Committee Final Reports are considered DRAFT until acknowledged by Council or accepted by the Executive Board

COMMITTEE NAME: Allergen Committee

DATE OF FINAL REPORT: 11/1/2019

COMMITTEE ASSIGNMENT: ☐ ***Council I*** ***X Council II*** ☐ ***Council III*** ☐ ***Executive Board***

REPORT SUBMITTED BY: Jeff Hawley – Committee Chair, Mike Pascucilla – Committee Vice Chair

COMMITTEE CHARGE(S): Issue 2018 I-015

- Review Issues 2018-I-015, 2018-II-007, 2018-II-008 and their original submitted Recommended Solution, including but not limited to:
  - Evaluation of major food allergen disclaimers in retail food establishments.
  - Development of methodology for retail food establishments to notify consumers when menu items contain major food allergens.
  - Determining if any additional staff training for food allergen awareness is needed.
  - Identifying any supporting research or evidence that supports recommendations.

- Recommend changes to the Food Code that support retail food establishments in their efforts to protect consumers with major food allergens.

- Report back findings and recommendations to the 2020 Biennial Meeting of the Conference for Food Protection.

COMMITTEE WORK PLAN AND TIMELINE:

1. This Committee has been holding regular conference calls, and workgroup calls between Committee calls. All Committee work has been completed.

COMMITTEE ACTIVITIES:

1. ***Dates of committee meetings or conference calls:9/28/18, 11/9/18, 11/30/18, 1/25/19, 2/22/19, 3/29/19, 4/26/19, 5/31/19, 6/28/19, 7/19/19, 8/9/19, 8/30/19, 9/13/19.***
2. ***Overview of committee activities:***

Two workgroups were formed to address Committee charges. Notification Workgroup addressed allergen notification in food service establishments. Training Workgroup addressed food allergen training in food service establishments. Committee members were asked to volunteer for one of the workgroups. Emilee Follett chaired the Notification Workgroup. Betsy Craig chaired the Training Workgroup.

The first order of business was to identify and review current major food allergen requirements for notification, labeling, disclaimers, and training. After reviewing current regulatory requirements the Committee recognized that rules for labeling major food allergens on packaged foods are very thorough. However, there is a gap in regulatory requirements for notification of major food allergens in food service establishments.

Notification Workgroup researched types of allergen notification that are currently being used domestically and internationally, to try and determine which methods are most effective. The Workgroup developed surveys that were sent to industry members within CFP and consumer groups, including food allergy organizations, to get input on how they prefer to be notified about major food allergens in food products.

Notification Workgroup made 3 recommendations that were approved by the Committee.

1) **3-602.11 Food Labels** – Amend part (C) to require posting of notification of major food allergens in bulk food that is available for customer self-service. This is currently not required for bulk foods.

2) Add new section to Food Code that requires the permit holder to notify consumers of the presence of major food allergens as ingredients in unpackaged food items using brochures, deli case or menu notifications, label statements, table tents, placards, or other effective written means.

3) **3-602.12 Other Forms of Information** - Add new part (C) that requires the permit holder to, upon request, provide consumers with a written list of all major food allergen ingredients in food items.

Additionally, the Workgroup developed a food allergy guidance document for food service establishments. Recommendation is to post this guidance document on the CFP website.

Training Workgroup researched food allergy training requirements by state, and county, and compiled a spreadsheet with this information. A survey was developed and sent to representatives of the food industry (restaurant and retail) to gather information about food allergy training provided by these establishments. Slightly more than half of those who completed the retail industry survey responded that they provide food allergy training, separate from food safety training. The survey was also sent to restaurant and retail members of the Allergen Committee. Results indicated that most establishments provide additional training for allergens. It was expressed that food allergen training courses are more specific to restaurants, so majority of retail respondents rely on in-house developed food allergy training. Consensus by the Workgroup was that additional food allergen training is necessary for food employees, but there should not be additional requirements for food allergen training in the Food Code.

Training Workgroup made 1 recommendation that was approved by the Committee.

1) **2-103.11 Person in Charge** - Amend part (N) to remove food allergy awareness training and add a new section (Q) identifying recommended components that should be included in food allergen training:
   - Identification of the major food allergens;
   - Food allergen ingredient identities and labeling;
   - Knowledge of cross-contact concerning the major food allergens;
   - Recognition of symptoms of an allergic reaction;
   - How to respond to an allergic reaction.

Other Activity: Committee Chair Jeff Hawley was interviewed by Eric Athas, writer with the NY Times, on 1/4/19. Mr. Athas is working on an article about food allergies that will cover people with food allergies, labeling and notification rules, manufacturing, etc, and contacted CFP through Jen Jobrack (FARE). I explained the CFP process and why the Allergen Committee was formed. I explained that current rules cover labeling of packaged foods, but there's very little regulation about major food allergen notification in food service establishments. I also explained that states must adopt the Food Code before it can become regulation. We spoke for about 15-20 minutes and I asked him to call or email me if he had further questions.

3. ***Charges <u>COMPLETED</u> and the rationale for each specific recommendation:***
   - **a.** Charge 1: Review Issues 2018-I-015, 2018-II-007, 2018-II-008 and their original submitted Recommended Solution, including but not limited to:
     - Evaluation of major food allergen disclaimers in retail food establishments.
     - Development of methodology for retail food establishments to notify consumers when menu items contain major food allergens.
     - Determining if any additional staff training for food allergen awareness is needed.
     - Identifying any supporting research or evidence that supports recommendations.

     After reviewing current major food allergen regulatory requirements the Committee determined that there is a gap in regulations for notification of major food allergens in food service establishments. We were also in consensus that the general statement about food allergy awareness training in 2-103.11(N) is weak, and should include recommendations for content of an allergen training programs. Because of these deficiencies in food allergen notification and training in the Food Code four states (Illinois, Massachusetts, Michigan, Rhode Island), one county (Montgomery County, Maryland), and 1 locality (Edison, NJ) have enacted their own food allergen notification and/or training requirements.

   - **b.** Charge 2: Recommend changes to the Food Code that support retail food establishments in their efforts to protect consumers with major food allergens.

     The Committee is making recommendations to address deficiencies in major food allergen regulatory requirements in food service establishments. These recommended changes will provide food allergen regulatory requirements that can be applied consistently in all states, counties and localities.

   - **c.** Charge 3: Report back findings and recommendations to the 2020 Biennial Meeting of the Conference for Food Protection.

4. ***Charges INCOMPLETE and to be continued to next biennium:***

a. None

COMMITTEE REQUESTED ACTION FOR EXECUTIVE BOARD:

☐ No requested Executive Board action at this time; all committee requests and recommendations are included as an Issue submittal.

LISTING OF CFP ISSUES TO BE SUBMITTED BY COMMITTEE:

1. ***Report – Allergen Committee:*** Acknowledge the 2018-20 Allergen Committee final report; thank the Committee members for their work; and disband the Committee.

a. List of content documents submitted with this Issue:

(a.1) Committee Report

(a.2) Committee Member Roster

(a.3) Food Allergy Notifications: A Guidance for Industry

b. List of supporting attachments: ☐ ***No supporting attachments submitted***

(1) Allergy Training Courses and Laws

(2) Allergen Committee Survey

(3) Allergen Notification Consumer Survey

(4) Food Industry Survey Results

(5) Restaurant servers' risk perceptions and risk communication-related behaviors when serving customers with food allergies in the US

(6) Comparing the Eating Out Experiences of Consumers Seeking to Avoid Different Food Allergens

(7) Consumer Preferences for Written and Oral Information about Allergies When Eating Out

(8) Food Allergy Knowledge and Attitudes of Restaurant Managers and Staff: An EHS-Net Study

2. ***Amend Food Code for Major Food Allergen Training for Food Employees***
3. ***Amend Food Code for Notification of Major Food Allergens in Bulk Foods***
4. ***Amend Food Code for Written Notification of Major Food Allergens***
5. ***Amend Food Code for Major Food Allergen Notification Upon Request by Consumer***

Committee Name: Allergen

Last Name	First Name	Position (Chair/Member)	Constituency	Employer	City	State	Telephone	Email
Hawley	Jeff	Chair	Retail Food Industry	Harris Teeter	Matthews	NC	704-844-3098	jhawley@harristeeter.com
Pascucilla	Michael	Vice-chair	Local Regulator	East Shore District Health Department	Branford	CT	203-619-1286	mpascucilla@esdhd.org
Brown	Lydia	Voting member	State Regulator	RIDOH Center for Food Protection	Providence	RI	401-222-7723	lydia.brown@health.ri.gov
Campbell	Archer	Voting member	Local Regulator	Thomas Jefferson Health District	Charlottesville	VA	434-972-6256	elizabetha.campbell@vdh.virginia.gov
Craig	Betsy	Voting member	Food Industry Support	MenuTrinfo	Fort Collins	CO	888-767-6368	betsy@menutrinfo.com
Follett	Emilee	Voting member	Food Industry Support	StateFoodSafety.com	OREM	UT	801-805-4679	efollett@statefoodsafety.com
Greco	Darby	Voting member	State Regulator	NYSDOH	Albany	NY	518-402-7600	darby.greco@health.ny.gov
Guzman	Jason	Voting member	State Regulator	Texas Dept of State Health Services	Austin	TX	512-834-4546	jason.guzman@dshs.texas.gov
Hilton	DeBrena	Voting member	Local Regulator	Tulsa Health Department	Tulsa	OK	918-595-4302	dhilton@tulsa-health.org
Jennings	Allison	Voting member	Retail Food Industry	Amazon	Seattle	WA	206-771-4021	jealliso@amazon.com
Jobrack	Jen	Voting member	Consumer	Food Allergy Pros	Skokie	IL	312-399-4171	jjobrack@gmail.com
Koester	Laura	Voting member	Retail Food Industry	Harmons	Salt Lake City	UT	801-349-0407	lauradykman@harmonsgrocery.com
Long	Teresa	Voting member	Local Regulator	Washoe County Health District	Reno	NV	775-328-2641	tlong@washoecounty.us
Love	Alicia	Voting member	State Regulator	State of Montana	Helena	MT	406-444-5303	alicia.love@mt.gov
McInnes	Carol	Voting member	Local Regulator	Boulder County Public Health	Boulder	CO	303-441-1438	cmcinnes@bouldercounty.org
Meinhardt	Christina	Voting member	Food Service Industry	Aramark	Philadelphia	PA	215-238-6892	meinhardt-christina@aramark.com
O'Donnell	Kathleen	Voting member	Retail Food Industry	Wegmans Food Markets, Inc.	Rochester	NY	585-429-3623	kathleen.odonnell@wegmans.com
Sigler	Larry	Voting member	Food Service Industry	Waffle House Inc.	Norcross	GA	770-729-5794	larrysigler@wafflehouse.com
Sweet	Bridget	Voting member	Academia	Johnson & Wales	Providence	RI	774-434-5146	bridget.sweet@jwu.edu

Tew	Dan	Voting member	Food Service Industry	Yum! Brands	Rigby	ID	972-338-8422	daniel.tew@yum.com
Williamson	Kenesha	Voting member	Retail Food Industry	Publix Super Markets Inc	Port Charlotte	FL	404-358-1267	kenesha.williamson@publix.com
Wilson	Nancy	Voting member	Retail Food Industry	Wawa, Inc.	Media	PA	610-812-3934	nancy.wilson@wawa.com
Wynne	Rebecca	Voting member	Food Service Industry	Darden	Denver	CO	303-895-4042	rwynne@darden.com
Arbizu	Thomas	At-Large	Retail Food Industry	HEB Grocery Company	San Anotnio	TX	210-938-6520	arbizu.thomas@heb.com
Bhatt	Chirag	At-Large	Retail Food Industry	Buc-ee's Ltd.	Pearland	TX	346-774-2259	chirag.bhatt@buc-ees.com
Brainerd Jr	Dana	At-Large	Retail Food Industry	CVS Health	Cumberland	MA	401-770-6194	dana.brainerdjr@cvshealth.com
Collins	Alicia	At-Large	Food Industry Support	The Steritech Group, Inc.	Charlotte	NC	707-208-4399	Alicia.Collins@Steritech.com
Craig	Sandra	At-Large	State Regulator	SCDHEC	Columbia	SC	803-896-0614	craigsd@dhec.sc.gov
Crownover	David	At-Large	Food Industry Support	Microbac Laboratories Inc	Pittsburgh	PA	412-699-0919	crowny2@comcast.net
De La Cruz	Hector	At-Large	Local Regulator	L.A. County Environmental Health	Panorama City	CA	818-672-2230	hsdelacruz@gmail.com
Deitzel	Diane	At-Large	Food Service Industry	Sheetz	Claysburg	PA	814-239-1531	ddeitzel@sheetz.com
Dickhaut	Jason	At-Large	Food Service Industry	BJ's Restaurants & Brewhouse	Huntington Beach	CA	214-674-1341	jdickhaut@bjsrestaurants.com
Diersen	Nancy	At-Large	State Regulator	Virginia Department of Health	Richmond	VA	804-864-7464	nancy.diersen@vdh.virginia.gov
Dunleavy	Sean	At-Large	State Regulator	MI Dept of Agriculture & Rural Development	Lansing	MI	517-243-8895	dunleavys@michigan.gov
Edsall	Jean	At-Large	Food Service Industry	Compass Group	Charlotte	NC	704-328-5893	jean.edsall@compass-usa.com
Eisenbeiser	Ashley	At-Large	Food Industry Support	Food Marketing Institute	Arlington	VA	202-220-0689	aeisenbeiser@fmi.org
Fessel	Ingrid	At-Large	Food Industry Support	Diversey Inc	Charlotte	NC	608-444-6490	ingrid.fessel@diversey.com
Follett	Danny	At-Large	Food Industry Support	StateFoodSafety	Orem	UT	801-995-9641	dfollett@abovetraining.com
Garvin	Amanda	At-Large	State Regulator	Michigan Department of Agriculture and Rural	South haven	MI	616-265-9985	garvina1@michigan.gov
Geller	Todd	At-Large	Food Service Industry	Sodexo	Fredericksburg	VA	540-207-8610	todd.geller@sodexo.com

Halbrook	Courtney	At-Large	Food Service Industry	Topgolf	Dallas	TX	214-202-8230	courtney.halbrook@topgolf.com
Harrison	Lisa	At-Large	State Regulator	indiana state department of health	indianapolis	IN	317-412-2106	lharriso@isdh.in.gov
Hill	Michelle	At-Large	Food Industry Support	Allergen Free Cooking	Woodbury	MN	612-701-4004	michelle@allergenfreecook.com
Hofer	Vasanthi	At-Large	Local Regulator	Maricopa County Environmental Services	Mesa	AZ	602-506-6986	vhofer@mail.maricopa.gov
Holmes	Becki	At-Large	Food Industry Support	Foodwit	Portland	OR	206-457-9598	becki@foodwit.com
Humphries	Sharon	At-Large	Food Service Industry	Bojangles' Restaurants, Inc.	Charlotte	NC	859-967-7066	shumphries@bojangles.com
Hussein	Sima	At-Large	Food Industry Support	Ecolab	Greensboro	NC	336-931-2625	sima.hussein@ecolab.com
Iglesias	Ralph	At-Large	Retail Food Industry	Sizzler USA	Mission Viejo	CA	619-610-8649	riglesias@sizzlerusa.com
Inman	Adam	At-Large	State Regulator	Kansas Department of Agriculture	Manhattan	KS	785-564-6764	adam.inman@ks.gov
Kender	Linda	At-Large	Academia	Johnson & Wales University, CCA	Providence	RI	401-598-1278	lkender@jwu.edu
Klein	Harry	At-Large	Food Service Industry	Prometric	Canton	MD	443-455-6233	harry.klein@prometric.com
Kor	Helen	At-Large	Retail Food Industry	Blue Apron LLC	New York	NY	718-930-1377	helen.kor@blueapron.com
Larsen	Thomas	At-Large	Food Industry Support	StateFoodSafety	Orem	UT	385-208-4994	tlarsen@statefoodsafety.com
Lindholm	Jeffrey	At-Large	Food Industry Support	iCertainty	Chevy Chase	MD	443-452-1950	jeff.lindholm@icertainty.com
Matthews-Lopez	Joy	At-Large	Consumer	Independent Consultant	Athens	OH	740-594-3266	joy.matthewslopez@gmail.com
McMahan	Thomas	At-Large	Retail Food Industry	Meijer	Grandville	MI	616-249-6035	thomas.mcmahan@meijer.com
McMillion	Ryan	At-Large	Food Industry Support	Prometric	Canton	MD	443-455-6244	ryan.mcmillion@prometric.com
Melichar	Wayne	At-Large	Vending- Distribution Food Industry	Feeding America	Chicago	IL	312-629-7263	wmelichar@feedingamerica.org
Meltz	Elizabeth	At-Large	Food Service Industry	Eataly USA	New York	NY	917-478-2971	ermeltz@gmail.com
Menes	Carlos	At-Large	Retail Food Industry	Sodexo	Newport Beach	CA	949-402-9322	carlos.menes@sodexo.com
Miller	Ashley	At-Large	Food Industry Support	National Restaurant Association	Chicago	IL	312-715-6754	acmiller@restaurant.org

Money	Elaine	At-Large	Food Service Industry	Ecolab	Greensbor	NC	336-931-2596	Elaine.Money@ecolab.com
Nakamura	George	At-Large	Retail Food Industry	State Food Safety	Sunnyvale	CA	408-482-4117	gmlnaka@comcast.net
Oswald	Steve	At-Large	Retail Food Industry	Wakefern Food Corp.	Elizabeth	NJ	908-527-3624	steve.oswald@wakefern.com
Paster	Tara	At-Large	Food Industry Support	Paster Training, Inc.	Gilbertsville	PA	610-970-1776	tara.paster@pastertraining.com
Pelech	Todd	At-Large	State Regulator	Arizona Department of Health Services	Phoenix	AZ	602-364-3122	todd.pelech@azdhs.gov
Read	David	At-Large	Academia	IFPTI	North St Paul	MN	651-485-8905	david.read@ifpti.org
Reighter	Matthew	At-Large	Retail Food Industry	Starbucks Coffee Company	Seattle	WA	206-200-2581	mreighte@starbucks.com
Roughan	George	At-Large	Food Industry Support	TAP Series	Westlake Village	CA	818-889-8799	gr@tapseries.com
Schneider	Kevin	At-Large	Retail Food Industry	Retail Business Services	Landover	MD	301-543-6133	kschneider@retailbusinessservices.com
Sees	Deb	At-Large	Local Regulator	Jackson County environmental health	Grain Valley	MO	816-847-7070	dsees@jacksongov.org
Slowinski	Traci	At-Large	Food Service Industry	Brinker International	Dallas	TX	972-770-8856	traci.slowinski@brinker.com
Snellen	Petra	At-Large	Food Service Industry	Aramark	Philadelphia	PA	267-235-6642	snellen-petra@aramark.com
Sparks	Christopher	At-Large	Local Regulator	Houston Health Department	Houston	TX	832-393-5131	Christopher.Sparks@houstontx.gov
Straughn	Ki	At-Large	Local Regulator	Public Health Seattle & King County	Bellevue	WA	206-263-8088	kstraughn@kingcounty.gov
Sylvis	Christine	At-Large	Local Regulator	Southern Nevada Health District	Las Vegas	NV	702-759-0507	sylvis@snhd.org
Vicino	Dee Dee	At-Large	Food Industry Support	AllerCuisine	Fort Collins	CO	954-254-7707	Deedee@AllerCuisine.com
Walker	Matthew	At-Large	State Regulator	Idaho Food Protection Program	Boise	ID	208-334-5946	matthew.walker@dhw.idaho.gov
Weichelt	William	At-Large	Food Industry Support	National Restaurant Association	Chicago	IL	312-715-5388	wweichelt@restaurant.org
Wijesekera	Dilshika	At-Large	Retail Food Industry	Instacart			479-879-3903	dilshika@instacart.com
Woodbury	Thomas	At-Large	Food Industry Support	ComplianceMate	Holladay	UT	801-330-9511	twoodbury@compliancemate.com
Abel	Greg	Consultant (2)	Federal Regulator	FDA	Minneapolis	MN	612-758-7199	greg.abel@fda.hhs.gov

Dutilly	Devin	Consultant (1)	Federal Regulator	FDA	College Park	MD	301-348-1980	devin.dutilly@fda.hhs.gov
Schwartz	Shinhey	Consultant	Federal Regulator	USDA-FSIS	Washington	DC	202-772-9166	shinhey.schwartz@usda.gov
Radke	Taylor	Consultant	Federal Regulator	CDC	Atlanta	GA	770-488-7652	yim3@cdc.gov

Food Allergen Notifications: A Guidance for Industry

Introduction

Background

Millions of Americans have food allergies, and the numbers appear to be on the rise[1]. The increasing prevalence of food allergies presents a significant challenge for food establishments who manage allergen control alongside the countless other responsibilities associated with retail food service. During the 2018 biennial meeting of the Conference for Food Protection, an Allergens Committee was created with the charge to "develop methodologies for retail food establishments to notify consumers when menu items contain major food allergens, using research or evidence to support recommendations." This guidance document was created in response to that charge.

