
Presence of food allergy emergency action plans in Mississippi

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Background: Multiple national, state, and local organizations recommend that emergency action plans (EAPs) direct therapy of allergic reactions in schoolchildren.

Objective: To investigate the school nurse's perception of food allergies and the presence of EAPs for food allergic students in Mississippi.

Methods: An investigator-developed food allergy survey was offered to all Mississippi public school nurses in 2008 and 2009.

Results: The survey had a combined response rate of 29% (194/659) for the 2 years of the study. In both years, most participating school nurses had at least 1 food allergic student at their school (mean [SD], 11 [10] students per school). In 2008, 30% (28/93) of the school nurses reported that food allergy EAPs were present for all of their food allergic students, whereas 29% (27/93) of school nurses had 0% to 10% of their known food allergic students on EAPs. Similarly, in 2009, 37% (34/93) of school nurses reported all of their food allergic students possessed a food allergy EAP, whereas 26% (24/93) of school nurses had 0% to 10% of their known food allergic students on EAPs. In 2008, students were more likely to have food EAPs if the nurse received information on food allergies from parents or a physician or if the student attended a school in an urban area. However in 2009, only if the nurse received information from a physician were they more likely to have an EAP for their students.

Conclusion: Although numerous organizations recommend food allergy EAPs for allergic students, our study highlights their inconsistent use in Mississippi.

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INTRODUCTION

Recent studies have indicated that atopic diseases, including food allergies, are increasing in the United States.^{1–4} Previous studies report that up to 6% of preschool and school-aged children have food allergies.⁵ Although a recent study suggests that the higher prevalence may be, at least in part, due to increased awareness among parents and health care professionals, a recent national, cross-sectional survey has documented an 18% increase in the prevalence of reported food allergy from 1997 through 2007.⁶ Food-based allergic reactions in children are a significant concern because up to 50% of all anaphylactic reactions in children are due to food allergies and many of these occur while in school.^{7,8} This is of particular concern because children spend a considerable amount of time without their parents (mostly at schools or daycares) and depend on other adults for supervision. Food reactions are common in the school setting, with a recent study showing 18% of known food allergic children having at least 1 food reaction at school in the year before the survey.⁹

However, the risk of food allergic reactions is not limited to children already diagnosed as having a food allergy because 25% of previously undiagnosed food allergic children have their first systemic food reaction at school or daycare.¹⁰

Recent estimates indicate that up to 2 million school-aged children in the United States are affected by food allergies.¹ Students with food allergies are protected by federal laws, including the Individuals with Disabilities Education Act (IDEA) and the US Rehabilitation Act (USRA) of 1973, section 504.¹¹ The IDEA requires that children with disabilities, including food allergies, be provided necessary services and/or special education opportunities to attend school.¹² In addition, section 504 of the USRA specifically prohibits an educational institution that receives federal funding from discriminating on the basis of a student's disability (which could, in many cases, include children with food allergies).

The Joint Task Force of the American College of Allergy, Asthma and Immunology (ACAAI) and the American Academy of Allergy, Asthma and Immunology (AAAAI) recommend that physician-prescribed treatment protocols be used to direct treatment of allergic reactions in children.^{13,14} The Executive Committee of the American Academy of Pediatrics (AAP) Section on Allergy and Immunology recommends the Food Allergy Action Plan developed by the Food Allergy and Anaphylaxis Network (FAAN) be used in schools for children with food allergies.^{15,16} The National Association of School Nurses (NASN) has identified the need for individual health care plans for students with food allergies.¹⁷ Specifically in Mississippi, the Mississippi Department of Education (DOE) advises the de-

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velopment of an individual food allergy action plan for all food allergic students in Mississippi.¹⁸

To date there have been no studies investigating the school nurse's perception of food allergy in Mississippi schools or their adherence to food allergy emergency action plan (EAP) recommendations. Previous studies, from other states, have shown a low prevalence of EAPs in place for students with food allergies. A 1998 survey response from school nurses in Indianapolis showed only 19% of surveyed schools had any sort of EAPs for food allergic children.¹⁹ In addition, a 2001 study of 101 public elementary schools in Michigan showed only 16% had food allergy EAPs.²⁰ A national study to investigate peanut or tree nut reactions in school or child care centers found an emergency plan in place for only 33% of children with allergic reactions in the school or child care setting.¹⁰ A 2007 survey of attendees at a regional school health conference in Illinois found that 64% (60/94) stated their school had a food allergy action plan; however, only 15% were identical to the current FAAN plan.²¹ Although nearly two-thirds of respondents had a food allergy EAP, the authors noted that many were lacking in crucial information, and they concluded that adherence to the FAAN action plan was preferred. Finally, our 2008 study from the largest public school district in South Carolina showed the inconsistency within a single district in the presence of food allergy EAPs. In the South Carolina study, 44% of schools had all food allergic students on EAPs. However, in the same school district, 42% of schools had an EAP in place for less than half of their food allergic students.²² Thus, with the ACAAI, AAAAI, AAP, NASN, and the state of Mississippi all recommending EAPs, our goal was to investigate the Mississippi school nurses' perceptions of food allergies and the prevalence of EAPs for food allergic students.

