extent* overall ($M = 2.18$; $SD = 0.93$). Individual faculty members also utilized mass communication channels to a *slight extent* overall ($M = 2.07$; $SD = 1.10$) to reach their clients.

Objective Two

Objective two sought to examine Extension faculty members' perceptions of the effectiveness of the communication methods utilized to communicate with clientele and members of the public during the 2017 hurricane season. Of the communication channels used, the majority of Extension faculty members of this study ($f = 79$; 62.7%) identified the internet as the most effective in conveying information to the public. Regarding the most effective methods used to communicate with clientele, more Extension faculty members ($f = 46$; 33%) identified Facebook than any other method.

Objective Three

Objective three assessed Florida Extension faculty members' perceptions of clientele and public awareness of Extension's efforts during the 2017 hurricane season. Overall, Extension faculty members believed Extension clientele were aware of their efforts to a *slight extent* ($M = 2.48$; $SD = 0.90$). Similarly, Extension faculty believed the general public was aware of Extension's efforts during the 2017 hurricane season to a *slight extent* ($M = 2.07$; $SD = 0.75$).

Conclusions, Implications, and Recommendations

Florida Extension faculty members used similar communication methods to communicate with clientele when compared with Florida Extension offices. The top three methods for both offices and individual agents were Email, phone and Facebook. Email was used to the greatest extent by both Extension faculty and offices, which may be due to the accessibility of email as an initial response mechanism in an emergency situation (Charanza & Naile, 2012). Further, email acts as a one-to-many response tool that allows Extension offices and individual agents to share information without having faculty members on site. This speaks to subjective norms in an emergency as both agents and offices engage in communicating with as many individuals as possible. Additionally, Florida Extension faculty members and offices may have utilized email more frequently than face-to-face communication to reach clientele due to the difficulty of traveling to locations during and after hurricane disaster situations. Again, this speaks to TPB as

preferred communication techniques were displaced due to changes in the environment, reducing the perceived behavioral control of Extension faculty.

As supported by the findings of this study, face-to-face communication is still frequently used in disaster situations, despite improvements in communication technologies (Garnett & Kouzmin, 2007). This is particularly true when communication technologies become unavailable in disasters (Boteler, 2007). When possible or when necessary, Florida Extension offices should continue to send Extension faculty to communicate face-to-face with clientele during hurricane preparation and recovery. As noted by D'Ambra, Rice, and O'Connor (1998), face-to-face communication with agents allows audiences to receive verbal and non-verbal reassuring cues that may otherwise be lost by using communication technologies. As mentioned in previous research, the public seeks information to ease psychological woes, and face-to-face communication allows for this (Acierno et al., 2007; Spence et al., 2015).

While communication scholars have given attention to social media platforms as a mechanism for communication during disasters (Cheng, 2018; Eriksson & Olsson, 2016; Freberg et al., 2013; Page et al., 2013; Pitt & Treen, 2017; Sadri et al., 2018), findings from this study indicated not all social media platforms are used as communication tools to the same extent. Facebook was the most prominent social media platform used (to a *moderate extent*) by Extension faculty members and offices to communicate with clientele. Instagram and Twitter were identified as *not at all* used, probably because of the target demographic of these platforms (Pew Research Center, 2018). Again, TPB can be applied where normative beliefs can influence the use of a communication channel. Extension faculty and offices should continue using Facebook as one of their main social media communication channels, or perhaps expand social media platform use as clients' needs evolve.

The top three mass communication channels used by Extension offices to convey information to the general public during the 2017 hurricane season included the internet/web, flyers/print materials, and newspapers. The acceptability of the internet as a widely used communication channel makes it feasible for Extension office managers to use this channel in an effort to reach as many clients as they can during an emergency (Salman, Abdullah, Mustaffa, Amizah, & Mahmud, 2015). However, Muegge (2005) noted print materials provided by Extension were scolded as a "waste of time" by the public because they felt Extension's efforts may have been more useful elsewhere. Live TV was the least-used mass communication channel. Factors that may have led to this finding is the lowered credibility and inherent biases of TV media outlets in disaster situations (West & Orr, 2007) and that it was difficult for faculty in local Extensions to even access television stations for live broadcasts.

