

Food allergy emergency preparedness in Illinois schools: rural disparity in guideline implementation

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Clinical Implications

- Legislation mandating food allergy education and allowing undesignated epinephrine in schools has had a positive impact. Opportunities for improvement include additional time and resources for food allergy training and increasing efforts in rural communities to address geographic health disparities.

TO THE EDITOR:

One in 13 students has a food allergy that requires individualized health care plans, emergency action plans, and training for school personnel.¹ Reactions in schools are common: 16%-18% of school-age children with food allergies experienced a reaction in the school,² and onset of symptoms in the school setting is a risk factor for fatal reactions.³ Given the prevalence and severity of this issue, the State of Illinois enacted "Guidelines for Managing Life-threatening Food Allergies in Illinois Schools."⁴ These guidelines stipulated that food allergy training for all staff with student contact be conducted every other year, and anaphylaxis drills be conducted yearly. In addition, Illinois passed the School Access to Emergency Epinephrine Act.⁵ This allowed schools to stock undesignated epinephrine for any child with a severe allergic reaction and allowed administration of epinephrine to a child with a written plan for epinephrine but unavailable medication. The assessment of current practices is important in the planning for appropriate resources for school emergency preparedness, including food allergy education and anaphylaxis drills for staff as similar legislation is applied nationally.⁶ Therefore, we sought to characterize school nurse response to food allergy emergencies in school and the impact recent Illinois State legislation has had on school nurses, including preparedness to manage severe food allergy reactions.

A cross-sectional online survey was administered to school nurses and aides throughout Illinois between October 1, 2012, and January 20, 2013. The Institutional Review Board of Ann & Robert H. Lurie Children's Hospital of Chicago approved the study protocol. Survey questions were designed to assess school experience with food allergy reactions and school response to recent food allergy legislation in the State of Illinois (see Figure E1 in this article's Online Repository at www.jaci-inpractice.org). A severe allergic reaction was determined by the nurses' perception of a severe reaction for which they would normally administer an epinephrine autoinjector. "Unavailability" of epinephrine meant that the nurse would have administered the drug had the student had epinephrine or undesignated

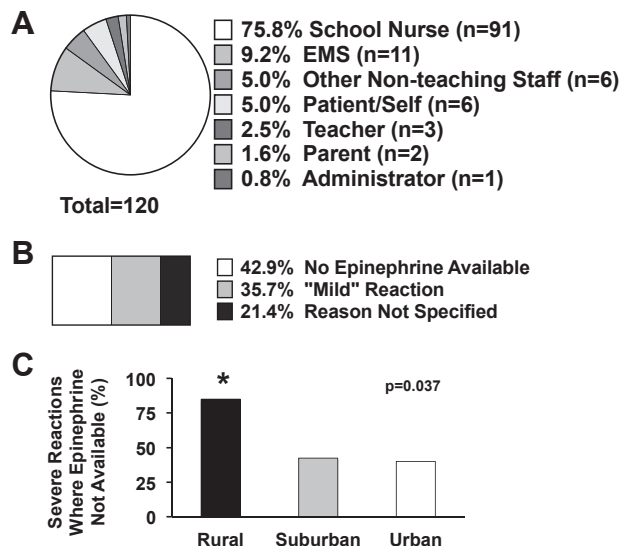


FIGURE 1. Treatment of severe allergic reactions at schools. **A**, School personnel responding to severe allergic reactions. Although they were not always available, school nurses responded to severe allergic reactions an overwhelmingly majority of the time. There was no difference between community types. **B**, Reasons specified for not giving epinephrine for a severe reaction. **C**, Rural communities reported epinephrine unavailability more often than urban and suburban communities (85.7% vs 42.4% vs 40%, * $P = .037$).

epinephrine. A drill was defined as a preplanned exercise conducted by a school (P.A. 94-600, 8-16-05). School community type was based on school nurse response regarding population density that the school covered. A χ^2 test of independence was used to compare answers by school community type (eg, rural, suburban, and urban) and school level (preschool/elementary school, middle/junior high, and high school).