METHODS

Location

In 2009, Mississippi's estimated population was 2,951,996 persons, with 549,071 school-aged inhabitants.²³ The number of employed Mississippi public school nurses varies from year to year, with 346 in 2008 and 313 in 2009 (Ms. Estelle Watts, Mississippi DOE, personal communication, August 20, 2009). Also, in some Mississippi school districts a nurse covers a single school, whereas in other school districts a single school nurse is responsible for multiple schools.

Survey Instrument 1

Using a database of names and addresses of school nurses employed in Mississippi in 2008 provided by the Mississippi DOE, an investigator-developed food allergy survey was offered to all public school nurses.²⁴ The anonymous paper survey, modeled after one used to study school nurses in Greenville, South Carolina, included 20 questions detailing the school nurses' perception of food allergy prevalence, management of food allergy reactions, and presence of food allergy EAPs.²² The survey also asked the school nurse to provide information on their school nursing environment,

including grade levels in the school, how many schools the nurse is responsible for, how many hours the school nurse attends the school, and county of the school. The surveys were mailed to all public school nurses on October 20, 2008. A reminder letter was sent on November 17, 2008, and all surveys that were returned by December 5, 2008, were included in the study.

Food Allergy Lecture

A 60-minute lecture on food allergies and the classroom was provided by one of the investigators (J.M.P.) at the Mississippi School Nurse Association (MSNA) convention in April 2009. The lecture provided information on the common causes of food allergic reactions in schools, reviewed the Managing Food Allergies in Mississippi Schools Guidelines as developed by the MS DOE, provided educational materials on the management of students with food allergies in the classroom, and provided instructions on the development of food allergy action plans for food allergic students.

Survey Instrument 2

Once again using a database of names and addresses for school nurses employed in Mississippi in 2009 provided by the MS DOE, the investigator-developed food allergy survey was offered to all public school nurses.²⁴ The anonymous, 20-question paper survey was identical to the 2008 survey except for a question on whether the school nurse had attended the food allergy lecture given at the 2009 MSNA convention replaced a question on whether the school nurse worked at a public or private school. The surveys were mailed to all public school nurses in October 2009. A reminder letter was sent on November 9, 2009, and all surveys that were returned by December 4, 2009, were included in the study. The study was approved by the University of Mississippi Medical Center institutional review board.

Statistical Analysis

For statistical analysis the survey results were entered into a spreadsheet software program (Microsoft Excel 2003; Microsoft Corporation, Redmond, Washington) and exported to statistical software (SPSS version 17; SPSS Inc, Chicago, Illinois). Descriptive analysis was performed using frequency distribution, means, medians, standard deviations, and percentiles. After testing for the normality of the data, group comparisons were performed using the *t* test or χ^2 test, depending on distribution. Significance level was set at .05.

RESULTS

Result Rate

Combined, the 2-year survey had an overall response rate of 29% (194/659), with 28% (96/346) of eligible school nurses participating in 2008 and 31% (98/313) in 2009 (Table 1).

In 2008, 97% (93/96) of the participating school nurses had at least 1 food allergic student at their school (mean [SD], 10 [9] food allergic students per school), which was similar to 2009, with 95% (93/98) of the participating schools having at least 1 food allergic student at their school (mean [SD], 12

Table 1. Characteristics of School Nurses Surveyed With the Mississippi Food Allergy Survey

Characteristic	No. (%) of school nurses	
	2008 Survey	2009 Survey
Total responders	96 (28)	98 (31)
Grade levels ^{a,b}		
Pre-K to 5	78 (81)	79 (81)
6–8	35 (37)	34 (35)
9–12	26 (27)	22 (22)
No. of schools covered ^b		
1	56 (58)	45 (46)
2	21 (22)	26 (27)
3	10 (10)	6 (6)
4	3 (3)	2 (2)
≥5	5 (5)	5 (5)

^a Some school nurses covered multiple grade levels.

^b Answers represent percentage of respondent school nurses.

