

How to text 911

A content analysis of text-to-911 public education information

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ABSTRACT

Public education programs improve public safety by teaching citizens how to mitigate risks and respond to emergencies. To improve these efforts, studies in the fields of risk communication and emergency management have examined the design and communication of public education information. However, few studies examine the diversity of information officials communicate to the public when state and national-level public education programs are decentralized and administered by local government agencies. This study reports findings from a content analysis of text-to-911 information published on the websites of local 911 service entities across the state of Texas. Overall, these websites communicate sparse, uneven, and sometimes inconsistent information to citizens across the state regarding the availability of text-to-911 service, when and for whom texting 911 is appropriate, and instructions and warnings for texting 911 during an emergency. These findings suggest the need for public education resources that help local governments communicate with local audiences and coordinate communications across jurisdictions working to accomplish state and national public-safety objectives.

CCS CONCEPTS

• **Social and professional topics;** • **Professional topics;** • **Computing education;**

KEYWORDS

Emergency management, Public education, Content analysis, Risk communication, Crisis informatics

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1 INTRODUCTION

Public education is an important component of public safety. Local governments provide citizens with information about hazards and

instructions for mitigating risks and preparing for emergencies. To improve these efforts, studies in the fields of risk communication and emergency management have examined the design and reception of public education programs [4, 6, 11]. However, these studies typically focus on a single agency that coordinates the planning, design, communication, and evaluation of public education programs.

In contrast, few studies examine decentralized public education programs that find local agencies adapting state and national public education resources to design and communicate information appropriate for citizens in their local jurisdictions. This is the case with the ongoing implementation of Next-Generation 911 (NG911), which requires municipal, county, and regional U.S. 911 service entities to educate citizens on the availability and proper use of new services such as text-to-911 [16]. The latter allows citizens, including the deaf/hard-of-hearing, to use a mobile device to send text messages to 911 call takers in Public-Safety Answering Points (PSAPs) [24]. While prior work has questioned the accessibility of text-to-911 among at-risk groups [5], no studies have empirically investigated these claims or examined citizens' knowledge, behavioral intentions, and usage of text-to-911. To address these issues requires understanding the relationship between text-to-911 service adoption and public education information designed and communicated by hundreds of local governments and 911 authorities administering approximately 6000 PSAPs in the United States [2].

A first step in this direction, this study presents a content analysis of text-to-911 public-safety information published on the websites of the 77 municipal, county, and regional 911 service entities in Texas [7]. Our findings point to sparse, uneven, and sometimes inconsistent information communicated to citizens across the state regarding the availability of text-to-911 service, when and for whom texting 911 is appropriate, and instructions and warnings for texting 911 during an emergency. These findings suggest challenges that emerge during decentralized public education campaigns, including the need for scalable resources that ensure consistency across local jurisdictions while adapting to the needs of local authorities and audiences.

2 BACKGROUND

Public education programs (or campaigns) represent a broad context for the study of risk communication and emergency management. By raising awareness about risks to human health, property, and the environment, public education programs seek to motivate and change behaviors to accomplish specific, public-safety objectives [4, 11, 14, 19]. Here public safety refers to the protection of people's welfare and property, typically through the provision of local

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government services by police and fire departments, emergency medical services, emergency management agencies, and public health and welfare departments. Public education in the context of public safety refers to efforts of local governments to inform citizens about risks and recommend actions they should take to mitigate, prepare for, and respond to emergencies.

Public education research includes studies that examine the design, communication, and reception of messages intended to inform citizens about risks posed by hazards such as smoking, radon, and infectious diseases and how they can reduce them [6, 15]. Studies of disaster risk reduction education focus on encouraging public preparedness and mitigation measures for disasters such as forest fires, tornadoes, hurricanes, floods, and chemical spills [4, 11, 14]. Elsewhere, studies examine public education programs that instruct people how to prevent and respond to relatively routine but tragic accidents [20], such as programs that teach children how to safely cross the street [19]. In different ways, these studies examine public education programs as essential components of risk and emergency management regimes implemented by local, state, and national governments.

2.1 Public education process

Public education programs typically involve a five-stage process: planning, design, communication, response, and evaluation [19]. First, as part of a wider risk management process, public-safety officials plan a public education program by characterizing the risk, identifying the target population, and setting communication goals that often include raising awareness and encouraging preventative behaviors. Surveying prior studies, Preusser and Blomberg [19] identified “midblock darts and dashes” as the most frequent type of pedestrian-motor vehicle accident and children as the most at-risk for these types of accidents. Noting children’s frequent failure to stop at the edge of the roadway and check for oncoming vehicles in accident reports, the researchers developed a public education program to address these causal behaviors.