Four hundred and sixty personnel (72% of the Illinois Association of School Nurses membership) completed the survey, which represented more than one thousand (1012) Illinois schools. Nurses were responsible for 2.4 schools on average and had a mean of 9.7 years of experience in their present school. Schools were described as suburban ($n = 662$ schools, 65.8%), rural ($n = 225$ schools, 22.2%) and urban ($n = 125$ schools, 12.4%), and were representative of the school makeup in the State of Illinois as categorized by the Illinois State Board of Education. All school levels from preschool to high school were represented (see Table E1 in this article's Online Repository at www.jaci-inpractice.org).

More than one-third (35.2%) of respondents reported an experience with a severe allergic reaction, although nurses from rural communities were least likely to report this experience ($n = 161$ emergencies, 18.9% rural vs 38.5% suburban vs 46% urban, $P = .001$). High school nurses were most likely to report this experience (29.7% preschool/elementary vs 32.3% middle/junior high vs 47.4% high school, $P = .002$). Importantly, 21.6% ($n = 35/161$) of the severe reactions were from a previously

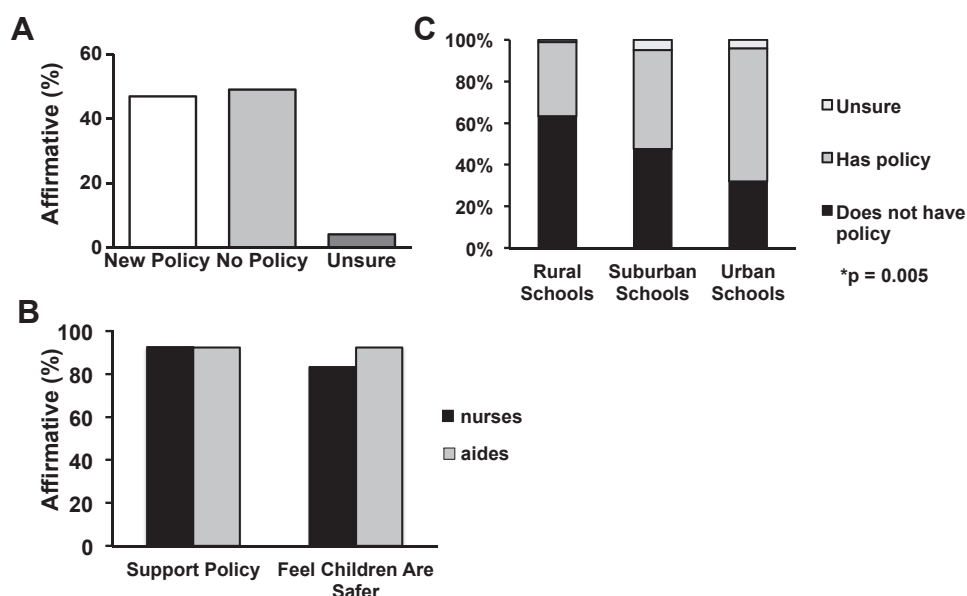


FIGURE 2. Undesignated epinephrine in schools. **A**, As a result of the Illinois State Food Allergy Guidelines, 46.9% of nurses reported a new school policy for the use of undesignated epinephrine in their school. However, the plurality of schools did not have undesignated epinephrine. **B**, School nurses and aides overwhelmingly supported the policy for undesignated epinephrine and indicated that it has made children safer in schools (black bars = nurses, gray bars = health aides). **C**, Nurses from rural schools were least likely to report a policy for undesignated epinephrine; urban schools were most likely. * $P = .005$.

unknown allergen and were independent of school location (35.3% rural vs 21.6% suburban, 13.0% urban, $P = .25$) and school level. Epinephrine was administered a total of 120 times (79.5%) but was not given in 28 of 161 severe reactions (17.4%; see Table E2 in this article's Online Repository at www.jaci-inpractice.org). When epinephrine was given, the school nurse administered epinephrine the overwhelming majority (75.8%) of the time (Figure 1, A). When epinephrine was not given, unavailability of the drug was the most frequently cited reason (Figure 1, B), and this was most common in rural schools (85.7% vs 50% vs 47%, $P = .037$, Figure 1, C). There was no difference based on school level.