Purpose

To provide food establishment operators with current industry best practices for notifying consumers of major food allergens present in menu items and food that is unpackaged.

Scope

This guidance document recommends best practices for informing consumers of major food allergen ingredients in menu items that are unpackaged (i.e., not covered by the Food Allergen Labeling and Consumer Protection Act or other labeling requirements). The recommendations outlined herein are supported by published peer-reviewed research, case studies, and survey results from operators and consumers. This guidance is intended for operators of retail food establishments, as defined in the US Food and Drug Administration (FDA) Food Code. For more detailed information, please refer to the appendix.

Major Food Allergens

The FDA has identified the following foods that account for 90% or more of the documented food allergies in the United States[2]. Known as "major food allergens," they are:

1. Milk
2. Egg
3. Soy
4. Wheat
5. Fish
6. Crustacean shellfish
7. Peanuts
8. Tree nuts

[1] (Stallings & Oria, 2017)
[2] (US Food & Drug Administration, 2017)

Guidance

Consumers with food allergies depend on allergen information that is made available on labels and menus (or "notifications") when making a purchasing decision. In a recent survey of 788 food-allergic consumers and family members, respondents overwhelmingly preferred a **combination of verbal and written allergen notifications** (Appendix B.1). Additionally, they indicated that notifications should be **specific** to menu items and the major food allergens they contain, rather than generic warnings that may apply to the entire menu or food preparation environment. Food allergen notifications should address all ingredients containing major food allergens, including "hidden ingredients," such as egg washes, sauces, garnishes, etc.

In some cases, a food operation not be able to accommodate an allergen-free order. **Be open and honest** with the consumer about the limitations of the establishment in controlling food allergens.

Written Notifications

Design menus (including those for online ordering, catering, and take-out) to ensure names and descriptions of food items fully represent the major food allergens they contain. For example:

1. Next to each menu item, include additional text to specify allergens (e.g., *Contains egg, milk*).
2. Use images (or "icons") of food allergens next to menu items where they are present. Include a key so consumers know what the icons represent[3]. (See Appendix A for icon sets available for commercial use.)
3. Keep a clear and thorough allergen menu available to customers that provides *all* the ingredients for each menu item. This is particularly helpful for customers who are allergic to foods not listed as major food allergens by the FDA.

Blueberry Smoothie – 325 cal
Contains: wheat, egg, milk, tree nuts (cashew)

Thai Fusion Salad – 660 cal
Contains: Peanuts, soy, wheat, fish

Example in-menu notification

Example allergen icons

Verbal Notifications

When allergen information is provided verbally (by servers, managers, etc.), ensure the information is **accurate, verifiable, and consistent**. Food-allergic customers pay close attention to the way food workers respond to their questions and make purchasing decisions based on their perceptions. Food workers who appear uninformed or disinterested can negatively impact a customer's confidence that their meal will be prepared safely[4].

[3] (Marra, et al., 2017)
[4] (Begen, et al., 2016)

To provide a safe and enjoyable dining experience, operators are encouraged to implement the following practices:

- Provide a list of menu items and their ingredients for food workers to study so they are well-prepared at the point of sale. Keep the information somewhere it can be easily accessed and used frequently.
- Conduct training for front-of-the-house and back-of-the-house employees on major food allergens and cross-contact prevention. Training is essential to preventing unintended food allergen exposure.
- Appoint at least one team member or manager per shift to respond to customer requests and questions about food allergens. That team member may be a manager or person in charge[5].

Additional Notifications

Many food establishments provide information regarding major food allergens in places other than menu (Appendix B.2). These notifications can be very effective when the information provided is specific and assists consumers in making informed decisions.

Depending on the specific food operation, menu, and workflow, an operator may consider using these additional methods for informing consumers about the presence of major food allergens in menu items:

- For operations that emphasize major allergens as key menu items (e.g., bakery or seafood restaurant), add a notification in a highly visible area, such as **on or near the entrance,** informing consumers of the prevalence of that specific allergen.
- When contact with a major food allergen is unavoidable (e.g., french fries prepared in the same fryer as breaded [wheat-containing] items), use **counter cards**, **table-talkers** or **signs at the point of sale** to inform consumers.
- **Static clings** on display cases provide major food allergen information in customer view. **Tags or tents** next to food items also work well.

Conclusion

When food-allergic customers feel confident and well-informed about their food choices, they are more willing to purchase—and they often bring friends and family along! Food operators who employ any combination of practices described in this document are making a business decision that will positively impact public health while simultaneously growing their customer base.

[5] (Radke, et al., 2016)

Food Allergen Notifications: A Guidance for Industry APPENDIX

A) Food Allergens Icons

Recommendations from this guidance include the use of food allergen icons. While there is currently no uniform set of icons to represent the major food allergens identified by the FDA, there are several vector sets available for download online. The following options are available for commercial use.

1. International Association for Food Protection (IAFP) Food Allergen Icons
2. StateFoodSafety Allergen Icons
3. Erudus Food Allergy Icons

B) Allergens Committee Notification Workgroup Surveys

In preparation for the development of this guidance document, the Notification Workgroup of the CFP Allergens Committee conducted two surveys: one to be completed by operators of licensed food establishments ("Industry Survey") and the second to be completed by food-allergic consumers and their family members and/or caregivers ("Consumer Survey"). These surveys were conducted during April and May 2019 by food operators and consumers in the United States.

1. Consumer Survey

Consumer Survey Overview

In May 2019, the Allergens Notification Workgroup created a survey to solicit the opinions of food-allergic consumers and their family members and caregivers. The survey was distributed to CFP members and to email directory recipients of Food Allergy Research and Education (FARE) and Food Allergy and Anaphylaxis Connection Team (FAACT). The survey garnered 788 responses from individuals across 49 US states.

Consumer Survey Summary of Responses

- More than 90% of respondents are dealing with food allergies or intolerances.
- The majority of respondents prefer:
    - A combination of written and verbal notifications regarding major food allergens;
    - Menus with major food allergen ingredients listed.
- A significant number of respondents requested cross-contact prevention information to be provided by food establishments claiming to be able to accommodate an allergen-free request.
- There was a consensus among respondents for:
    - Easy-to-recognize major food allergen icons;
    - Major food allergens to be listed directly near menu items rather than in a separate grid of all menu items.

2. Industry Survey

Industry Survey Overview

A survey was sent out to industry regarding allergen notification in order to assess the following: current methods utilized to notify consumers of allergens present in unpackaged food; challenges associated with allergen notification; and to determine if there is a general consensus to provide a standard method for allergen notification across the food service industry.

The survey was distributed to the CFP industry caucus members and Florida Restaurant and Lodging Association members. A total of 72 individuals/organizations responded to the survey. Responses were received from individuals in the grocery and restaurant sectors.

Industry Survey Summary of Responses

- Of industry respondents, 77% provide written information regarding major food allergens to consumers. This information is provided through a variety of means (menus, pamphlets, table tents, websites, smartphone apps, posters, scale labels, etc.). Many of the respondents use more than one method to provide the information. Of the remaining 23% of the survey respondents, the majority provide verbal information when asked by a customer.
- Of those that provide written information, 13% utilize symbols to identify major food allergens.
- Among respondents, 88% share information verbally when a customer asks about allergens, whereas 12% reported that the server takes a proactive approach and asks the customer if they have a food allergy prior to placing an order.
- In an open-ended survey question, respondents identified several challenges to notifying consumers of major food allergens, including:
    - Employee Training
    - Limited space on labels to provide full details
    - Customer understanding of challenges and requirements
- The majority of the respondents agree that a standard method of allergen notification should be utilized by establishments that serve prepared food that is not pre-packaged.

C) References

Begen, F. M., Barnett, J., Payne, R., Roy, D., Gowland, M. H., & Lucas, J. S. (2016). Consumer Preferences for Written and Oral Information about Allergens When Eating Out. *PLOS ONE*, DOI:10.1371/journal.pone.0156073.

Marra, C. A., Harvard, S., Grubisic, M., Galo, J., Clarke, A., Elliot, S., & Lynd, L. D. (2017). Consumer preferences for food allergen labeling. *Allergy, Asthma & Clinical Immunology*, 13:19.

Radke, T. J., Brown, L. G., Hoover, E. R., Faw, B. V., Reimann, D., Wong, M. R., . . . Ripley, D. (2016). Food Allergy Knowledge and Attitudes of Restaurant Managers and Staff: An EHS-Net Study. *Journal of Food Protection, Vol. 29, No. 9*, 1588–1598.

Stallings, V. A., & Oria, M. P. (2017). *Finding a Path to Safety in Food Allergy Assessment of the Global Burden, Causes, Prevention, Managment, and Public Policy.* National Academies of Science, Engineering, Medicine, Committee on Food Allergies. Washington DC: The National Academies Press. Retrieved from https://www.nap.edu/read/23658

US Food & Drug Administration. (2017, 12 18). *Frequently Asked Questions About Food Allergies*. Retrieved from FDA Web site: https://www.fda.gov/food/food-allergens/frequently-asked-questions-about-food-allergies

Allergy Training Courses and Laws

Data Set	Year	Author Affiliation	Study Population	Report Title	Link	Summary	Conclusions related to training
1	2018	Virginia Polytechnic Institute and State University	Food Service Industry	Food Allergy Awareness Training for the Food Service Industry by Virginia Polytech	https://vtechworks.lib.vt.edu/bitstream/handle/10919/82732/Stoneman-MALS%20Project%20and%20Report%20Final%20April%204%202018.pdf?sequence=1&isAllowed=y	This study was conducted in southwest Virginia to determine if an instructor-led food allergy training program specifically designed for foodservice workers could produce an increase in knowledge and potentially change behavior to minimize the risk of food allergy reactions in food service establishments. Virginia Polytech Institute survey on effectiveness of training on knowledge (short term, they recognize the need to go further out) is also interesting, just published last March.	93 people trained: 97% of participants had an increase in knowledge, 98% felt they gained new ideas to implement, and 100% indicated they would recommend this training to others in the industry. Additional studies should assess the long-term effect on knowledge and behavior.
2	2018	Ryerson University	Restaurants and Food Service	A systematic review and meta-regression of the knowledge, practices, and training of restaurant and food service personnel toward food allergies and Celiac disease	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0203496	A systematic review to identify and characterize all published research on the prevalence of food allergy and celiac disease knowledge, practices, and trainign among restaurant and food service personnel. 38 relevant studies were identified with 50% being conducted in the United States. Key knowledge and practice gaps were identified that could be targeted by future training programs. Research gaps were also identified, including a need for more experimental studies to evaluate food allergy and CD training interventions.	Participants generally had a higher knowledge, self-efficacy, and use of practices related to preparing and serving allergen-free meals compared to food allergy emergency response. Participants' reported use of various risk prevention and response practices was generally low. Most participants across studies had not received prior food allergy training (median prevalence of 65% across 12 studies).Key knowledge and practice gaps were identified that could be targeted by future training programs. Research gaps were also identified, including a need for more experimental studies to evaluate food allergy and CD training interventions.

3	2016	CDC	Restaurants	EHS-Net (that's also the CDC) Report	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5321626/	This publication is based on data collected and provided by CDC EHS-Net, which is supported by a CDC grant award funded under CDC-RFA-EH05-013.	Knowledge and attitudes of all groups were higher at restaurants that had a specific person to answer food allergy questions or a plan for answering questions from customers. Food allergy training was not associated with knowledge but was associated with attitude of managers and servers.
	2016	CDC	Restaurants	CDC Report simple conclusions in 2 pages	https://www.cdc.gov/nceh/ehs/ehsnet/plain_language/food-allergies.pdf	Simple conclusions from the CDC study produced by the CDC	3 key recommendations: Have a plan, choose a specific person, train staff
	2017	CDC	Restaurants	Restaurant Food Allergy Practices — Six Selected Sites, United States, 2014	https://www.cdc.gov/mmwr/volumes/66/wr/mm6615a2.htm	More of the hard facts from the CDC survey MMWR Report of EHS-Net data presented in 2016 CDC publication below.	278 restaurants at 6 sites: 44% of managers, 41% of food workers, and 33% of servers reported receiving food allergy training.
4	2017	Australian Society of Clinical Immunology and Allergy	Food Service Industry	P53: Addressing food allergy in food service: The National Allergy Strategy Food Service Project	https://onlinelibrary.wiley.com/doi/full/10.1111/imj.53_13578	Project aimed to identify education needs through a Food Service Forum for Food Allergy in Australia and New Zealand.	Forum identified that a stndardized, basic level online training course for food service staff should be developed. In addition, consumers should be educated about their responsibility for declaring their food allergy when eating out.
5	2017	University of North Texas	Restaurants	Restaurant servers' risk perceptions and risk communication-related behaviors when serving customers with food allergies in the U.S.	https://www.sciencedirect.com/science/article/pii/S0277843191730275X	Survey to explore perceived risk and risk communication related behaviors of restaurant servers when serving customers with food allergies in the U.S. 316 participants, split 50/50 between chain operated and independently owned restaurants.	Results indicated that most survers lacked knowledge about food allergies and perceived that initiating communication and preventing allergic reactions were mostly the responsibilty of the customer. Respondents who had received training had higher knowledge scores than those who had not. Only 46% of participants had received some type of food allergy training.

6	2016	University of Pennsylvania	Restaurants - Food Allergy Management among restaurant workers in a large U.S. city	Food allergy management among restaurant workers in a large U.S. city	https://www.sciencedirect.com/science/article/pii/S095671351530298X	Survey of quick-service Philadelphia restaurants regarding their adherence to 7 best practices to reduce food allergy adverse events.	No restaurant employee used all 7 best practices, few respondents knew how to respond to anaphylaxis, improved training and review of policies is warranted.
7	2016	Iowa State University	University Foodservice	A mixed methods approach to examining food allergy accommodation efforts in colleges and universities	https://lib.dr.iastate.edu/aeshm_pubs/121/	findings suggest variability in CU foodservice professionals' approaches to accommodations, regardless of policy presence.	
8	2016	Auburn University	Restaurants - Comparison of Food allergy policies and training between Alabama (AL) and National Restaurant Industry	Comparison of Food Allergy Policies and Training between Alabama (AL) and National Restaurant Industry	https://www.tandfonline.com/doi/abs/10.1080/15428052.2016.1185071?journalCode=wcsc20	Online questionnaires comlpeted by 185 managerial staff (75 AL, 110 US).	Managers viewed employees' lack of commitment and interest as barriers of training provision.
9	2016	Auburn University	Restaurants - Food Allergy knowledge and training among restaurant employees	Food allergy knowledge and training among restaurant employees	https://www.sciencedirect.com/science/article/pii/S0278431916300627	Study investigated 229 restaurant employees' food allergy knowledge, prior training, preferred characteristics of future training, and reasons for low interest in training.	Many employees not trained (63%) but expreseed interest in training. Participants who had been trained had a higher knowledge score. Preference for self-paced training with real world examples and simple language.

10	2016	University of Bath		Consumer Preferences for Written and Oral Information about Allergens When Eating Out	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0156073	Interviews with food allergic/intolerant adults and parents/caregivers of food allergic/intolerant children to identify consumer preferences for written and/or verbal allergen information when eating out or ordering takeout food.	Overwhelmingly, written information was favored in the first instance but credible personal/verbal communication was highly valued and essential to a good eating out experience. When written information is lacking, verbal reliability is more in doubt. Conclusion- Understanding the subtle negotiations and difficulties encountered by FA/FIs when eating out can serve as a guide for legislators and food providers; by encouraging provision of clear written and verbal allergen information, and training of proactive, allergen-aware staff. This, in tandem with legal requirements for allergen information provision, paves the way for FA/FIs to feel more confident in eating out choices; and to experience improved eating out experiences."
11	2015	Auburn University	Restaurants - Food allergy knowledge, attitudes, and prerparedness among restaurant managerial staff	Food Allergy Knowledge, Attitudes, and preparedness among restaurant managerial staff	https://www.tandfonline.com/doi/abs/10.1080/15378020.2015.1093452?journalCode=wfbr20	Survey of 110 restaurant managers to investigate food allergy knowledge, awareness, and preparedness.	69% of managers surveyed have provided employee food allergy training. Identified employee lack of commitment and time constraints as training barriers

11.5	2014	Kansas State University	Child Nutrition professionals	A Focus Group Study of Child Nutrition Professionals' Attitudes about Food Allergies and Current Training Practices	https://schoolnutrition.org/5--News-and-Publications/4--The-Journal-of-Child-Nutrition-andManagement/Spring-2014/Volume-38,-Issue-1,-Spring-2014---Lee,-Kwon,-Sauer/	This study conducted focus groups that explored Child Nutrition Professionals' attitudes (in Midwestern States) about food allergies, current practices related to food allergy training, and operational issues related to training in school foodservice operations.	Participants felt that the prevalence and types of food allergies affecting school nutrition programs have increased in recent years. They also felt that communicating with other stakeholders and verifying physicians' recommendations regarding food allergies can be difficult. Participants agreed that training could improve food allergy knowledge and awareness of their employees and improve safety of children with food allergies. However, only a few reported providing specific food allergy training for employees. Cost, scheduling difficulties, and time constraints were identified as barriers to providing food allergy training. Participants preferred having credentialed professionals to conduct employee food allergy training. Support from school administrators and witnessing a food allergic reaction in the cafeteria would trigger a decision to initiate food allergy training.
12	2013	Iowa State University	Unviersity Foodservice - Food Allergy Knowledge, attitudes, practices, and training of foodservice workers at a university foodservice operation in the Midwestern United States	Food Allergy Knowledge, attitudes, practices, and training of foodservice workers at a university foodservice operation in the Midwestern United States	https://www.sciencedirect.com/science/article/pii/S0956713512005816	193 participants completed a paper-based questionnaire at one large university to assess food allergy knowledge, attitudes, practices, and training among university foodservice employees.	Food allergy training was not provided to 69-79% of respondents but was perceived to be important. Development of training and appropriate policies and procedures is needed. Significant differences between student and non-student employees.