Second, officials design public safety messages to accomplish the awareness and behavioral objectives of the campaign. This design process involves examining gaps in public knowledge about risks and risk reduction activities. Mehta et al. [14], for example, explored citizens’ knowledge about potential dam failures to inform the design of public education information intended to raise awareness of risks and improve community preparedness. As previously described, these studies typically focus on a single agency responsible for the design of public education materials where issues of coordination and message coherence do not arise [20].

Third, officials communicate messages to the targeted population using appropriate channels. These include television, radio, and online (e.g., social media) PSAs or workshops facilitated in schools, workplaces, community centers, etc. [3, 6, 13]. Officials communicate messages with the goal of exposing as many members of the targeted population to public education messages as possible. The goal of message exposure therefore includes concerns for accessibility and engagement that guide the design and communication of public education information. This stage, however, involves the challenge of distribution, which “reflects the fact that every member of the target audience will not be exposed to the

message regardless of how often the media products are aired or shown” [19].

Fourth, citizens of targeted populations respond to public safety messages with improved knowledge and attitudes concerning risk and by adopting risk reduction actions. Citizens, of course, can also respond with apathy, misunderstanding, and inaction. Sanchez et al. [20], for example, report that health care professionals felt more prepared for an active shooter situation after participating in a simulated emergency at a large children’s hospital. In a post-hoc survey, 66% of participants reported that their first response would be to flee during such an incident, while 4% reported they would call first 911. Elsewhere, Heath et al. [11] surveyed citizens living near a petrochemical manufacturing plant to understand attitudes and behavioral intentions to shelter in place in the event of a chemical-release emergency.

Fifth, and lastly, officials evaluate the extent to which public-safety education programs improve citizens’ knowledge and attitudes regarding the risk and change their risk-related behaviors. Evaluations often rely on pre- and post-hoc measures to observe the effect of interventions on the knowledge, attitudes, and behaviors of targeted groups. Luria et al. [13], for example, conducted pre- and post-hoc surveys to measure the knowledge of students who did and did not participate in Safe City, a program that taught elementary students how to call 911 during an emergency. Elsewhere, Savage [21] observes a significant relationship between states that launched the OL campaign and accidents at rail-highway intersections, suggesting that the public education program helps reduce the number of statewide train-automobile collisions. Overall, these studies attempt to evaluate how effectively public education programs contribute to public safety objectives, e.g., teach children how to call 911, decrease train-automobile collisions, etc.

2.2 Decentralized public education programs

Despite addressing a broad range of hazards and public-safety objectives, studies have typically examined the centralized, top-down design and communication of public education information. The Safe City program reported by Luria et al. [13], for example, was developed by the American Red Cross of Columbus, Ohio and administered to kindergarten classes in Columbus. Sanchez et al. [20] examine an active shooter simulation designed and administered among the staff of a single, albeit large, pediatric hospital. Williams et al. [25] designed and showed two films to a single audience to measure its effects on the perceived severity of stroke symptoms and intent to quickly call 911. Consequently, studies have overlooked the common challenge of accomplishing state and national public safety objectives through the decentralized design and communication of public education programs by local governments.

An exception is the volunteer organization Operation Lifesaver, initiated in the 1970s, which involved state and local public education efforts to prevent accidents at rail-highway intersections. As Savage [21] describes, “Each state organization is an independent entity, and the level and type of [public education] activity varies. . .” such that “data on [Operation Lifesaver] activity is at the state level and not disaggregated to the individual municipalities in which a crossing may be located.” Operation Lifesaver represents a decentralized public education program in which municipal

governments and volunteer groups attempt to accomplish national and state public-safety objectives by designing and communicating public education information to local, targeted populations.

Similarly, public education efforts surrounding text-to-911 are guided by state and national policymakers but carried out by decentralized networks of local governments and municipal, county, and regional 911 service entities. In the United States, 911 services are provided locally. PSAPs organized under municipal, county, and regional authorities are responsible for administering 911 services to citizens in their jurisdictions. This includes public education efforts to help citizens understand what to do during an emergency. Historically, citizens have been advised to call 911 to report emergencies and request assistance [1], but new services such as text-to-911 complicate existing protocols.

