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Public Health Preparedness of Health Providers: Meeting the Needs of Diverse, Rural Communities

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Meeting the needs of public health emergency and response presents a unique challenge for health practitioners with primary responsibilities for rural communities that are often very diverse. The present study assessed the language capabilities, confidence and training needs of Texas rural physicians in responding to public health emergencies. In the first half of year 2004, a cross-sectional, semistructured survey questionnaire was administered in northern, rural Texas. The study population consisted of 841 practicing or retired physicians in the targeted area. One-hundred-sixty-six physicians (30%) responded to the survey. The responses were geographically referenced in maps. Respondents reported seeing patients with diverse cultural backgrounds. They communicated in 16 different languages other than English in clinical practice or at home, with 40% speaking Spanish at work. Most were not confident in the diagnosis or treatment of public health emergency cases. Geographic information systems were found useful in identifying those jurisdictions with expressed training and cultural needs. Additional efforts should be extended to involve African-American/Hispanic physicians in preparedness plans for providing culturally and linguistically appropriate care in emergencies.

Key words: public health preparedness ■ emergency response ■ minority health ■ rural health

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INTRODUCTION

Public health emergency response and disaster management has become a major concern in the United States^{1,2} as a consequence of recent natural disasters and manmade terrorist acts. These events revealed potential vulnerability in the nation's health emergency response systems at the local level. Several studies suggest that initial response to a public health emergency would generally begin at the local level.³⁻⁵ However, assessments have indicated that local jurisdictions are not sufficiently prepared to respond to and/or manage a potential disaster, such as a bioterrorist attack.^{6,7} Additionally, public health responses to hurricanes in the southern states in 2005 further indicated that preparedness and response efforts should be expanded beyond urban centers to rural regions, as the latter constitute a major portion of the southern U.S. local jurisdictions. For instance, over three-quarters of the counties in Texas are federally designated as "rural" (i.e., <50,000 residents) or "frontier" (i.e., <6 person/mile²).

Specific challenges related to preparedness confronted by rural areas include population diversity, with different cultural and language needs, and lack of public health infrastructure. For example, by the year 2010, minority communities in the United States will comprise >36% of the total population.⁸ By 2020, physicians will spend 40% of their total patient care hours with minority patients.⁹ Whether the future needs of patients with diverse cultural backgrounds could be met by providers

remain to be seen. For example, in the geographic area included in this study, the two largest minority groups constitute 19% of the total population, including 5% African Americans (n=50,254), and 14% Hispanics (n=147,922).⁸ However, only 6.8% of the physicians serving the area were African American and Hispanic.

Additionally, many rural counties do not have local health departments to coordinate emergency responses and their healthcare providers may have only limited experience with bioterrorism agents. This constitutes a challenge in the case of an attack with chemical, biological, radiological, nuclear and explosive (CBRNE) agents. For emergency preparedness, it is important to assess whether rural physicians are willing, ready, and able to provide culturally and linguistically appropriate care to diverse rural patients.

LITERATURE REVIEW

The literature suggests that physicians play a unique role in public health preparedness, as they are among the most trusted first-responders in health-related emergencies.^{2-5,10} In the event of catastrophic emergencies, successful provision of care would often require trust and confidence on the part of culturally diverse communities, yet challenges abound for rural physicians when providing emergency care rural communities with diverse populations.

To strengthen emergency preparedness across communities, public health officials and healthcare providers must continue to improve perceived fairness among African-American,^{11,12} Asian Pacific Islander¹² and Hispanic communities.¹³ How minority communities discern treatment as being fair is an important factor for emergency response,¹⁴ and level of trust in the system could affect their willingness to participate in emergency response efforts.

In the event of a natural disaster, first-receiving physicians are often the frontline response for community members, as they can activate the appropriate emergency response systems.^{2,4,15,16} However, studies suggest that many physicians are not prepared to handle public health emergency cases. A recent national survey revealed that, while 80% of physician respondents were willing to participate in the diagnosis and treatment of bioterrorism cases, only 21% felt prepared to handle the cases.¹⁷ The perception of unpreparedness seems pervasive among healthcare providers in general.¹⁸⁻²² Other national and state-level studies similarly indicated that allied healthcare providers lack confidence in treating bioterrorism-related cases and indicated the need for strengthening their professional training for emergency response.^{2,23-25} The lack of confidence in responding to public health emergencies may be improved by appropriate education and training exercises for large-scale bioterrorist and natural disaster events.

