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Missouri K-12 school disaster and biological event preparedness and seasonal influenza vaccination among school nurses

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Background: School preparedness for bioevents, such as emerging infectious diseases, bioterrorism, and pandemics, is imperative, but historically has been low.

Methods: The Missouri Association of School Nurses members were sent an online survey during the 2013-2014 school year to assess current bioevent readiness. There were 15 and 35 indicators of school disaster and bioevent preparedness, respectively. Multivariate linear regressions were conducted to delineate factors associated with higher school disaster and bioevent preparedness scores.

Results: In total, 133 school nurses participated, with a 33.6% response rate. On average, schools had fewer than half of the disaster or bioevent indicators. Disaster and bioevent preparedness scores ranged from 1-12.5 (mean, 6.0) and 5-25 (mean, 13.8), respectively. The least frequently reported plan components included bioterrorism-specific psychological needs addressed (1.5%, n = 2), having a foodservice biosecurity plan (8.3%, n = 11), and having a liberal sick leave policy for bioevents (22.6%, n = 30). Determinants of better bioevent preparedness include perception that the school is well prepared for a pandemic (P = .001) or natural disaster (P < .05), nurse being on the disaster planning committee (P = .001), and school being a closed point of dispensing (P < .05).

Conclusion: Schools are underprepared for biological events and are not on track to meet state and national biological preparedness goals.

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The 2014-2015 Ebola outbreak in West Africa and subsequent importation of cases into other countries have revealed a lack of biological event preparedness in the United States. Although much focus has been given to hospital and health care agency preparedness, biological preparedness in other sectors of society has been under-researched. K-12 schools in particular represent a large, vulnerable population and a common setting for the spread of communicable diseases. Despite the U.S. Department of Education's mandate and the National Association of School Nurses' and American Academy of Pediatrics' recommendation that all schools have disaster and biological event preparedness plans, research indicates that many K-12 school nurses lack appropriate disaster training and preparedness, especially in relation to biological events.

A nationwide study of U.S. schools and academic institutions was conducted in 2011 to assess their preparedness for natural disasters and pandemics. That study found that schools were poorly prepared for any type of disaster, but pandemic planning was particularly lacking; the average school reported having less than half of the possible pandemic planning components measured. For example, about half of the participating schools reported having a school disaster plan that addresses pandemics, one-third did not provide any student training on infection prevention, and only 4% had conducted an exercise that involved an infectious disease scenario. Since that study was conducted, 2 studies have examined K-12 schools and biological events. One study consisted of an international review of school closure policies...
and procedures related to the 2009 H1N1 pandemic, and the other study examined differences across local health department implementation of school-based vaccination clinics. No study has examined the extent to which schools are prepared for natural disasters or pandemics since the nationwide 2011 study. In addition, the 2011 study only examined 17 indicators of pandemic planning, and issues specific to bioterrorism planning, such as having a foodservice biosecurity plan, were not measured in that study. This study’s purpose is to conduct an updated, more thorough assessment of Missouri K-12 schools’ readiness for disasters, particularly for large-scale biological events, including emerging infectious diseases, bioterrorism, and pandemics.

METHODS

This study is part of a larger study that aimed to assess the effectiveness of an educational intervention on school emergency management plans using a pre- and postintervention methodology at the start and end of the 2013-2014 school year. The primary study examined only school nurses who completed both a pre- and postintervention survey ($n = 47$). The present study uses data from all participating school nurses, regardless of whether they completed only a preintervention survey, postintervention survey, or both ($N = 133$). If the nurse only completed 1 survey (pre- or postintervention), that survey was used for analysis ($n = 86$); for nurses who completed both a pre- and postintervention survey ($n = 47$), only their postintervention survey was included in analysis. This was done to create a cross-sectional dataset representing the 2013-2014 school year. The purpose of this study is to assess the current state of school readiness in follow-up to a 2011 survey that found that many areas of U.S. school disaster preparedness were lacking, especially in relation to pandemic planning. An online survey was administered through Qualtrics (an online survey platform) to school nurses belonging to the Missouri Association of School Nurses (MASN) during the 2013-2014 school year. A recruitment e-mail was sent to MASN, who forwarded the link to members. Two follow-up recruitment e-mails were sent, 2 and 4 weeks after the initial e-mail, to maximize response rates. Nurses were asked to consult with the school disaster planner or administrator in charge of the school plan when completing the survey, if needed (ie, if they were not familiar with the plan). The Saint Louis University Institutional Review Board approved this study.