13	2013	University of Houston	Retail Delis - Identifying baseline food safety training practices for retail delis using the Delphi expert consensus method	Identifying baseline food safety training practices for retail delis using the Delphi expert consensus method	https://www.sciencedirect.com/science/article/pii/S0956713512005671	3 round Delphi technique used to screen food safety objectives overall. Goal of the study was to identify base-line food safety training objectives that should be included in a new deli employee's food safety training program.	Food allergies were identified as a food safety objective that should be included in deli employee training. None of the current online food safety training materials address deli specific content.

Survey Name: CFP Allergen Committee Survey
Response Status: Partial & Completed
Created January 28, 2019
10 Responses To Date

1. Does your brand have its own food allergy training class?

3 Yes
7 No

2. Does your brand believe you teach enough about food allergies within your food safety program such as a food manager or food handler class?

6 Yes
3 No
1 N/A

3. Have you used an allergy training class by a 3rd party?

4 Yes
6 No

4. If YES than which training class have you used? (Check any/all that apply)

AllerTrain or AllerTrain Lite (MenuTrinfo)	1	25.0%
Allergen or Allergy Awareness (TAP, Always Food Safe or A Plus)	0	0.0%
Basics of Food Allergy Training (Diversys)	0	0.0%
Food Allergen (NRA)	2	50.0%
Food Allergen Training Program (Institute of Food Safety)	0	0.0%
Food Safety Allergen (State Food Safety)	1	25.0%
Total	4	100%

5. Any additional comments about food allergy training classes?

- FARRP, FARE
- I've always wondered why there was a need for a separate allergen training course. Why not update the Manager certification and food handler courses to contain sufficient allergen training rather than create separate courses.
- I strongly believe that while there should be better allergen communication be that labeling or verbal communication at the point of sale I strongly feel the consumer should have the responsibility to educate themselves and make responsible decisions when choosing foods to eat. In other words.. consumer allergen classes as well.
- Our goal is to get every PIC certified.
- We have developed our own Allergen Training Program that focuses heavily on the allergens we have within our operation. The training program is required for all employees.

CFP Allergen Notification Sub-Committee

Consumer Survey Summary

June 7, 2019

Agenda

- Background
- Objective / CFP Allergen Committee Charges
- Executive Summary
- Demographics
- Food Allergens
- Allergen Notification Preference

Background

- The Conference for Food Protection (CFP) is a non-profit organization which originated in 1971. It was created to provide a formal process whereby members of industry, regulatory, academia, consumer, and professional organizations are afforded equal input in the development and/or modification of food safety guidance. Such guidance is incorporated into food safety laws and regulations at all levels of government throughout the United States.

- The Allergen Notification Sub-Committee solicited the opinion of consumers in May 2019 in regard to consumer preferences regarding notifications of food allergens in retail food establishments.

- Based on consumer feedback, the responses were reviewed and recommendations will be made during the 2020 biennial CFP meeting.

- Survey results: https://www.surveymonkey.com/results/SM-2LGT2YK6V/

CFP Allergen Committee, 2018-20 Charges

- Review Issues 2018-I-015, 2018-II-007, 2018-II-008 and their original submitted. Recommended Solution, including but not limited to:
  - Evaluation of major food allergen disclaimers in retail food establishments.
  - Development of methodology for retail food establishments to notify consumers when menu items contain major food allergens.
  - Determining if any additional staff training for food allergen awareness is needed
  - Identifying any supporting research or evidence that supports recommendations.

- Recommend changes to the Food Code that support retail food establishments in their efforts to protect consumers with major food allergens.

- Report back findings and recommendations to the 2020 Biennial Meeting of the Conference for Food Protection.

Executive Summary

- 788 respondents (consumers) completed the survey across US 49 states

- Over 90% respondents are dealing with food allergies or intolerance
  - >90% responded that food allergen menus are very to extremely important to have in retail food establishment for those suffering with food allergies vs >60% for those without allergies
  - Similarly, availability of online food allergen menus in food retail establishment are very to extremely important to have for those suffering with food allergies

- Type of food allergen notification
  - Majority prefer combination of written and verbal food allergen notification
  - Majority prefer allergen menu to include ingredients with major allergens listed
  - Significant amount of respondents requested cross-contact risk be listed as well (i.e. cooking oil or equipment processing cross contamination risk)
  - Consensus is to recommend a set of easy to recognize major food allergen icon to represent the food allergen for consistency
  - Consensus is to list allergen information next to menu for easy reference; avoid big or long table to trace the allergen information

Most Preferred Food Allergen Notification (Example)

Food Item

List ingredients:
and/or list allergen icon:

Poster

Please inform us if anyone in your party has FOOD ALLERGY before ordering

Food Allergen Notification - Consumer Survey

Friday, June 07, 2019

788

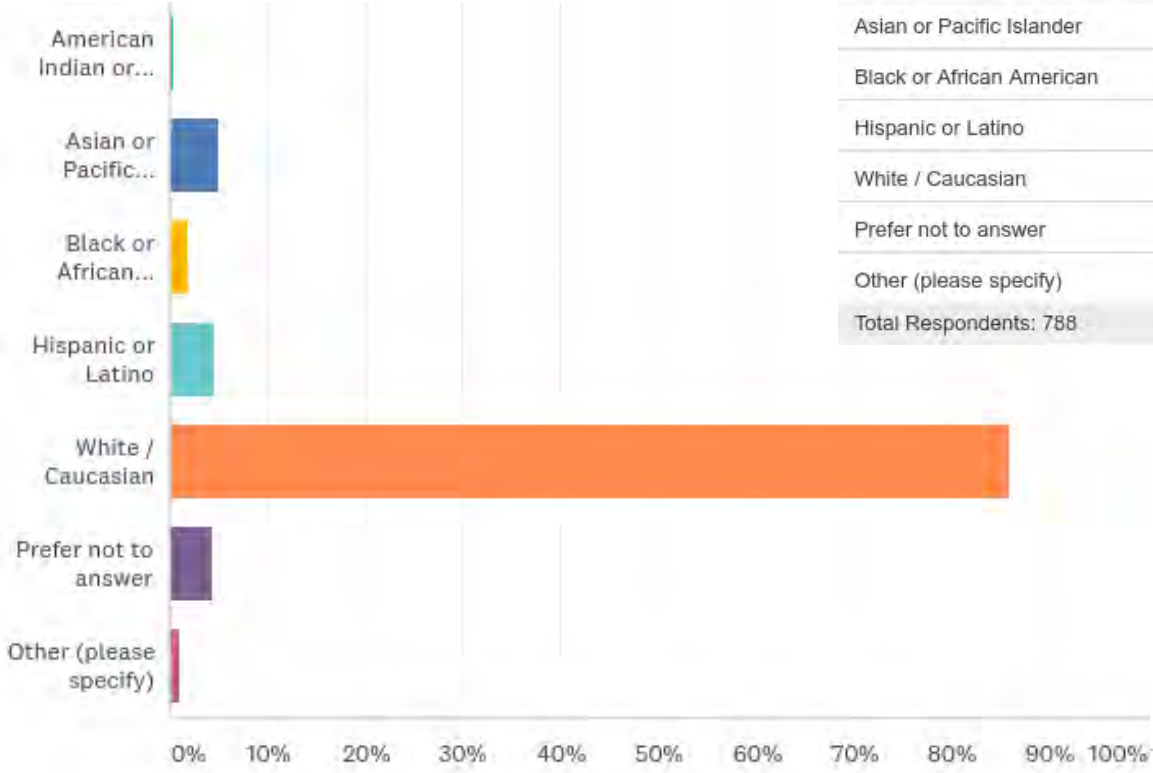
Total Responses

Date Created: Tuesday, April 30, 2019

Complete Responses: 518

Q1: What is your ethnicity? (Please select all that apply.)

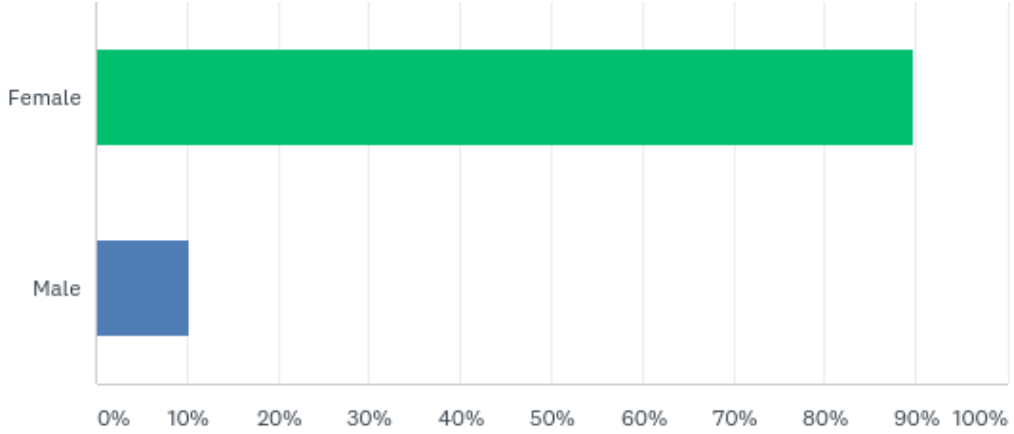
Answered: 788 Skipped: 0



ANSWER CHOICES	RESPONSES	
American Indian or Alaskan Native	0.51%	4
Asian or Pacific Islander	4.95%	39
Black or African American	1.90%	15
Hispanic or Latino	4.57%	36
White / Caucasian	86.04%	678
Prefer not to answer	4.31%	34
Other (please specify)	1.14%	9
Total Respondents: 788		

Q2: What is your gender?

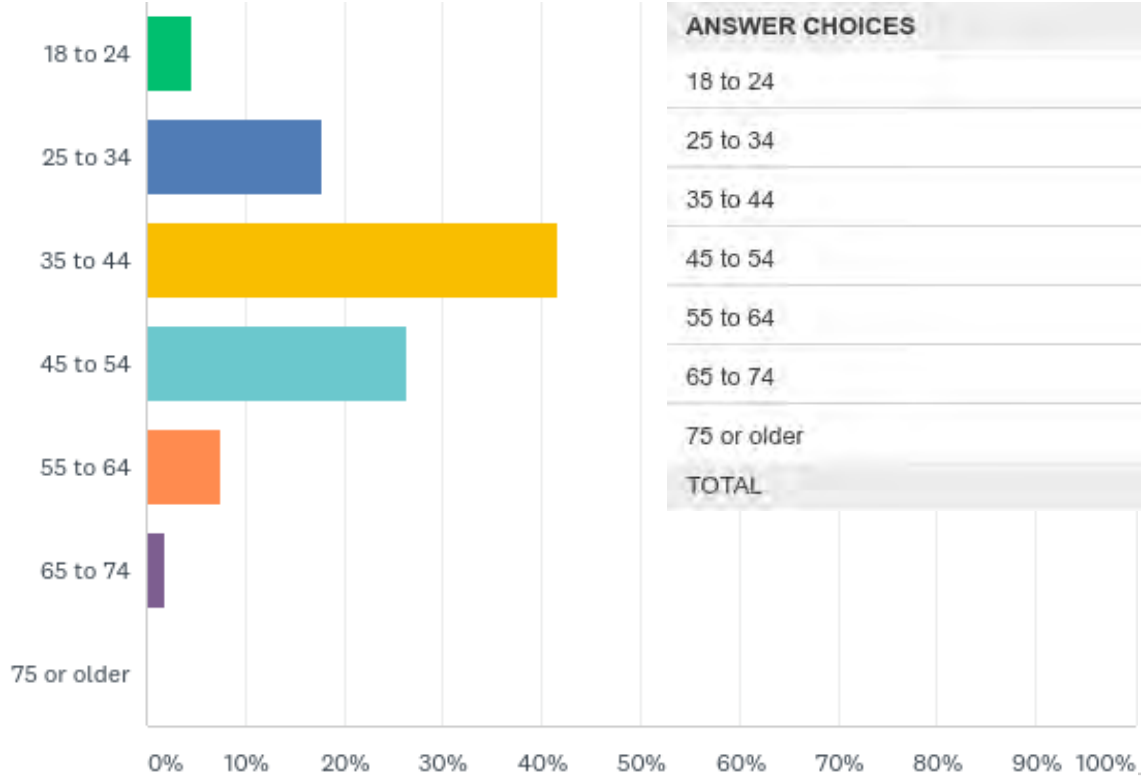
Answered: 779 Skipped: 9



ANSWER CHOICES	RESPONSES	
Female	89.73%	699
Male	10.27%	80
TOTAL		779

Q3: What is your age?

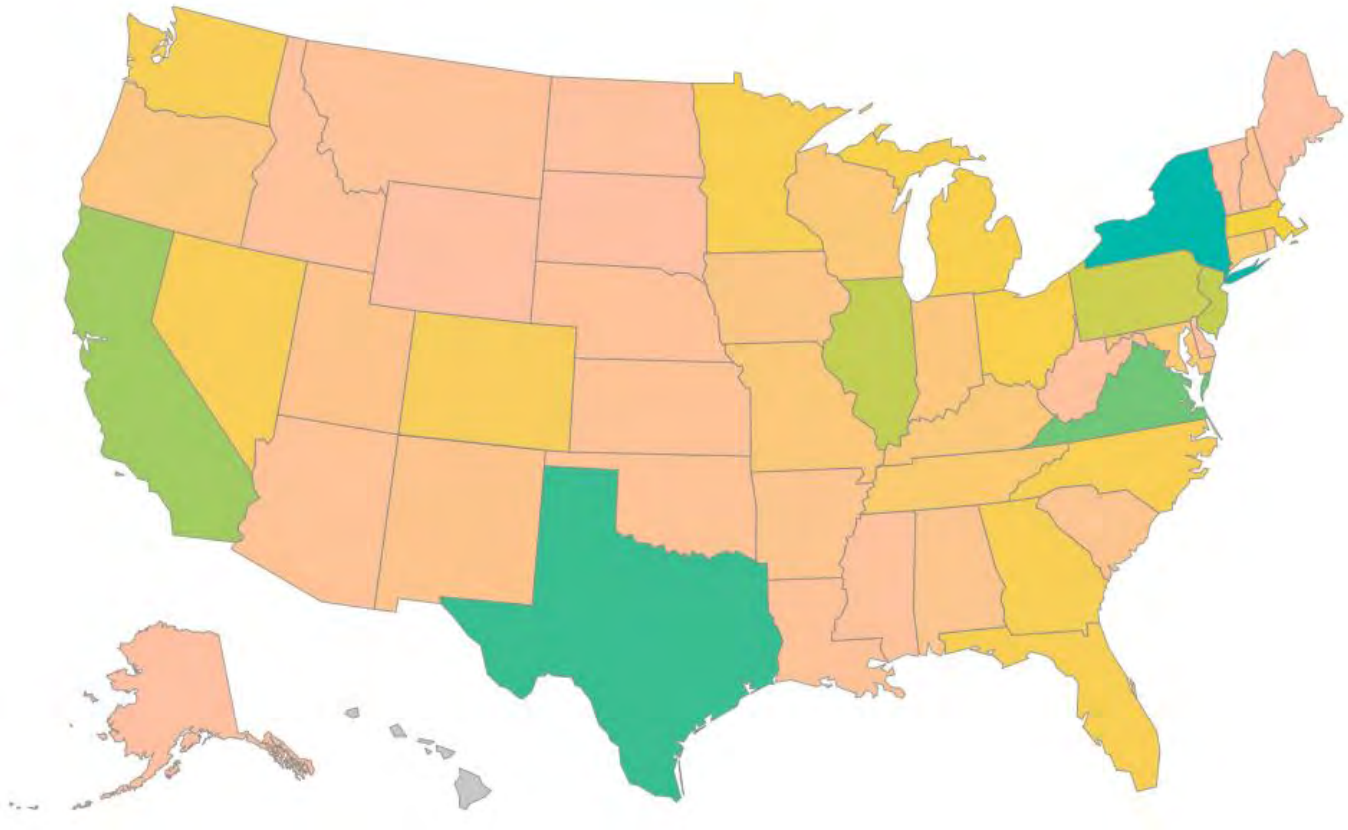
Answered: 786 Skipped: 2



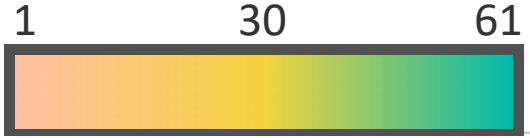
ANSWER CHOICES	RESPONSES	
18 to 24	4.58%	36
25 to 34	17.68%	139
35 to 44	41.73%	328
45 to 54	26.46%	208
55 to 64	7.51%	59
65 to 74	1.78%	14
75 or older	0.25%	2
TOTAL		786

Q4: What state do you reside in?

Answered: 776 Skipped: 12

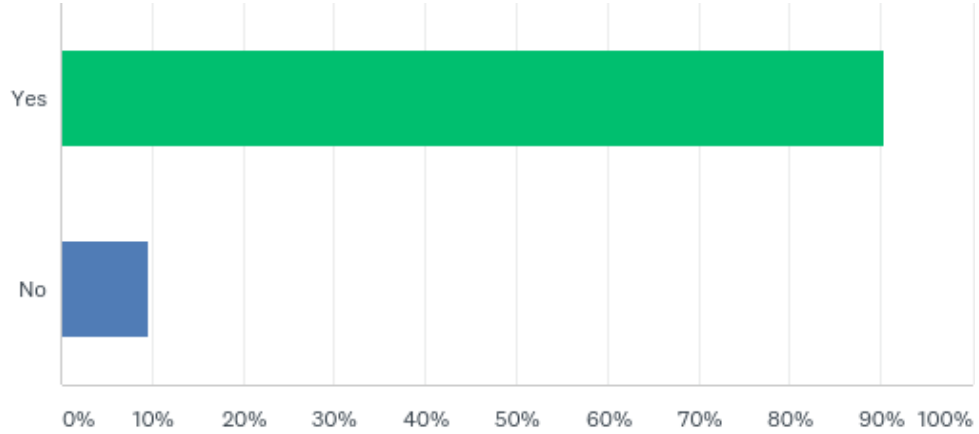


- Great participation across 49 states, except from Hawaii



Q5: Do you or does anyone in your home have food allergies or intolerance?