Regarding Extension faculty members' beliefs about the effectiveness of communication methods, the majority of respondents identified the internet as the most effective method for communicating information to the public. This finding is similar to the findings reported by Salman et al. (2005). When communicating with clientele, more respondents identified Facebook as the most effective than any other method. Facebook as a platform for information has continuously evolved in light of disaster activity to the point where Extension faculty can collect data on individuals who report themselves as safe (Ribeiro, 2015). The ease of use, wide reach, and access to audiences may explain Extension faculty members' perceptions of Facebook as a feasible mechanism to use to relay information where necessary. However, this finding was surprising considering Extension faculty members did not identify Facebook as one of the communication methods used to the greatest extent to communicate with clientele. Regarding clientele and public awareness, respondents believed that both Extension clientele and members

of the general public were aware of their efforts to only a slight extent. As such, it is recommended that future measures be taken to increase public and clientele awareness of Extension's role in disaster situations.

Based on the findings of this study regarding use and effectiveness of communication methods used, it is recommended that further research investigate potential reasons for Extension offices' and faculty members' choices of communication methods to reach clientele and the public during and after hurricanes. Research is also needed to further examine differences in the methods most used by Extension faculty members and those perceived to be most effective. The use of inferential statistics could assist in explaining choice of communication methods based on demographic characteristics or regional location to determine whether a state-wide or county-wide approach should be employed.

As this study only examined the perceptions and behaviors of Florida Extension offices and faculty members, future research should also be conducted to examine the communication methods and information sources used and preferred by Extension clientele and members of the public in Florida. The results of such research could also be compared to the findings of this study to identify any discrepancies between the current communication approaches used by Extension offices and the approaches preferred by the populations they serve. Research conducted with Extension clientele and the public may also provide insight regarding other factors that should be examined in future research with Florida Extension offices and faculty members. Should such factors be identified, the survey instrument used in this study should be modified accordingly. Research conducted with clientele and the public should also seek to examine their awareness of Extension's efforts during the 2017 hurricane season to compare to Extension faculty members' beliefs about the public's awareness. The results of this study should then be shared with Extension offices and faculty members to inform them of the actual degree to which clientele and the public were aware of their work.

References

- Acierno, R., Ruggiero, K. J., Galea, S., Resnick, H. S., Koenen, K., Roitzsch, J., ... Kilpatrick, D. G. (2007). Psychological sequelae resulting from the 2004 Florida hurricanes: implications for postdisaster intervention. *American Journal of Public Health, 97 Suppl 1*, 16–18. <https://doi.org/10.2105/AJPH.2006.087007>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Angima, S., & Stokes, A. (2019). Engage the future: The new Extension learners. *Journal of Extension, 57*(2), Article # 2COM1. Retrieved from <https://joe.org/joe/2019april/comm1.php>
- Anthony, K. E., Cowden-hodgson, K. R., Hair, H. D. O., Robert, L., & Eosco, G. M. (2014). Complexities in communication and collaboration in the hurricane warning system. *Communication Studies 65*(5), 468–483. <https://doi.org/10.1080/10510974.2014.957785>
- Atkinson, R. W. (2012). *The Greensburg 2007 tornado crisis: Extension agents make sense of informational needs, information seeking behaviors and information satisfaction*. (Unpublished doctoral dissertation). Retrieved from <https://esirc.emporia.edu/handle/123456789/3251>.
- Boteler, F. E. (2007). Building disaster-resilient families, communities, and businesses. *Journal of Extension, 45*(6), 1–9. Retrieved from <https://www.joe.org/joe/2007december/a1.php>
- Campbell, D., & Beckford, C. (2009). Negotiating uncertainty: Jamaican small farmers '

