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RESEARCH

Participation in emergency preparedness and response: a national survey of pharmacists and pharmacist extenders

Yi Zhao, Kavon Diggs, David Ha, Hannah Fish, John Beckner, Salisa C. Westrick*

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ABSTRACT

Background: The COVID-19 pandemic highlights the critical role of pharmacists in pandemic response. To enhance pharmacist's involvement in future emergency situations, there is a critical need to understand pharmacists' knowledge, willingness and preparedness in response to various emergency situations.

Objective: This study aimed to describe pharmacists and pharmacist extenders on their participation in emergency response activities and training, preparedness and willingness to respond in emergency situations, and knowledge of the Memorandum of Understanding (MOU) and their pharmacy's emergency preparedness plans.

Methods: A cross-sectional design with an online survey of pharmacist, pharmacy owner, and pharmacy technician members of the National Community Pharmacists Association was employed in the United States in July – August 2020. Descriptive statistics summarized participants' level of actual participation and their willingness to participate in emergency situations and training and their knowledge of MOU and their pharmacy's emergency plans. A non-response bias investigation was conducted by comparing the early and late responders.

Results: Of the 6,486 members, 255 completed the questionnaire (RR1 = 4.0%). With the confidence level of 95%, the margin of error was 6%. About 60% were independently owned and in urban areas. More than 80% and 64% of the participants have not volunteered in any emergency or participated in any emergency training program, respectively. Over 60% were very willing to assist with the distribution of medications and vaccine administration. Less than 10% had MOUs with health departments. More than 60% of respondents were not aware of what MOU is.

Conclusion: Despite limited involvement in actual emergency activities and training, pharmacists and pharmacist extenders exhibited a high level of willingness to participate in emergency training and assist in case of emergencies. This study recommends the development of programs aimed at increasing pharmacists' and pharmacist extenders' participation in emergency training and in future public health emergencies.

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Emergency response and preparedness is a critical component of the current health care landscape in the United States. An emergency can refer to a wide range of events and situations, including but not confined to natural disasters, bioterrorism emergencies, chemical emergencies and pandemics.¹ In general terms, emergency preparedness is a plan

describing a set of activities with properly assigned roles that enable people to act in specific ways under particular circumstances.² It has been acknowledged that emergency response can be effective if it involves cross-functional teams, including pharmacists, that are properly trained and prepared to address a wide range of issues.

Pharmacists' roles in emergency response have gained momentum, especially during the coronavirus disease-2019 (COVID-19) pandemic.^{1–4} During emergencies or disasters, pharmacists can perform the roles of first responders to provide COVID-19 nasal and antibody testing, administer vaccines, prescribe antiviral medications, distribute medical countermeasures, and educate the community about

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* **Correspondence:** Salisa C Westrick, PhD, Auburn University, Health Outcomes Research and Policy, 4306 Walker Building, Auburn University, AL 36830.

E-mail address: westrsc@auburn.edu (S.C. Westrick).

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Key Points**Background:**

- Pharmacists and pharmacist extenders are not well prepared in emergency response because of limited training and experience in this area.
- Using a memorandum of understanding (MOU) could improve the roles of pharmacists and pharmacist extenders in emergency preparedness and response.

Findings:

- The study found that pharmacists and pharmacist extenders, especially those working with an independently owned pharmacy, have a high level of willingness to participate in emergency training and willingness to assist in case of emergencies.
- The study revealed the gaps in pharmacists' and pharmacist extenders' preparedness for emergency events and in awareness of MOU.

COVID-19.^{1,3,5,6} It is recommended that pharmacists be involved in emergency response planning and execution because they can provide guidance related to medication use and prioritization, as well as ensure appropriate packaging, storage, and dispensing of drugs and distribution of associated resources.⁷ Therefore, they play a critical role in emergency preparedness and response, especially during natural disasters or pandemics, which becomes critical in rural areas where access to resources is limited.⁸