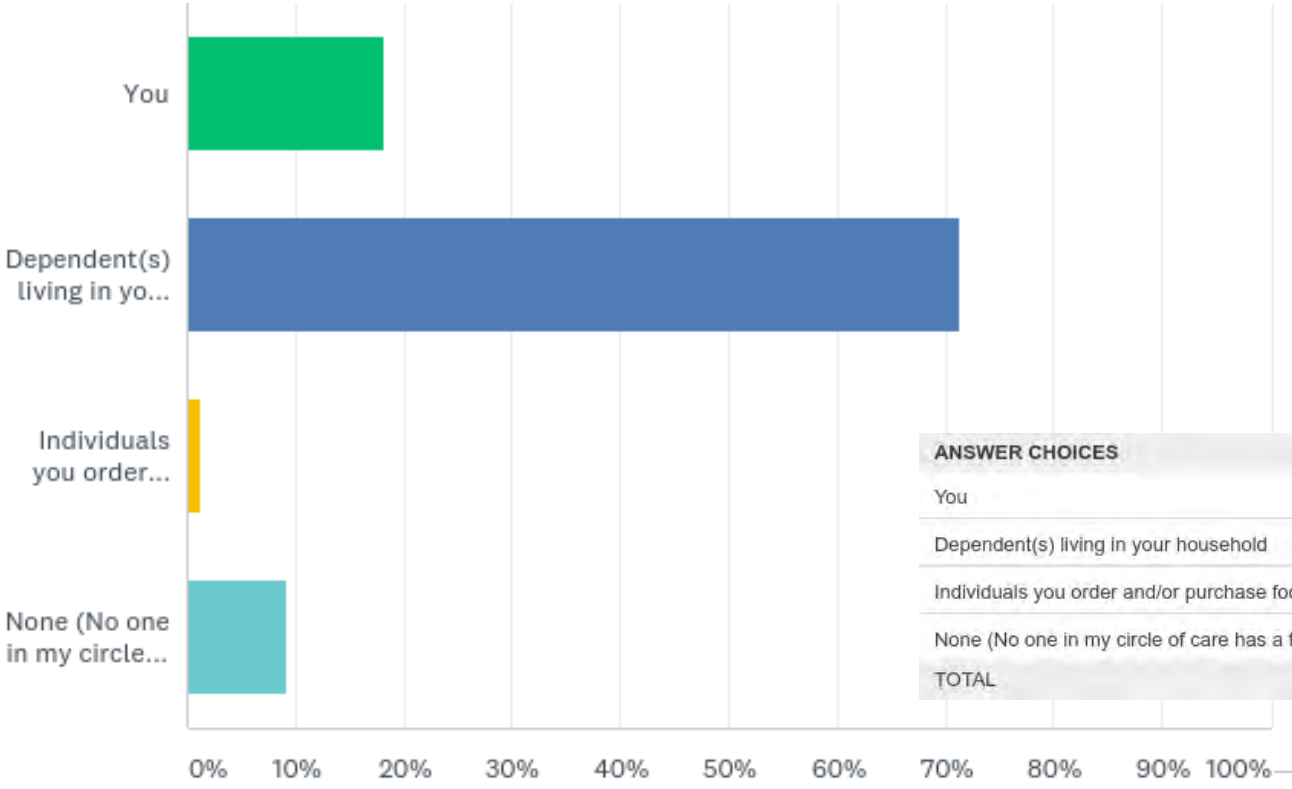
Answered: 786 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	90.46%	711
No	9.54%	75
TOTAL		786

Q6: Who in your home has food allergies/intolerance?

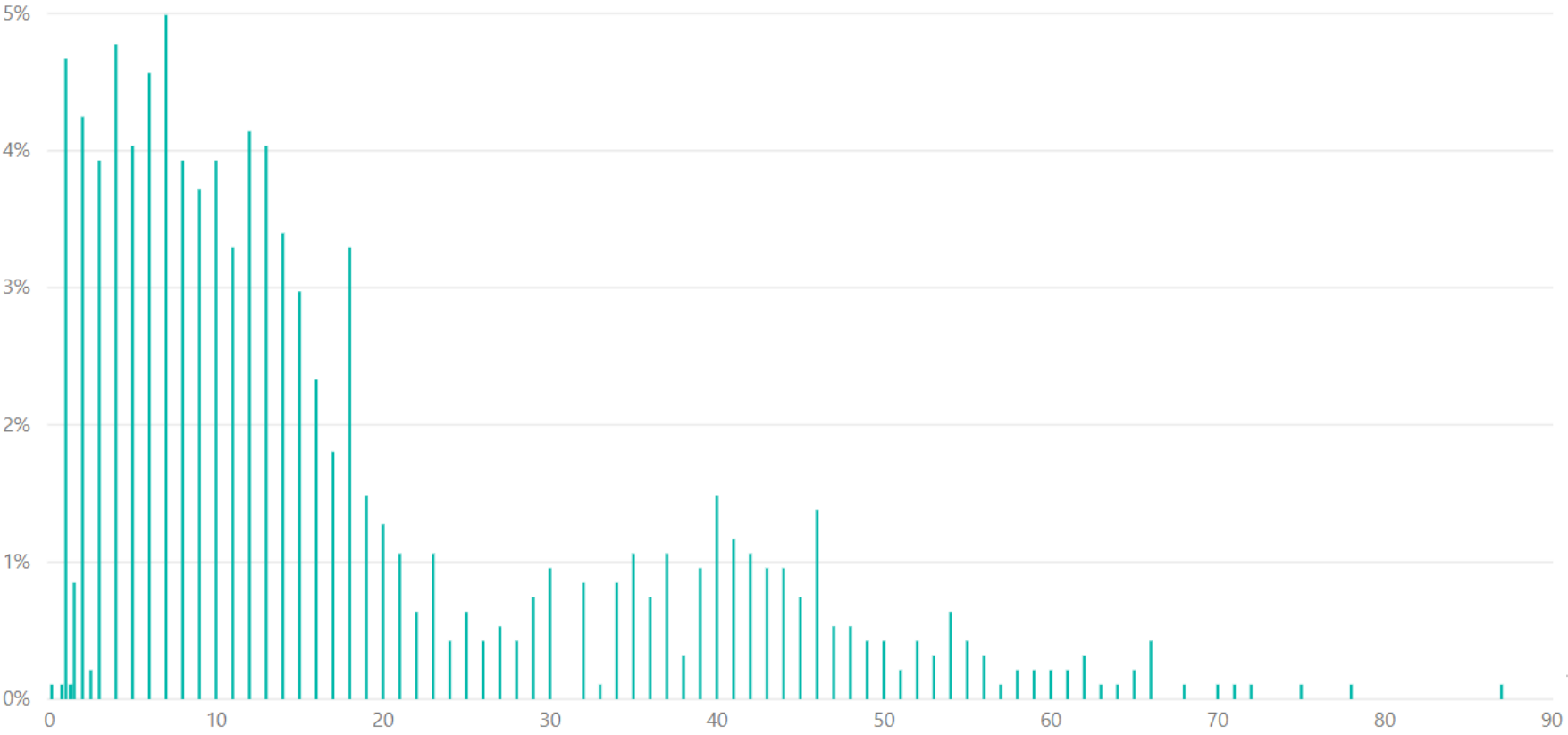
Answered: 755 Skipped: 33



ANSWER CHOICES	RESPONSES	
You	18.15%	137
Dependent(s) living in your household	71.39%	539
Individuals you order and/or purchase food for in a professional capacity	1.32%	10
None (No one in my circle of care has a food allergy)	9.14%	69
TOTAL		755

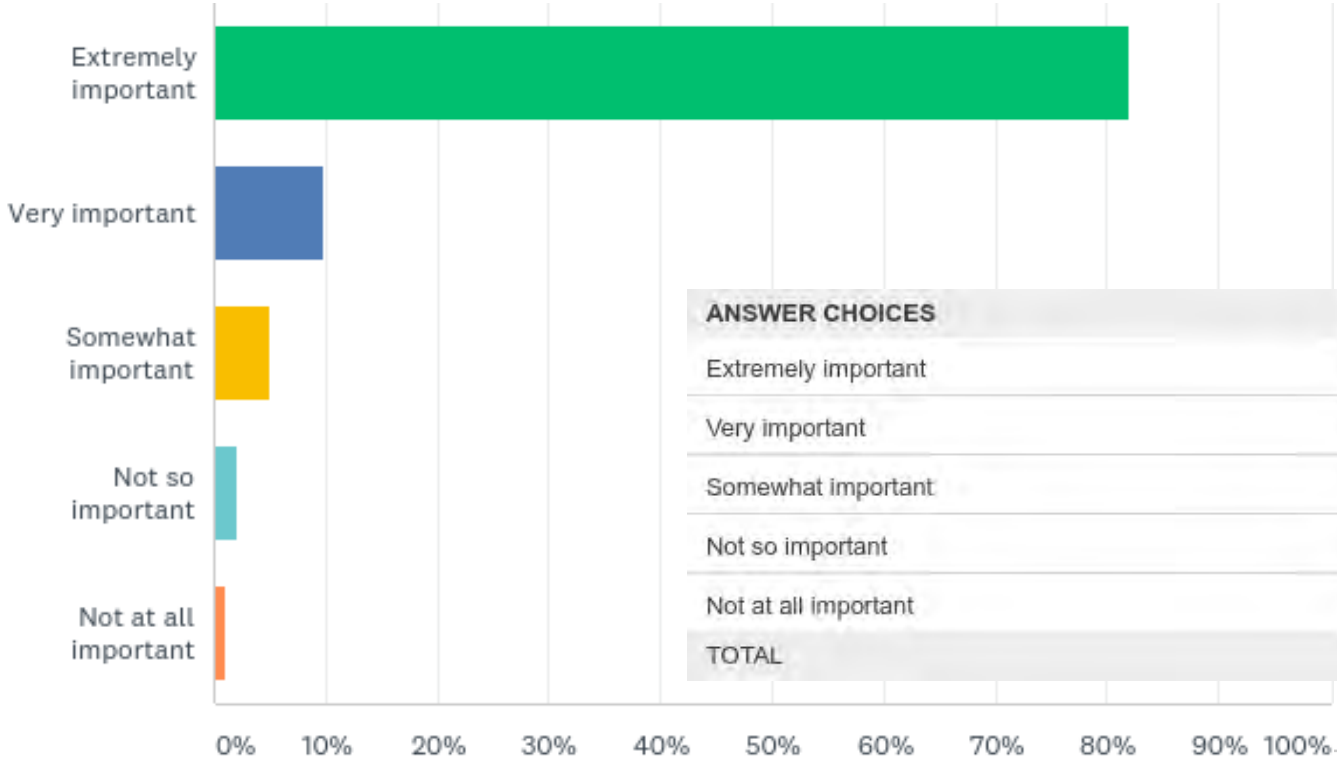
Ages of those in care with food allergies?

Back to report | %GT A_RESPONDENT BY AGE OF ALLERGIC DEPENDENTS IN CARE



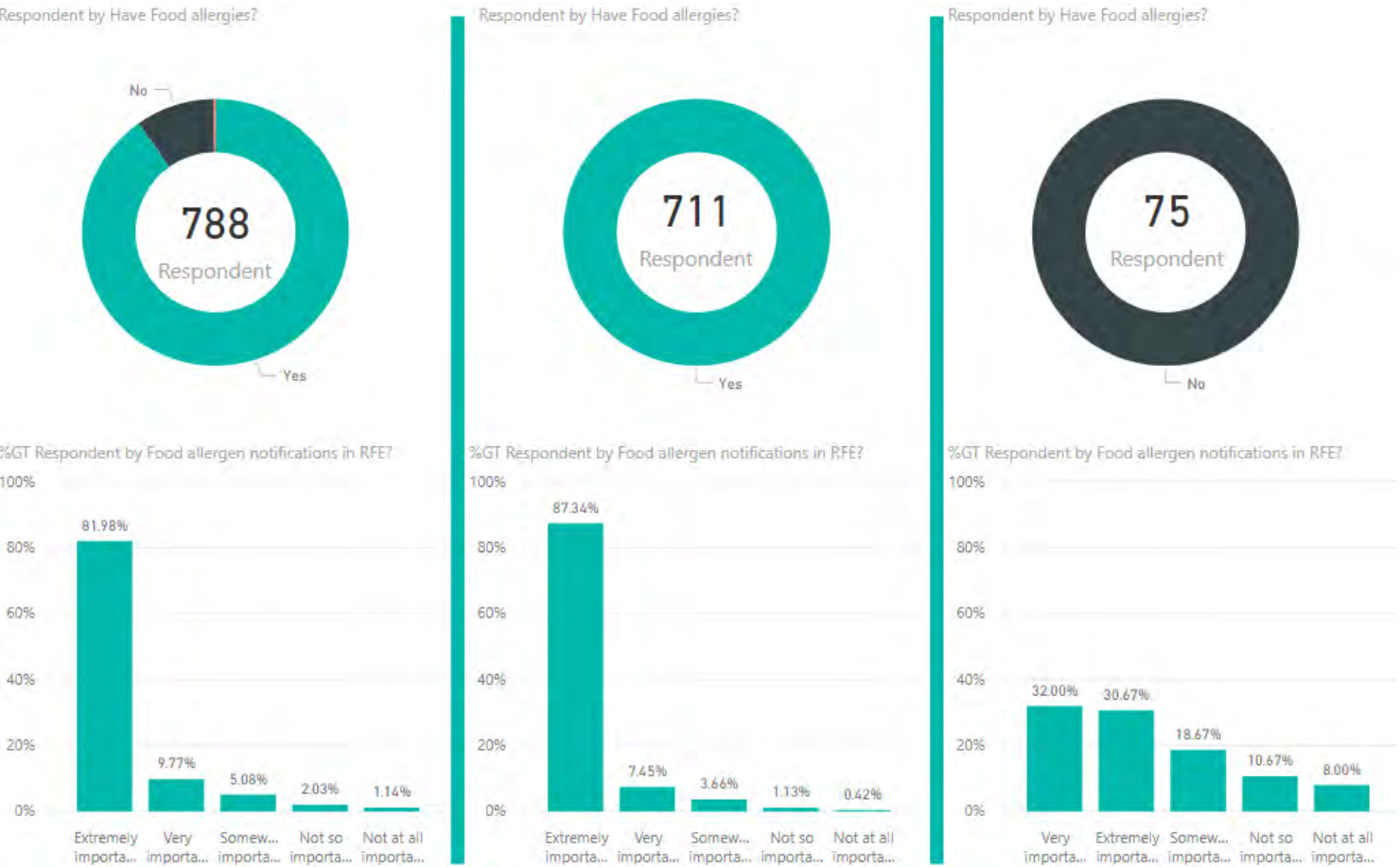
Q8: How important is having food allergen disclaimers/notifications in retail food establishments to you?

Answered: 788 Skipped: 0



ANSWER CHOICES	RESPONSES	
Extremely important	81.98%	646
Very important	9.77%	77
Somewhat important	5.08%	40
Not so important	2.03%	16
Not at all important	1.14%	9
TOTAL		788

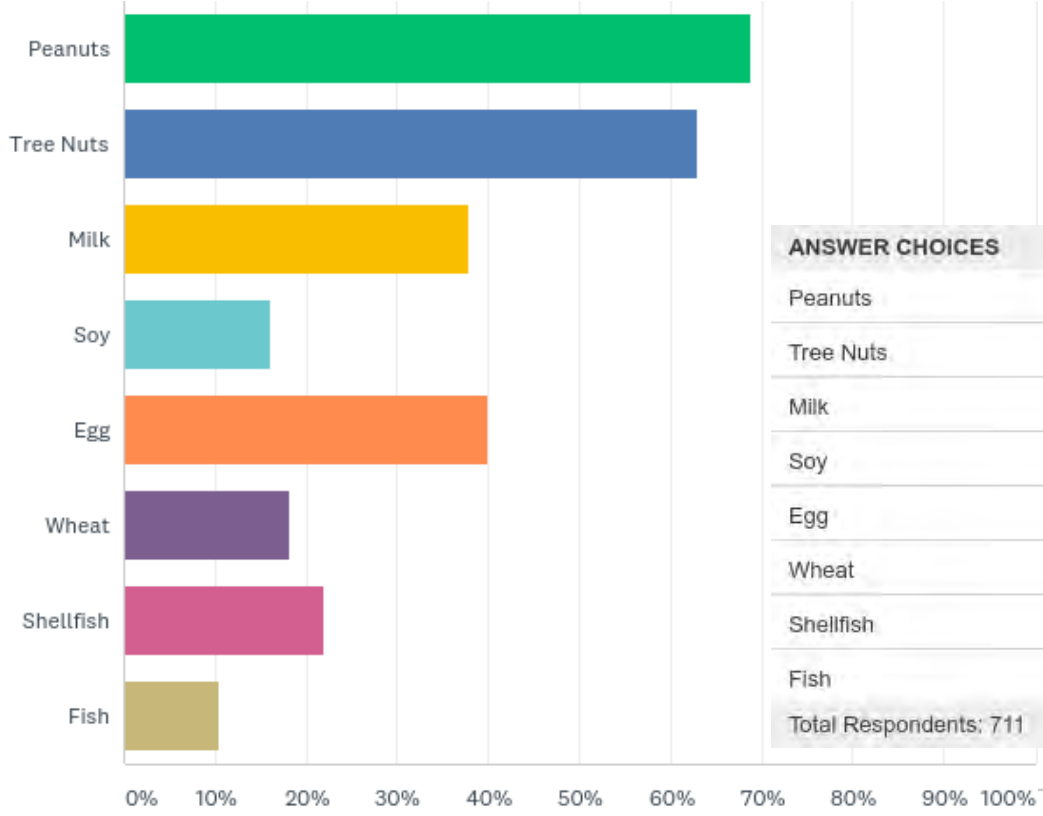
Q8: How important is having food allergen disclaimers/notifications in retail food establishments to you?



