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# CHILD NUTRITION PROGRAM MENU PLANNERS' PERCEPTIONS OF COSTS ASSOCIATED WITH MEALS FOR CHILDREN WITH FOOD ALLERGIES IN CALIFORNIA SCHOOLS

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## ABSTRACT

**PURPOSE:** The USDA requires children with food allergies be offered modified menus with no additional meal reimbursement. Food allergies affect up to 8% of children in the U.S.; eight allergens account for over 90% of allergic reactions. This study assessed perceptions of child nutrition program menu planners in California, a state with a high and diverse population, of costs associated with allergy related meal accommodations.

**METHODS:** An online survey was sent to the population of menu planners for children with food allergies at all California public schools (N = 902).

**RESULTS:** Child nutrition program menu planners (n = 212) frequently identified two factors affecting cost of food in providing meals for children with food allergies: type of allergy and additional cost of special foods. Multiple factors were frequently identified as affecting labor costs including purchase of special foods, planning menus, training foodservice workers, communication with nutrition staff and others, separation of food production areas to avoid cross-contact, research of suitable food substitutions, and time for documentation on production records. Participants perceived accommodating children with wheat, soy, milk products, and multiple allergens cost more than providing non-modified meals. Ready availability and ease of sourcing substitute foods reduced perceptions of negative labor impacts on operations.

**APPLICATIONS FOR CHILD NUTRITION PROFESSIONALS:** Knowledge of the local frequency of accommodations for children with specific food allergies can be used to plan lower cost menus for the most frequently modified allergens. Short cycle menus could be prepared in advance for the most common allergens or allergen combinations in the district reducing the time spent and potentially reducing cost of labor for menu planning of modified meals. Further, information about types and frequency of allergen accommodations within the district can be useful when developing specifications for bid purchases of foods and inclusion of identified acceptable substitutes.

KEY WORDS: allergens, special diets, food cost, labor cost, meal accommodations

# INTRODUCTION

Child nutrition programs in schools in the United States (U.S.) provide healthy, safe, and affordable meals for a diverse population of children every school day (Healthy Hunger-Free Kids Act [HHFKA], 2010). U.S. Department of Agriculture (USDA) Child Nutrition Programs, the National School Lunch Program and School Breakfast Program, provide meals consistent with the current Dietary Guidelines for Americans, and portioned based on age or grade level of the child (Nutrition Standards in the National School Lunch and School Breakfast Programs; Final Rule, 2012).

The Americans with Disabilities Act (ADA) of 1990 mandated accommodations for students with disabilities, such as food allergy (ADA, 1990). Given that children spend up to 50% of their waking hours at school, and foods that most frequently cause food allergy reactions, such as dairy products, wheat, and peanuts, are commonly found at schools (Sheetz et al., 2004), the likelihood of a reaction at school is high. A study conducted from 2009 to 2010 with 38,480 children under the age of 18 found food allergy prevalence for this sample was 8.0% (Gupta et al., 2011). Study results also found that among children with food allergy, 38.7% of those had a history of severe allergy reactions. Prevalence was highest for peanut allergy (25.2%), followed by milk (21.1%), and shellfish (17.2%). Food allergy reactions while at school during the previous 2-year period were reported for 18% of children in the study (Gupta et al., 2011). Sauer, Patten, Roberts, and Schartz (2018) reported that nearly all of the 480 respondents from their national convenience sample of over 5,000 districts provided meals to students with allergies to peanuts (97%), tree nuts and wheat (77%), and eggs (71%).

A food allergy reaction can include symptoms such as itching, hives, swelling, diarrhea, and shortness of breath (U. S. Department of Health and Human Services [DHHS], 2007). A food allergy can also cause more severe symptoms and a life-threatening response called anaphylaxis (U.S. Food and Drug Administration [U.S. FDA], 2009).

Eight foods account for over 90% of allergy reactions in susceptible individuals: milk, eggs, peanuts, tree nuts, fish, shellfish, soy, and wheat (Branum & Lukacs, 2008; Sampson, 2004). The Food Allergen Labeling & Consumer Protection Act of 2004 requires these eight foods be clearly listed on a food ingredient label (U.S. FDA, 2009).