Despite pharmacists' potential contributions to emergency response and preparedness, existing research indicates that pharmacists are not well prepared to become active participants when responding to emergencies because of limited training in this area.^{1-3,8} Their lack of awareness regarding their roles in emergency preparedness and response could be because they did not have formal education nor on-the-job training concerning emergency preparedness.^{3,4} Furthermore, pharmacists' limited experience in emergency response and preparedness training may lead to a lack of understanding of their role in emergency preparedness and response^{4,9} and lead them to feel overwhelming to take part in emergency response and preparedness projects.^{8,9} In addition to pharmacists, pharmacist extenders, defined as pharmacy students or certified pharmacy technicians,¹⁰ could contribute to reduce pharmacists' workload without threatening service accuracy and fidelity.^{11,12} When looking at student pharmacists' perceptions of their role in emergency preparedness, research reported that they displayed some degree of willingness to be trained^{4,13}; however, they are not sufficiently committed to the idea and do not widely participate or seek training opportunities.¹³ Research found that emergency preparedness training was not commonly included in pharmacy school education. Pharmacists often acquire the skills for emergency response after their academic education, instead, through training provided by emergency management agencies, disaster assistance teams, or experience during an emergency event.^{4,13} Fortunately, when

pharmacy students participated in an emergency preparedness training, they expressed positive attitudes toward the training.⁴ Training such as this is critical because it could have a positive effect on students' willingness to participate in emergency preparedness and response teams in their further academic years and professional lives.⁴

The recent COVID-19 pandemic heightens the need for pharmacists to be involved in emergency preparedness training and enlist them to help conquer the COVID-19 pandemic as well as prepare for any future emergencies and pandemics. Because the existing literature on pharmacist involvement in emergency response and preparedness is mostly outdated,⁹ focused primarily on pharmacy students,^{4,13,14} and was not nationally represented,^{14,15} additional research is warranted. This study aimed to describe pharmacists and pharmacist extenders on (1) their participation in emergency response activities and training, (2) their preparedness and willingness to respond in emergency situations, and (3) their knowledge of the memorandum of understanding (MOU) and the emergency preparedness plans available at their pharmacies.

Methods*Study design, sample, measures*

The study employed a cross-sectional design using an online Qualtrics (Qualtrics XM Platform, Provo, Utah) survey of pharmacists, pharmacy owners, and pharmacy technicians. The study protocol was reviewed by the corresponding author's Institutional Review Board and determined the protocol as Exempt. Members of the National Community Pharmacists Association (NCPA), excluding student pharmacists, were eligible to participate. Participants were recruited through 3 e-mail invitations and NCPA electronic newsletters (3 issues) delivered to owner, pharmacist, and technician members in July-August 2020. The survey was closed on August 14. Ten \$100 gift cards were offered as a lottery incentive.

The questionnaire was divided into 4 sections, including (1) participation in emergency preparedness activities: a total of 14 questions were asked to assess respondents' participation in emergency preparedness training, willingness and preparedness to respond in various emergency threats and their organization capacity to participate in a natural or manmade disaster, or a pandemic emergency; (2) pharmacy response to the COVID-19 pandemic section consists of 20 questions; (3) seasonal and routine immunization activities section includes 6 questions; and (4) individual and pharmacy characteristics section consists of 12 questions inquiring about participants gender, race, ethnicity, age, job title, education levels as well as their practice pharmacy types, immunization provision, availability of drive-through, and availability of delivery services. Questions regarding availability of drive-through and delivery services were used to assess pharmacies' infrastructure to help reduce contact and control infections.¹⁶ The questionnaire used multiple choice questions, open-ended questions, and matrix questions, which included a series of 3-point Likert scaled questions ranging from not at all, somewhat to very, or 5-point Likert scaled questions ranging from strongly disagree (1) to strongly agree (5). The draft questionnaire was pretested by 10 individuals including pharmacists employed by NCPA,

Table 1
Participant and pharmacy characteristics (N = 255)