In compliance with State Guidelines, the majority of nurses (79.4%) and school health aides (53.6%) provided food allergy training to the school staff within the past year (Figure E1); this did not differ by community type or school level. However, anaphylaxis drills were rarely conducted (6.6%) despite the recommendation in state guidelines (see Figure E2 in this article's Online Repository at www.jaci-inpractice.org). Barriers to conducting anaphylaxis drills are shown (Figure E2). When asked what would help the nurse conduct anaphylaxis drills, the most frequent suggestions were training (materials and training for nurses), support from administration and staff, and mandated anaphylaxis drills by Illinois State Board of Education (drills currently "recommended," but not "mandated"). These responses were similar between community types and school levels.

Nearly all respondents (99.1%) reported feeling either fairly confident or confident in their ability to manage a food allergy reaction, and 75.5% attributed most or some of their confidence to their district's food allergy policy. Interestingly, confidence in management varied widely depending on the location of the reaction (Table E3 in this article's Online Repository at www.jaci-inpractice.org). School buses, playgrounds, and field trips

remain areas of concern. Perceived readiness did not differ between community types or school levels.

Rural schools were least likely to have a written plan or protocol to outline staff procedure in the event of a severe allergic reaction (59.4% of respondents working at rural schools were aware of a written plan or protocol vs 81.7% for suburban vs 71.9% for urban, $P = .0019$). This did not differ between school levels. Additionally, rural schools were least likely to report undesignated epinephrine policies (35.6% of rural, 47.5% of suburban, and 64.0% of urban schools, Figure 2, $P = .005$). Among those schools with undesignated epinephrine autoinjectors, nearly all nurses and aides supported the new policy (92.4% nurses, 92.3% aides, Figure 2, C) and the majority of nurses (83.2%) and aides (92.3%) indicated that they felt children with food allergy were now safer in school.

Together, these data emphasize that all school personnel are called upon to administer injectable epinephrine, and that school nurses support expanded legislation regarding food allergy education, training, and availability of injectable epinephrine. Additionally, we report a previously unrecognized rural disparity in implementation of food allergy guidelines and access to undesignated epinephrine. Our study indicates that nurses provide 76% of the injectable epinephrine, despite being in the school less than 50% of the time. This leads to the question of why epinephrine is given much less frequently by other personnel. Is this due to lack of recognition of symptoms or lack of confidence in providing the treatment? This is of great concern because a delay in administration of epinephrine is an identified risk factor for death from food-induced anaphylaxis.^{2,3} As mentioned earlier, 21.6% of the severe reactions were from a previously unknown allergen, supporting access to undesignated epinephrine even for students not previously diagnosed. Additionally, lack of anaphylaxis drills despite a desire to conduct these drills

suggests that additional resources such as a module outlining steps to conduct, record, and evaluate an anaphylaxis drill would be helpful. Thus, this study highlights the need for food allergy training in the schools and areas where training can be improved.

Previously unrecognized, this study illustrates an important health disparity and an opportunity for improved implementation and advocacy. Nurses from rural schools reported the least experience with food allergy reactions, were least likely to recall a written policy for handling of food allergy emergencies in their school, and were least likely to report a new policy for undesignated epinephrine. Of note, rural schools were defined by nurse response regarding population density. Additionally, we report percentages of school nurses from these areas that have responded to the policy. Therefore, the rural disparity compared with urban or suburban counterparts illustrate that rural schools were least likely to respond to legislation, are not easily explained by the possibility of fewer students. Geographic health disparity is well recognized, and rural health disparity with regard to access to care and health outcome has been described particularly in cardiac and cancer care.⁷ With regard to food allergy, although previous studies have reported disparities with regard to geography in the United States⁸ and socio-economic status,⁹ disparity based on community type has not yet been described. The presence of food allergy guidelines was associated with increased emergency health plan compliance in a smaller study of 124 schools.¹⁰

Limitations include a potential reporting bias in that nurses most interested in this topic may have completed the survey and, therefore, were most enthusiastic about food allergy education and training. A “severe allergic reaction” was used in the survey without a prespecified definition; the nurses’ perception of a severe reaction, and not an objective definition, was used. Finally, as differences in school response by population density were an unexpected finding, data regarding outcomes due to the lack of new policies or decreased access to epinephrine were not collected. Rather, the survey focused on school nurse implementation and attitudes toward the State Guidelines.