In 2013, USDA informed child nutrition program operators that the Americans with Disabilities Act Amendments Act of 2008 ([ADAAA]; USDA, 2013) broadened the scope of diagnoses in children that could require meal accommodations, including children with food intolerances. A medical statement is required for the school to receive Federal reimbursement if the modified meal does not meet program meal pattern requirements, such as a missing meal component. At the time of the study, the USDA issued guidance to schools in a document titled *Accommodating Children with Special Dietary Needs in School Nutrition Programs* (USDA, 2001). The guidance was updated in 2017 (USDA, 2017). Both documents stated schools are required to make substitutions in the reimbursable school meal for students disabled by food allergies. The guidance recommends written documentation from a state licensed healthcare professional be required before schools make meal modifications. The medical statement must include a description of the food allergy, how the allergy restricts the diet, major life activities affected by the disability, foods to be omitted from the diet, and foods that can be substituted. The healthcare professional's information is needed to assist the child nutrition program staff to provide a safe and appropriate meal for the student.

At the time of this study, the California Retail Food Code was modeled after the 2005 FDA Food Code (California Department of Public Health, 2012). The Food Code requires that all retail food

outlets have one “food protection manager” certified individual on the premises when the food facility is in operation and that this individual is knowledgeable about the eight most common food allergens. The 2013 FDA Food Code included recommendations to clean and sanitize equipment and food contact surfaces to prevent cross-contamination that could cause unintended allergy reaction in susceptible individuals (U.S. FDA, 2013).

Schools cannot charge the child more than the price of a regular meal for an allergen modified meal and state and federal reimbursements are the same for these meals. For the 2014-2015 school year, California schools received a total of $3.2648 for every reimbursable free meal and $2.8748 for every reduced-price meal. With the additional $0.06 per lunch meal to school districts certified in compliance HHFKA updated meal pattern requirements, reimbursable meal rates could have been $3.3248 and $2.9348 for free and reduced-price meals, respectively.

Conklin and Nettles (1994) conducted a case study with 15 schools in eight districts to investigate labor, food, and equipment cost estimates associated with providing school meals for children with special food and nutrition needs. These researchers found some schools spent more than others, and all districts had increased labor costs, but food cost per meal was dependent on the type of special diet prepared. The authors concluded that it was “not a costly undertaking” for the schools to provide special modified meals.

However, much has changed within child nutrition programs since the time of that study. Anecdotal evidence suggests providing substitutions for children with food allergies does indeed create increased food and labor costs for child nutrition programs in schools, particularly given that the food allergy rate among children 18 years and younger increased 18% between 1997 and 2007 (Branum & Lukacs, 2008). In the most recent survey available, the School Nutrition Association (SNA) 2012 Back to School Trends Report (2012) stated that 80% of 579 responding districts reported an increase in the number of students with special dietary needs during the 2011-12 school year.

The attention required to produce specialized menu items or modified meals likely requires additional cost for ingredients, equipment, and/or labor. There were no current published studies found in the literature that assessed perceived or actual costs of modified meals prepared for children with food allergies. Therefore, the purpose of this study was to assess perceptions of child nutrition program menu planners in California, a state with a high and diverse population, of the costs associated with allergy related meal accommodations.

## METHODS

The Institutional Review Board for Human Subjects approved data collection instruments and research protocol prior to beginning the study.

### Population

The target population for this study was one child nutrition program menu planner in each public school district in the state of California that participated in the federal child nutrition programs for the 2013-2014 academic year. This is the person who designs and implements menus for children requiring accommodations for one or more of the eight most common food allergens. In that school year, the California Department of Education reported 902 approved public school child nutrition program sponsors. A district level approach was used to avoid over-representation by districts, because the number of child nutrition program menu planners in California is unknown as school districts could have more than one menu planner, and it was assumed district wide policies would guide actions and impact perceptions of respondents.

The nutrition program food service director or manager identified by each school district participating in child nutrition programs in the state of California (N=902) as part of the school nutrition program sponsor application for the 2013-2014 school year received an email survey. Survey recipients were asked to complete the survey or forward the invitation email with embedded link to one individual in the district who prepared modified lunch menus for children with food allergies.