In light of the natural and manmade emergency

response challenges we face, it is important to assess level of readiness of first responders, including rural physicians. The purpose of this study was to assess the language capabilities, confidence and training needs of rural physicians in handling public health emergency cases. The results were aggregated and presented in thematic maps to produce geographically referenced illustrations of the status of preparedness.

MATERIALS/METHODS

To determine the public health emergency-related readiness and training needs of rural physicians, this study employed a cross-sectional design that included physicians practicing in 37 north Texas counties. Although these counties are served by the Texas Public Health Region 2/3 office in Arlington, they do not have a local health department. Furthermore, at the time of the study, four counties did not have a practicing physician.

Data source consisted of a physician database that was obtained from the Texas State Board of Medical Examiners (TSBME). The database included physicians' contract and demographic information (e.g., race/ethnicity, gender and age), license number, education, practice status and practice location. Eight-hundred-forty-one physicians in the targeted geographic area were identified. The unit of analysis and observation for this study consisted of the individual physician. The main selection criteria for inclusion were: 1) being a licensed physician and 2) practicing or residing in one of the 37 selected counties in north Texas. Both actively practicing and retired physicians were recruited for this study.

Survey Instrument

Details of the survey development and administration were reported elsewhere³⁷ and will only be briefly summarized below. Through an extensive review of the literature, survey instruments described in public health emergency-related literature^{2,26-27} were identified and used by the research team to develop the set of questions. Several survey characteristics, including brevity, consistency, ease of response and various methods of survey delivery and response, were all considered in the development of the instrument for this study. The final survey, approved by the institutional review board, consisted of three main sections: 1) language use, 2) confidence in public health emergency-related events, and 3) experience in related training. The language questions in the first section referred to the language(s) other than English spoken at home and/or in professional practice. The second section included questions regarding previous experience with four selected bioterrorism (category A) agents (i.e., anthrax, smallpox, botulism, plague), and two types of exposures (i.e., chemical and radiological exposure). Category-A agents were selected because of the public's perception of risk associated with recent intentional events and to the fact that they

are among the most likely biological agents to be used in a bioterrorism attack in the United States.^{4,28,29} Additionally, these agents have the potential for causing mass casualties, can be widely disseminated and are easily transmitted.^{4,29} This section also included prior experience with public health preparedness training. Finally, the third section explored self-confidence in handling bioterrorism events, and availability for collaborating with the state department of health in the event of an emergency.

Response scales included Likert-type and categorical scales. Prior to survey administration, the instrument was pilot tested with a small number of physicians who were not part of the study population. Feedback on the format, content, wording and the time required for completing the instrument was collected. Respondents reported completing the survey in <10 minutes and provided positive feedback. The final version of the survey included 12 items (the instrument is available upon request). In an attempt to enhance response rate, the survey was posted on the university website (www.hsc.unt.edu/departments/SPH/survey/biot.cfm?form.id&form.ln).

Data Collection Procedures

Data were collected through both a mailed and web-based survey. A package consisting of a cover letter; the survey questionnaire; and a stamped, self-addressed envelope was mailed to the 841 physicians who met the selection criteria. The cover letter included a description of the study, information regarding the protection of human subjects, discussion on the importance of the study and instructions on how to complete the survey. The web-based survey was accessible to participants through a personalized authentication system that combined the participants' first and last initials and the last four digits of their license number. This code was provided to each participant in the mailed package and was required for log-in to the system. The server verified participants' information and permit access to the web page. Completed online survey information was automatically saved to a database. The data entered were then collected and stored in a relational database that was linked to the corresponding physicians' license numbers.

Two weeks after the initial mailing, a reminder postcard was mailed to about 200 physicians in counties for which no survey had been received. A week later, a second survey package was sent to all physicians for whom a completed survey had not yet been received.

Data Analysis

Data were analyzed using SPSS[®] 11.5.0 (SPSS Inc., Chicago, IL, 1989–2002) and Arc View 8.3 (ESRI Inc., Redland CA, 1999–2002). The analyses included simple descriptive statistics to determine the distribution of responses regarding the research questions of interest.