- adaptation and coping strategies, before and after hurricanes - A case study of Hurricane Dean. *Sustainability*, 1(4), 1366–1387. <https://doi.org/10.3390/su1041366>
- Cathey, L., Coreil, P., Schexnayder, M., & White, R. (2007). True colors shining through: Cooperative extension strengths in time of disaster. *Journal of Extension*, 45(6). Retrieved from <https://www.joe.org/joe/2007december/comm1.php>
- Charanza, A. D., & Naile, T. L. (2012). Media dependency during a food safety incident related to the U.S. beef industry. *Journal of Applied Communications*, 96(3). <https://doi.org/10.4148/1051-0834.1145>
- Cheng, Y. (2018). How social media is changing crisis communication strategies: Evidence from the updated literature. *Journal of Contingencies and Crisis Management*, 26(1), 58–68. <https://doi.org/10.1111/1468-5973.12130>
- Coombs, W. T. (2007). Protecting organization reputations during a crisis: The development and application of situational crisis communication theory. *Corporate Reputation Review*, 10(3), 163–176. <https://doi.org/10.1057/palgrave.crr.1550049>
- Dailey, D., & Starbird, K. (2014). Visible skepticism: Community vetting after Hurricane Irene. In *Proceedings of the 11th International ISCRAM Conference* (pp. 772–776). Retrieved from https://static1.squarespace.com/static/56b290c52eeb817ddb26446b/t/580fe84f46c3c44e7d4fa6d7/1477437524660/ISCRAM14_Dailey_Starbird_Visible_Skepticism.pdf
- Downey, L. H., Buys, D., Fountain, B., Ball, T., Hilbun, A. H., & Threadgill, P. (2018). Assisting after disaster: A volunteer management and donations management training. *Journal of Extension*, 56(3), 2014–2017. Retrieved from <https://joe.org/joe/2018june/tt2.php#.W0-caskJfOE.mendeley>
- Edgar, L. D., Edgar, D. W., McGuire, A., Rutherford, T. A., Doerfert, D. L., & Murphrey, T. P. (2012). Crisis communication needs assessment: A Delphi study to enhance instruction for agricultural communicators and other stakeholders. *NACTA Journal*, 56(4), 52–62. Retrieved from <https://www.nactateachers.org/index.php/vol-56-num-4-dec-2012/2013--crisis-communication-needs-assessment-a-delphi-study-to-enhance-instruction-for-agricultural-communicators-and-other-stakeholders>
- Eighmy, M. A., Hall, T. E., & Sahr, E. (2012). The Extension service and rural/frontier disaster planning, response, and recovery. *Journal of Extension*, 50(4). Retrieved from <https://joe.org/joe/2012august/a10.php>
- Elie, J. (2017, November 1). “It feels like Dominica is finished”: Life amid the ruins left by hurricane Maria. *The Guardian*. Retrieved from <https://www.theguardian.com/global-development/2017/nov/01/it-feels-like-dominica-is-finished-life-amid-the-ruins-left-by-hurricane-maria>.
- Eriksson, M., & Olsson, E. (2016). Facebook and Twitter in crisis communication: A comparative study of crisis communication professionals and citizens. *Journal of Contingencies and Crisis Management*, 24(4), 198–208. <https://doi.org/10.1111/1468-5973.12116>
- Extension Disaster Education Network (EDEN). (2011). *Reducing the impact of disasters through education*. Retrieved from <http://eden.lsu.edu/AboutEDEN/HowEDENWorks>.
- Fannin, J. M., & Guidry, K. (2010). Developing economic assessments in response to natural disasters: A strategic plan for executing Extension’s mission. *Journal of Extension*, 48(3), 1–7. Retrieved from <https://joe.org/joe/2010june/tt1.php>
- Federal Emergency Management Agency (FEMA). (2015). *2015 Hawaii catastrophic hurricane*