**Data Collection Instrument Development**

An online survey was developed utilizing key issues and concepts from an electronic Delphi panel conducted previously (Grumbles, 2015) and a review of literature. The survey consisted of 33 questions; of those, 10 were demographic questions about the menu planner and the district, and the remaining 23 assessed perceptions of the district menu planner regarding frequency and costs associated with food allergy meal accommodations. Demographic characteristics of child nutrition program menu planners included age, gender, educational level, years of service, job title/category, professional affiliations, and certifications. School district characteristics included student enrollment, average lunch meal participation, free and reduced- price meal eligibility percent, location (county), number of children with a food allergy medical statement on file, and estimated number of modified meals served daily for children with food allergies.

Perceptions of menu planners that were assessed included factors affecting costs of food and labor to prepare meals for children with food allergies, and factors affecting choice of product substitution. Respondents indicated level of agreement to statements using a five-point Likert scale (1 = *strongly disagree;* 5 = *strongly agree*). One question asked participants to indicate whether the costs for food and labor to produce a modified meal for a child with one of the eight most common allergens was *less, the same, more, or don't know.* While the larger study (Grumbles, 2015) assessed other factors related to providing modified meals to students with food allergies, only the data relating to perceptions of cost issues are presented in this manuscript.

**Pilot Test**

The online survey was pilot tested by a panel of ten child nutrition program menu planners who prepare menus for children with food allergies outside of California. These were identified from referrals by Iowa State University doctoral students and faculty, and School Nutrition Association contacts with the lead researcher. Pilot test participants received an email letter with an embedded link to the survey and reviewed it for readability, clarity, and estimated amount of time needed to respond. Nine of the ten participants responded with changes in content made to clarify wording on several questions and add a "back" button on each page of the survey. Both of these suggestions were implemented in the survey released.

**Data Collection**

In November 2014, an email invitation to participate with an embedded link to the online survey was sent to child nutrition program director/managers in California (N=902) with instructions to forward to the appropriate person in the district who plans menus for children with food allergies. Emails were sent using Qualtrics distribution system. Follow-up emails were sent on four occasions over a three-month period after deployment with a varied script reminder and request to complete the survey, including an embedded link (Dillman, Smyth, & Christian, 2009). As recommended by Dillman et al. (2009), a tangible reward was offered to maximize response rate with an opportunity to participate in a drawing to win one of four $50.00 value gift cards.

**Data Analysis**
Data were analyzed using JMP Pro 10 Statistical Discovery Software and SAS 9.3 statistical software. Descriptive statistics (frequencies, means, and standard deviations) used to analyze the data are reported in this manuscript.

## RESULTS AND DISCUSSION

Of 902 email invitations sent out, 463 survey links (51.3%) were opened, 291 surveys (32.3%) were started, and 260 questionnaires (28.8%) were submitted. Of those surveys submitted, 48 were deemed incomplete (less than 70% of questions were answered) and removed from the data analyses. A total of 212 (23.5%) surveys were used in the final data analyses.

**Demographics**
The majority of the 212 respondents was female (n=163, 83.6%), 51-60 years of age (n=89, 46.1%), and had a Bachelor's degree (n=70, 36.1%) or some college (n=52, 26.8%) (Table 1). More than three-quarters of respondents indicated they were food safety manager certified (n=138, 83.6%). Additional certifications and credentials reported were the School Nutrition Association (SNA) Certificate in School Nutrition (n=27, 16.4%), Registered Dietitian (n=27, 16.4%), and SNA School Nutrition Specialist credential (n=30, 18.2%). At least one professional certification or credential was held by 165 respondents, although multiple responses were given by participants with 239 responses recorded.

Participants were asked how many years they had been in their current positions. One-third of respondents (n=64, 33.0%) indicated they had spent two to five years in the current job, however, 60 respondents (30.9%) indicated they had worked in some capacity in child nutrition programs for more than 20 years. The majority of respondents (n=122, 62.2%) reported their job title to be "child nutrition program director," and an additional 26 (13.3%) indicated their job title to be "child nutrition program manager."