- For those >90% respondent have food allergies; they responded that food allergen notification is very/extremely important; in contrary, those without food allergies, their responses vary greatly

Q9: Thinking of the food-allergic individuals within your circle of care, select which food allergies they experience:

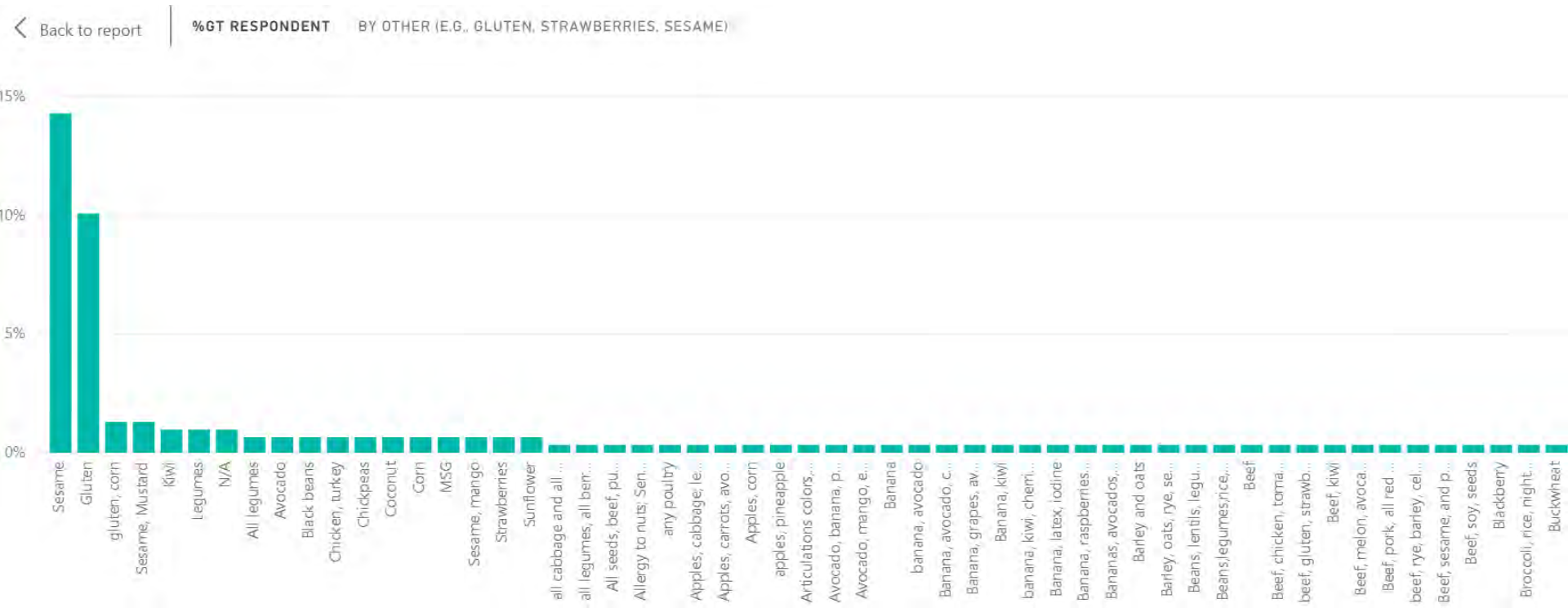
Answered: 711 Skipped: 77



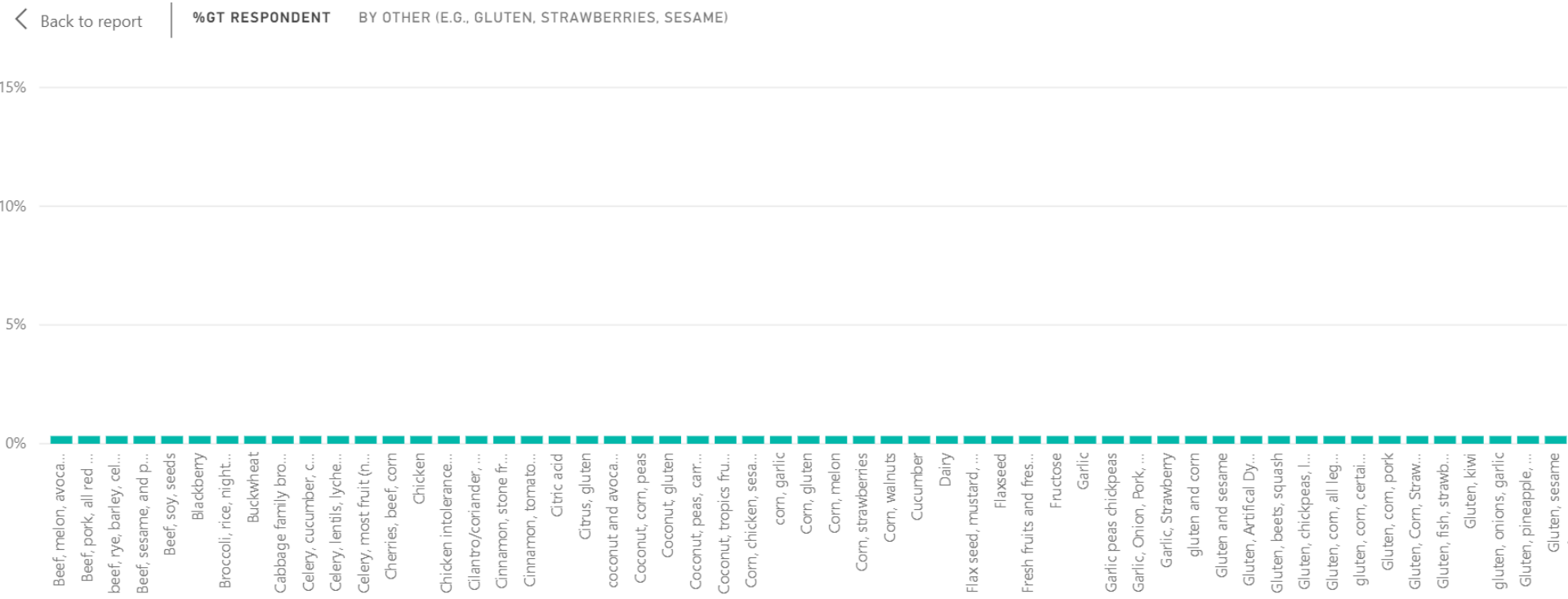
ANSWER CHOICES	RESPONSES	
Peanuts	68.92%	490
Tree Nuts	62.87%	447
Milk	37.83%	269
Soy	16.17%	115
Egg	39.94%	284
Wheat	18.28%	130
Shellfish	21.94%	156
Fish	10.41%	74
Total Respondents: 711		

Q9: List other food allergies within your circle of care:

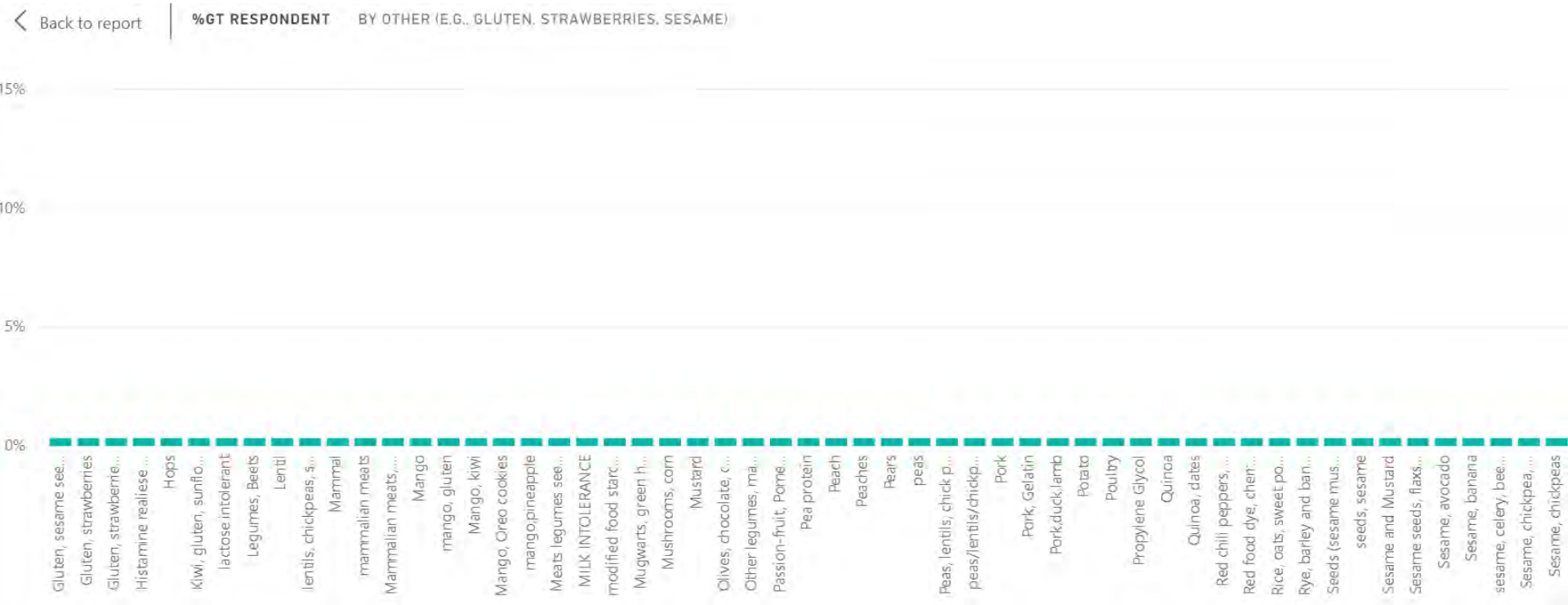
Sesame and gluten allergies / intolerance are the leading food allergies outside of the BIG 8 major allergens



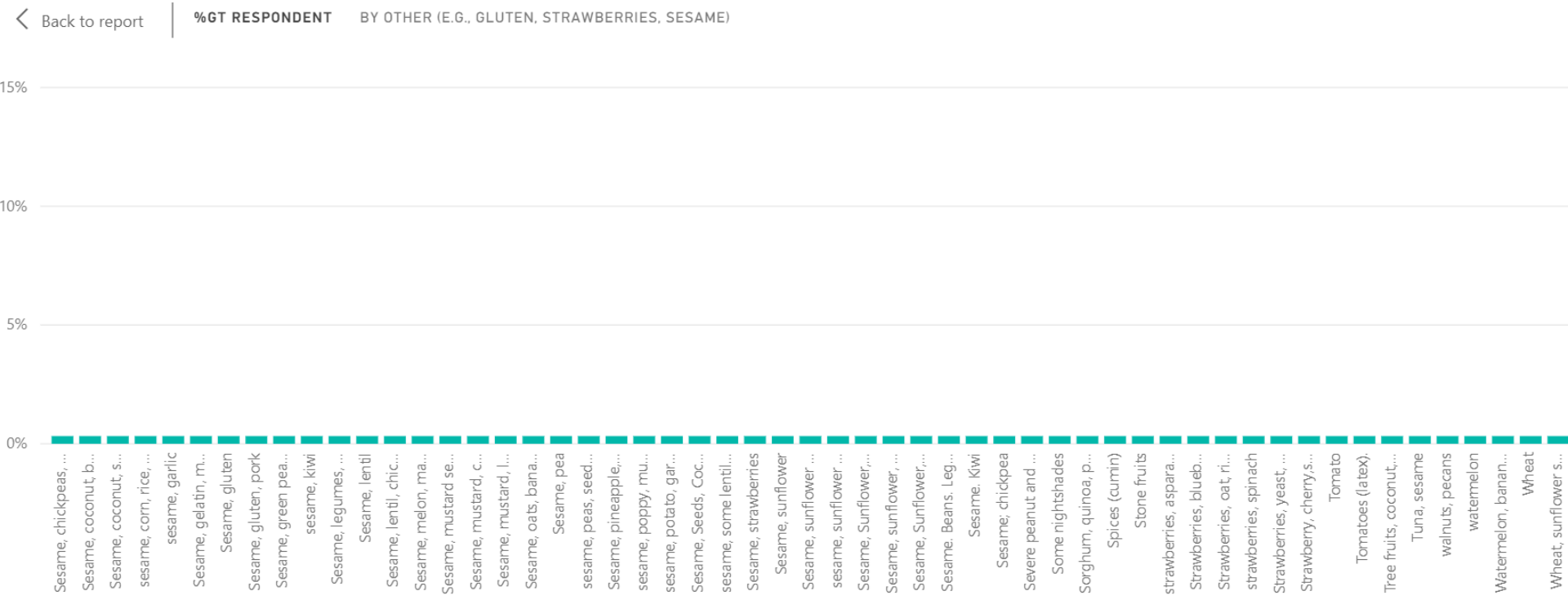
Q9: List other food allergies within your circle of care:



Q9: List other food allergies within your circle of care:



Q9: List other food allergies within your circle of care:



Q10-Q15: From pictures, please rate effectiveness and ease of use of allergen notification on table menus A, B & C (1=worst, 10 = best)

Answered: 677 Skipped: 111

Menu	Effectiveness	Ease of Use	Comments
A	5.8 ± 2.7	5.3 ± 2.7	Table too busy, hard to understand symbol, need a legend
B	5.0 ± 2.8	5.0 ± 2.8	Like the icon in front/beginning of menu, need a legend
C	**6.0 ± 2.4**	**6.0 ± 2.5**	Standardized symbol is a must, easiest to read

Q16-Q21: From pictures, please rate effectiveness and ease of use of allergen notification on table menus D, E & F (1=worst, 10 = best)

MENU ITEM	MAY CONTAIN ONE OR MORE OF THE FOLLOWING
APPETIZERS	
Chips & Spicy White Queso	Milk, Soybean Oil.
Nashville Hot Deviled Eggs	Milk, Soybean Oil, Eggs.
O'Charley's Chicken Tender Appetizer, Chipotle	Eggs, Fish, Milk, Peanuts, Shellfish, Soy, Soybean Oil, Tree Nuts, Wheat.
O'Charley's Chicken Tenders Appetizer, Buffalo	Eggs, Fish, Milk, Peanuts, Shellfish, Soy, Soybean Oil, Tree Nuts, Wheat.
O'Charley's Famous Chicken Tenders Appetizer, Original	Eggs, Fish, Milk, Peanuts, Shellfish, Soy, Soybean Oil, Tree Nuts, Wheat.
O'Charley's Famous Chicken Tenders Appetizer, Nashville Hot	Eggs, Fish, Milk, Peanuts, Shellfish, Soy, Soybean Oil, Soy Lecithin ,Tree Nuts, Wheat.
O'Charley's Fried Green Tomatoes	Soy, Soybean Oil, Wheat.
Loaded Potato Skins	Milk, Soy, Soybean Oil.
Spinach & Artichoke Dip	Barley, Wheat, Milk, Soybean Oil, Soy Lecithin.
Spicy Jack Cheese Wedges	Eggs, Fish, Milk, Peanuts, Shellfish, Soy, Soybean Oil, Tree Nuts, Wheat.
Top Shelf Combination Appetizer	Eggs, Fish, Milk, Peanuts, Shellfish, Soy, Soybean Oil, Tree Nuts, Wheat.
Crispy Pickle Chips	Eggs, Fish, Soy, Wheat. May also contain Gluten.

D

ALLERGEN CHART	Milk	Egg	Fish	Shellfish	Wheat	Soy	Peanuts	Nuts
ALFREDO SAUCE	•				•	•		
AMERICAN CHEESE	•					•		
ANCHOVIES			•			•		
BACON								
BACON CHEDDAR HOAGIE	•				•	•		
BALSAMIC DRESSING						•		

E

Blueberry Muffin

Ingredients

Whole grain flour (wheat [gluten]), blueberries, white sugar, egg (egg), butter (milk), milk (milk), baking powder, salt, vanilla extract

Pistachio Macaron

Ingredients

Shells: Almond flour (tree nut), pistachio flour (tree nut), powdered sugar, egg whites (egg), cream of tartar, sugar

Filling: Sugar, water, egg yolk (egg), butter (milk), pistachio paste (tree nut)

F

Menu	Effectiveness	Ease of Use	Comments
D	**7.4 ± 2.4**	**7.3 ± 2.5**	Too busy to read; like it clearly stated; don't like "may contain"
E	7.3 ± 2.3	7.3 ± 2.4	Like the dots; hard to scan by column; like the table approach
F	7.0 ± 2.7	6.6 ± 2.8	Easy to read; need to bold out allergen information

Q22-Q27: From pictures, please rate effectiveness and ease of use of allergen notification on table menus G, H & I (1=worst, 10 = best)

brightside BREAKFASTS

	Total calories (cal)	Calories from fat (fat cal)	Total Fat (g)	Saturated Fat (g)	Trans Fat (g)	Cholesterol (mg)	Sodium (mg)	Total carbohydrate (g)	Dietary Fiber (g)	Sugars (g)	Protein (g)	Eggs	Fish	Milk	Peanuts	Shellfish	Soy	Tree Nuts	Wheat	Gluten
2 Eggs, any style except poached	220	160	18	5	0	475	150	1	0	0	13	•					•			
Egg Whites (4 oz)	120	60	7	1.5	0	0	190	1	0	1	12	•					•			
Low-Cholesterol Egg Substitute (4 oz)	140	80	9	2	0	95	320	1	0	1	13	•					•			

G

Whataburger®

590	25	29	1220	62
Calories	Total Fat (g)	Protein (g)	Sodium (mg)	Carbs (g)

Allergens: Wheat, Soy, Gluten

SEE MORE

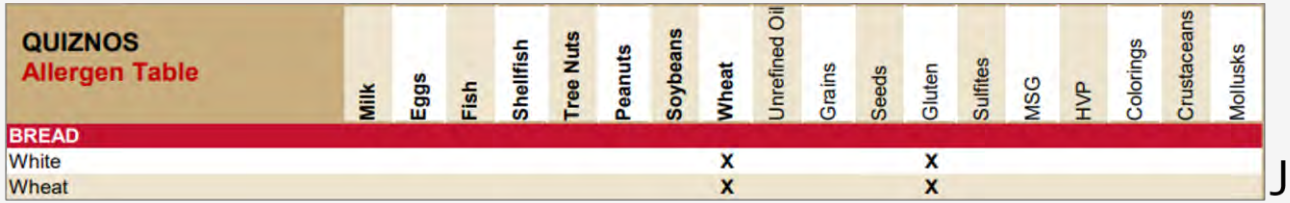
H

Nutrition Facts												Allergens							
MENU ITEMS	Serving Size (oz)	Calories	Calories From Fat (g)	Total Fat (g)	Saturated Fat (g)	Trans Fat (g)	Cholestrol (mg)	Sodium (mg)	Total Carb (g)	Dietary Fiber (g)	Sugars (g)	Protein (g)	Wheat	Soy	Peanuts	Treenuts	Fish	Shellfish	Eggs	Milk
SIDE																				
Chow Mein	9.4 oz	510	180	20	3.5	0	0	860	80	6	9	13	Y	Y						
Chow Fun*	8.5 oz	410	80	9	1	0	0	1110	73	1	6	9	Y	Y						Y
Fried Rice	9.3 oz	520	140	16	3	0	120	850	85	1	3	11	Y	Y					Y	

I

Menu	Effectiveness	Ease of Use	Comments – need cross contamination information
G	6.3 ± 2.3	6.1 ± 2.4	Allergen notification lost with nutritional info
H	**6.7 ± 2.7**	**6.8 ± 2.7**	Easy to follow; not enough information
I	**6.8 ± 2.3**	**6.7 ± 2.3**	Like the color to differentiate nutrition from allergen , too small

Q28-Q33: From pictures, please rate effectiveness and ease of use of allergen notification on table menus J, K & L (1=worst, 10 = best)

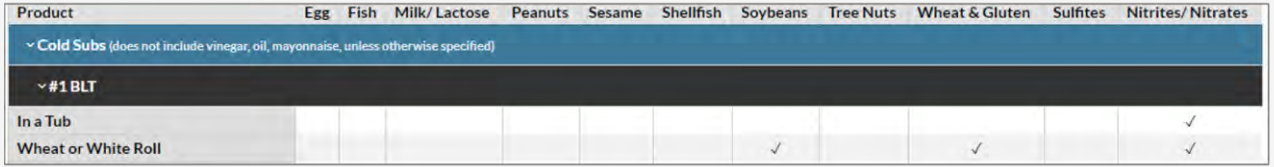


QUIZNOS Allergen Table	Milk	Eggs	Fish	Shellfish	Tree Nuts	Peanuts	Soybeans	Wheat	Unrefined Oil	Grains	Seeds	Gluten	Sulfites	MSG	HVP	Colorings	Crustaceans	Mollusks
BREAD																		
White								X				X						
Wheat								X				X						

J

Item	Peanut	Tree Nut	Egg	Milk	Wheat	Soy	Fish	Shellfish	Sesame
Crust Options									
Original Hand Tossed Dough					✓				

K

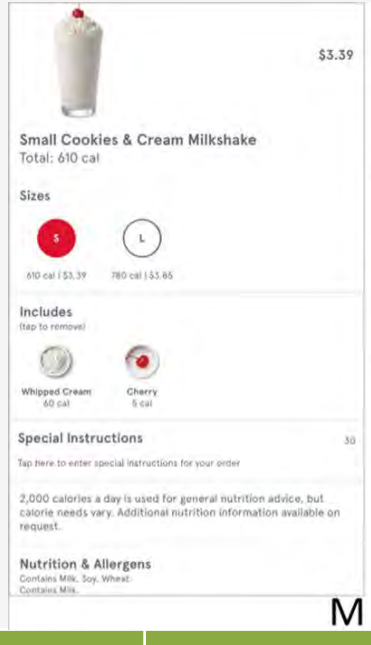


Product	Egg	Fish	Milk/ Lactose	Peanuts	Sesame	Shellfish	Soybeans	Tree Nuts	Wheat & Gluten	Sulfites	Nitrites/ Nitrates
Cold Subs (does not include vinegar, oil, mayonnaise, unless otherwise specified)											
#1 BLT											
In a Tub											✓
Wheat or White Roll							✓		✓		✓