- plan/ FEMA RIX Hawaii catastrophic annex*[Brochure]. Author. Retrieved from https://dod.hawaii.gov/hiema/files/2016/03/2015Hawaii_Cat_Plan.pdf.
- Fisher, B., Austin, L., & Jin, Y. (2011). How publics respond to crisis communication strategies: The interplay of information form and source. *Public Relations Review*, 37, 345–353. <https://doi.org/10.1016/j.pubrev.2011.08.004>
- Freberg, K., Saling, K., Vidoloff, K. G., & Eosco, G. (2013). Using value modeling to evaluate social media messages: The case of Hurricane Irene. *Public Relations Review*, 39, 185–192. <https://doi.org/10.1016/j.pubrev.2013.02.010>
- Fujii, T. (1998). Statistical analysis of the characteristics of severe typhoons hitting the Japanese main islands. *Monthly Weather Review*, 126(4), 1091–1097. [https://doi.org/10.1175/1520-0493\(1998\)126<1091:saotco>2.0.co;2](https://doi.org/10.1175/1520-0493(1998)126<1091:saotco>2.0.co;2)
- Fussell, H., Collins, E. L., & Zoch, L. M. (2010). Through the looking glass: A decade of Red Cross crisis response and situational crisis communication theory. *Public Relations Review*, 36, 21–27. <https://doi.org/10.1016/j.pubrev.2009.08.018>
- Garnett, J. L., & Kouzmin, A. (2007). Communicating throughout Katrina: Competing and complementary conceptual lenses on crisis communication. *Public Administration Review*, 67, 171–188. <https://doi.org/doi:10.1111/j.1540-6210.2007.00826.x>.
- Gordon, J. C. (2009). *Media dependency theory and a tale of two hurricanes: Crisis communication in Southeast Louisiana for hurricanes Katrina and Gustav*. Paper presented at the 2009 National Communication Association. Retrieved from <http://connection.ebscohost.com/c/articles/54434089/media-dependency-theory-tale-two-hurricanes-crisis-communication-southeast-louisiana-hurricanes-katrina-gustav>.
- Huang, C. M., Chan, E., & Hyder, A. A. (2010). Web 2.0 and internet social networking: A new tool for disaster management? - Lessons from Taiwan. *BMC Medical Informatics and Decision Making*, 10(57), 191–200. <https://doi.org/10.1186/1472-6947-10-57>
- Huang, S. K., Wu, H. C., Lindell, M. K., Wei, H. L., & Samuelson, C. D. (2017). Perceptions, behavioral expectations, and implementation timing for response actions in a hurricane emergency. *Natural Hazards*, 88(1), 533–558. <https://doi.org/10.1007/s11069-017-2877-4>
- Kassam, A. (2017, October 4). Dominica in tatters weeks after Maria: ‘We saw everything totally destroyed’. *The Guardian*. Retrieved from <https://www.theguardian.com/world/2017/oct/03/hurricane-maria-dominica-recovery>
- Kerr, S., Sanders, C., Moulton, C., & Gaffney, M. (2018). The role of extension in a University’s response to a natural disaster. *Journal of Extension*, 56(4). Retrieved from <https://joe.org/joe/2018august/a5.php>
- Klotzbach, P. J., Bowen, S. G., Pielke, R., & Bell, M. (2018). Continental U.S. hurricane landfall frequency and associated damage: Observations and future risks. *Bulletin of the American Meteorological Society*, 99(7), 1359–1376. <https://doi.org/10.1175/BAMS-D-17-0184.1>
- Lindner, J. R., & Dolly, D. (2012). Extension and outreach: Not a question of if, but how. *Journal of International Agricultural and Extension Education*, 19(3), 6–14. <https://doi.org/doi:10.5191/jiaee.2012.19301>
- Long, A., Williams, R., Demers, C., Nowak, J., Strong, N., & Davidson, J. (2015). *Assessment and management of hurricane damaged timberland*. University of Florida Cooperative Extension Service Publication Series (SS-FOR22). Gainesville, FL. Retrieved from <https://edis.ifas.ufl.edu/fr154>
- Longboan, L. (2018). “I don’t want trouble”: Freedom of expression and use of backchannels in the wake of Typhoon Haiyan. *Disaster Prevention & Management*, 27(4), 380–392.