This study demonstrates positive effects of recent state legislation mandating food allergy education and the allowance of undesignated epinephrine in schools and highlights the need for school-wide food allergy preparedness and training. Our findings also reveal opportunities for improvement in food allergy policy implementation, including securing additional time and resources for food allergy training and anaphylaxis drills, and addressing geographic health disparities by increasing efforts in rural communities.

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Before beginning the survey, please tell us about yourself.

*** 1. I am a...**

Illinois school nurse
School health aid
School administrator
None of the above

*** 2. While working at your current school, have any students/staff experienced a severe allergic reaction?**

Yes
No
Unsure

*** 3. How confident do you feel about your ability to react to a child who is having a food allergy reaction?**

Not confident
Fairly confident
Confident
Unsure

*** 4. How much of your confidence is due to your district's food allergy policy?**

Most
Some
None
Not applicable/no policy

*** 5. Do you feel you still need additional training to be able to manage a child who is having a food allergy reaction?**

Yes
No

*** 6. Does your district have a new policy on maintaining a supply of epinephrine (undesignated EpiPens) in your school?**

Yes
No
Unsure

*** 7. Do you support this new policy?**

Yes
Indifferent
No, because _____

*** 8. Do you think children with food allergy are now safer in schools due to this new policy?**

Yes
Indifferent
No, because _____

*** 9. Is this new policy sufficient to keep children with food allergy safe in schools?**

Yes
Indifferent
No, because _____

*** 10. Is there any part of the policy that bothers you?**

No
Indifferent
Yes, _____

*** 11. How can the new policy be improved?**

FIGURE E1. Survey questions. The survey was administered via [surveymonkey.com](https://www.surveymonkey.com).

The policy is fine
Indifferent

The policy can be improved by _____

*** 12. Is there a written plan or protocol in place at your school which outlines what staff are to do if a child is having a severe allergic reaction?**

Yes

No

Unsure

*** 13. General food allergy knowledge**

True

False

I don't know

Asthma is an important risk factor for severe allergic reactions.

Asthma is an important risk factor for severe allergic reactions. True

Asthma is an important risk factor for severe allergic reactions. False

Asthma is an important risk factor for severe allergic reactions. I don't know

A child can die from a milk allergy reaction.

A child can die from a milk allergy reaction. True

A child can die from a milk allergy reaction. False

A child can die from a milk allergy reaction. I don't know

Teenagers are at higher risk for fatal food allergy compared to younger children.

Teenagers are at higher risk for fatal food allergy compared to younger children. True

Teenagers are at higher risk for fatal food allergy compared to younger children. False

Teenagers are at higher risk for fatal food allergy compared to younger children. I don't know

Taking a daily antihistamine is effective for preventing a food allergy reaction.

Taking a daily antihistamine is effective for preventing a food allergy reaction. True

Taking a daily antihistamine is effective for preventing a food allergy reaction. False

Taking a daily antihistamine is effective for preventing a food allergy reaction. I don't know

*** 14. Which of the following doses of epinephrine (i.e. EpiPen) would you administer to a child who weighs 60 lbs (27kg)?**

0.15 mg of epinephrine (i.e. EpiPen Jr.)

0.3 mg of epinephrine (i.e. EpiPen)

Neither of the above

I don't know

*** 15. Which location do you instruct your patients to inject epinephrine (i.e.**

Agree

Disagree

Indifferent

Most people in my school take food allergy seriously.

Most people in my school take food allergy seriously. Agree

Most people in my school take food allergy seriously. Disagree

Most people in my school take food allergy seriously. Indifferent

Children with food allergies are teased at school.

Children with food allergies are teased at school. Agree

Children with food allergies are teased at school. Disagree

Children with food allergies are teased at school. Indifferent

All classrooms should be nut-free (e.g. peanuts, tree nuts).