[10] food allergic students per school). During both years of the study, the most common food allergens reported included peanut, cow's milk, egg, fish, and shellfish (Fig 1).

In 2008, 28 school nurses (30%) reported that food allergy EAPs were present for all of their food allergic students, whereas 27 school nurses (29%) had 0% to 10% of their known food allergic students on food allergy EAPs. In 2009, 34 school nurses (37%) reported that all of their food allergic students possessed a food allergy EAP, whereas 24 school nurses (26%) had 0% to 10% of their known food allergic students on food allergy EAPs (Fig 2). Further investigation of the 2008 survey showed that students were more likely to have food allergy action plans if the school nurse received information on food allergies from parents or a physician or if the student attended a school in an urban area. However, in the 2009 survey, only if the school nurse received information from a physician was the school nurse significantly more likely to have food allergy action plans for their students (Table 2). In 2008, a school nurse who covered multiple

schools tended to have more students on EAPs. This finding compared to 2009, when school nurses who were responsible for 1 school were significantly more likely to have an EAP for their students (Table 3). A 1-hour lecture on food allergies and the classroom did not significantly affect the presence of food allergy EAPs in Mississippi schools between 2008 and 2009. Finally, Mississippi school nurses reported food allergy reactions in approximately one-third of respondent schools, and most of these reactions occurred in the classroom or in the lunchroom (Table 4).

DISCUSSION

This anonymous, 2-year survey of school nurses was the first of its kind known to the authors to assess the school nurse's perception of food allergies in Mississippi public schools. This study builds on a more limited study of school nurse's perceptions of food allergies performed by us in Greenville, South Carolina, in 2008 and adds to the growing body of literature investigating food allergies in US schools.

In both years of this study, at least 1 food allergic student was noted in nearly 100% of respondent surveys with a mean (SD) of 11 (10) students (combined data for 2 years) per survey. Not surprisingly, the most common food allergens reported included peanuts, cow's milk, egg, fish, and shellfish. However, what was somewhat surprising was the ubiquitous nature of peanut allergies in Mississippi, with 80% to 89% of respondent schools indicating at least 1 student with that sensitivity. This high presence of peanut allergic students is in agreement with a recent study showing the rate of peanut allergy in children increasing from 0.4% to 1.4% from 1997 to 2008.²⁵ This is concerning because 90% of fatal food anaphylaxis is caused by peanut and/or tree nut sensitivity.²⁶ In addition, because 80% of children are unlikely to outgrow this food allergen, their risk for reactions may be lifelong.²⁷

In Mississippi, 88% to 92% of the respondent schools reported at least 1 accommodation for students with food allergies. Peanut-specific restrictions were made in more than 50% of the schools. However, 8 schools in 2008 and 5

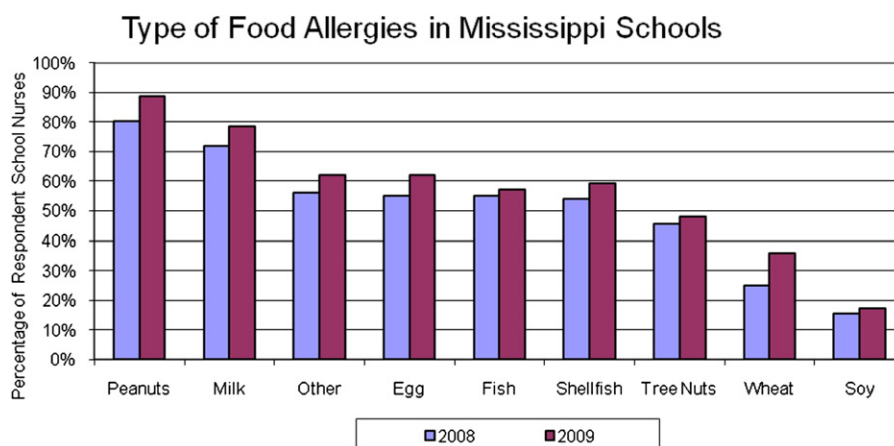


Figure 1. Percentage of schools with at least 1 student with a specific food allergy.