Instrument

The survey instrument used in the 2011 school preparedness study was used as the basis for this questionnaire. In addition, the questionnaire was greatly expanded from the original to more thoroughly assess readiness for all biological events by incorporating measures outlined in recent Federal Emergency Management Agency and U.S. Department of Agriculture planning documents that did not exist when the 2011 study took place. Psychometric testing conducted on the instrument has been described previously. The questionnaire consisted of 72 items plus demographic questions. The following items were assessed: school disaster preparedness, school biological event preparedness, school having been or plan to be a point of dispensing (POD), stockpiling of infection prevention supplies, seasonal influenza vaccination policy for school personnel, and attitudes regarding school preparedness (eg, perceived preparedness, perceived importance of preparedness).

Data analysis

All analyses were conducted using SPSS version 22.0 (IBM Corporation, Armonk, NY). School disaster preparedness was measured using 15 indicators, each scored 0-1 point each. Biological event readiness was measured using 13 of the disaster preparedness indicators plus 22 that are unique to infectious diseases (35 indicators total). Almost all of the indicators were dichotomous and scored 0 or 1 point only; a few could have been partially achieved—met and could be scored 0, 0.5, or 1 point (Table 1 lists all indicators). Disaster and biological event preparedness scores could range from 0-15 or 0-35, respectively, that is 1 point maximum for each of the preparedness indicators.

Descriptive statistics were computed for each question and used to describe indicators of school disaster and biological event preparedness. The $\chi^2$ and Fisher exact tests were conducted to compare mandatory vaccination policies across occupation (nurses, teachers, etc) and to compare offering vaccine to the nurse by type of school (public vs private) or school location. A Pearson correlation was used to compare the association between the nurse being encouraged to have a personal disaster plan and attitudes regarding perceived school preparedness and perceived readiness to respond to disasters. McNemar tests were used to compare agreement between attitudinal questions. Multivariate linear regressions were conducted to delineate factors associated with higher school disaster and biological event preparedness scores. Bivariate analyses were conducted prior to regression analyses; only variables significant in univariate analysis were included in multivariate analyses. Only final models are reported. A critical $P$ value of .05 was used for all analyses.

RESULTS

In total, 133 school nurses participated (33.6% response rate). Almost all nurse participants were women (99.2%, $n = 132$) and white (95.5%, $n = 127$). Most were aged ≥41 years, with almost half (48.9%, $n = 65$) being 51-60 years and 23.3% ($n = 31$) being 41-50 years old. Over half of the nurses had either an associate’s degree (22.6%, $n = 30$) or a bachelor’s degree (39.1%, $n = 52$); only 1 (0.8%) was a nurse practitioner. Approximately half (58.6%, $n = 78$) reported being a school nurse (as opposed to being a lead nurse). Half (51.9%, $n = 69$) were members of their school disaster planning committee. Nurse participants reported covering from 1-17 schools. Most (63.2%, $n = 84$) cover only a single school; of those who cover >1 school ($n = 49$), almost half (44.9%, $n = 22$) cover 2 schools. The nurses represented schools of all sizes and grade levels. Just under half of the schools (42.9%, $n = 57$) had >501 students, and a quarter (24.8%, $n = 33$) had ≤300. Half (49.2%, $n = 65$) were elementary schools, 22.7% ($n = 30$) were middle schools, and 28.0% ($n = 37$) were high schools. Almost all of the schools (94.7%, $n = 126$) were public. Almost half (45.6%, $n = 61$) were suburban, and only 12.8% ($n = 17$) were urban. Demographics of the nurse participants are nearly identical to those of school nurses nationwide.