Participant and pharmacy characteristics	Mean/n(%)
Age (N = 255)	49.2 (12.0)
Sex (N = 254)	
Male	153 (60.2)
Race (N = 251)	
White	224 (89.2)
Asian	10 (4.0)
Black	1 (0.4)
American Indian or Alaska Native	1 (0.4)
Other	15 (6.0)
Ethnicity (N = 248)	
Hispanic or Latino	2 (0.8)
Not Hispanic or Latino	246 (99.2)
Title ^a (N = 255)	
Pharmacist pharmacy owner/partner/manager	206 (80.8)
Staff pharmacist	35 (13.7)
Nonpharmacist pharmacy owner/partner/manager	13 (5.1)
Pharmacy technician or clerk	8 (3.1)
Student pharmacist	4 (1.6)
Other	6 (2.4)
Education/Training ^a (N=255)	
B.S. Pharmacy	121 (47.5)
PharmD	113 (44.3)
Residency in Pharmacy	15 (5.9)
Pharmacy Technician Certification	11 (4.3)
Master of Pharmacy	2 (0.8)
Other	24 (9.4)
Pharmacy type ^a (N = 254)	
Stand-alone independent pharmacy	213 (60.2)
Pharmacy within a grocery or retail store	21 (39.8)
Pharmacy embedded within a medical clinic or a hospital	16 (6.3)
Other	9 (3.5)
Geographic regions (N = 246)	
Southeast	77 (31.3)
Midwest	72 (29.3)
Northeast	46 (18.7)
Southwest	28 (11.4)
West	23 (9.3)
Rurality ^b (N = 246)	
Urban	142 (57.7)
Rural	61 (24.8)
Suburban	43 (17.5)
Prescription volume per day (N = 249)	240.88 (170.9)
Full-time equivalents, 40 hr/wk (N = 253)	3.4 (7.3)

^a More than one option can be selected

^b Degree of rurality was classified on the basis of 2010 rural-urban commuting area codes. Codes 1 to 3 were defined as urban areas, 4 to 6 as suburban areas, and 7 to 10 as rural areas.

immunization experts from CDC, a clinical pharmacist with infectious diseases expertise, pharmacy students, and graduate students in the field of health outcomes.

This study reported responses obtained from the first section of the questionnaire. The questions aimed to assess participants' experience in, actual participation in, and training for emergency situations; participants' and their pharmacies' preparedness and willingness to respond in emergency situations, participants' knowledge and awareness of an MOU, and their pharmacy disaster preparedness plan.

Potential nonresponse bias investigation

A nonresponse investigation was conducted after survey completion by comparing the early and late responders. Early

Table 2
Participant experience in actual participation in and training for emergency situations

Participant experience	n (%)
Whether they are registered as an emergency preparedness volunteer (n = 285)	
Yes → Reported comfort with the following (check all that apply):	44 (15.4)
Point-of-dispensing system	41 (93.1)
Receiving medications and supplies from the Strategic National Stockpile	37 (84.1)
Managing inventory	36 (81.8)
Ensuring adequate drugs and supplies	35 (79.5)
Dispensing medications	40 (90.9)
Providing education for diverse populations	34 (77.3)
No → Whether they consider registering as a volunteer and being trained in emergency preparedness and response	229 (80.4)
Yes	161 (71.2)
No	8 (3.5)
Unsure	57 (25.2)
Not sure	12 (4.2)
Whether they have volunteered in an actual public health emergency in the past 5 years (N = 342)	
Yes → Type of emergency (check all that apply):	40 (11.7)
Natural disasters	27 (67.5)
Non-COVID-19 disease outbreaks	14 (35.0)
Chemical emergencies	6 (15.0)
Bioterrorism emergencies	5 (12.5)
Other public health emergencies	7 (17.5)
No	294 (86.0)
Don't remember or unsure	8 (2.3)
Whether they participated in a training session or an emergency preparedness drill in the past 5 years (N = 336)	
Yes → Whether immunization topic was included in the training:	108 (32.1)
Yes	44 (0.41)
No	216 (64.3)
Unsure	12 (3.6)
Willingness to be trained in an emergency preparedness (N = 333)	
Not at all	3 (0.9)
Somewhat	155 (46.5)
Very	175 (52.6)

responders are defined as the first 15% of participants to complete the survey, whereas late responders are defined as the last 15% to complete the survey. Late respondents are assumed to have responded because of additional stimulation to answer and are expected to be more similar to non-respondents.¹⁷ *t* test and chi-square tests were used to compare the differences between early and late respondents. When frequency of subgroup was low, Fisher's exact test was used instead of chi-square analysis. A significance level of 0.05 was used for all statistical analyses.