Additionally, to compare the characteristics of respondents and nonrespondents, Student's *t* test was used for the analysis of continuous response variables and a Chi-squared test was employed for categorical response variables. The response variables included gender, age, practice setting, primary specialty, type of medical school degree (DO versus MD) and ethnicity. Choropleth (color-shaded) maps were used to summarize survey results by county. These maps highlighted the number of physicians with experience in public health emergency and the training needs in the region.

RESULTS

Approximately 67% (559 out of 841) of the identified physicians who were mailed a survey package were potentially contacted. More than 33% of mailed packets were not delivered and were returned due to wrong or outdated addresses. The response rate was calculated at 30% (166/559) after excluding the returned packets. Three physicians chose to complete the survey online. The survey results are summarized in Tables 1–2 and Figures 1–2. Most respondents (82.8%) were male with a mean age of 50.2. The majority of respondents were non-Hispanic white (79.1%), followed by Asian American or Pacific Islander (13.5%), Hispanic (4.9%), American Indian or Alaskan Native (1.2%), and African American (0.6%). The majority of respondents held a DO degree (81.5%) versus an MD degree (18.5%). Most respondents were in private practice (43.2%), followed by group practice (37.4%), in-hospital practice (15.5%) and Veterans Health Administration (VA) practice (1.9%). The participants represented 28 (75%) of the 37 rural counties served by the Department of Health Arlington Regional Office. More than 80% of the counties had ≥ 1 practicing physician.

Study results also indicate that there were significant differences in response status by MD versus DO degree criteria: those with a DO degree had a substantially higher response rate than those with a MD degree ($\chi^2=4.98$, $p=0.026$). No significant differences at the 95% confidence level were found between respondents and nonrespondents for the other response variables.

The results suggest that rural clinicians are serving a very culturally and linguistically diverse community. These practitioners speak 16 languages at home or at work (Table 1). English was the language most frequently spoken at home (75.3%) and in practice (52.5%), followed by Spanish (40%), Tagalog (Filipino language) and others (Table 2). Almost 40% ($n=65$, 39.2%) of respondents reported using Spanish in their practice, followed by Tagalog ($n=6$, 3.6%), Chinese Mandarin ($n=2$, 1.2%) and others.

Regarding experience with public health emergency events and previous training, a small percentage of respondents ($n=34$, 20.9%) reported having seen or treated ($n=30$, 18.1%) chemical exposure emergencies,

and most reported having neither seen (79.1%) or treated (81.6%) the other types of exposures. The majority (n=118; 72.4%) had not participated in bioterrorism preparedness and response training. Of those who reported having received training, most (73.2%) had received this training after September 11, 2001. For the respondents who had received some training in handling a bioterrorism event, many had received ≥ 1 type of training (Table 2).

Almost half of the respondents (45.8%) reported being willing and available to collaborate with health authorities in the event of a public health emergency (Map 2). However, as presented in Map 2, there were 12 counties in which respondents expressed no willingness to receive training or to participate in state-led response plans (note: information is presented in the map with dissolved county boundary).

In terms of confidence and interest in receiving further training, most (77.5%) respondents were not confident in their ability to diagnose or treat public health emergency cases (Figure 1). Although the majority (72.4%) of respondents reported that they would like to receive additional information or materials on public

health emergency (Figure 2), only a minority (9.2%) reported being willing to participate in formal training. Among those who expressed willingness to participate in formal training, 57% preferred instructor-led, small-group workshops and 41% preferred large group presentations. Thirty-one percent preferred CD-ROM-based training, 26% audio-visual instructor-led training materials, 23% curriculum-based reading materials, 18% Internet-based training, and 14% self-paced professional/scientific journals and publications. With the inclusion of only those respondents in an active practice status (not including retirees, n=12 or 7.2%), both "willing to receive training" and "willing to participate in formal training" responses were enhanced to 76.1% and 11.5%, respectively.