School disaster preparedness

There were 15 indicators of school disaster preparedness measured, for a possible range of scores from 0-15. Actual school disaster preparedness scores ranged from 1-12.5, with a mean score of 6.0. The most frequently reported disaster plan components included having a written school disaster plan (88.7%, $n = 118$) and having a communications platform for alerting parents (84.2%, $n = 112$) (see Table 1). The least frequently reported disaster plan components included having a plan in place to provide distance-based education during disasters (2.3%, $n = 3$), evaluating the school incident command system to determine compatibility with public health’s incident command system (5.3%, $n = 7$), and involving parents in school disaster planning (9.0%, $n = 12$). Indicators of better school disaster preparedness include perception that the school is well prepared
Table 1
School preparedness indicators for biological and nonbiological events

| Preparedness indicator for biological and non-biological events | Has plan component, % (n) |
|---------------------------------------------------------------|---------------------------|
| Preparedness indicator for non-biological event               |                           |
| Conducted at least 1 exercise during school year               | 100.0 (133)              |
| Conducted an interior lockdown exercise at least once a year   | 94.0 (125)               |
| Conducted fire drill at least once a month                    | 30.8 (41)                |
| Preparedness indicator for biological event                   |                           |
| School collects syndromic surveillance data                   | 90.2 (120)               |
| School offered seasonal influenza vaccine to the school nurse  | 85.7 (114)               |
| Written policy that encourages sick students to stay home     | 85.7 (114)               |
| Perfect attendance award for students                         | 84.2 (112)               |
| Frequency of student infection prevention training             |                           |
| At least once per year                                        | 72.2 (96)                |
| Not provided annually                                         | 27.8 (37)                |
| Number of staff provided respiratory hygiene training          |                           |
| All school staff trained                                      | 54.9 (73)                |
| Some school staff trained                                     | 33.1 (44)                |
| No staff trained                                              | 12.0 (16)                |
| Designated sick room with no pass-through                     | 51.1 (68)                |
| Written policy that encourages sick employees to stay home    | 51.1 (68)                |
| School nurse encouraged to a personal disaster plan           |                           |
| School nurse mandated to get vaccinated                       | 1.5 (2)                  |
| School nurse encouraged to get vaccinated                     | 82.7 (110)               |
| School nurse neither mandated nor encouraged to get vaccinated| 15.8 (21)                |
| Disaster plan for psychological services addresses bioterrorism| 1.5 (2)                  |

(Continued on next page)

| Preparedness indicator for biological and non-biological events | Has plan component, % (n) |
|----------------------------------------------------------------|---------------------------|
| Plans in place for distance-based education for school closure |                           |
| Plan is in place                                               | 2.3 (3)                   |
| Plan is in development, but it is not in place yet             | 7.5 (10)                  |
| No plans are being made or discussed                           | 90.2 (120)                |

Continued

ICS, incident command structure/system; MOA, memorandum of agreement; PPE, personal protective equipment.

*Indicator was scored zero or 1 point.

Indicates that the nurse is prepared to handle his or her role in responding to a natural disaster, pandemic, or bioterrorism attack.

School preparedness for a biological event

Biological event preparedness was assessed using 35 indicators, for a possible range of scores from 0-35. Actual biological event preparedness scores ranged from 5-25 points, with an average score of 13.8. The frequency with which schools reported having the indicators of school disaster and biological event preparedness is outlined in Table 1. The most frequently reported biological plan components included collecting any syndromic surveillance data (90.2%, n = 120), school offering the seasonal influenza vaccine to the nurse (85.7%, n = 114), and having a written policy that encourages sick students to stay home (85.7%, n = 114) (see Table 1). A few of the least frequently reported biological plan components included addressing bioterrorism-specific psychological needs into the plan (1.5%, n = 2), having a foodservice biosecurity plan (8.3%, n = 11), and having a liberal sick leave policy for biological events (22.6%, n = 30) (Table 1). Determinants of better school biological event preparedness include perception that the school is well prepared for a pandemic, nurse being a member of the school disaster planning committee, and nurse having attended 1-2 disaster planning training sessions during the last 2 years (Table 2). All other school and nurse demographic and attitudinal questions were not associated with higher school disaster preparedness.