Results

Of the 6486 potential respondents, total open rate of the e-mail invitation was 36%-37% for each e-mail sent. A total of 255 completed all the sections of the questionnaire (response rate = 4.0%); with the confidence level of 95%, the margin of error of this survey was 6%. However, a greater number of participants have responded to questions in the first section of the questionnaire, as reflected in Tables 2-4. We compared

Table 3
Individual and pharmacy preparedness and willingness to respond in emergency situations

Preparedness and willingness	Emergency situations	Not at all	Somewhat	Very
Individual preparedness (N = 324)	Natural disasters	34 (10.5)	219 (67.6)	71 (21.9)
	Bioterrorism emergencies	168 (51.9)	136 (42.0)	20 (6.2)
	Influenza pandemic	9 (2.8)	152 (46.9)	163 (50.3)
	Noninfluenza respiratory virus pandemic	22 (6.8)	198 (61.1)	104 (32.1)
Pharmacy preparedness (N = 316)	Natural disasters	43 (13.6)	219 (69.3)	54 (17.1)
	Bioterrorism emergencies	170 (53.8)	131 (41.5)	15 (4.7)
	Influenza pandemic	13 (4.1)	164 (51.9)	139 (44.0)
	Noninfluenza respiratory virus pandemic	23 (7.3)	193 (61.1)	100 (31.6)
Individual willingness (N = 301)	Distribution of prophylactic medical countermeasures	8 (2.7)	104 (34.6)	189 (62.8)
	Distribution of treatment medical countermeasures	7 (2.3)	101 (33.6)	193 (64.1)
	Vaccine administration	13 (4.3)	57 (18.9)	231 (76.7)
	Diagnostic testing for suspected infection	39 (13.0)	135 (44.9)	127 (42.2)
	Antibody testing for postinfectious	35 (11.6)	104 (34.6)	162 (53.8)
Pharmacy willingness (N = 290)	Distribution of prophylactic medical countermeasures	6 (2.1)	86 (29.7)	198 (68.3)
	Distribution of treatment medical countermeasures	5 (1.7)	88 (30.3)	197 (67.9)
	Vaccine administration	10 (3.4)	62 (21.4)	218 (75.2)
	Diagnostic testing for suspected infection	41 (14.1)	129 (44.5)	120 (41.4)
	Antibody testing for postinfectious	34 (11.7)	101 (34.8)	155 (53.4)

early and late respondents in terms of their gender, race, ethnicity, job title, educational levels, pharmacy types, immunization provision, availability of drive-through, and availability of delivery services (Appendices 1 and 2). Because of insufficient number of respondents in certain categories, we had to combine it with another category. For example, there were only 2 pharmacy technicians as early respondents and 1 pharmacy technician as a late respondent, which was not applicable for a chi-square test or Fisher's exact test.¹⁸ In conclusion, we found that the late respondent group had a higher proportion of nonwhite compared with early respondents (P -value = 0.011). There was no statistically significant difference between early and late responders in the remaining variables.

The detailed descriptive results are shown in Tables 1-4. Because of skip logic used in certain questions and unanswered questions, the number of observations for different questions may vary. Table 1 shows participants and their pharmacy characteristics. The average age was 49 years. The majority were male (60.2%), white (89.2%), and non-Hispanic (99.2%) and held pharmacy owner or manager positions (80.8%). About 60% of the pharmacies were independently owned and in urban areas.

Table 2 shows participant involvement in an emergency situation or an emergency training program. Specifically, 80.4% were not registered as a volunteer, and 86.0% of respondents did not volunteer in a health emergency situation in the past 5 years. Among the registered volunteers, almost all were prepared to address the issues related to point-of-dispensing system (93.1%), strategic national stockpiles (84.1%), and inventory management and storage (81.8%). Among those who had volunteered in actual events, over 67% responded to natural disasters, and 35% were responders to the outbreaks of non-COVID illnesses. When asked whether they participated in emergency training activities or drills, 64.3% did not take part in any emergency preparedness drill or training program in the past 5 years. Among those who were not trained or unsure, more than 70% considered registering as a volunteer in emergency preparedness. When asked about willingness to be trained, 52.6% displayed great willingness to be trained in emergency preparedness and response.