All classrooms should be nut-free (e.g. peanuts, tree nuts). Agree

All classrooms should be nut-free (e.g. peanuts, tree nuts). Disagree

All classrooms should be nut-free (e.g. peanuts, tree nuts). Indifferent

Elementary schools should have special tables where children with food allergies can safely eat lunch.

Elementary schools should have special tables where children with food allergies can safely eat lunch. Agree

Elementary schools should have special tables where children with food allergies can safely eat lunch. Disagree

Elementary schools should have special

FIGURE E1. (Continued).

Elementary school
Middle school
Junior high school
High school

*** 21. How would you classify your current school(s)?**

Rural
Suburban
Urban

*** 22. What is your gender?**

Male
Female

*** 23. How old are you?**

18 – 24
45 - 65

25 – 44
Over 65

*** 24. What is your race/ethnicity? Mark all that apply.**

White
African American
Hispanic or Latino
Asian
Other (please specify)

*** 25. What is the highest education level you have completed?**

Less than high school
High school
2 year college
4 year college
Graduate degree

*** 26. Please tell us about your staff's training on food allergy.**

	Not confident	Fairly confident	Confident	Unsure
How confident do you feel that a severe allergic reaction would be recognized by your staff?	How confident do you feel that a severe allergic reaction would be recognized by your staff? Not confident	How confident do you feel that a severe allergic reaction would be recognized by your staff? Fairly confident	How confident do you feel that a severe allergic reaction would be recognized by your staff? Confident	How confident do you feel that a severe allergic reaction would be recognized by your staff? Unsure
How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CLASSROOM?	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CLASSROOM? Not confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CLASSROOM? Fairly confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CLASSROOM? Confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CLASSROOM? Unsure

FIGURE E1. (Continued).

How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON A FIELD TRIP?	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON A FIELD TRIP? Not confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON A FIELD TRIP? Fairly confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON A FIELD TRIP? Confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON A FIELD TRIP? Unsure
How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE PLAYGROUND?	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE PLAYGROUND? Not confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE PLAYGROUND? Fairly confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE PLAYGROUND? Confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE PLAYGROUND? Unsure
How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CAFETERIA?	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CAFETERIA? Not confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CAFETERIA? Fairly confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CAFETERIA? Confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction IN THE CAFETERIA? Unsure
How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE BUS?	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE BUS? Not confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE BUS? Fairly confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE BUS? Confident	How confident do you feel that your staff would know what to do if a student had a severe allergic reaction ON THE BUS? Unsure

*** 27. In your absence, who would manage a severe allergy emergency?**
Administrator
Teacher
Substitute nurse
Non-teaching staff
Other (please specify)

*** 28. Has your principal asked you (or expects you) to provide food allergy education to the staff?**
Yes
No

FIGURE E1. (Continued).

*** 29. How confident would you feel in providing food allergy training at your school in the next month?**

Not confident
Fairly confident
Confident
Unsure

*** 30. Have you provided food allergy training for school staff within the past year?**

Yes
No

*** 31. How much time are you given to provide food allergy training?**

Minutes per year:

*** 32. During training, each staff member is asked to demonstrate correct epinephrine administration technique with a training device.**

None of the time
Some of the time
Most of the time

*** 33. Has your principal asked you (or expects you) to conduct an anaphylaxis drill?**

Yes
No

*** 34. How confident would you feel in leading an anaphylaxis drill at your school in the next month?**

Not confident
Fairly confident
Confident
Unsure

*** 35. Have you conducted anaphylaxis drills within the past year?**

Yes
No

*** 36. Please briefly describe your anaphylaxis drills.**

*** 37. Who do you think should be part of an anaphylaxis drill? Mark all that apply.**

Principal
Assistant Principal
Office staff
Students
Classroom teacher
Cafeteria monitor
Cafeteria staff
Other (please specify)

*** 38. Who should be in charge of running a drill in the school?**

Principal
Nurse
Other (please specify)

39. What are the biggest barriers to conducting anaphylaxis drills in your school?

40. What are the biggest things that would help you conduct anaphylaxis drills in your school?

*** 41. Would an online module outlining steps to conduct, record and evaluate an anaphylaxis drill be helpful for you?**

Yes
No
Unsure

42. Do you have any comments about this survey?

FIGURE E1. (Continued).