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School nurse encouraged to have a personal disaster plan

Multiple federal disaster planning organizations recommend that individuals and families develop a personal disaster plan consisting of emergency protocols and the stockpiling of supplies. In this study, less than half of the school nurses (42.96%, n = 57) reported that their employer encourages them to develop a personal disaster plan (Table 1). There were no differences between any school demographic variables (size, location, or type of school) and whether the nurse was encouraged to have such a plan. There was a positive correlation between being encouraged to have a family disaster plan and reporting the belief that the school is well prepared to handle a natural disaster ($r = .19, P < .05$) or to manage a pandemic ($r = .19, P < .05$). However, there was no correlation between the nurse being encouraged to have a personal plan and belief that the school is prepared for bioterrorism, or perception that the nurse is prepared to handle his or her role in responding to a natural disaster, pandemic, or bioterrorism attack.
School nurses were significantly more likely to be mandated to receive the seasonal influenza vaccine than all other occupations (P < .001 for all comparisons) (Table 3). Most schools encourage their staff to receive the seasonal influenza vaccine, with a range of 83.5% that encourage counselors or librarians to 85.7% that encourage school staff. Even when a school has a mandatory vaccination policy, it is only for school nurses (Table 3). School nurses were significantly more likely to be mandated to receive the seasonal influenza vaccine than all other occupations (P < .001 for all comparisons) (Table 3). Most schools encourage their staff to receive the seasonal influenza vaccine, with a range of 83.5% that encourage counselors or librarians to 85.7% that encourage school staff. Even when a school has a mandatory vaccination policy, it is only for school nurses (Table 3). School nurses were significantly more likely to be mandated to receive the seasonal influenza vaccine than all other occupations (P < .001 for all comparisons) (Table 3). Most schools encourage their staff to receive the seasonal influenza vaccine, with a range of 83.5% that encourage counselors or librarians to 85.7% that encourage school staff. Even when a school has a mandatory vaccination policy, it is only for school nurses (Table 3).

**Tables**

**Table 2** Determinants of school disaster and biologic event preparedness from multivariate linear regression

| Factor                        | Disaster preparedness | Biologic event preparedness |
|-------------------------------|-----------------------|-----------------------------|
|                               | β  | SEM | P value | β  | SEM | P value |
| Perception that school is well prepared for a pandemic | 2.2 | 0.51 | <.001 | 3.2 | 0.95 | .001 |
| Member of the school disaster planning committee | 1.6 | 0.41 | <.001 | 2.3 | 0.69 | .001 |
| Attended 1-2 disaster planning trainings in last 2 years | 1.2 | 0.42 | <.01 | NIM |
| School will be a closed POD in future event | NIM | 2.1 | 0.91 | <.05 |
| Perception that school is well prepared for a natural disaster | NIM | 1.6 | 0.75 | <.05 |

**Table 3** Extent that 2013-2014 seasonal influenza vaccine was mandated or encouraged by occupation

| Occupation                  | Mandated to receive vaccine, % (n) | Encouraged to receive vaccine, n (%) | Neither mandated nor encouraged to receive vaccine, n (%) |
|-----------------------------|------------------------------------|--------------------------------------|-------------------------------------------------------|
| School nurse                | 1.5 (2)†                          | 82.7 (110)                           | 15.8 (21)                                             |
| Teacher or teaching assistant | 0 (0)†                           | 85.7 (114)                           | 14.3 (19)                                             |
| Administrator or staff      | 0 (0)†                            | 85.0 (113)                           | 15.0 (20)                                             |
| Counselor or librarian       | 0 (0)†                            | 83.5 (111)                           | 16.5 (22)                                             |
| Custodian                    | 0 (0)†                            | 84.2 (112)                           | 15.8 (21)                                             |
| Volunteer                    | 0 (0)†                            | 51.9 (69)                            | 48.1 (64)                                             |

*Significant difference between nurses and all other groups determined by the Fisher exact test (P < .001 for all comparisons).