DISCUSSION

The results of this study indicate that respondents speak a wide array of non-English languages in their practice; nearly 40% of the respondents speak Spanish at work. This suggests that rural physicians in north Texas are serving diverse ethnic communities. Additionally, the data point out the need for getting these physi-

Table 1. Language used at home and in the practice

Languages Used	At Home		At Work	
	Frequency	Percentage	Frequency	Percentage
American sign language	0	0.0	0	0
Chinese Mandarin	2	1.2	2	1.2
Chinese, Cantonese	1	0.6	2	1.2
Dutch	1	0.6	0	0
English	125	75.3	87	52.4
Filipino, Tagalog	6	3.6	3	1.8
French	1	0.6	1	0.6
Hindi, Gujarati	1	0.6	0	0
Hindi, Telugu	2	1.2	0	0
German	0	0.0	2	1.2
Italian	1	0.6	0	0
Korean	1	0.6	1	0.6
Spanish	21	12.7	65	39.2
Portuguese	1	0.6	1	0.6
Thai	1	0.6	1	0.6
Urdu	1	0.6	0	0
Vietnamese	1	0.6	0	0
Nonanswer	0	0.0	1	0.6

Table 2. Respondents who received training in public health emergency events

Public Health Emergency Events	Diagnosis n (%)	Treatment n (%)	Emergency Preparedness n (%)	Risk Communication n (%)
Anthrax	28 (17.4)	27 (16.8)	21 (13.0)	18 (11.2)
Botulism	22 (13.7)	21 (13.0)	16 (9.9)	13 (8.1)
Small Pox	26 (16.1)	26 (16.1)	19 (11.8)	16 (9.9)
Plague	20 (12.4)	20 (12.4)	14 (8.7)	12 (7.5)
Chemical exposure	29 (18.0)	29 (18.0)	24 (14.9)	18 (11.2)
Radiological exposure	23 (14.3)	23 (14.3)	21 (13.0)	16 (9.9)

cians specifically trained in attending to the emergency needs of Hispanic communities. This constitutes an important challenge and opportunity for preparedness planning.

Consistent with the literature,^{2,17,24} the majority of physicians in this study reported not being confident in their ability to handle public health emergency cases. Most of them had not participated in any type of public health emergency training, and only a small percentage indicated willingness to participate in formal training. The results are also consistent with previous research by this team with physician assistants.³⁸ The results of both studies underscore the importance of developing “tailored educational approaches” for continuing medical education, particularly for physicians with time limitations. The development of effective education and training approaches is essential for addressing the needs of those physicians who are willing to assist in the event of a public health emergency but are not confident in their ability to do so.

Geographic Information Systems (GIS) were used to geographically reference aggregated results and visually assess the level of preparedness. Map 1 revealed that there were 19 counties in the study region that did not have Spanish-speaking physicians. Additionally, in these counties, there were no physicians who expressed willingness to receive training or to participate in state-led response plans. The Texas Department of State Health Services has been diligent in addressing these weaknesses in emergency preparedness. Through the collaboration that funded the present study, bioterrorism-related data have been collected among physicians, physician assistants, veterinarians and nurses.