L

Menu	Effectiveness	Ease of Use	Comments – would be nice to include actual ingredients
J	**7.0 ± 2.2**	**6.9 ± 2.2**	Comprehensive; hard to scan if it's a long list, need sesame info
K	6.5 ± 2.2	6.5 ± 2.2	Need bolder lines; glad it includes sesame
L	6.2 ± 2.3	6.1 ± 2.4	Too many columns to follow; glad it includes nitrites/sulfites

Q34-Q39: From pictures, please rate effectiveness and ease of use of allergen notification on online menus M, N & O (1=worst, 10 = best)



M

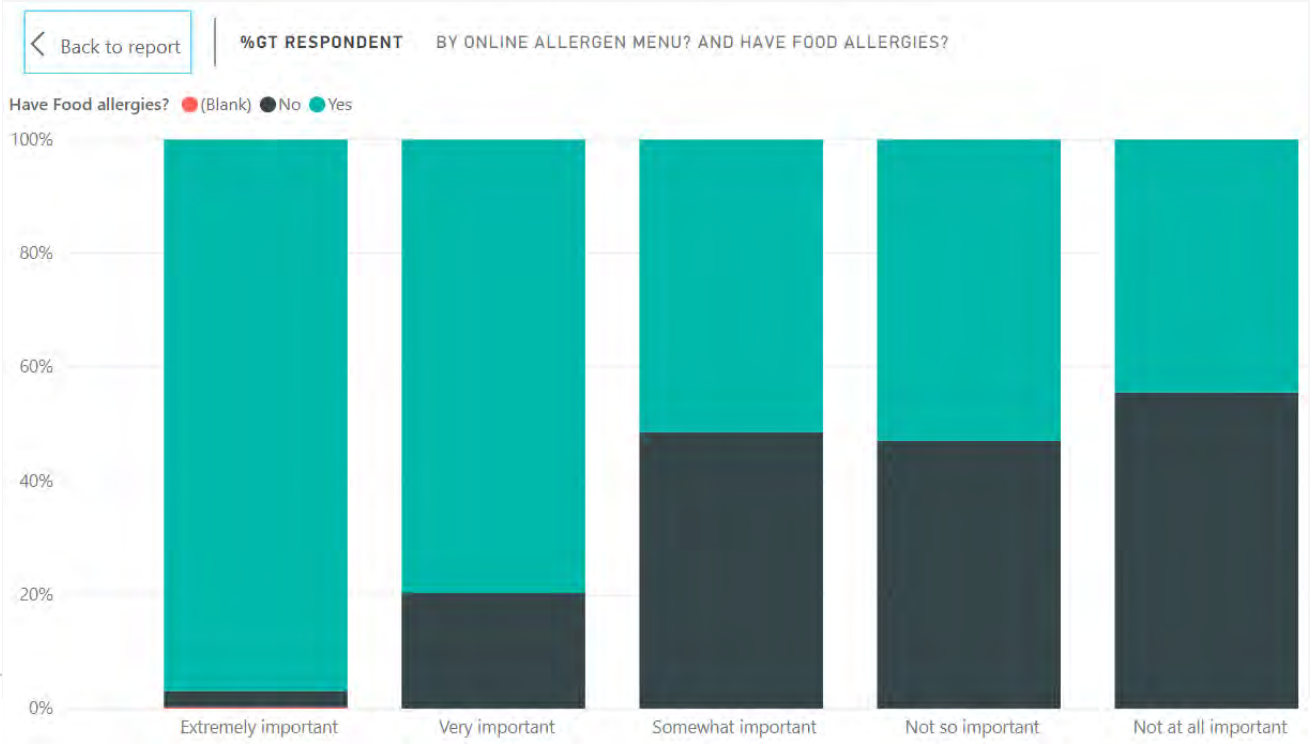
N

O

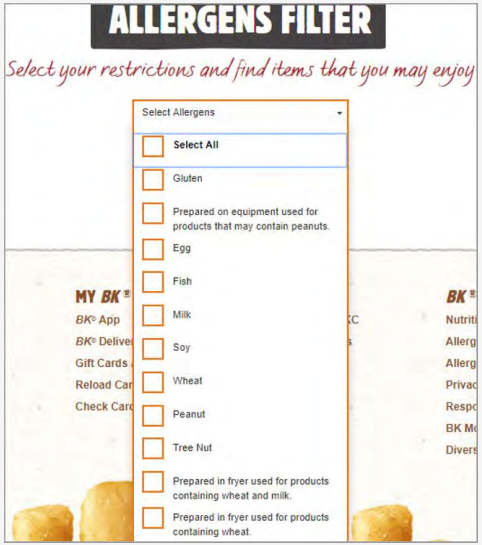
Menu	Effectiveness	Ease of Use	Comments – would be nice to include ingredients
M	5.9 ± 2.4	5.7 ± 2.4	Allergen information is buried, should be listed on top
N	**7.5 ± 2.3**	**7.6 ± 2.3**	Easy and simple
O	6.3 ± 3.0	5.6 ± 2.9	Like “may contain” info; too many words to sort through

Q40: How important is the availability of an online allergen menu to you?

- Again, responses vary greatly. Those with food allergies, responded that availability of an online allergen menu is very/extremely important.

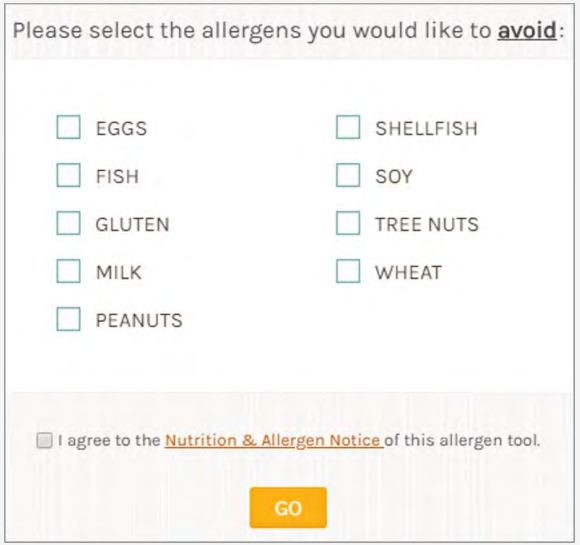


Q41-Q46: From pictures, please rate effectiveness and ease of use of allergen notification on online menus P, Q & R (1=worst, 10 = best)



P

Q

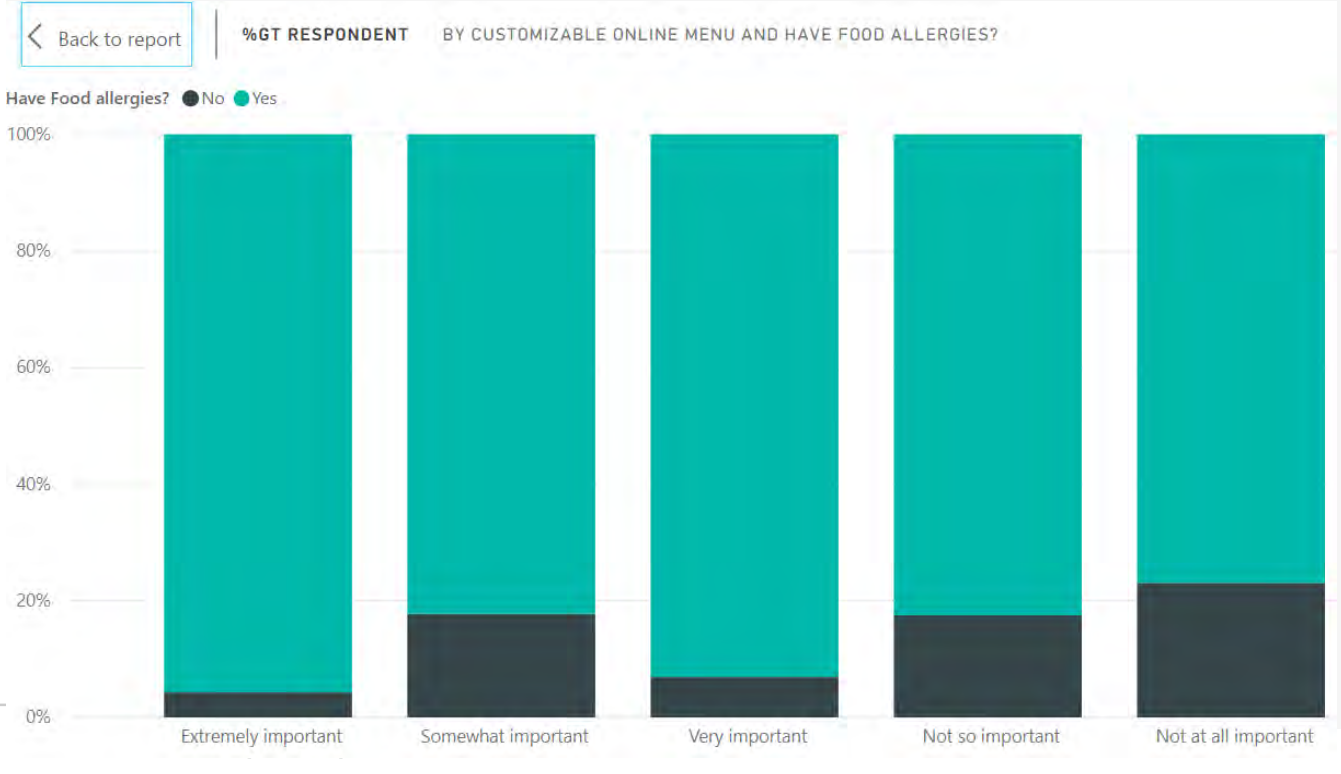


R

Menu	Effectiveness	Ease of Use	Comments – would be nice to include ingredients
P	6.9 ± 2.6	6.8 ± 2.6	Would be nice to include equipment oil and cross-contamination
Q	**7.1 ± 2.4**	**7.2 ± 2.3**	Would be nice to include disclaimer; dislike “I agree to….” (risk?)
R	6.9 ± 2.4	7.1 ± 2.3	Prefer ingredient listed for those with allergens outside of big8

Q47: How important is a customize-able online allergen menu to you?

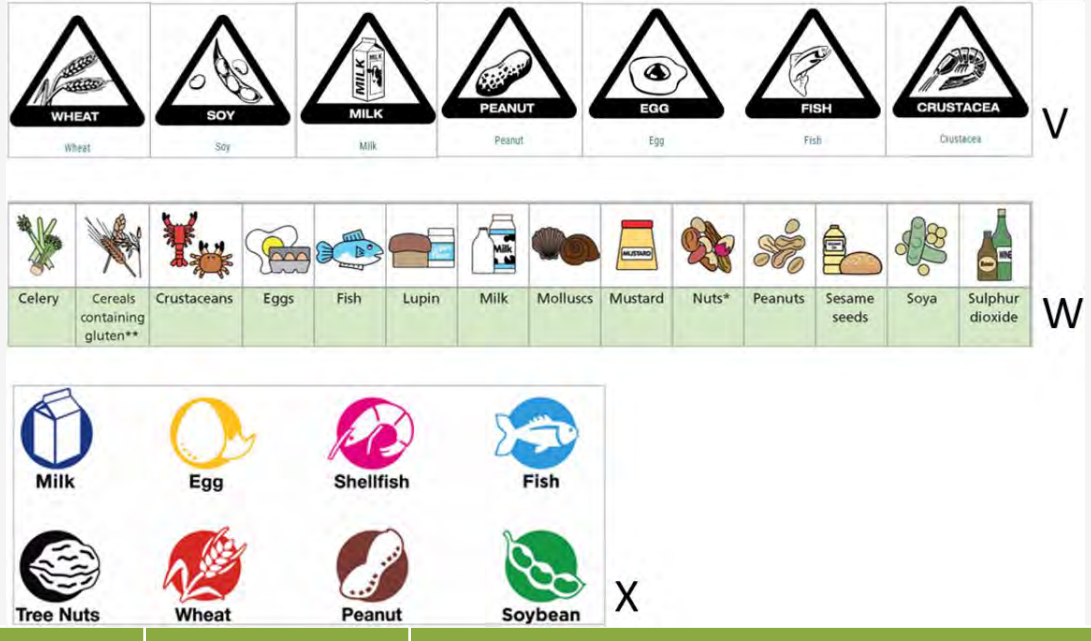
- Again, responses vary greatly. Those with food allergies, responded that availability of a customizable online allergen menu is very/extremely important.



Q48-Q53: From pictures, please rate effectiveness and ease of use of allergen notification on posters S, T & U (1=worst, 10 = best)

Menu	Effectiveness	Ease of Use	Comments – would be nice to include ingredients
S	5.7 ± 2.6	5.7 ± 2.6	Nice to have chef included! Worried about relaying correct information
T	**7.3 ± 2.4**	**7.3 ± 2.4**	Greatly dependent on staff knowledge and training
U	6.4 ± 2.5	6.4 ± 2.5	Too informal, still greatly dependent on staff knowledge and training

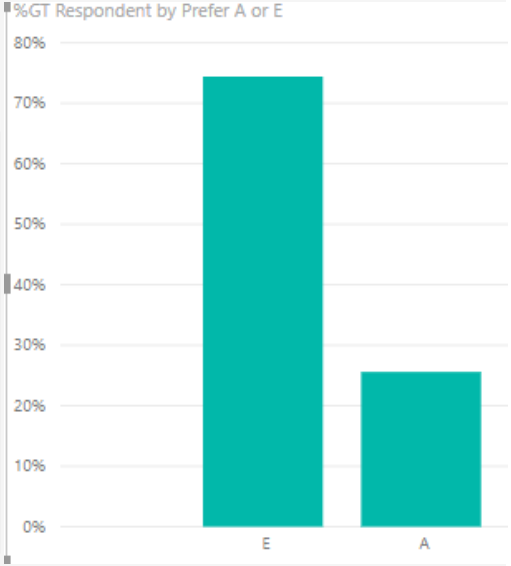
Q54-Q59: From pictures, please rate effectiveness and ease of use of allergen icons V, W & X (1=worst, 10 = best)



Menu	Effectiveness	Ease of Use	Comments – would be nice to include ingredients
V	6.5 ± 2.5	6.5 ± 2.4	Triangle mimic hazard signage; prefer colors; easy to mix up
W	6.6 ± 2.5	6.6 ± 2.5	Hard to identify food; too many icon
X	**7.8 ± 2.0**	**7.9 ± 2.0**	Clear, easy to read; too colorful; make sure words accompany icon

Q60: Which of the allergen notification menus above do you prefer?

>70% prefer full text as icon was difficult to distinguish unless a legend is provided



Q61: Which of the allergen notification menus above do you prefer?

>60% prefer to include only the major food allergen information be included in notification

ALLERGEN CHART

	Milk	Egg	Fish	Shellfish	Wheat	Soy	Peanuts	Nuts
ALFREDO SAUCE	●				●	●		
AMERICAN CHEESE	●					●		

E

Nutrition Facts													Allergens							
MENU ITEMS	Serving Size (oz)	Calories	Calories From Fat (g)	Total Fat (g)	Saturated Fat (g)	Trans Fat (g)	Cholestrol (mg)	Sodium (mg)	Total Carb (g)	Dietary Fiber (g)	Sugars (g)	Protein (g)	Wheat	Soy	Peanuts	Treenuts	Fish	Shellfish	Eggs	Milk
SIDE																				
Chow Mein	9.4 oz	510	180	20	3.5	0	0	860	80	6	9	13	Y	Y						
Chow Fun*	8.5 oz	410	80	9	1	0	0	1110	73	1	6	9	Y	Y						Y

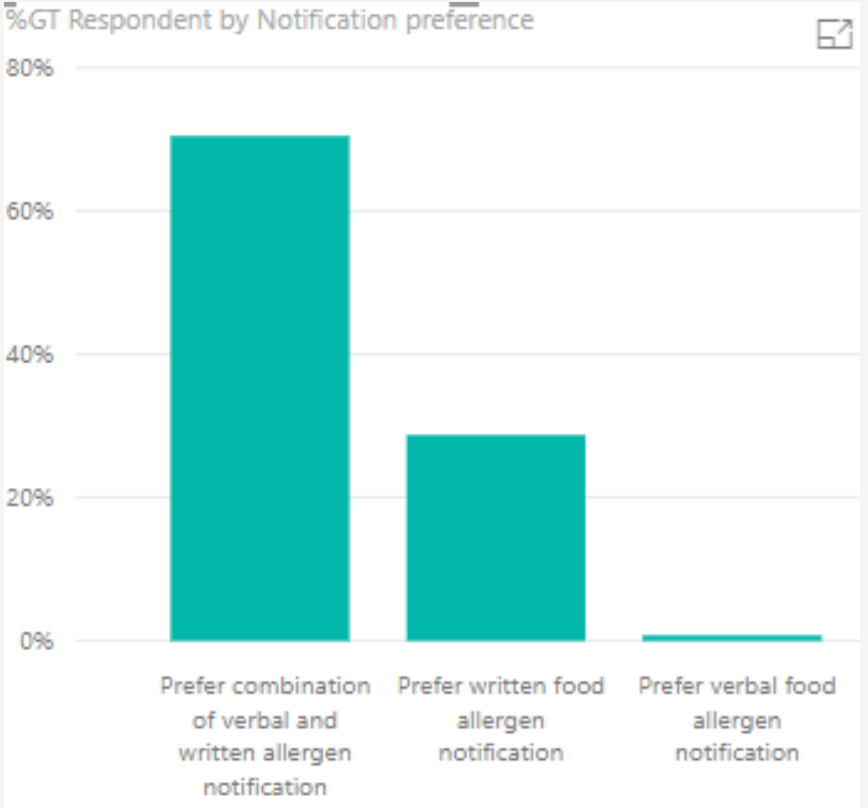
I

Item	Peanut	Tree Nut	Egg	Milk	Wheat	Soy	Fish	Shellfish	Sesame
Crust Options									
Original Hand Tossed Dough					✓				

K

Q62: How do you prefer to be notified of food allergens in retail establishments?