The greatest number of respondents reported they were employed by small size school districts with student enrollments of 0 to 2,500 students (n=71, 36.4%). Next most common was respondents employed by medium size school districts with student enrollments of 2,501 to 10,000 students (n=67, 34.4%). Also reporting were 38 (19.5%) participants from large size school districts (10,001 to 25,000 student enrollment) and 19 (9.7%) participants from mega size school districts (more than 25,000 student enrollment). The distribution of district enrollments of respondents was similar to the state of California as 53.1% of public schools are small size, 29.1% of schools are medium sized, 12.4% are large size, and 5.4% are mega sized (California Department of Education, 2015). Free and reduced-price meal eligibility, commonly referred to as "needy" meal eligibility, in reporting districts (n=157) varied from 7.0 to 100.0 percent, with an average of 67.1 % and median of 74.0%.

**Table 1. Characteristics of Child Nutrition Program Menu Planners in California Public School Districts (N = 212)**

| Characteristic | n | % |
|---|---|---|
| **Sex (n=195)** | | |
| Female | 163 | 83.6 |
| Male | 28 | 14.4 |
| Prefer not to Answer | 4 | 2.0 |
| **Age Category (n=193)** | | |
| Under 21 years old | 0 | 0.00 |
| 21 – 25 years old | 1 | 0.5 |
| 26 – 30 years old | 6 | 3.1 |
| 31 – 40 years old | 27 | 14.0 |
| 41 – 50 years old | 54 | 28.0 |
| 51 – 60 years old | 89 | 46.1 |
| 61 years old or better | 16 | 8.3 |
| **Highest Level of Education Obtained (n=194)** | | |
| Bachelor's degree | 70 | 36.1 |
| Some college | 52 | 26.8 |
| Master's degree | 31 | 16.0 |
| Associates degree | 22 | 11.3 |
| High school graduate | 13 | 6.7 |
| Other | 4 | 2.1 |
| Doctorate degree | 2 | 1.0 |
| Specialist degree | 0 | 0.0 |
| **Professional Certifications or Credentials (n=165)[a]** | | |
| Food Safety Manager Certified (Ex: ServSafe®) | 138 | 83.6 |
| School Nutrition Specialist (SNS) | 30 | 18.2 |
| SNA Certificate in School Nutrition | 27 | 16.4 |
| Registered Dietitian (RD or RDN) | 27 | 16.4 |
| Other | 9 | 5.5 |
| Certified Dietary Manager (CDM) | 6 | 3.6 |
| Dietetic Technician, Registered (DTR) | 2 | 1.2 |
| Registered Nurse (RN) | 0 | 0.0 |
| **Years Worked in Current Position (n=194)** | | |
| 0 – 1 year | 25 | 12.9 |
| 2 – 5 years | 64 | 33.0 |
| 6 – 10 years | 41 | 21.1 |
| 11 – 15 years | 24 | 12.4 |
| 16 – 20 years | 21 | 10.8 |
| More than 20 years | 19 | 9.8 |

| Characteristic | n | % |
|---|---|---|
| **Years Worked in Child Nutrition Programs (n=194)** | | |
| 0 – 1 year | 10 | 5.2 |
| 2 – 5 years | 26 | 13.4 |
| 6 – 10 years | 33 | 17.0 |
| 11 – 15 years | 33 | 17.0 |
| 16 – 20 years | 32 | 16.5 |
| More than 20 years | 60 | 30.9 |
| **Current Job Title (n=196)** | | |
| Child Nutrition Program Director | 122 | 62.2 |
| Child Nutrition Program Manager | 26 | 13.3 |
| Child Nutrition Program Supervisor | 9 | 4.6 |
| Dietitian | 5 | 2.6 |
| Child Nutrition Program Coordinator | 4 | 2.0 |
| Child Nutrition Program Specialist | 4 | 2.0 |
| Nurse | 0 | 0.0 |
| Other | 26 | 13.3 |
| **District Enrollment (n=195)** | | |
| Small: 0 – 2,500 students | 71 | 36.4 |
| Medium: 2,501 – 10,000 students | 67 | 34.4 |
| Large: 10,001 – 25,000 students | 38 | 19.5 |
| Mega: more than 25,000 students | 19 | 9.7 |
| **District Free and Reduced Eligibility (n=157)** | | |
| Minimum | | 7.0 |
| Maximum | | 100.0 |
| Median | | 74.0 |
| Average | | 67.1 |