To teach citizens how to text 911, policymakers have recommended the slogan “call if you can, text if you can’t” in public education programs targeted to the deaf/hard-of-hearing community [17]. National and state 911 authorities also provide public education materials that local governments and service entities can adopt and communicate to citizens in their jurisdictions. At the national level, the Federal Communications Commission (FCC) [24], National Emergency Number Association (NENA) [17], and Association of Public-Safety Communication Officials (APCO) [12] provide various public educational resources, including FAQs, flyers and brochures, press release templates, and public education guides for local 911 officials. Further resources are provided at the state level, produced by 911 authorities such as the Texas Commission on State Emergency Communications (CSEC) [23].

However, while national and state authorities create text-to-911 public education materials, we do not know the extent to which local authorities communicate this information to citizens in regional, county, and municipal 911 service jurisdictions. To evaluate the effectiveness of decentralized text-to-911 public education programs requires measuring citizens’ knowledge, attitudes, and use of text-to-911. These measures require, in turn, measures of the design and communication of public education information by local 911 service entities. Understanding the diversity of public education information across local 911 jurisdictions can help officials evaluate the effectiveness of communications strategies and inform the design of centralized, scalable resources that support decentralized public education programs.

3 METHODS

This study is part of a larger project to evaluate and improve decentralized text-to-911 public education programs in the United States [10]. This project involves understanding the objectives and communication strategies of public safety officials, text-to-911 information designed and communicated to citizens, and citizens’ responses to public education information, including text-to-911. To understand the characteristics of public education information, we performed a content analysis to answer the following research question: What text-to-911 information is published on 911 service entity websites?

The state of Texas was selected for investigation due to its size and diversity. Texas includes three kinds of 911 service entities that administratively organize hundreds of PSAP providing 911

service to rural, suburban, and urban jurisdictions that include both early and late text-to-911 adopters. Regional Planning Commissions (RPCs) are geographically large, multi-county entities responsible for rural areas in the state. Emergency Communications Districts (ECDs) are single-county entities that typically include a mid-sized city (e.g., Lubbock) and the surrounding rural areas of the county (e.g., Lubbock County). Lastly, Municipal Emergency Communications Districts (MECDs) cover geographically small but densely populated areas of cities such as Dallas and Houston. Organized under CSEC [7], 21 RPCs, 27 ECDs, and 29 MECDs provide the administrative structure for hundreds of PSAPs providing 911 service, including text-to-911, to citizens living across the state of Texas.

Data collection consisted of a census of text-to-911 public education information published on the 77 911 service entity websites. As many MECDs do not maintain their own website, we collected text-to-911 information available from the websites of their respective city governments. Website content, graphics, and links were downloaded for each RPC, ECD, and MECD in three documents to create a 42-page dataset.

To categorize the characteristics of text-to-911 information on 911 service entity websites, we consulted the public education materials provided by state and national 911 authorities. These include public education flyers and brochures, frequently asked questions documents, press release tips and templates provided by the FCC [24], NENA [22], APCO [12], and, in Texas, the CSEC [23]. We organized this information into nine types that provided the variables for our content analysis of text-to-911 information. To these we added three medium-specific variables—video PSA, linked document, external link—to account for multimodal and hyperlinked information published on these websites. All variables include two values (present/absent) except “availability,” which includes four: service available, service unavailable, inconsistent information, and no availability information. Definitions for these eleven variables, along with examples coded during the content analysis, are presented in Table 1

To analyze the dataset, the first and second author separately coded a selection of text-to-911 information published by RPCs, ECDs, and MECDs. We performed a pilot intercoder reliability test to understand instances of agreement and disagreement in our coding. Discussing these provided the opportunity to clarify the operational definitions of the Availability, Warnings, and Requirements variables. We then independently coded information from 31 randomly selected service entity websites—a subsample constituting 40% of the dataset—to perform a final intercoder reliability test using Cohen’s Kappa. Cohen’s Kappa (κ) is a statistic appropriate for calculating coding performed by two coders for nominal variables that considers the possibility for chance agreement [18]. When using Cohen’s Kappa, a coefficient of >0.75 indicates high intercoder reliability [18]. Table 2 displays the κ coefficients for each of the eleven variables measured in the study, ranging from $\kappa = 0.77$ to 1.00. After determining strong agreement in the application of our coding scheme, the second author finished coding the entire dataset and then calculated the counts and associated percentages for each measure of information presented on the 77 911 service entity websites. We report these results in the following section.