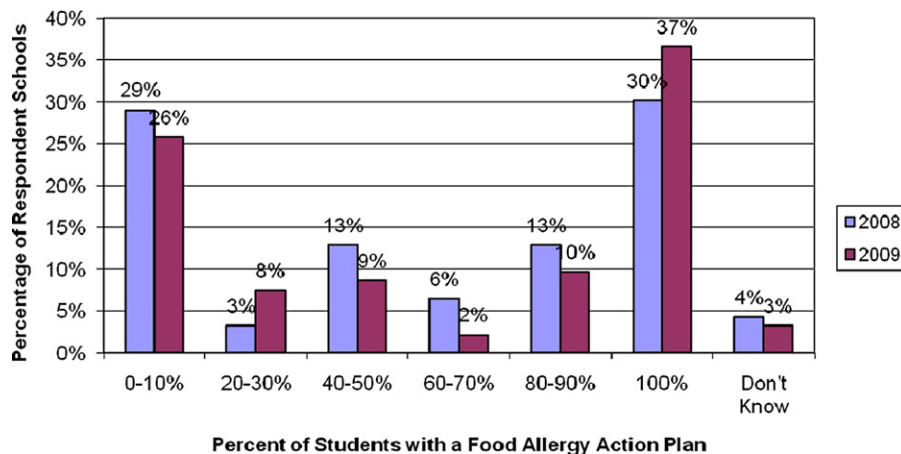


Figure 2. Presence of food allergy action plans in Mississippi schools.

schools in 2009 with identified peanut allergic students failed to make any food allergy accommodations at all. This survey illustrates the individual autonomy schools possess in preparing for food allergy reactions and creating school accommodations for food allergic students even when provided guidelines by the state.¹⁸

An additional goal of this study was to examine the frequency and location of food allergic reactions in Mississippi schools. From 2008 to 2009 the number of reported food reactions was essentially stable. These reactions occurred in a variety of locations; however, the classroom and lunchroom accounted for more than 90% of the reactions. The similarity between the numbers of reactions in the classroom compared with the lunchroom indicates the ubiquitous presence of food in all parts of Mississippi school buildings. Because food is often used in class projects, at birthday parties, or as special awards, a food allergic reaction is not limited to the 4 walls of the school cafeteria. Thus, one can understand why FAAN, a food allergy support organization, recommends eliminating the use of food allergens in educational tools, in arts and crafts projects, or as incentives in the school setting.²⁸

A crucial aspect of anaphylaxis care is prompt administration of rescue epinephrine. However, we discovered that in a

troubling minority of schools (10%–13%) only the school nurse was empowered to provide rescue medications. This finding is concerning because prior studies have noted a significant risk to students having a food allergic reaction if the school nurse is not available.²⁹ Although various state and federal laws affect the ability of school nurses to delegate their health care roles to other school personnel, specific plans should be in place to administer life-sustaining epinephrine for all students with food-induced anaphylaxis. A coordinated EAP that designates who can administer rescue medications if the school nurse is not available is recommended for all students with the potential to have life-threatening anaphylaxis.

As another portion of this study, one of the authors (J.M.P.) provided a 1-hour lecture on food allergies and the classroom to 180 school nurses at the 2009 MSNA convention. Unfortunately, because of the anonymous nature of the lecture and this study, we were unable to compare 2008 and 2009 survey results to assess the direct effect of the lecture on the school nurse's behavior. However, because in both years of the study information provided by a physician to a school nurse was significantly related to the presence of an EAP, we contend

Table 2. Factors That Affect the Presence of Food Allergy Action Plans in Mississippi Schools

Factor	2008 Survey		2009 Survey	
	Students with food allergy action plans, % (95% CI)	P value (t test)	Students with food allergy action plans, % (95% CI)	P value (t test)
Information from parents	61 (52–70)		60 (50–71)	
No information from parents	35 (14–56)	.02	56 (34–77)	.67
Information from physicians	63 (53–73)		66 (55–76)	
No information from physicians	42 (27–58)	.02	44 (24–60)	.02
Urban area ^a	74 (62–85)		71 (56–86)	
Nonurban area	46 (35–57)	.002	54 (42–66)	.09

Abbreviation: CI, confidence interval.

^a Urban area defined as school in a county with a city of 25,000 inhabitants or more.

Table 3. Comparison of Schools With High and Low Presence of EAPs

Presence of EAPs	2008 Survey		2009 Survey	
	No. of schools covered by school nurse (95% CI)	P value (t test)	No. of schools covered by school nurse (95% CI)	P value (t test)
0%–10% of students with EAPs	1.31 (1.09–1.53)	.08	2.04 (1.45–2.63)	.04
100% of students with EAPs	1.71 (1.32–2.10)		1.44 (1.15–1.73)	

Abbreviations: CI, confidence interval; EAP, emergency action plan.

that the physician–school nurse relationship is vital to food allergy management in Mississippi schools.