[a]*Some participants selected multiple responses*

**Perceptions of Costs Affecting Food in Planning, Preparing, and Service of Modified Meals**
Participants were asked to rate their levels of agreement with four listed factors affecting cost of food in planning, preparing, and service of modified meals for children with food allergies (Table 2). A 5-point scale was used with 1 = *strongly disagree* and 5 = *strongly agree.* Agreement was very good on all four factors, with mean scores ranging from 4.1±1.0 to 4.3±0.8 on the 5-point scale. Respondents agreed or strongly agreed that the following factors affected the cost of food: type of allergy (n=174, 82.0%); additional cost of special foods (n=173, 82.4%); severity of allergy (n=156, 74.3%); and meal meets reimbursable meal criteria (n=153, 72.8%). The standard deviation for two of the factors was 1.0 (severity of allergy and meal meets reimbursable meal criteria) indicating a wider range of responses and less agreement with these factors.

**Table 2. Frequency, Mean, and Standard Deviation of Respondents' Levels of Agreement with Factors Affecting Costs of Food in Providing Modified Meals for Children with Food Allergies.**

| Factors Affecting Food Costs | Level of Agreement Rating[a] | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Mean ± SD |
| | % | | | | | |
| Type of allergy (n=212) | 1<br>0.5 | 4<br>1.9 | 33<br>15.6 | 66<br>31.1 | 108<br>50.9 | 4.3<br>±0.8 |
| Additional cost of special foods (n=210) | 4<br>1.9 | 5<br>2.4 | 28<br>13.3 | 60<br>28.6 | 113<br>53.8 | 4.3<br>±0.9 |
| Severity of allergy (n=210) | 4<br>1.9 | 12<br>5.7 | 38<br>18.1 | 58<br>27.6 | 98<br>46.7 | 4.1<br>±1.0 |
| Meal meets reimbursable meal criteria (n=210) | 3<br>1.4 | 10<br>4.8 | 44<br>21.0 | 54<br>25.7 | 99<br>47.1 | 4.1<br>±1.0 |

[a] 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, and 5 = Strongly Agree.

**Perceptions of Costs Affecting Labor in Planning, Preparing, and Service of Modified Meals**

Using the same 5-point scale, participants were asked to rate their levels of agreement with factors affecting perceived cost of labor in planning, preparing, and service of meals for children with food allergies. Respondents were in greatest agreement on seven of eight factors listed, with a majority of respondents rating them as agree or strongly agree (4 and 5 on the 5-point scale): purchase of special food products (n=177, 83.9%); planning special diet menus (n=171, 80.6%); training food workers (n=173, 81.6%), communication of menu plan with other food workers (n=169, 80.1%); preparation of food separately to avoid cross-contact (n=158, 74.9%); research of suitable substitutions (n=162, 76.4%); and additional time for documentation on production records and pack-out sheets (n=151, 72.6%) (Table 3). There was less agreement on whether preparation of food at school sites rather than a central kitchen affected cost of labor (mean=3.8, SD=1.0). Results for this item may be confounded as some smaller districts already utilize decentralized food production.

**Table 3. Frequency, Mean, and Standard Deviation of Respondents' Level of Agreement with Factors Affecting Labor Costs in Providing Modified Meals for Children with Food Allergies**