- Majority prefer combination of written and verbal notification



Contributor & Survey Partnership

Contributor:

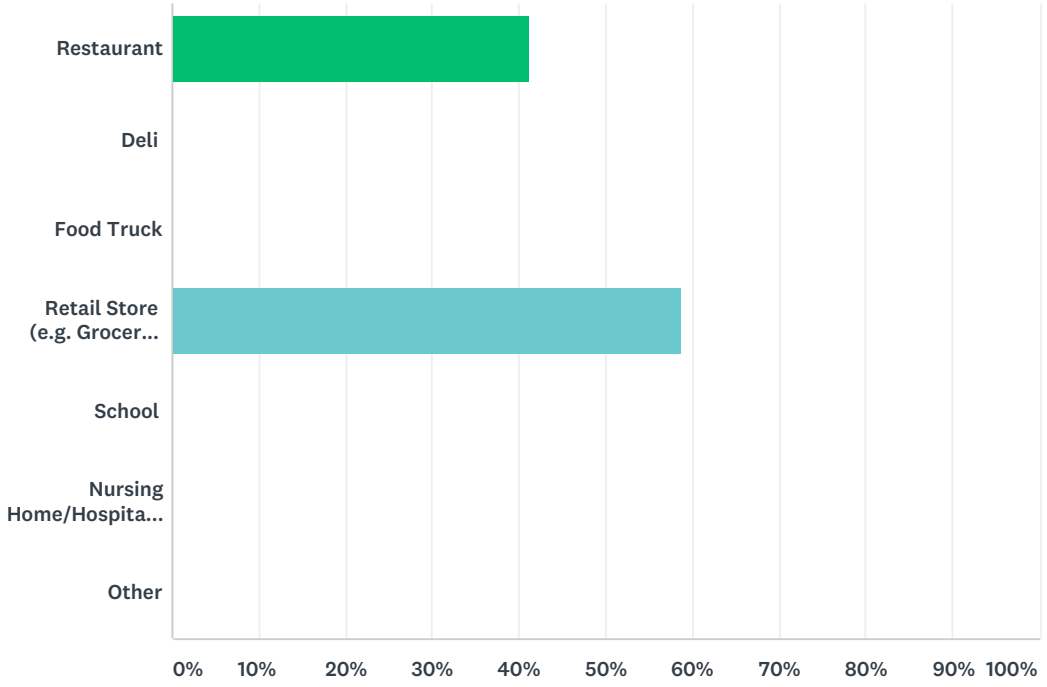
- **Elaine Money**, Principal Regulatory Specialist, Ecolab®
- **Dee Dee Vicino**, Chief Executive Officer, AllerCuisine™
- **Archer Campbell**, Environmental Health Technical Consultant, VA Thomas Jefferson Health District
- **Todd Pelech**, Public Health Sanitarian, Arizona Department of Health Services
- **Crystine Sylvis**, Environmental Health Supervisor, Southern Nevada Health District
- **Emilee Follett**, VP Product Development, StateFood Safety

In Partnership with and special thanks to:

- **Jon Hoffman, Associate Director of Advocacy, FARE® (Food Allergy Research & Education)**
- **Chef Keith Norman, Food Safety Manager/Asst Executive Chef, South Point Hotel Casino and Spa**

Q1 What type of food establishment do you represent?

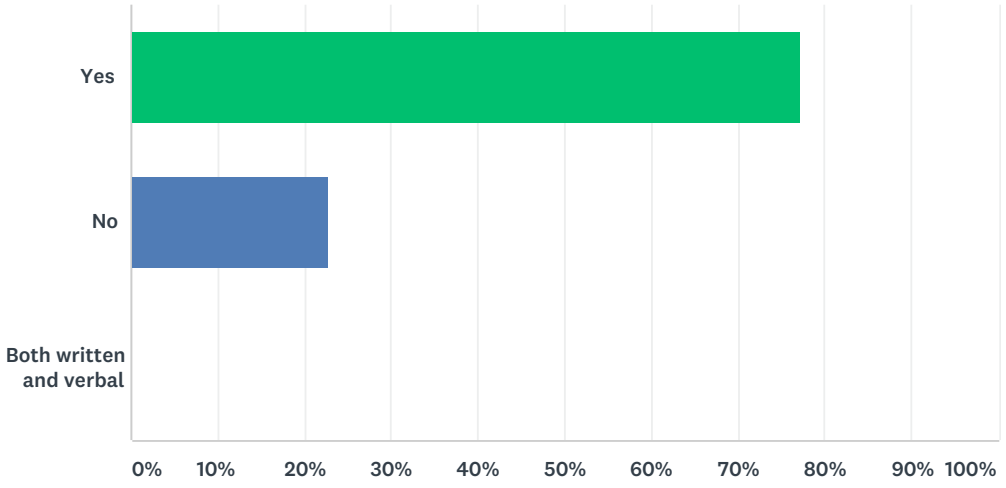
Answered: 51 Skipped: 21



ANSWER CHOICES	RESPONSES	
Restaurant	41.18%	21
Deli	0.00%	0
Food Truck	0.00%	0
Retail Store (e.g. Grocery, Convenience, Deli)	58.82%	30
School	0.00%	0
Nursing Home/Hospital/Assisted Living Facility	0.00%	0
Other	0.00%	0
TOTAL		51

Q2 Do you provide written information regarding allergens to your customers on things such as a menu/menu board, website, pamphlet, etc.?

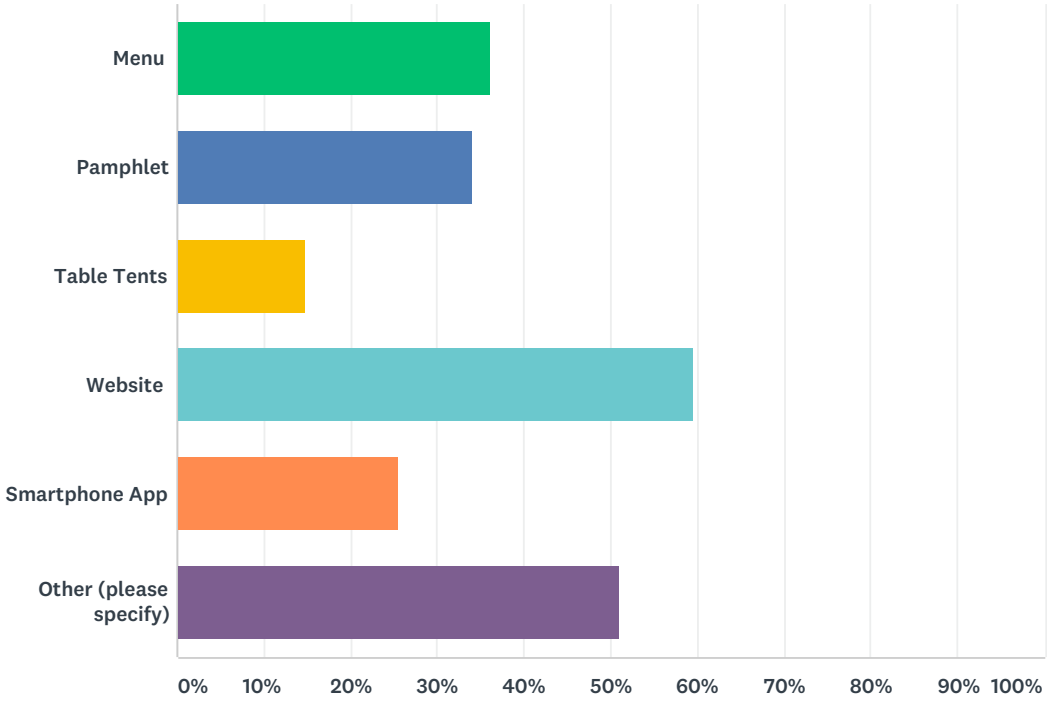
Answered: 66 Skipped: 6



ANSWER CHOICES	RESPONSES	
Yes	77.27%	51
No	22.73%	15
Both written and verbal	0.00%	0
TOTAL		66

Q3 Where do you use written communication to provide food allergen information to your customers. (List all below)

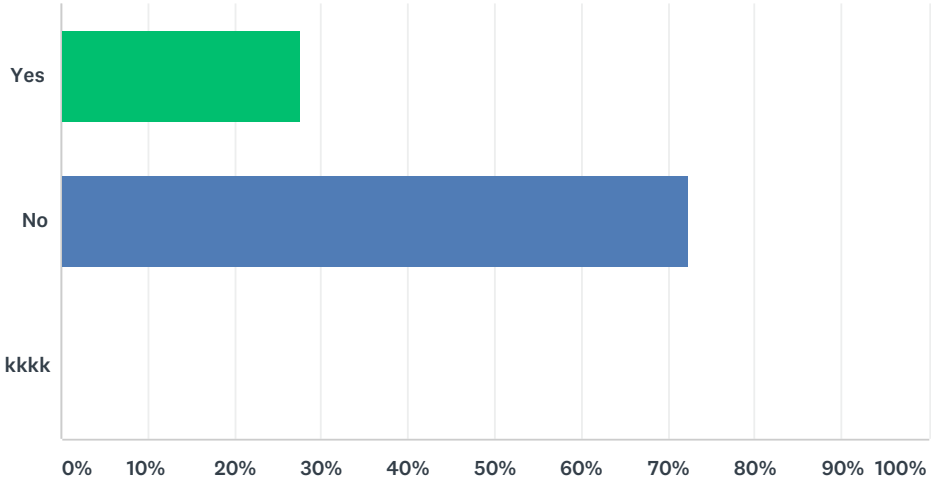
Answered: 47 Skipped: 25



ANSWER CHOICES	RESPONSES	
Menu	36.17%	17
Pamphlet	34.04%	16
Table Tents	14.89%	7
Website	59.57%	28
Smartphone App	25.53%	12
Other (please specify)	51.06%	24
Total Respondents: 47		

Q4 Do you utilize symbols for the various allergens?

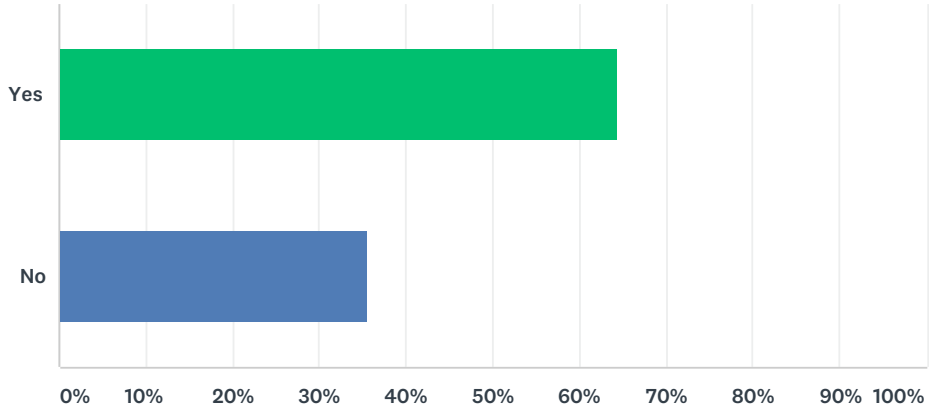
Answered: 47 Skipped: 25



ANSWER CHOICES	RESPONSES	
Yes	27.66%	13
No	72.34%	34
kkkk	0.00%	0
TOTAL		47

Q5 Do you provide verbal information regarding allergens to your customers?

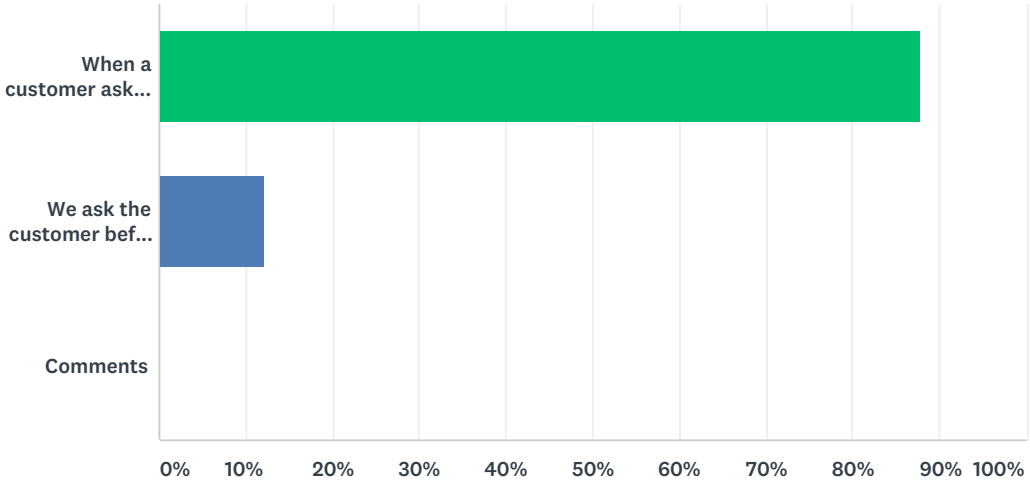
Answered: 59 Skipped: 13



ANSWER CHOICES	RESPONSES	
Yes	64.41%	38
No	35.59%	21
TOTAL		59

Q6 In which of the following situations do you verbally share food allergen information?

Answered: 33 Skipped: 39



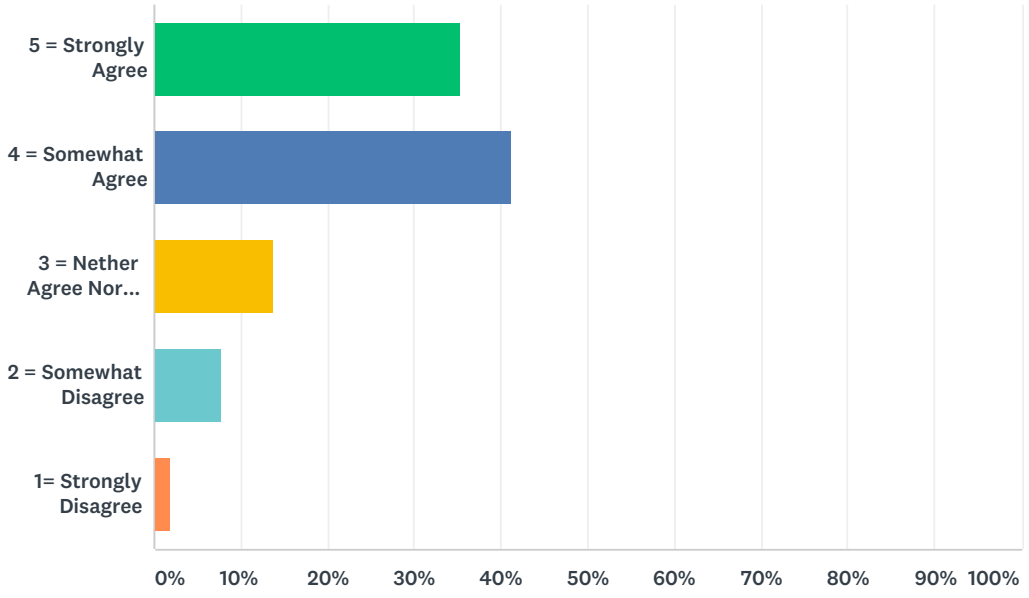
ANSWER CHOICES	RESPONSES	
When a customer asks about allergens	87.88%	29
We ask the customer before they order if they have a food allergy and need more information	12.12%	4
Comments	0.00%	0
TOTAL		33

Q7 What types of challenges do you encounter with food allergen notification?

Answered: 47 Skipped: 25

Q8 How much do you agree or disagree that a standard method for allergen notification should be utilized by establishments that use prepared food (that's not pre-packaged)?

Answered: 51 Skipped: 21



ANSWER CHOICES	RESPONSES	
5 = Strongly Agree	35.29%	18
4 = Somewhat Agree	41.18%	21
3 = Nether Agree Nor Disagree	13.73%	7
2 = Somewhat Disagree	7.84%	4
1= Strongly Disagree	1.96%	1
TOTAL		51

Q9 Please let us know why you selected your response

Answered: 51 Skipped: 21

Restaurant servers' risk perceptions and risk communication-related behaviors when serving customers with food allergies in the U.S.

Han Wen[a,*], Junehee Kwon[b]

[a] University of North Texas, Denton, TX, USA [b] Kansas State University, Manhattan, KS, USA

a r t i c l e i n f o

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a b s t r a c t

Communication between and among customers with food allergies and foodservice staff has become a concern in the restaurant industry. The purpose of this research was to explore the perceived risks and risk communication-related behaviors of restaurant servers when serving customers with food allergies in the U.S. An online survey instrument was developed based on interviews with full service restaurant managers, pilot-tested, and distributed through an online survey research firm. The results indicated that most servers lacked knowledge about food allergies and perceived that initiating communication and preventing allergic reactions were mostly the responsibilities of customers with food allergies. Servers' risk reduction and communication behaviors were affected by their perceived severity of food allergy reactions, previous training, sources of media exposure, and the perceived responsibilities of preventing food allergy reactions. Restaurateurs and foodservice educators may use these findings to develop training and strategies for food allergy risk communication in the restaurant industry.

1. Introduction

A food allergy is "an adverse health effect arising from a specific immune response that occurs reproducibly on exposure to a given food" (Boyce et al., 2010, p. S8). Food allergy reactions range from mild to severe and usually appear within the first two hours after the ingestion of allergens (Chafen et al., 2010). Anaphylaxis, one of the most severe food allergy responses, can result in circulatory collapse, coma, and even death (Mandell et al., 2005).

Food allergies are prevalent in the United States (U.S.), affect- ing about 9 million adults (4% of the U.S. adult population) and 6 million children (8% of the U.S. children ≤18 years) (Branum and Lukacs, 2008; De Blok et al., 2007; Food Allergy Research and Education, 2016). The Centers for Disease Control and Prevention (CDC) estimates an increased number of anaphylaxis caused by food allergies (Centers for Disease Control and Prevention, 2011). Food allergy reactions account for nearly 200,000 emergency room visits, approximately one every three minutes (Clark et al., 2011) and 150–200 deaths each year (Sampson, 2003). Eggs, fish, milk, peanuts, soy, shellfish, tree nuts, and wheat are the "Big 8" food allergens, which have triggered more than 90% of the food allergy reactions in the U.S. (Sicherer et al., 2010). For the food manufactur- ing industry, the Food Allergen Labeling and Consumer Protection Act (FALCPA) of 2004 requires any ingredients or proteins derived from the "Big 8" food allergens to be disclosed on all food labels that are regulated by the U.S. Food and Drug Administration (FDA). However, for the restaurant industry, the Food Code (Food and Drug Administration, 2013) is the only federal level regula- tion related to the management of food allergies in restaurants. The Food Code states that the person in charge of a foodservice establishment should have knowledge about major food aller- gens, cross-contacts, and symptoms of food allergy reactions (Food and Drug Administration, 2013). The code also mandates that all establishments "ensure that employees are properly trained in food safety, including food allergy awareness as it relates to their assigned duties" (Food and Drug Administration, 2013, p. 31). These statements in the Food Code, however, lack practical guidelines for operations to follow in order to prevent food allergy reactions. Furthermore, food allergy legislation at the state level is limited only to Massachusetts, Michigan, Rhode Island, and Virginia, where legislation for the management of food allergies in restaurants are established (Food Allergy Research and Education, 2016).

About 33% of all the fatal food allergy reactions (n = 31) that occurred in the U.S. between 2001 and 2006 were triggered by foods prepared away from home (Bock et al., 2001, 2007; Wanich et al., 2008). The existence of hidden allergens and cross-contacts from food allergens were the most recognized causes of food allergy reactions in restaurants, followed by miscommunication between and among restaurant staff and customers with food aller- gies (Furlong et al., 2001; Kwon and Lee, 2012; Leftwich et al., 2011). Communication researchers have found that risk commu- nication plays an important role in controlling and preventing negative consequences (McComas, 2006; Parrott, 2004) such as food allergy reactions in restaurants. Establishing proper communi- cation between and among customers and foodservice employees may be one of the first and most important steps in preventing food allergy reactions in restaurants (Leftwich et al., 2011). Proper com- munication among stakeholders would initiate increased attention to food preparation and service staff when serving customers with food allergies. Although there are other food allergy-related pub- lications available, no research has been published regarding food allergy risk communication.

Therefore, the purpose of this study was to explore the perceived risks and risk reduction and communication-related behaviors of restaurant service staff when serving customers with food allergies in the U.S. The specific objectives were to examine the per- ceived risks of restaurant

* Corresponding author at: 1155 Union Circle # 311100, Denton, TX 76203-5017, USA. E-mail addresses: han.wen@unt.edu (H. Wen), jkwon@ksu.edu (J. Kwon).