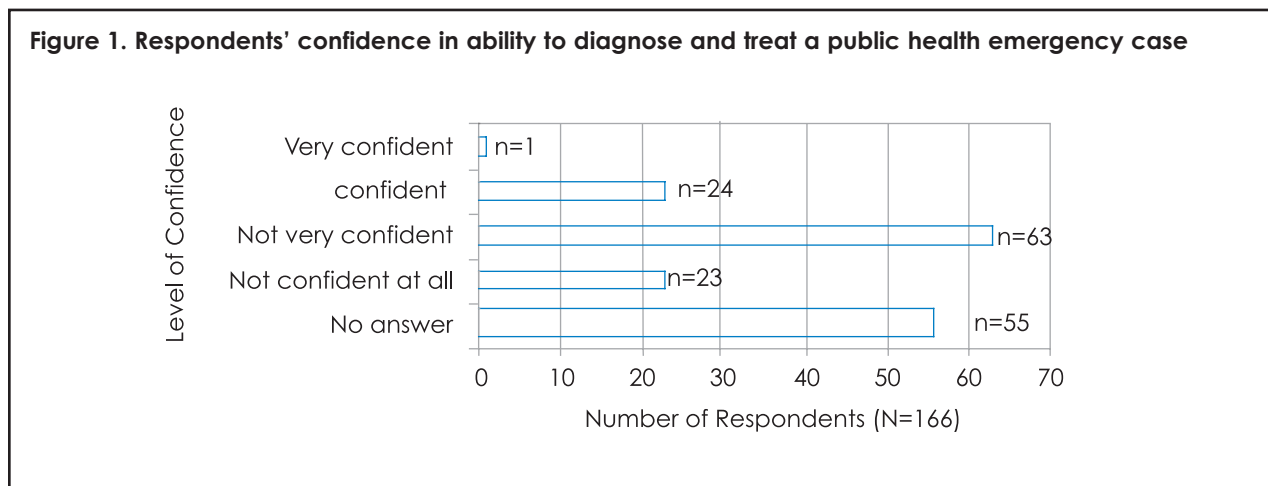
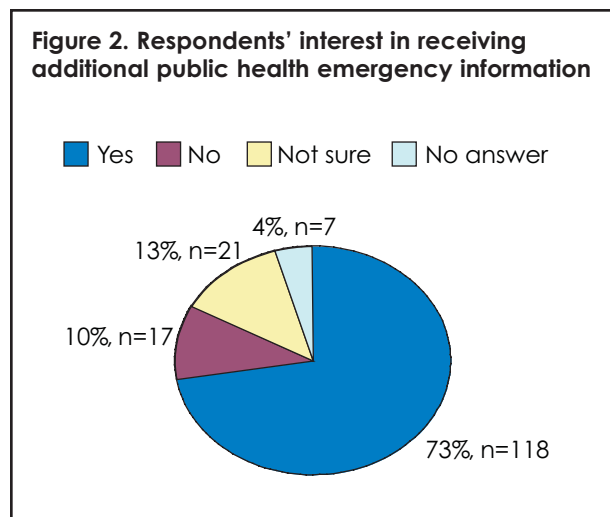
Finally, the response rate for this study was low (30%). This is consistent with other studies that assessed physicians’ willingness to participate in preparedness-related training and response activities.^{15,17} A possible explanation for this low response rate may be lack of interest in the subject matter on the part of participants. On the other hand, the data may suggest that

minority physicians are more interested in participating in bioterrorism-related research. Of the 841 physicians (MDs: 667, 79.3%; DOs: 174, 20.7%) practicing in rural north Texas counties at the time of the present study, 22 (2.7%) were African American and 34 (4.1%) Hispanic, representing 6.8% of the sample population. This approximates the 6% response rate we obtained in the present study from African-American and Hispanic physicians, and warrants further research.

Implications for Future Research

The results of this study identified a potential problem with the physician database obtained from the state licensing board, as >33% of mailed surveys were returned due to wrong/outdated address. This critical issue should be addressed by the state health department. Health authorities and emergency preparedness planners should work with professional organizations to maintain accurate and reliable databases.

The present study obtained higher response rates among physicians with a DO degree. This is noteworthy given MD/DO ratio of 4:1 (672 vs. 168) in the study region and 15:1 (49,486 vs 3,192) in the entire state. It is



intuitively appealing to infer that physicians with DO degrees may likely be more responsive to public health emergency-related issues than physicians with MD degrees. Although more DOs than MDs responded to this survey, and it is known that most DOs practice in primary care settings, it may be inaccurate to assume that DOs are more responsive to this type of study or training. Given the small sample captured in this study, further research is warranted to clarify the responsiveness of physicians with different degrees, backgrounds, and specialties.

Another issue that warrants attention is the low response rate obtained by the present and other similar studies. Possible approaches to enhancing response rate in this type of studies may include active collaboration with medical associations, and the provision of incentives for participating.

Finally, the underrepresentation of minority physicians in the study area, specifically African American and Hispanic, should also be noticed by health service/administration agencies. Underrepresentation of minority physicians has been identified as a barrier for minority population to accessing and receiving appropriate care.^{39,40} This could pose a substantial challenge for effective provision of culturally appropriate emergency response. Identifying and training physicians who are able to communicate in languages other than English may be an essential component for emergency preparedness.