<https://doi.org/doi:10.1108/DPM-01-2018-0021>

- Lutz, L. D., & Lindell, M. K. (2008). Incident command system as a response model within emergency operation centers during Hurricane Rita. *Journal of Contingencies and Crisis Management*, 16(3), 122–134. <https://doi.org/10.1111/j.1468-5973.2008.00541.x>
- Macias, W., Hilyard, K., & Freimuth, V. (2009). Blog functions as risk and crisis communication during hurricane Katrina. *Journal of Computer-Mediated Communication*, 15, 1–31. <https://doi.org/10.1111/j.1083-6101.2009.01490.x>
- Muegge, M. D. (2005). *Communication efforts of Florida Extension faculty during the 2004 hurricane season* (Unpublished master's thesis). University of Florida, Gainesville, Florida.
- Page, S., Freberg, K., & Saling, K. (2013). Emerging media crisis value model: A comparison of relevant, timely message strategies for emergency events. *Journal of Strategic Security*, 6(2), 20–31. <https://doi.org/10.5038/1944-0472.6.2.2>
- Pew Research Center. (2018, February 05). *Social media fact sheet*. Retrieved September 6, 2018, from <http://www.pewinternet.org/fact-sheet/social-media/>.
- Pinellas County Florida Emergency Management. (2018). *Pinellas County, Florida Hurricane Irma after action report*. Retrieved from https://www.pinellascounty.org/emergency/PDF/Irma/after_action_report.pdf
- Pitt, C. S., & Treen, E. (2017). Understanding communication in disaster response: A marketing strategy formulation and implementation perspective. *Journal of Public Affairs*, 17(3), 1–6. <https://doi.org/10.1002/pa.1639>
- Ribeiro, J. (2015). Facebook to widen use of Safety Check tool beyond Paris attacks. *PC World* (08131384), 1.
- Sadri, A. M., Hasan, S., Ukkusuri, S. V., & Cebrian, M. (2018). Crisis communication patterns in social media during Hurricane Sandy. *Transportation Research Record*, 2672(1), 125–137. <https://doi.org/10.1177/0361198118773896>
- Salman, A., Abdullah, M. Y., Mustaffa, N., Amizah, W., & Mahmud, W. (2015). Sustaining internet usage in the emerging digital economy: Transforming urban living? *Journal of Asian Pacific Communication*, 25(2), 169–180. <https://doi.org/10.1075/japc.25.2.01sal>
- Schattenberg, P. (2018, February). *AgriLife Extension playing key role helping hurricane survivors with recovery*. Retrieved from <https://today.agrilife.org/2018/02/26/agrilife-extension-playing-key-role-rebuild-texas-efforts/>.
- Semple, K., & Ahmed, A. (2017, September 19). Hurricane Maria does 'mind-boggling' damage to Dominica, leader says. *The New York Times*. Retrieved from <https://www.nytimes.com/2017/09/19/world/americas/hurricane-maria-caribbean.html>.
- Spence, P. R., Lachlan, K. A., Lin, X., & Greco, M. (2015). Variability in Twitter content across the stages of a natural disaster: Implications for crisis communication. *Communication Quarterly*, 63(2), 171–186. <https://doi.org/10.1080/01463373.2015.1012219>
- Tandoc, E. C., & Takahashi, B. (2017). Log in if you survived: Collective coping on social media in the aftermath of Typhoon Haiyan in the Philippines. *New Media and Society*, 19(11), 1778–1793. <https://doi.org/10.1177/1461444816642755>
- Telg, R., Irani, T., Muegge, M. D., Kistle, M., & Place, N. T. (2007). Communication efforts of Florida Extension agents during the 2004 hurricane season. *Journal of Extension*, 45(3). Retrieved from <https://www.joe.org/joe/2007june/a4.php>
- Wang, B., & Zhuang, J. (2017). Crisis information distribution on Twitter : a content analysis of tweets during Hurricane Sandy. *Natural Hazards*, 89(1), 161–181.

<https://doi.org/10.1007/s11069-017-2960-x>

West, D. M., & Orr, M. (2007). Race, gender, and communications in natural disasters. *Policy Studies Journal*, 35(4), 569–586. <https://doi.org/10.1111/j.1541-0072.2007.00237.x>

Yi, C. J., & Kuri, M. (2016). The prospect of online communication in the event of a disaster. *Journal of Risk Research*, 19(7), 951–963. <https://doi.org/10.1080/13669877.2015.1115424>