**Seasonal influenza vaccination policy**

Almost no schools (1.5%, n = 2) mandate that school staff receive the seasonal influenza vaccine, and even when a school has a mandatory vaccination policy, it is only for school nurses (Table 3). School nurses were significantly more likely to be mandated to receive the seasonal influenza vaccine than all other occupations (P < .001 for all comparisons) (Table 3). Most schools encourage their staff to receive the seasonal influenza vaccine, with a range of 83.5% that encourage counselors or librarians to 85.7% that encourage school staff. Even when a school has a mandatory vaccination policy, it is only for school nurses (Table 3). School nurses were significantly more likely to be mandated to receive the seasonal influenza vaccine than all other occupations (P < .001 for all comparisons) (Table 3). Most schools encourage their staff to receive the seasonal influenza vaccine, with a range of 83.5% that encourage counselors or librarians to 85.7% that encourage school staff. Even when a school has a mandatory vaccination policy, it is only for school nurses (Table 3). School nurses were significantly more likely to be mandated to receive the seasonal influenza vaccine than all other occupations (P < .001 for all comparisons) (Table 3). Most schools encourage their staff to receive the seasonal influenza vaccine, with a range of 83.5% that encourage counselors or librarians to 85.7% that encourage school staff. Even when a school has a mandatory vaccination policy, it is only for school nurses (Table 3).

**DISCUSSION**

Critical aspects of school preparedness for biological events include having a written plan that addresses biological events and bioterrorism-specific psychological services, collecting and reporting syndromic surveillance data, training staff and students on disaster planning, biosecurity, respiratory hygiene, and infection prevention, stockpiling or having access to personal protective equipment and medication, having policies that limit disease transmission, offering the school nurse seasonal influenza vaccine, and engaging in disaster exercises that incorporate an infectious disease scenario. Many schools reported having a perfect attendance award for students; however, far fewer had such a policy for staff. Perfect attendance policies do not contribute to school preparedness because they could encourage ill individuals to go to school while contagious, which could contribute to disease spread. Similar to previous research, this study found that most K-12 schools are poorly prepared for biological events. On average, schools reported having less than half of the measured indicators of preparedness. This study greatly expanded on the single previous study that measured school readiness for pandemics. In particular, this study assessed school readiness for bioterrorism and outbreaks of emerging pathogens in addition to focusing on pandemics and found a general lack of preparedness for biological events. It is vital that schools become better prepared for all types of biological events. Just in the last year, the United States has experienced multiple outbreaks of vaccine preventable diseases that have occurred primarily among school-aged children and young adults, including measles and mumps. Other outbreaks and biological events during the last year, such as the importation of Middle East respiratory syndrome coronavirus and Ebola, have also had a strong impact on the United States, although less so on schools than health care agencies and public health. Should an outbreak of an emerging pathogen take hold in the United States, especially if it is a respiratory disease, it is likely that school settings will aid in disease transmission because of the close proximity of students. It is vital that schools work toward better readiness for biological events. School nurses’ perceptions about schools being better prepared for natural disasters versus biological events reflect actual
preparation as measured by this study, in that schools are better prepared for natural disasters than events involving an infectious disease. Interestingly, nurses reported equal agreement in the importance of school preparedness for both natural disasters and biological events. These findings indicate that although nurses believe it is important for the school to prepare for biological events, they correctly perceive that little is being done in this area to improve readiness. A general comparison between the similar 2011 school pandemic preparedness study and this study is useful because both compared 8 of the same biological event preparedness components. In both, schools were found to be lacking in all 8 categories at almost the same rate. For example, 56.3% of school nurses said they reported syndromic surveillance data to their local health department in the 2011 study, whereas 49.6% of nurses in this study indicated that their school reports syndromic surveillance data. Almost half (47.8%) of the nurses in the 2011 study reported that the school plan addresses pandemics, whereas 34.6% in the current study indicated that the school plan addresses all biological events, such as bioterrorism, pandemics, and emerging pathogens. These findings imply that Missouri schools do not appear to be making much progress for biological event preparedness.