Table 1: Variables for content analysis of text-to-911 information

Variable	Definition
Availability	Information describing the availability of text-to-911 service in the service entity jurisdiction.
Slogan	Statement of national text-to-911 slogan, i.e., "Call if you can, text if you can't"
Deaf / Hard-of-Hearing Users	Information advising the use of text-to-911 by people with hearing and/or speech impairments.
Situational Users	Information advising the use of text-to-911 by people in situations when they are unable to speak or when speaking would put them in danger.
Instructions	Instructions (do's and don'ts) on the proper use of text-to-911.
Warnings	Information about uses of text-to-911 that impede users from receiving timely assistance from 911 dispatchers and first responders.
Requirements	Information on preconditions for the use of text-to-911 in a jurisdiction.
Multimedia Texting	Information about texting images or videos to 911.
Video PSA	Embedded or linked video providing information about text-to-911.
External Link	Link to another service entity or authority website with information about text-to-911.
Linked Document	Link to a document about text-to-911 provided by the local service entity.

Table 2: Intercode reliability for content analysis variables

Variable	Simple Agreement	Cohen's Kappa
Availability	87.1	0.77
Slogan	93.55	0.87
Deaf/Hard-of-Hearing Users	93.55	0.84
Situational Users	90.32	0.8
Instructions	93.55	0.86
Warnings	90.32	0.8
Requirements	93.55	0.79
Multimedia Texting	96.77	0.9
Video PSA	93.55	0.85
External Link	100	1.00
Linked Document	96.77	0.91

4 RESULTS

The results of our content analysis show a sparsity of text-to-911 information available on Texas 911 service entity websites. Less than half of these websites include any information about text-to-911 and those that do provide inconsistent information on who should use the service and how they should use it, as well as warnings and requirements related to limitations on text-to-911 service among citizens in the state. We report these findings below.

4.1 Text-to-911 service availability information

Despite widespread text-to-911 service across the state, less than half (47%) of all 911 service entity websites include information about text-to-911 service in their jurisdictions (Figure 1). However, the websites of RPCs (67%) and ECDs (52%) more often include information on text-to-11 service than MECDs or associated city government websites (31%). While these differences regard only text-to-911 information published on 911 service entity websites and not, for example, on social media or other platforms, our findings observe that officials in rural and suburban single and multi-county jurisdictions maintain websites with more text-to-911 information than officials responsible for 911 service in urban centers.

Of the 37 websites with text-to-911 information, 33 (89%) inform citizens that the service is available in their jurisdiction. The Heart of Texas Council of Governments (HOTCOG), for example, states that "The HOTCOG regional 9-1-1 Program is pleased to announce the availability of Text-to-9-1-1 service in Bosque, Falls, Freestone, Hill, and Limestone Counties. Several, however, inform citizens that Text-to-911 is not available in the jurisdiction, or include inconsistent information. One RPC, for example, includes one webpage stating that "9-1-1 cannot receive text messages, pictures, crash notification information (OnStar, Sync), etc." and another stating "You can now text 9-1-1!"

4.2 Characteristics of text-to-911 public education information

We next examined the characteristics of text-to-911 information on the 37 service entity websites where it is available (Table 3). Of these websites, 23 (62%) include the "Call if you can, text if you can't" slogan recommended by national 911 authorities. Use of the slogan is more common among RPC (71%) and ECD (71%) than MECD or city government websites (33%). Most service entities adopt the logo developed by NENA or incorporate a similar graphic.

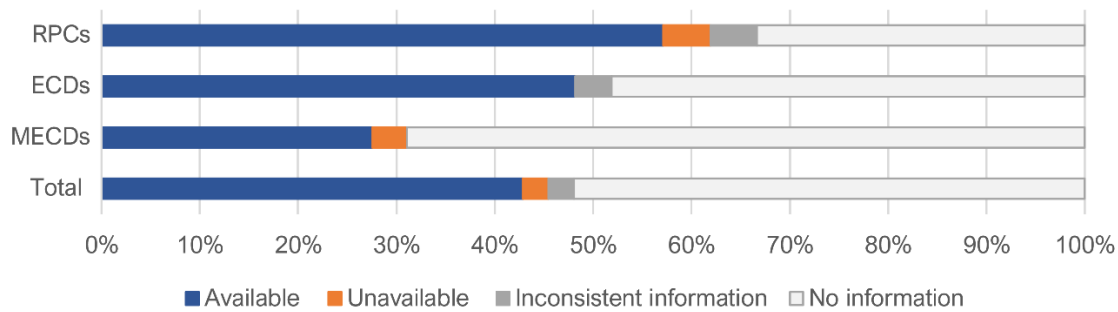


Figure 1: Text-to-911 service availability information on service entity websites

Table 3: Text-to-911 public education information on 911 service entity websites.