Table 3 describes participants' and their pharmacies' preparedness and willingness to participate in various emergency situations. Regarding the individual preparedness, about half (50.3%) were very prepared for an influenza pandemic. In contrast, about half were not at all prepared to respond to bioterrorism emergencies (51.9%). Pharmacy preparedness displayed a similar pattern to the individual preparedness. As for willingness of individuals and pharmacies to participate in emergency response measures, vaccine administration had a high level of willingness among individuals (76.7%) and pharmacies (75.2%). Over 60% among pharmacists and pharmacies were willing to participate in the distribution of prophylactic and treatment medical countermeasures. Similarly, about half of respondents, reporting for both individual and pharmacy, were very willing to offer testing services, with a slightly higher interest in antibody testing compared to diagnostic testing.

Table 4 reports on participants' awareness and knowledge of MOUs and emergency preparedness plans among the participants. More than 61% of respondents reported no MOU at their pharmacies, and 63.5% did not know what this document was. Regarding the establishment of an MOU, 43.9% of pharmacists did not know how to establish it, and 17.6% were unsure how to do that. A large portion of the respondents (62.7%) were somewhat or very willing to develop an MOU. As for their familiarity of the pharmacy's disaster preparedness plan, 64.5% were familiar with the plan. Among those who expressed their familiarity with an emergency preparedness plan, 56.7% believed that the plan was adequate for the COVID-19 pandemic. That being said, almost 78% of participants said that they would like to obtain assistance in updating the existing emergency preparedness plan.

Discussions

As of April 2021, more than 32 million people were identified as being infected with COVID-19, and more than 573,000 people lost their lives to COVID-19 in the United States after the first identified cases in the state of Washington in January 2020.^{19,20} Whereas the COVID-19 pandemic is the most significant public health emergency in recent years, it is by no means unique. In

Table 4
Participants' knowledge and awareness of an MOU and their pharmacies' disaster preparedness plan

Knowledge and awareness	n(%)
Whether pharmacy has an MOU with health departments (N = 289)	
Yes	6 (9.0)
No	177 (61.2)
Not sure	86 (29.8)
Know what MOU is (N = 263)	
Yes	46 (17.5)
No	167 (63.5)
Unsure	50 (19.0)
Know how to establish an MOU (N = 262)	
Yes	13 (5.0)
No	115 (43.9)
Unsure	46 (17.6)
Don't know what MOU is	88 (33.6)
Willingness to develop an MOU (N = 262)	
Not at all	2 (0.8)
Somewhat	107 (41.2)
Very	56 (21.5)
Don't know what MOU is	95 (36.5)
Familiarity with the pharmacy's disaster preparedness plan (N=279)	
Yes → Whether the plan was adequate for the COVID pandemic:	180 (64.5)
Yes	101 (56.7)
No	26 (14.6)
Unsure	51 (28.7)
No	67 (24.0)
Unsure	32 (11.5)
Whether they want to receive assistance to update a disaster preparedness plan (N = 276)	
Yes	215 (77.9)
No	27 (9.8)
Unsure	34 (12.3)

Abbreviations used: MOU, memorandum of understanding; COVID, coronavirus disease.

2009–2010, the Hemagglutinin Type 1 and Neuraminidase Type 1 (H1N1) influenza pandemic, which originated in Mexico, infected approximately 60.8 million people caused 274,304 hospitalizations and 12,469 deaths in the United States alone, and affected more than 170 countries worldwide.²¹ Furthermore, from 2013 to 2016, a large outbreak of Ebola virus disease in West Africa infected more than 28,000 people and caused more than 11,000 deaths.²² Public health emergencies or pandemics such as the examples described above have resulted in urgent needs for health care providers to assist with vaccinations and distribution of prophylactic medical countermeasures in a short period of time.²³ Unfortunately, responses to emergencies are typically delayed, which can lead to avoidable morbidity and mortality.²² Intra- and interagency coordination among health care agencies are required to deliver effective responses.²⁴ To effectively respond to emergencies, several factors contributing to the effective responses must be present, including concrete emergency planning, timely training for health care personnel, sufficient institutional support, effective allocation and use of resources implementation of standardized care, and involvement of pharmacists and pharmacist extenders in the emergency preparedness plans of local department of health.²³