LIMITATIONS

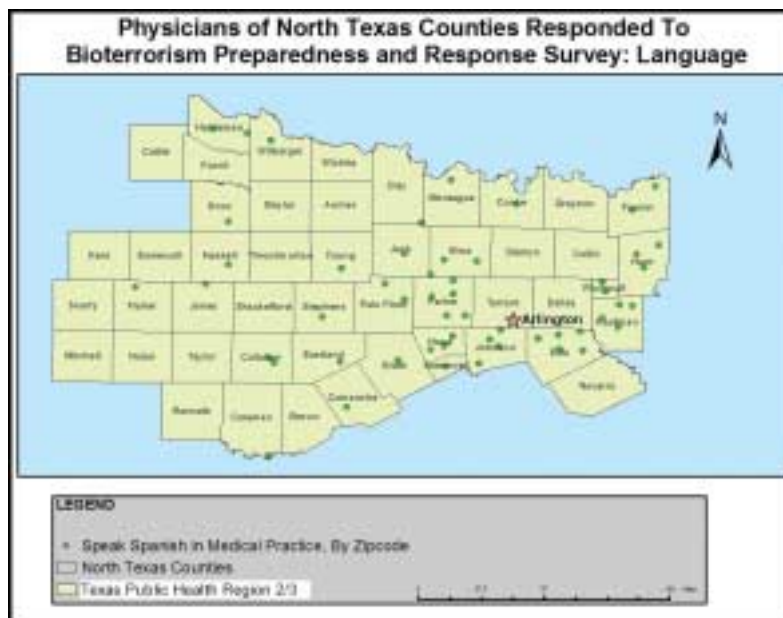
The potential for generalizing the results of this needs assessment study is constrained by a moderately low response

rate and the restriction to physicians in rural counties. However, the results are generally consistent with published literature that has explored the attitudes and experience of physicians practicing in urban counties.¹⁵⁻¹⁷

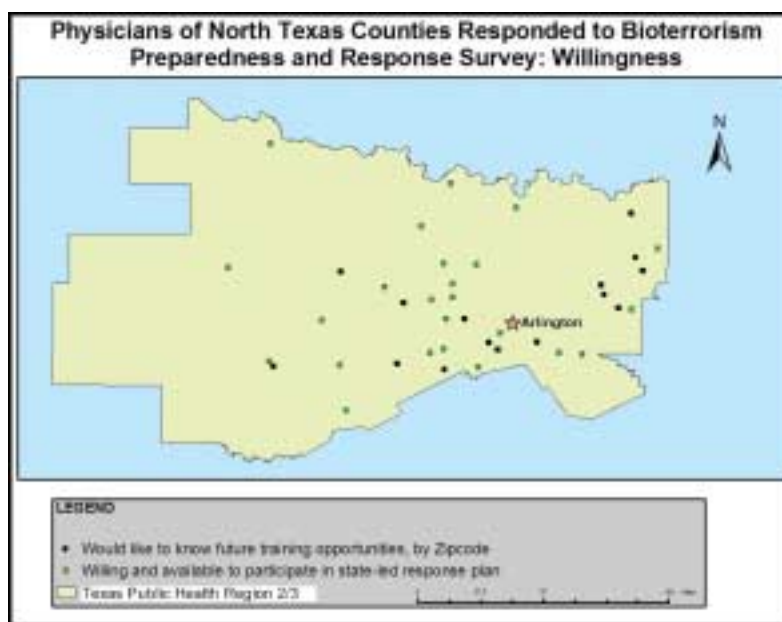
CONCLUSIONS

Rural physicians in north Texas are serving culturally and linguistically diverse community members but are not confident in the diagnosis and treatment of pub-

Map 1. Language used by survey respondents, north Texas counties



Map 2. Survey respondents who are willing to receive further training information, and willing and able to participate in state-led response plan, north Texas counties



lic health emergency cases, and have not received adequate public health emergency training. Many respondents are willing to participate in a state-led response plan. Additional efforts should be extended to allocate minority physicians to rural areas.

GIS were instrumental in identifying jurisdictions with potential emergency planning and response weaknesses. A database that includes the bioterrorism-related experience, skills and attitudes of physicians may be instrumental in emergency planning and response initiatives. The most practical format is an electronic database in a web-based GIS format that allows for routine update and dynamic query of information. In health surveillance and training practice, GIS have gained wide applications in public health preparedness and health surveillance.^{30-33,35,36} In light of its potential application in addressing public health preparedness needs, several health education programs have incorporated the health education training curriculum¹² and in strengthening state health practitioners in the planning and coordination of preparedness events.³¹

Although this study focused on physicians in rural settings, the results may prove beneficial for all health-care providers, including those practicing in urban areas. Many clinicians lack public health emergency-related awareness, knowledge and experience. Additional studies should explore these issues. The findings of this study present the challenges and opportunities of developing coordinated emergency preparedness and response strategies at the local and regional levels.

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