Information	RPCs (n=14)		ECDs (n=14)		MECDs (n=9)		Total (n=37)	
Slogan	10	71%	10	71%	3	33%	23	62%
Deaf/HoH Users	7	50%	8	57%	3	33%	18	49%
Situational Users	8	57%	9	64%	4	44%	21	57%
Instructions	9	64%	11	79%	3	33%	23	62%
Warnings	7	50%	10	71%	4	44%	21	57%
Requirements	4	29%	10	71%	3	33%	17	46%
Multimedia Text	4	29%	8	57%	4	44%	16	43%
Video PSA	8	57%	7	50%	3	33%	18	49%
External Link	3	21%	2	14%	1	11%	6	16%
Linked Doc.	7	50%	1	7%	0	0%	8	22%

Service entities identify citizens who are deaf/hard-of-hearing as the intended users of text-to-911 on 18 (49%) websites. On 21 (57%) websites, service entities recommend that citizens use text-to-911 in situations when a voice call would put them in danger or otherwise impossible. Service entities that include information on text-to-911 users typically identify both user groups and sometimes include use cases. The City of Kilgore (MECD), for example, reminds citizens that “Text to 9-1-1... provides a silent alternative in cases such as a child abduction, active shooter or domestic abuse.” In contrast, 12 (32%) websites including text-to-911 information do not identify the intended users of the service.

Only 23 (30%) of the 77 911 service entities in Texas provide instructions on the use of text-to-911. These websites represent roughly half, 62%, of the 37 service entity websites that include any sort of text-to-911 information. Again, RPCs (64%) and ECDs (79%) are more likely to define text-to-911 users than MECDs (33%). Instructions included on service entity websites vary. Some include only instructions recommended by national and state authorities: “The first text you send should be a short explanation of the emergency with the location of that emergency and the type of help needed” (CSEC, 2016). Other jurisdictions, such as the Rio Grande Council of Governments (RPC), include additional details: “9-1-1 caller must know their exact location. Use street signs, mile markers, crossroads, and landmarks.”

Warnings for text-to-911 users are included on 21 (27%) of the 77 911 service entity websites. These represent 57% of websites

that include text-to-911 public education information. Warnings include injunctions against texting while driving and uses of slang, abbreviations, and emojis in texts sent to 911. Service entities also remind citizens to make voice calls whenever possible, warning that “9-1-1 messages can take longer to receive, can get out of order or may not be received.”

Service entities detail requirements for text-to-911 on 17 (22%) of 77 911 service entity websites. These account for 46% of the 37 websites with available text-to-911 public education information. Requirements for users include a subscription or data plan with a wireless carrier that supports texting to and from U.S. phone numbers and location in a text-to-911 service area. Importantly, “Text messaging apps that only support texting with other app users or texting via social media are not required to support text-to-911” (FCC, 2020). Few websites warn citizens about this important difference between “texting” via SMS and “messaging” via social media applications.

Lastly, service entities include information about texting pictures or videos to 911. This information includes instructions that were coded separately from those previously reported. Only 16 (21%) of the 77 911 service entity websites discuss multimedia texting. These account for 43% of the 37 websites that include text-to-911 public education information. Most service entities instruct citizens not to send multimedia texts: “Don’t attach pictures or videos to a text message to 911.” However, some jurisdictions describe the development of NG911 systems that “will be prepared to accept

Table 4: Video PSAs included on 911 service entity websites.

Source	Entity	#Websites
CSEC / Texas School for the Deaf	State	7
East Texas Council of Governments (RPC)	Local	4
Greater Harris County 911 Emergency Network (ECD)	Local	2
NENA / North Carolina Dept. Health and Human Services	National	1
NENA / North Carolina Dept. Health and Human Services	National	1
NENA / North Carolina Dept. Health and Human Services	National	1
CSEC	State	1
Capital Area Council of Governments (ECD)	Local	1
City of Aransas Pass (MECD)	Local	1
Dallas Police Department (MECD)	Local	1
Denco Area 911 District (ECD)	Local	1
Gulf Coast Regional 9-1-1 Communications District (ECD)	Local	1
Lower Rio Grande Valley Development Council (RPC)	Local	1
West Central Texas Council of Governments (RPC)	Local	1

new forms of 911 data, including pictures and video.” In contrast to other types of text-to-911 information, MECDs (44%) more often discuss multimedia texting than RPCs (29%), but less often than ECDs (57%).