During influenza pandemics and other public health emergencies, there is frequently great need for boosting

vaccination capacity. Without advance preparation, state and territorial health agencies, pharmacists, and pharmacies may face logistical, legal, and administrative challenges that can hinder the use of pharmacists or pharmacist extenders as vaccinators. These challenges can be avoided by using agreements that outline terms and conditions of partnership between health agencies and pharmacies, often referred to as an MOU.²⁵ For example, an MOU may outline (1) pharmacy responsibilities including dispensing, delivering, and administering vaccines and medications when notified by the respective state; (2) whether pharmacists and other vaccinating personnel of pharmacy are preregistered as pandemic vaccine providers; and (3) how the signing pharmacy can charge an administration fee for the vaccine administered. All in all, having established MOUs between pharmacists and pharmacies and health agencies, physician offices, clinics, and hospitals would authorize them to act quickly during the pandemics to allocate and distribute vaccines, set up vaccination clinics, administer vaccines, report vaccination doses, and receive reimbursements, which, in turn, can help prevent unnecessary deaths and hospitalizations. However, our study shows that less than 10% of our participants have established MOUs with their health agencies and that many were not sure what an MOU is and how to go about establishing it. These results are consistent with the existing research on the matter as pharmacists tend to have limited knowledge about MOUs.²⁶ Therefore, there is a need to increase pharmacist's awareness of MOUs and their importance in pandemic responses. For example, there is a template and workshops hosted by American Pharmacists Association that can be useful for pharmacists who are interested in developing an MOU.²⁷ Their website²⁷ is linked with resources that will provide helpful information and support the cooperation with the pharmacy profession and public health programs amidst the pandemic. Moreover, the findings of this study have led NCPA to develop several educational sessions for their members including a continuing pharmacy education article and an educational session at their annual meeting to discuss how to be trained and to volunteer in future pandemics or emergencies. Furthermore, the study findings could be shared with pharmacy schools to help updating curricula to reflect the role of pharmacists in emergency preparedness.

We also reported that about 15% of participants have signed up as volunteers to assist with emergencies, and about 12% have participated in actual emergencies, with the most common type being natural emergencies. However, the majority were willing to be trained in emergency preparedness and willing to assist with future emergencies. Similar to the previous study, pharmacists had a high level of willingness in providing support to help with pandemic but had expressed a lower level of readiness to perform specific services.^{28,29} These results may have been impacted by the COVID-19 pandemic. Public health communities and state and national pharmacy associations should capitalize on this willingness among pharmacists to provide emergency response support by providing mechanisms to enable training in emergency preparedness, participation in emergency response, and establishment of MOUs. Interested pharmacists and technicians shall contact their state pharmacist or pharmacy association or Medical Reserve Corps to identify volunteering and training opportunities. In addition, of the 40 (15%) participant

pharmacies who have signed up as volunteers, 28 (70%) were independently owned pharmacies, and 12 (30%) were embedded within a medical clinic, hospital, or grocery store pharmacy. Given the proportion of independently owned pharmacies in the study population (60%), although it did not show a statistical difference, independently owned pharmacies had a higher level of participation in responding to emergency. This may indicate that independently owned pharmacies higher willingness in emergency preparedness and that they have the autonomy to decide whether they want to assist in emergency preparedness and response effort.

This study is not without limitations. Nonresponse, recall, and social-desirability biases may affect the survey results reported in this study. In addition, low response rate may affect the study validity.³⁰ Furthermore, members of NCPA primarily consist of pharmacists working with an independently owned pharmacy. In this study, more than 60% participants are independently owned pharmacies. Therefore, generalizability of the findings to pharmacists working in corporately owned pharmacies should be conducted with cautions. Moreover, the survey results may have been impacted by the COVID-19 pandemic, for which the study team plans to design and launch follow-up survey to assess perception changes of pharmacists and pharmacist extenders during and after the pandemic.