| Factors Affecting Labor Costs | Level of Agreement Rating[a] | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Mean ± SD |
| | % | | | | | |
| Purchase of special food products (n=211) | 4<br>1.9 | 7<br>3.3 | 23<br>10.9 | 76<br>36.0 | 101<br>47.9 | 4.2<br>±0.9 |
| Planning special diet menus (n=212) | 3<br>1.4 | 8<br>3.8 | 30<br>14.2 | 76<br>35.8 | 95<br>44.8 | 4.2<br>±0.9 |
| Training food workers (n=212) | 2<br>0.9 | 7<br>3.3 | 30<br>14.2 | 87<br>41.0 | 86<br>40.6 | 4.2<br>±0.9 |
| Communication of menu plan with other food workers (n=211) | 2<br>0.9 | 12<br>5.7 | 28<br>13.3 | 88<br>41.7 | 81<br>38.4 | 4.1<br>±0.9 |
| Preparation of food separately to avoid cross-contact (n=211) | 3<br>1.4 | 11<br>5.2 | 39<br>18.5 | 66<br>31.3 | 92<br>43.6 | 4.1<br>±1.0 |
| Research of suitable substitutions (n=212) | 3<br>1.4 | 10<br>4.7 | 37<br>17.5 | 89<br>42.0 | 73<br>34.4 | 4.0<br>±0.9 |
| Additional time for documentation on production records, pack-out sheets (n=208) | 3<br>1.4 | 14<br>6.7 | 40<br>19.2 | 63<br>30.3 | 88<br>42.3 | 4.0<br>±1.0 |
| Preparation of food at school site instead of central kitchen (n=211) | 5<br>2.4 | 15<br>7.1 | 57<br>27.0 | 64<br>30.3 | 70<br>33.2 | 3.8<br>±1.0 |

[a] 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, and 5 = Strongly Agree

**Selection of Substitute Foods for Meal Accommodations**

Participants were asked to rate their levels of agreement with the impact of listed items on selection of substitute foods used to accommodate children with food allergies in their districts. All seven items listed had good agreement from respondents with means and standard deviations at or above 4.0±1.0 on a 5-point scale. Respondents *agreed* or *strongly agreed* with the following listed factors: ingredients of food items do not contain allergen (n=193, 91.5%); ability to source substitute food from regular vendor (n=168, 80.0%); student acceptance of substituted food (n=175, 83.3%); ease of food preparation for staff (n=174, 82.5%); cost of food substituted (n=161, 76.6%); district's current food production method (n=160, 77.0%); and availability of substitute food from local sources (n=151, 71.9%). See Table 4.

**Table 4. Frequency, Mean, and Standard Deviation of Respondents' Agreement Ratings to Impact of Listed Factors on Selection of Substitute Foods Used to Accommodate Children with Food Allergies**

| Selection of Substitute Foods Factors | Level of Agreement Rating[a] | | | | | Mean ± SD |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| | % | | | | | |
| Ingredients of food items (food does not contain allergen) (n=211) | 0<br>0.0 | 3<br>1.4 | 15<br>7.1 | 61<br>28.9 | 132<br>62.6 | 4.5<br>±0.7 |
| Ability to source substitute food from vendor (n=210) | 1<br>0.5 | 9<br>4.3 | 32<br>15.2 | 60<br>28.6 | 108<br>51.4 | 4.3<br>±0.9 |
| Student acceptance of substituted food (n=210) | 0<br>0.0 | 4<br>1.9 | 31<br>14.8 | 76<br>36.2 | 99<br>47.1 | 4.3<br>±0.8 |
| Ease of food preparation for staff (n=211) | 2<br>0.9 | 6<br>2.8 | 29<br>13.7 | 82<br>38.9 | 92<br>43.6 | 4.2<br>±0.9 |
| Cost of food substituted (n=210) | 1<br>0.5 | 10<br>4.8 | 38<br>18.1 | 61<br>29.0 | 100<br>47.6 | 4.2<br>±0.9 |
| District's current food production method (n=208) | 3<br>1.4 | 6<br>2.9 | 39<br>18.8 | 80<br>38.5 | 80<br>38.5 | 4.1<br>±0.9 |
| Availability of substitute food from local sources (n=210) | 5<br>2.4 | 11<br>5.2 | 43<br>20.5 | 63<br>30.0 | 88<br>41.9 | 4.0<br>±1.0 |

[a] 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, and 5 = Strongly Agree.