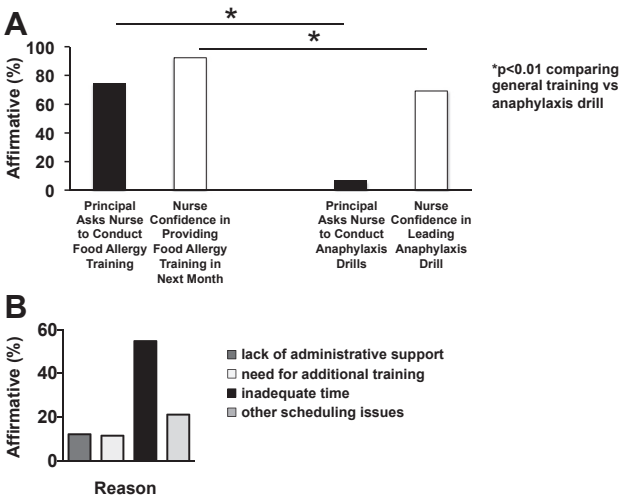


FIGURE E2. Food allergy training in Illinois schools. **A**, With regard to education, general food allergy training is most often provided. Despite the request for anaphylaxis drills in the State Guidelines, they were rarely asked for or conducted, and nurses report decreased confidence in leading an anaphylaxis drill compared with general training (black bars = asked by principal, white bars = nurse confidence). **B**, Nurses’ perceived barriers to conducting anaphylaxis drills despite inclusion in the Illinois State Guidelines. There was no difference between community types or school level. * $P < .01$ compares principal requests and nurse confidence in conducting food allergy training vs anaphylaxis drills.

TABLE E1. School description; total percentages are greater than 100 because nurses typically covered more than 1 school

	N = 1012	Percentage
Location of current school		
Suburban	662	65.4
Rural	225	22.2
Urban	125	12.4
Level of current school		
Preschool	405	40
Elementary	713	70.5
Middle school	422	41.7
Junior high	286	28.3
High school	337	33.3

TABLE E2. Failure to give epinephrine

Community type	No epinephrine given (total n)	Epinephrine not available (n, %)	Benadryl only given (n, %)	Reason not specified (n, %)
Rural	7	6 (85.7%)	1 (14.3%)	0 (0%)
Urban	4	2 (50%)	2 (50%)	0 (0%)
Suburban	17	8 (47%)	5 (29.4%)	3 (17.6%)

TABLE E3. High risk areas of concern for food allergy reactions: nurse confidence in staff's ability to handle a severe allergic reaction by community type and student age

How confident do you feel that your staff would know what to do if a student had a severe allergic reaction...	Total respondents not confident or unsure (%)	Preschool/elementary school (n, %)	Middle/junior high school (n, %)	High school (n, %)	<i>P</i> value
In the classroom	68 (15.9)	30	21	17	.67
On a field trip	70 (16.3)	20 (23.0)	40 (15.2)	10 (20.4)	.29
On the playground	62 (14.5)	19 (43.0)	31 (45.0)	12 (36.7)	.72
In the cafeteria	33 (7.8)	13 (14.9)	25 (9.6)	5 (10.9)	.17
On the school bus	196 (45.7)	41 (47.7)	124 (47.7)	31 (64.6)	.047

How confident do you feel that your staff would know what to do if a student had a severe allergic reaction...	Total respondents not confident or unsure (%)	Rural school respondents (%)	Suburban school respondents (%)	Urban school respondents (%)	<i>P</i> value
In the classroom	45 (11.1)	15 (13.9)	23 (9.5)	7 (10.8)	.034
On a field trip	70 (17.2)	20 (18.5)	40 (16.4)	10 (15.4)	.29
On the playground	62 (15.3)	19 (17.6)	31 (12.8)	12 (36.7)	.72
In the cafeteria	33 (8.1)	13 (12.0)	25 (10.3)	5 (18.5)	.17
On the school bus	196 (48.2)	41 (37.9)	124 (51.0)	31 (47.7)	.047

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