The exact reasons why schools continue to lag in biological preparedness are unclear. Almost all nurses in this study reported that they are interested in school preparedness, and almost three-quarters indicated that they have time to receive this training. However, this study did not differentiate between nurses’ interest in school preparedness for natural disasters versus biological events. It is possible that school nurses’ interest in preparedness is only in the area of natural disasters or school-related violence and not biological events. One possible explanation is that nurses do not know how to better prepare their school for biological events or know where to obtain that information. Two past studies conducted in Missouri found that only 40% of nurses had received any bioterrorism training, and 83% had not participated in any bioterrorism scenario drills or exercises, and school nurses scored poorly on an objective assessment of bioterrorism-related knowledge. It is not known if the Missouri nurses who participated in the past bioterrorism-related studies also participated in this current study, but it is unlikely that the Missouri school nurse participants in this current study are significantly different from those in the previous studies. Therefore, Missouri school nurses’ general lack of bioterrorism knowledge or participation in bioterrorism-related exercises and receipt of little to no bioterrorism training likely have an impact on schools’ lag in biological preparedness, especially as it relates to bioterrorism preparedness. Schools can partner with public health to receive training on biological event preparedness. It is also possible that Missouri schools are better prepared than is reported in this study if the nurse participant was unfamiliar with the school plan and did not consult with a planner or administrator when completing the questionnaire. Future school preparedness studies should consider incorporating school administrators’ awareness, knowledge, and perceptions related to biological event preparedness because these individuals can have great influence over disaster planning for the institution.

An interesting finding from this study is that some of the largest gaps in school preparedness relate to bioterrorism readiness. For example, less than 10% of schools have a foodservice biosecurity plan, and only 1.5% address the unique psychological needs that accompany a bioterrorism attack. It is not known if nurses were unaware of the bioterrorism-specific needs for school disaster planning, if they do not know how to address these issues, or if the school disaster planning committee prioritizes other aspects of preparedness. Another possible explanation for the poor school biological event preparedness is that school administrators or school nurses may prioritize readiness for greater perceived threats, such as an active shooter, versus infectious diseases. Future studies need to examine this issue more closely to determine the reasons for the discrepancy between perceived importance for school biological disaster readiness and actual poor preparedness for these events. Studies using a qualitative methodology may be particularly useful to flesh out these issues.

A critical finding from this study is that only a very small percentage of schools are addressing student psychological needs as part of disaster planning. Numerous researchers have emphasized the important role schools will play in meeting student and staff psychological needs during and after disasters. Bioterrorism, in particular, is believed to pose unique psychological challenges because of the nature of such an event: the uncertainty of contaminated areas or human exposures after a covert release and the potential for disease spread if a contagious agent is used. For example, mass panic was experienced in multiple schools in the weeks after the 2001 anthrax bioterrorism attack. Children and adolescents are at increased risk for severe illness and post-traumatic stress disorder after a bioterrorism attack, and they spend ~80% of their waking hours at school. Researchers have also asserted that school nurses need to be able to identify students needing referral for treatment to address the psychological effects of
a bioterrorism attack. For all of these reasons, it is essential that schools address the psychological needs of students and staff as part of disaster planning, especially as it relates to biological events. School disaster plans need to be coordinated with mental health professionals. This is likely to be most challenging for elementary schools that often do not have counseling staff on-site. It would be prudent for schools to partner with local public health agencies or mental health community-based organizations that can assist with development of plans to address students’ psychological needs.