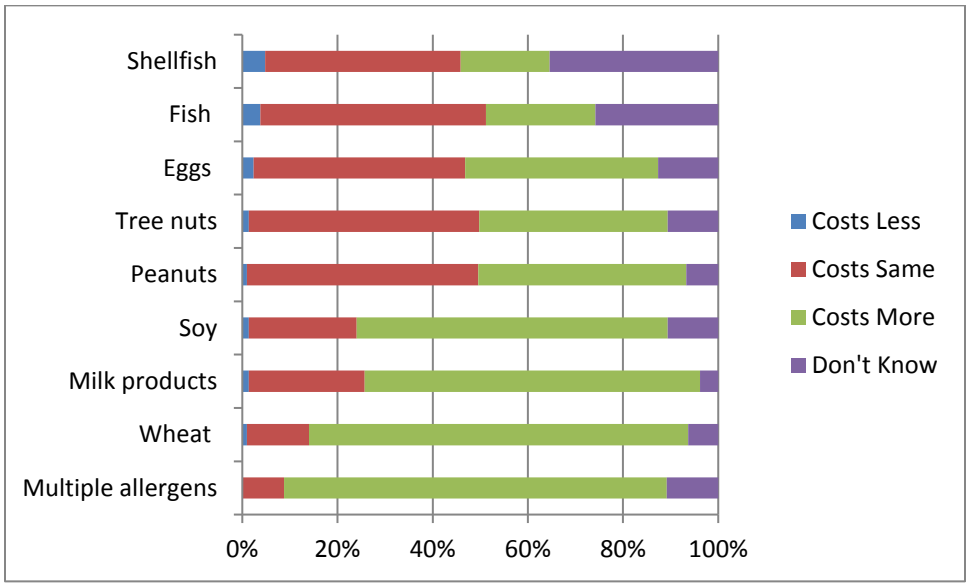
Findings suggest that menu planners were in agreement that ease of sourcing substitute foods reduces impact on their operations. Further, time required for staff to travel to a local store versus ordering foods from a regular distributor would negatively impact labor costs. The cost of substituted foods remains a concern, as additional reimbursement is not provided by federal or state sources for meals modified for food allergen accommodation and schools cannot charge the child more for a modified meal. Agreement regarding ease of preparation for staff (mean=4.2, SD=0.9) suggests that menu planners are concerned about streamlining labor as well as limiting possibility of error or cross-contact during preparation and service.

**Perceptions of Food and Labor to Produce a Modified Meal**

Participants were asked to provide their perceptions of costs of food and labor to produce a modified meal for a child with listed food allergies as compared to costs associated with producing a non-modified meal, indicating whether the accommodation costs more, costs the same, or costs less. Findings suggest respondents perceive meals modified to accommodate children with four of the eight listed allergen categories cost more to produce than a non-modified meal. Meals modified for wheat (n=165, 79.7%), multiple allergens (n=164, 80.4%), milk products (n=148, 70.5%), and soy (n=136, 65.4%) were most frequently identified as

costing more (Figure 1). This finding is not surprising given wheat, soy, and milk products are difficult to substitute because ingredients such as wheat flour, soy oil, and milk product derivatives are used in many processed food items (Sauer et al., 2018).

**Figure 1. Percent of Respondents' Opinions of Costs (Food and Labor) to Provide Modified Meals for Child with Listed Food Allergy Compared to Cost Non-Modified Meal (N=212)**




Four allergens were perceived most frequently to cost about the same in providing accommodations as a non-modified meal: fish (n=99, 47.4%), peanuts (n=101, 48.6%), tree nuts (n=100, 48.3%) and shellfish (n=86, 41.1%). It is possible that these four allergens were frequently noted in the "costs same" category because of ease of modifications. Peanuts and tree nuts can often be omitted as an ingredient in recipes. Some schools or districts may already have peanut and/or tree nut free policies and not have these items on the menu. Fish and shellfish are not served often or regularly on child nutrition program menus (other than during Lenten season) due to limited popularity and high food cost.

Meals modified for egg allergy were perceived differently by respondents, with 44.4% indicating meals cost the same and 40.2% noting meals with these accommodations cost more. None of the respondents indicated that meals modified for multiple allergens cost less than non-modified meals, indicating that complexity of an accommodation for a student with more than one food allergy affected food and labor costs.

## CONCLUSION AND APPLICATIONS

### Summary

Findings from this study show meal accommodations for children with food allergies are perceived to impact food and labor costs from planning to service of meals. There was strong agreement by respondents that two frequently identified factors affecting the cost of food in planning, preparation, and service of menus for children with food allergies were the type of allergy and additional cost of special foods needed for the accommodation. Yet multiple factors were frequently identified as affecting cost of labor in planning, preparation, and service of modified meals: purchase of special food products, planning menus, training food service

workers, communication of menu plan with food service workers, separate food production areas to avoid cross-contact, research of suitable food substitutions, and additional time for documentation on production records. These findings contradict the Conklin and Nettles (1994) case study that concluded it was "not a costly undertaking" to provide modified meals for allergy affected children.