4.3 Additional text-to-911 public education information

In addition to the textual content described above, websites of 911 service entities include video PSAs and links to internal documents and external websites. Text-to-911 video PSAs are often hosted on YouTube and embedded next to website content which can include hyperlinks to additional documentation created by the jurisdiction or the websites of state and national 911 authorities. The sources of this additional information are reported below to describe relationships between individual 911 service entities and the public education materials they adopt.

Video PSAs are included on 18 (23%) of 77 911 service entity websites. These account for 49% of the 37 websites with available text-to-911 public education information. Overall, there are 14 different videos published across the service entity websites. Significantly, most PSAs are created by local service entities, but some include PSAs created by national and state 911 authorities (Table 4). While four service entities include multiple video PSAs, most include a single, locally produced PSA alongside the textual information about text-to-911 described above.

Additional information about text-to-911 is also available in various linked documents, e.g., PDFs, published on 911 service entity websites. These documents vary and include public education FAQs, flyers and brochures, as well as annual city and council of government reports. However, only 8 (10%) of 77 service entity websites include additional documentation. The Capitol Area of Governments Council (ECD), for example, provides citizens with a PDF summarizing the text-to-911 information published elsewhere on their website.

Lastly, 6 (8%) of the 77 service entity websites include external links to websites with additional text-to-911 information. Four service entities direct citizens to the FCC’s “what you need to know”

page on text-to-911 [24], or to the FCC’s master registry of PSAPs with text-to-911 capability [2]. Other service entities provide links to additional information provided by other jurisdictions or the Commission of State Emergency Communications [23].

5 DISCUSSION

Overall, we observe a sparsity of text-to-911 information available on Texas 911 service entity websites. Less than half (47%) of these websites include any information about text-to-911 service. Limited to a content analysis of service entity websites and not, for example, local news coverage or social media posts by public-safety agencies, our findings suggest that some jurisdictions provide more public education information on text-to-911 service than other jurisdictions. These findings also suggest that citizens and news media in many areas of Texas, lacking official statements on the availability and use of text-to-911 information in their area, must resort to generic and scattered public education materials published by state and national 911 authorities. These findings recall research on digital divides that result from the production, characteristics, and curation of online content that benefits some people and not others [8, 9].

We also observe differences in text-to-911 information provided by 911 authorities representing large, rural geographic areas and urban centers. Texas organizes the administration of 911 service under three types of service entities. RPCs administer 911 service in multi-county, rural, sparsely populated geographic areas. ECDs provide 911 service to single county areas that include small cities and surrounding rural areas. Lastly, MECDs represent urban areas within highly populated counties including large cities such as Dallas and Houston. We observe that RPCs (67%) and ECDs (52%) more often provide information on text-to-11 service than MECDs or associated city government websites (31%). RPCs and ECDs also more often include information on text-to-911 users, instructions, warnings, and requirements than MECDs.

These differences suggest that rural areas with a single 911 authority tend to rely on the RPC or ECD to maintain a website with public education materials that, in turn, provides local citizens with

a centralized resource for accessing information about the availability and use of text-to-911 in their area. In contrast, MECDs, whose organizational structures overlap with those of municipal government, often do not maintain independent websites and defer to the websites and public information work of municipal and public-safety agencies. The latter include websites of city governments and police departments that may not provide extensive information related to 911 service in the jurisdiction. Consequently, citizens in cities and suburban areas are likely presented with fragmented public education resources describing the availability and use of text-to-911.

5.1 Conclusion and future work

This study reports findings from a content analysis of text-to-911 information published on the websites of Texas 911 service entities. Overall, these websites communicate sparse, uneven, and sometimes inconsistent information to citizens across the state regarding the availability of text-to-911 service, when and for whom texting 911 is appropriate, and instructions and warnings for texting 911 during an emergency. These findings, in turn, suggest challenges that emerge during decentralized public education campaigns, including the need for state and national resources that help local 911 authorities design, communicate, and evaluate text-to-911 public education programs. Furthermore, studies need to examine the challenges of local officials tasked with tailoring these general information resources for local audiences. Prior studies highlight difficulties local officials face when tasked with public information work, including role sharing that limits the time and resources these officials can devote to public education [4]. The findings of this study suggest additional difficulties related to the coordination of public education programs across jurisdictions working to accomplish local as well as state and national public-safety objectives.

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