Similar to a 2011 study, approximately half of the school nurses in this study reported being members of their school disaster planning committee. Although this is higher than participation rates reported in a 2005 study, it still means that half of the nurses in this study are not part of their school planning committee. Researchers and the National Association of School Nurses have asserted that it is vital that school nurses be involved in school disaster planning activities. School nurses are often key health care providers to children and adolescents during routine times and are expected to play a major role in pediatric health if a biological disaster should occur. School nurses are also more likely than school administrators to have knowledge about how to prevent disease transmission in the school setting, a vital skill for biological event planning and response. Participation in the school disaster planning committee may also have benefits for the school nurse in the form of higher perceived readiness to respond to a biological event. A 2004 study reported that years of work experience were associated with higher school nurses’ perceived readiness to respond to a biological event. That association was not found in this study, but being a member of the disaster planning committee was associated with a higher perceived personal readiness to respond to a pandemic and a higher perceived school preparedness for natural disasters. The 2004 study did not assess participation in school planning committees; therefore, it is not known whether those nurses’ work experience included being on a planning committee or not. Regardless, the current study’s findings suggest school nurse involvement in school planning has personal and institutional benefits. Interestingly, there was no association between school nurse involvement in school planning and perceived interest in disaster planning or perceived importance of school readiness for natural disasters or biological events. This implies that there may be more opportunities for school nurses to be involved in school planning, something that would benefit the individual and the school. This study found an association between being a member of the school planning committee and perceived administrative support to be involved. Dedicated time for disaster planning would be essential for school nurses to be involved. A potential future intervention would be to increase awareness among school administrators regarding the need and benefits of involving school nurses in school disaster planning.

As with previous research, this study found that although most schools offer seasonal influenza vaccine to the nurse, very few schools mandate that the nurse get vaccinated annually. Furthermore, even in the rare situation of a school having a mandatory vaccination policy, nurses are the only school staff to whom the policy applies. No other school staff are mandated to get vaccinated, and about half of all school volunteers are neither mandated nor encouraged to get vaccinated. These findings are not in line with the Healthy People 2020 goal of having 80% of non-health care professional adults and 90% of health care professionals receive the influenza vaccine annually. Immunization of school staff against seasonal influenza and other vaccine preventable diseases should be a priority for school districts. This protects not only the school staff from disease, but also reduces sick leave and minimizes disease spread even in nonhospital settings. School administrators should consider implementing a mandatory vaccination policy for nurses and, at a minimum, encourage all other staff to get immunized. Research indicates that having a mandatory vaccination policy and encouraging workers to get vaccinated have a significant impact on vaccine uptake. This would be a simple and cost-effective method of improving school preparedness for biological events. One option for increasing seasonal influenza vaccine uptake among school personnel would be to host a school-based immunization clinic. Past research indicates that schools that are planned POD sites, which could include being a vaccine clinic, were more prepared for pandemics than non-POD school sites.

This study is the most thorough assessment of school preparedness for biological events that has been conducted, and to our knowledge it is the first to measure readiness for multiple types of infectious disease disasters, including bioterrorism, pandemics, and outbreaks of emerging pathogens. A few limitations must also be noted. One limitation is that only schools in Missouri were assessed and only those whose nurse belongs to the MASN were invited to participate. Therefore, findings from this study may not be generalizable to all of Missouri or the United States. Only a small number of Missouri school nurses are MASN members, perhaps because of time and cost restrictions; therefore, the findings from this study may be biased toward better-funded schools that cover nurses’ MASN membership costs or nurses who prioritize MASN membership who might not be representative of the state as a whole. Second, there may be some responder bias. Characteristics of the nonresponders could not be assessed, a common limitation in survey research. It is likely that nurse respondents were more interested or involved in disaster planning compared with those who chose not to participate. This means that the findings could overestimate school preparedness and affect reported attitudes toward disaster planning assessed in this study. In addition, results pertaining to interest in, and perceived importance of, disaster planning may be artificially inflated because of social desirability bias.

CONCLUSION

K-12 Missouri schools remain lacking in many critical aspects of biological event preparedness, despite school nurses reporting interest in disaster planning. Infectious disease disaster planning among Missouri schools does not appear to have progressed much over the last 4 years since a similar nationwide study was conducted, and most Missouri schools are not meeting many national and professional organization recommendations and guidelines. The United States continues to experience infectious disease outbreaks and importation of emerging pathogens; schools must be prepared to implement control measures to prevent disease transmission in the school setting. Findings from this study and previous studies and national recommendations indicate that school nurses should be involved in school planning efforts because these professionals have the knowledge and clinical skills needed for infectious disease disaster planning.

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