Conclusions

Despite limited involvement in actual emergency activities and training among pharmacists and pharmacist extenders, they exhibited a high level of willingness to participate in emergency training and willingness to assist in case of emergencies. Pharmacists and pharmacist extenders could access related training provided by state pharmacists associations. The study team has launched a continuing pharmacy education program to provide the basics about emergency preparedness and how to get involved at the local, state, and federal level. The study team will design and distribute additional educational programs in relation to emergency preparedness and immunization services as part of the CDC-funded project. The participants' levels of preparedness to respond in case of emergency varied depending on the type of emergency, with the highest level being influenza pandemics. To further advance pharmacists' role in emergency preparedness, formal relationships between pharmacies and public health departments, physician offices, hospitals, and other health care facilities should be established through the use of MOUs. However, very few reported having established MOUs, and many were unsure what MOUs were. Therefore, the study revealed the gaps in the participants' preparedness for emergency events, which needs further exploration and the development of the programs aimed at addressing these gaps.

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- Yi Zhao, MPH**, Doctoral Student and Graduate Research Assistant, Auburn University Harrison School of Pharmacy Department of Health Outcomes Research and Policy, Auburn, AL
- Kavon Diggs**, PharmD Candidate, Auburn University Harrison School of Pharmacy, Department of Pharmacy Practice, Auburn, AL
- David Ha, PharmD, BCIDP**, Infectious Diseases Pharmacist, Stanford Antimicrobial Safety and Sustainability Program, Stanford Healthcare, Palo Alto, CA
- Hannah Fish, PharmD, CPHQ**, Associate Director, Strategic Initiatives, National Community Pharmacists Association (NCPA), 100 Daingerfield Road Alexandria, VA
- John Beckner, RPh**, Director, Strategic Initiatives, National Community Pharmacists Association (NCPA), 100 Daingerfield Road Alexandria, VA
- Salisa C Westrick, PhD**, Professor and Head, Department of Health Outcomes Research and Policy, Auburn University Harrison School of Pharmacy, Auburn, AL

Appendix

Appendix 1

Demographical characteristics between early and late responders

	Early Responders (15%)	Late Responders (15%)	P-value ^{1,*}
	Mean (SD)	Mean (SD)	
Age	49.76 (12.36)	48.54 (10.57)	0.093
	N (%)	N (%)	
Gender			
Male	22 (57.9)	21 (55.3)	0.817
Female	16 (42.1)	17 (44.7)	
Race			
White	37 (100.0)	30 (78.9)	0.011*
Other	0	8 (21.1)	
Ethnicity			
Not Hispanic or Latino	37 (100)	35 (100)	-
Title			
Pharmacist pharmacy owner/partner/manager	32 (84.2)	28 (73.7)	0.260
Other	6 (15.8)	10 (26.3)	
Education/Training			
PharmD	20 (52.6)	20 (52.6)	1.000
Other	18 (47.4)	18 (47.4)	

¹ Potential difference between early respondents and late respondents were investigated by using t-test for respondents' age, Fisher's Exact test for race and Chi-square test for respondents' gender, title and education.

* Significant difference is defined as P-value < 0.05.

Appendix 2

Pharmacy characteristics between early and late responders

	Early Responders (15%)	Late Responders (15%)	P-value ¹
	N (%)	N (%)	
Pharmacy Type			1.000
Stand-alone independent pharmacy	32 (84.2)	32 (84.2)	
Other	6 (15.8)	6 (15.8)	
Does your pharmacy offer immunization services during COVID-19 pandemic?			0.345
Yes, no change	6 (17.6)	9 (27.3)	
Yes, with some modifications or No	28 (82.4)	24 (72.7)	
Does your pharmacy offer immunization services during COVID-19 pandemic?			0.105
Yes, no change or with some modifications	28 (82.4)	32 (97.0)	
No	6 (17.6)	1 (3.0)	
Does your pharmacy have a drive-through?			0.803
Yes	12 (31.6)	11 (28.9)	
No	26 (68.4)	27 (71.1)	
Medication delivery service			1.000
Yes	36 (94.7)	36 (94.7)	
No	2 (5.3)	2 (5.3)	

¹ Potential difference between early respondents and late respondents were investigated by using Chi-square test. Significant difference is defined as P-value < 0.05.