The major objective of this study was to investigate the presence or absence of EAPs in Mississippi. As has been previously noted, many groups (federal agencies, state governments, and local school districts) and the Mississippi DOE recommend EAPs in schools for food allergic students.^{13,14,16,18,30,31} Unfortunately, our study highlights their inconsistent use in Mississippi. During the 2 years of our study, we found EAPs in place for all allergic students in only 30% to 37% of respondent schools. Equally troubling was that in 26% to

29% of respondent schools, less than 10% of their students with known food allergies had an EAP.

The remarkable disparity between the presence and absence of food allergy EAPs in Mississippi is concerning but not at all unique to this state. Our previous study in Greenville, South Carolina, showed a similar dichotomous pattern of the presence and absence of EAPs within a single school district.²² Therefore, we used this study to further investigate school nurse characteristics that might support the presence of EAPs. We found that in our 2008 study, a school nurse was more likely to have food allergy EAPs in place if the school nurse received information on food allergies from parents or a physician or if the student attended a school in an urban area. In addition, a trend emerged showing school nurses who had a higher prevalence of students with food allergy EAPs covered more schools than those school nurses with a very low prevalence of food allergy EAPs. In our 2009 study, the school nurse was significantly more likely to have food allergy action plans for their students only if she/he received information directly from a physician. Finally, in our 2009 study the school nurses who covered only 1 school were significantly more likely to have food allergy EAPs compared with school nurses who were responsible for multiple schools.

Although EAPs were only present in approximately one-third of Mississippi public schools, this is comparable to prevalence rates of EAPs in other published studies (16%–64%).^{10,19–22} Unfortunately, a large number of food allergic students remain without a food allergy EAP. Using the results of this study, a more focused educational initiative aimed at Mississippi school nurses is underdevelopment. It is essential that this educational instruction include school nurses in nonurban areas of Mississippi, where the reported presence of EAPs was low. Beyond Mississippi, future national studies comparing different regional areas, performed in a nonanonymous manner to directly compare the presence and absence of EAPs after an educational initiative, are warranted. In addition, a study surveying community physicians (particularly allergist-immunologists) and how often they provide parents and guardians of school-aged children with EAPs is necessary to further examine the physician's role in the presence or absence of EAPs.

As in all survey-based studies, there were anticipated potential limitations to this study. First, we recognize ascertainment bias, which we believe was limited because of the

Table 4. Results of Mississippi Food Allergy Survey

Result	No. (%) of school nurses	
	2008 Survey	2009 Survey
Schools with a food allergy reaction		
Schools with a reaction	29 (31)	27 (29)
Schools with multiple reactions	10 (11)	12 (13)
Locations of food allergic reactions		
in past year		
Classroom	19 (20)	15 (16)
Lunchroom	15 (16)	16 (17)
Other location	3 (3)	3 (3)
Accommodations made for students with food allergies		
Peanut or tree nut free schools	10 (10)	13 (13)
Peanut free tables	17 (18)	16 (16)
Peanuts restricted from classroom	44 (46)	37 (38)
Separate eating areas	16 (17)	20 (20)
Alternative meals	68 (71)	62 (63)
No accommodations	11 (11)	8 (8)
No. of additional school personnel trained in administering rescue medications		
0	10 (10)	15 (15)
1	15 (16)	11 (11)
2	19 (20)	17 (17)
≥3	60 (63)	55 (56)
Additional school personnel trained in administering rescue medications		
Classroom teachers	62 (65)	58 (59)
Administrators	48 (50)	46 (47)
Food service staff	5 (5)	5 (5)
Teaching assistants	22 (23)	33 (34)
Other	42 (44)	39 (40)

masked, anonymous nature of the survey and the use of only aggregate data in the results. Second, we acknowledge the response rate for this 2-year study (28%–31%) was below previously published surveys on food allergies, which have been in the range of 38% to 64%.^{19–22} Although we concede a 100% response rate would have been ideal, the masked, anonymous nature of this study precluded further investigation of the nonresponding school nurses. Third, we disclosed the possibility of recall bias in our study. Because both years of the study were restricted only to the current school year, we suggest that recall bias was minimal. Finally, we recognize this 2-year study depended on the school nurse's perception of food allergies in their school; as such, no formal allergy testing was performed to substantiate the school nurse's identification of food allergic students.

In conclusion, although disturbing that this 2-year study of Mississippi public schools noted the absence of a food allergy EAP for many students, the overall prevalence of food allergy EAPs in Mississippi public schools is comparable to previously published levels. Specific guidance from a physician appears to significantly influence school nurse behavior, but further research is indicated to investigate the underlying causes for disparity between schools that do and do not adhere to the recommended school food allergy guidelines.

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