Participants agreed the following factors impacted the selection of substitute foods to accommodate children with food allergies: allergen not listed as an ingredient, ability to source substitute food from regular vendor, student acceptance of substituted food, ease of food preparation for staff, cost of food substituted, district's current food production method, and availability of substitute food from local sources. Findings suggest that ready availability and ease of sourcing substitute foods reduced negative impacts on operations, particularly as applied to labor inputs.

When asked to indicate their perceptions of whether food and labor costs to produce a modified meal by specific allergen cost more, cost the same, or cost less than a non-modified meal, participants most frequently indicated meals cost more for four of the nine listed allergen accommodations: wheat, multiple allergens, milk products, and soy. Four allergens were perceived most frequently to cost about the same in providing meal accommodations as a non-modified meal: fish, peanuts, tree nuts, and shellfish. The cost of substituting for an egg allergen was perceived differently with about half of respondents indicating it cost more and about half that it cost the same.

**Applications**

Sauer et al. (2018) noted that a school district's ability to provide allergen-free meals to children with food allergies required attention and effective communication among many internal and external stakeholders. These researchers recommended a management plan be developed to guide actions by multiple stakeholders including the student, parents, school nutrition staff, school nurses who may be responsible when an allergy reaction occurs, teachers, and food suppliers.

Those responsible for planning meals for children with food allergies could consider development of district-wide ratios in efforts to control costs. These calculated benchmarks using information from local meal accommodation requirements, can be useful to child nutrition program menu planners and directors in estimating food and labor cost impacts on the department budget. Comparison of local needs with national estimates that 8% of children have a food allergy, as noted by Gupta et al (2011), can guide decision makers in developing budgets and staffing schedules. Knowledge of the local frequency of accommodations for children with specific food allergies can be used to plan lower cost menus for the most frequently modified allergens. Short cycle menus could be prepared in advance for the most common allergens or allergen combinations in the district reducing the time spent, and potentially reducing cost of labor or improving productivity, for menu planning of modified meals.

Further, information about types and frequency of allergen accommodations within the district can be useful when developing specifications for bid purchases of foods and inclusion of identified acceptable substitutes. Specifically, wheat, milk products, and soy allergens were perceived by respondents in this study to cost more to accommodate; in order to have the greatest impact on lowering costs, menu planners should concentrate on sourcing substitute foods for menus accommodating these allergens using a systematic approach to reduce transactional costs such as communication with vendor or staff time in reviewing labels. Local food vendors could be asked to source and stock common foods used to accommodate these identified allergens, which would decrease impact on labor to source and procure substitute foods. In addition,

implementing production methods to reduce labor impact of accommodations for most frequently accommodated allergens would have a positive impact on a school district's labor costs. For example, designation of a special diet production area or kitchen could be staffed by those with an understanding of the standard operating procedures identified to avoid cross contact with allergens. Food service workers with a keen knowledge of cross-contamination and cross-contact procedures would support recommendations in the 2013 Food Code (U.S. FDA, 2013) and California Retail Food Code (California Department of Public Health, 2012) for cleaning food contact surfaces and requiring a "certified food protection manager" on the premises during food production.

**Limitations**

Self-reported data was a limitation of this study as this method has the potential for many personal biases to influence the integrity of reporting. Also, child nutrition program menu planners may not have been able to accurately estimate the additional labor time and cost of a modified meal produced for a child with severe food allergy, especially considering the additional time to procure and prepare the food. Districts serving larger numbers of modified meals may be able to procure larger amounts of food items used as menu substitutions at a lower cost, but further analysis in this area is indicated.

While the results of this study may not be generalizable outside the state where data collection was done, findings do provide evidence to support the anecdotal data that meal accommodations do impact food and labor costs. This evidence can support petitions to district decision makers for additional revenue to meet the special dietary needs of these children, similar to funding provided to meet other educational requirements for special needs students.

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