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staff when serving consumers with food allergies, explore factors affecting restaurant service staff's risk reduction and communication-related behaviors, and provide rec- ommendations for the restaurant industry regarding food allergy risk communication strategies and training needs.

2. Literature review

2.1. Food allergies and the restaurant industry

Considering the fact that the population with food allergies is increasing in the U.S., it is important for restaurant staff to be fully informed about food allergies and ways to prevent allergic reac- tions (Mandabach et al., 2005). The benefits of accommodating consumers with food allergies include increased sales, customer appreciation, and customer loyalty (Kwon et al., 2013; Tsai, 2013). However, serving consumers with food allergies also poses chal- lenges given the variety of food allergens present at restaurants (Abbot et al., 2007; Ahuja and Sicherer, 2007; Kronenberg, 2012).

Researchers found that restaurant staff lacked knowledge regarding food allergens in the menu, ways to prevent cross- contact, and the severity of food allergy reactions (Abbot et al., 2007). One study from the United Kingdom revealed that about 21% of the peanut-free meals that were prepared right after peanut- containing meals were contaminated with peanut or peanut protein (Leith et al., 2005). Researchers also found that restaurant employees' confidence levels were high even though their knowl- edge about serving customers with food allergies was not adequate (Ahuja and Sicherer, 2007). Specifically, 70% of the respondents in this study felt that they could guarantee a safe meal, while 35% thought that fryer heat could destroy allergens and 25% thought it was safe to remove allergens from a finished meal (Ahuja and Sicherer, 2007).

Researchers have revealed that most foodservice employees did not receive food allergy training (Ahuja and Sicherer, 2007; Choi and Rajagopal, 2013; Mandabach et al., 2005). If servers lack knowl- edge and awareness about food allergies, they may not be able to respond to questions and requests from customers with food allergies (Kronenberg, 2012). In addition, servers may incorrectly assume that an item is allergen-free if they are not aware of the hid- den ingredients (Mandabach et al., 2005). The high cost of training, high labor turnover rate, time constraints, language barriers, the lack of interest in implementing food allergy training, and the lack of commitment from employees were identified as reasons why such training was not provided to restaurant employees (Abbot et al., 2007; Lee and Xu, 2014; Mandabach et al., 2005).

2.2. Dining experiences of customers with food allergies

Strict avoidance of food allergens and early recognition and response to allergic reactions are extremely important for indi- viduals with food allergies to prevent fatal food allergy reactions (Food Allergy Research and Education, 2016; Sicherer and Teuber, 2004). To prevent potential food allergy reactions, customers with food allergies have used various strategies prior to and while dining out (Kwon and Lee, 2012; Kwon et al., 2013). For example, cus- tomers chose restaurants with which they were familiar and where they were known by the staff; avoided establishments and cuisines that are considered high-risk such as buffets or ethnic restaurants; and checked online menus, ingredients, and allergen information before dining out (Kwon et al., 2013; Leftwich et al., 2011).

Despite these prevention strategies, customers with food aller- gies have experienced communication challenges when dining out because some restaurant staff did not seem to have knowledge about food allergies, did not understand special requests, and were not aware of the severity of food allergy reactions (Kwon and Lee, 2012; Kwon et al., 2013). Because many customers with food aller- gies or parents of children with food allergies have perceived a lack of control in food preparation and service processes, they have felt anxiety or fear when dining in restaurants, especially when going to a restaurant for the first time (Kwon et al. 2013; Leftwich et al., 2011). Such anxiety and fear may also be due to a significant number of customers with food allergies experiencing allergic reac- tions after eating in restaurants (Bock et al., 2001, 2007; Wanich et al., 2008). In many of these food allergy reaction cases, cus- tomers believed that the food they ordered was safe (Sampson et al., 1992) and failed to notify restaurant staff about their food allergies (Mandabach et al., 2005).

Further, even though some restaurant operators or managers provide food allergy training with regard to identifying food aller- gens and preventing cross-contact, few of them have provided training about the proper communication between the front- of-house and back-of-house employees or between restaurant employees and customers (Lee and Xu, 2014). Considering one of the major causes of food allergy reactions is the lack of proper communication between and among restaurant employees and customers with food allergies (Furlong et al., 2001; Kwon and Lee, 2012; Leftwich et al., 2011), there is a strong need for researchers to address this risk and promote interpersonal communication among restaurant staff and customers.

2.3. Food allergy risk perception and risk communication

Risk perception, which refers to an individual's views regarding the risk involved in a particular situation (Schroeder et al., 2007), is a special concern in the food safety context. Food allergies pose one of the food safety risks that has been widely discussed lately through- out food and foodservice industries, as well as related consumer advocacy groups. As for the risk of food allergies in foodservice establishments, scholars contended that zero risk is not realistic or attainable (Kroes et al., 2000; Madsen et al., 2012). Risk per- ception, as part of the health behavior theories, includes different dimensions or determinants, such as perceived susceptibility and perceived severity (Brewer et al., 2007; Janmaimool and Watanabe, 2014). Perceived susceptibility refers to an individual's subjective perception of the risk of contracting a hazard (Janz and Becker, 1984). Perceived severity refers to an individual's feelings regard- ing the seriousness of contracting a hazard and reflects the extent of the harm a hazard would cause (Brewer et al., 2007; Janz and Becker, 1984). Risk perceptions can also be influenced by different

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Comparing the eating out experiences of consumers seeking to avoid different food allergens

Julie Barnett[1], Fiona M. Begen[1*], M. Hazel Gowland[2] and Jane S. Lucas[3]

Abstract

Background: Eating outside the home is challenging for consumers with food allergy (FA) and intolerance (FI) and lack of allergen information provision in eating out venues can lead to unnecessary restrictions. Following European legislation (2014) designed to improve allergen information provision, little is known about differences in information provision experienced by consumers seeking to avoid particular allergens, or how this impacts on their eating out experiences. This study compared the information provision that consumers with FA/FI to different allergens experience when eating out.

Methods: Using mixed methods, participants were recruited from across the UK and took part in self-report surveys or in-depth interviews. Surveys were completed by 232 participants avoiding either gluten ($n = 66$), nuts (peanuts/tree nuts) ($n = 94$), or milk ($n = 74$), and responses were subject to quantitative analyses. Interviews were carried out with 49 participants avoiding either gluten ($n = 13$), nuts ($n = 14$), milk ($n = 13$) or a combination of these allergens ($n = 9$), and analysed using the framework approach.

Results: Although general improvements in information provision following the legislation were reported, variations in provision between allergen groups led participants seeking to avoid milk to conclude that their dietary needs were less well-understood and seen as less important. These perceptions were reflected in a reluctance to involve eating out venue staff in deliberations about the potential for milk-free meal options.

Conclusions: The provision of visual indicators of the presence of milk and of staff trained in allergen-awareness would improve the eating out experiences of consumers seeking to avoid milk. Medical professions can play a key role in encouraging these patients to pursue their right to make enquiries about allergens in order to avoid accidental milk ingestion when eating out.

Keywords: Food allergy, Food intolerance, Allergen avoidance, Eating out, Information provision, Gluten, Peanuts / tree nuts, Milk

Background

Allergen avoidance is a key management strategy for food allergic (FA) and food intolerant (FI) individuals, and eating outside the home represents a particular risk of accidental allergen ingestion [1] where the provision of information regarding ingredients and food preparation is inadequate or insufficient [2]. Food allergies are caused by an abnormal immunological response to a food, whereas food intolerances have a non-immunological basis [3, 4]. As a general rule, allergic reactions occur very rapidly after ingestion and sometimes lead to immediately life threatening symptoms [5], whilst food intolerances have a delayed reaction and extremely rarely have life threatening symptoms although, like FA, they too can result in significant ill health and impaired quality of life [6]. Between 21 and 31% of accidental allergen ingestions occur when eating in restaurants, and 13–23% occur in other eating out settings such as the work-place or school canteens [7]. In cases of children suffering anaphylaxis to a known food allergen, over half of these occurred outside the home [8].

* Correspondence: fiona.m.begen@bath.edu
[1]Department of Psychology, University of Bath, Claverton Down, Bath BA2 7AY, UK
Full list of author information is available at the end of the article

EU legislation (EU Food Information for Consumer Regulation No. 1169/2011, (EU FIC)) introduced in December 2014 [9], requires food businesses providing and selling non-prepacked foods to provide allergen information relating to the inclusion of any of 14 specified food allergens (peanuts, tree nuts, milk, soya, mustard, lupin, eggs, fish, molluscs, crustaceans, cereals containing gluten, sesame seeds, celery, and sulphur dioxide at levels above 10 mg/kg, or 10 mg/litre) as ingredients in their foods. The legislation thus affects restaurants, takeaway establishments, food stalls, institutions including prisons and nursing homes, as well as workplace and school canteens. Allergen information can be provided in written or verbal form. Where verbal information is provided, written information must also be available to customers within the venue. Thus far however, there has been little consideration of how people's eating out experiences - including the provision of allergen information – varies in relation to different allergens.

Given that adverse reactions can occur in response to any of these allergens, differences in the quality of information provided about them is important. Little work has considered the differential impact of seeking to avoid particular allergens or how experiences of seeking to avoid particular allergens vary. Although adherence to an allergen-free diet has been associated with poorer quality of life, and significant social and behavioural restrictions [10–14], literature tends to generalise across populations avoiding allergens [11, 15] or focus on one specific allergen grouping; most commonly avoidance of peanuts and/or tree nuts [16–18], or gluten in coeliac populations [19, 20]. Where studies have focused on the difficulties encountered by populations seeking to avoid 'staple food' allergens (milk, wheat, eggs) [21–23], no distinction has been made between allergens in order to assess any differences experienced between these groups. Where differences between allergen avoidance groups have been considered in parents of FA children, there was greater psychosocial impact on parents seeking to avoid milk or eggs on behalf of their child than for parents seeking to avoid other food allergens [24, 25].

As yet, the eating out experiences of populations seeking to avoid particular allergens has not been considered. In light of the EU FIC legislation, eating out venues are required to provide information about the content of each of the 14 allergens in their foods, and attention has recently turned to the adequacy of this information provision for each allergen. For example, online resources such as 'Guide to eating out with a food allergy' [26], show how well some eating out venues cater for customers avoiding a particular allergen by reporting the availability of allergen-free meals for each of the 14 allergens.

Evaluating the impact of the EU FIC legislation provided the opportunity to compare the information provision that customers with FA/FI experience in relation to different allergens when eating out. In order to investigate this, in a mixed methods study we conducted semi-structured interviews and self-report surveys with customers who avoided particular allergens (gluten, nuts: peanuts/tree nuts, or milk) following implementation of the legislation. We assessed differences between these groups based on their satisfaction with allergen information provision, and their preferences for written and verbal forms of information delivery.

Methods

Overview

As part of wider programme of longitudinal research into the eating out experiences of adults and parents/carers of children with FA/FI [27] prior to (2014) and following (2016) implementation of EU FIC legislation [28], we recruited participants from across the UK to take part in either (A) In-depth interviews in 2014 and 2016, or (B) Surveys in 2014 and/or 2016. Ethical approval was gained from the institution's departmental ethics committee prior to recruitment (Ref: 14–055/16–146). The current paper reports findings relating to participants who reported avoiding gluten, nuts (peanuts and/or tree nuts) or milk in 2016 interviews or surveys. Interview findings from 2014 are reported elsewhere [2].

Online survey

Recruitment and study population

Survey participants were recruited from across the UK by a professional market research agency: Acumen Fieldwork-Medical (66%) and using the websites and mailing lists of three UK-based charities: Allergy UK (28%), Anaphylaxis Campaign (3%), Coeliac UK (3%). Between November and December 2016, 392 participants completed the survey. Of these, 188 (48%) had been recruited to complete a prior version of the survey in 2014 and returned to complete the 2016 survey, and 204 (52%) were recruited as new participants to complete the 2016 survey. Of the total 2016 survey population, 232 (59%) participants were included in analyses because they avoided either gluten, nuts or milk when eating out.

Online survey

Participants completed a screening questionnaire to ensure that they met the minimum requirements for inclusion in the study. The inclusion criteria were that participants aged over 18, or their child in the case of parents/caregivers: a) experienced reactions to one or more of the 14 allergens covered by the EU FIC legislation; b) ate out at, or ordered takeaway food from a restaurant, café, coffee shop, fast food outlet, or any other place where they can buy non-prepacked food; c) sought to avoid one or more of the 14 allergens covered by the

EU FIC legislation when eating out or ordering takeaway food; d) experienced one or more symptoms typically associated with IgE-mediated food allergy or non-IgE-mediated reactions (classified as food intolerance in this study). Survey results for participants seeking to avoid nuts (tree nuts and peanuts), gluten or milk are reported. Classification criteria are shown in Table 1.

Survey content

We designed an online survey relating to attitudes and behaviours when eating out specifically for the study. Survey design was informed by a literature review, discussions with support groups and interviews conducted in 2014, prior to EU FIC legislation [2]. Interviews were coded and analysed using the framework approach. Themes derived from these interviews were used as the basis for survey items, which were worded and sense-checked by the research team before being piloted with a small sample ($n = 20$) of participants. Survey subscales included: 'Reliance on speaking to staff'; 'Satisfaction with written information'; 'Staff as an additional information source'; 'Preference for separate allergen menu'; and two single items-'Menu invites you to ask staff' and 'Sign invites you to ask staff'. All 2014 survey items were retained in the 2016 survey. Full details of subscale items and item reversals are shown in Table 2.

Procedure

Following provision of informed consent, participants meeting the inclusion criteria were routed to the survey for completion.

Data analyses

Statistical analyses were carried out using IBM SPSS Statistics (v22). Data was screened to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. The extent of missing data (less than 2%) and non-response patterns were assessed to see if missing items would impact on analyses (Little's MCAR test ($p > .05$)). Missing values for items within subscales were imputed using expectation-maximization (EM) [29] and subscale reliabilities were calculated. Differences between allergen groups (gluten, nuts or milk) were analysed using mixed ANOVAs including 'Adult/Parent', 'food allergy/intolerance' as independent variables (IVs), and the four eating out subscales and two single-item questions as outcome variables. Post hoc analyses was carried out using Bonferroni procedure. A post hoc cut-off of $p \leq .05$ was used, although post hoc tests approaching significance ($p=.051 - p=.056$) are also reported.

In-depth interviews

Recruitment and population

Full details of 2014 interview recruitment procedure, populations and results are reported elsewhere [2]. Of the 57 participants who completed interviews between June and July 2016, all had been recruited through a professional research agency (as above) and had completed previous interviews in 2014. Of the total interview population in 2016, 49 (86%) participants were included in analyses because they avoided gluten, nuts and/or milk when eating out.

Procedure

In-depth semi-structured interviews were carried out in participants' homes following an interview protocol detailing questions and possible prompts (a copy of this interview protocol can be provided on request from the corresponding author). Each interview was audio-recorded with participants' permission. Initial questions related to any changes that had occurred in returning participants' lives; and in relation to their food allergy in particular. The interview then focused on participants' recent eating out experiences and any changes in these, including their encounters with information about food allergens. They were asked for their reflections and evaluations of these changes, and about the impact of the legislation on allergen information provision in relation to their eating out experiences. Interviews lasted between 27 and 76 min.

Analyses

Interview recordings were transcribed verbatim and explored in detail using framework analysis [30]. Interviews

Table 1 Allergy or intolerance classification criteria and allergy severity classification criteria

Classification	Symptoms	Severity
ALLERGY: Symptoms associated with IgE-mediated reactions	'Stinging nettle' rash, urticaria, hives, Itching or swelling of the lips, tongue or mouth, asthma, wheezing, facial swelling (does not experience 'severe' symptoms)	MILD/MODERATE *(Does not include 'severe' symptoms)*
	Breathing difficulties, anaphylaxis, collapse *(May additionally include symptoms associated with non-IgE-mediated reactions)*	SEVERE *(May additionally include 'mild/moderate' symptoms)*
INTOLERANCE: Symptoms associated with non-IgE-mediated reactions	Vomiting, Diarrhoea, Sneezing, Catarrh, Hyperactivity, Tiredness, Stomach cramps, Other digestive problems (e.g. bloating, constipation), Eczema flare, Migraines/headaches, Aching joints/muscles, Behavioural/mood changes *(Does not include symptoms associated with IgE-mediated reactions)*	

Table 2 Details of survey subscales

Survey subscale	Survey item[a] (R) = Reverse scored	Response scale	Cronbach's alpha
Reliance on speaking to staff	- I am happy to ask serving staff about allergens in the food they are serving - I ask to speak to the manager if I want more information about allergens in the dishes - I ask to speak to the chef if I want more information about the meal being cooked for me - I don't like asking staff questions about allergens (R) - I feel awkward and embarrassed to ask staff questions about the food they are serving (R)	0 ➔ 6 Never ➔ Always	.685
Satisfaction with written information	- Menu information online (R) - The menu displayed outside the place (R) - The menu displayed at the counter (R) - The menu at the Table (R) - Phone apps (R) - Information folder about ingredients of foods being served (R)	1 ➔ 5 Very satisfied ➔ Very dissatisfied	.827
Staff as an additional information source	- Even if there was information about allergens on the menu I would like to ask a member of staff about the dish (R) - No matter how good the written information is I would prefer to talk to staff (R)	1 ➔ 5 Strongly agree ➔ Strongly disagree	.834
Preference for a separate allergen menu	- I would like to see separate menus for people with particular food intolerance or allergies. (R) - I want to know from the menu how the food is cooked not just what is in it (R) - It is reasonable to expect that there are separate menus to help people avoid particular allergens (R)	1 ➔ 5 Strongly agree ➔ Strongly disagree	.730
Menu invites you to ask staff about allergens	- I like it when it says in the menu that they welcome customers with allergies and intolerances asking about dishes (R)	1 ➔ 5 Strongly agree ➔ Strongly disagree	Single item
Sign invites you to ask staff about allergens	- I like it when there is a sign up that says that they welcome customers with allergies and intolerances asking about dishes (R)	1 ➔ 5 Strongly agree ➔ Strongly disagree	Single item

[a]Survey items were not subject to factor analysis

were coded and analysed using QSR-NVivo (version 10). Identified themes are illustrated in results. In order to maintain anonymity, participant details are indicated in brackets as follows: A/P refers to Adult/Parent; participant number; and reported food allergens. Italicised text within quotes reflects interviewer prompts.

Results

Online survey

Characteristics of survey participants are shown in Table 3 (further demographic details are shown in Additional file 1). Of the 392 participants who completed surveys, 232 (59%) avoided one of the target food allergens, either: gluten, nuts or milk. Participants who avoided more than one target food allergen (n = 121, 31%) and those who avoided an allergen other than gluten, nuts or milk (n = 39, 10%) were excluded from analyses.

Summarised in Table 4, the survey revealed significant differences in participants' perceptions of information provision depending on whether they wished to avoid gluten, nuts or milk when eating out. Unless otherwise stated, there were no interactions between 'allergen avoided' and other IVs ('Food allergy/Food intolerance' or 'Adult/Parent') (all ps > .05).

Reliance on speaking to staff

There was a significant main effect of 'allergen' (gluten/nuts/milk) on participants' reliance on speaking to staff (p < .05). Participants avoiding nuts reported a greater reliance on speaking to staff than those avoiding gluten (p = .019), and those avoiding milk (p = .003).

Satisfaction with written information

There was a significant main effect of 'allergen' (gluten/nuts/milk) on participants' satisfaction with written information (p < .05). Post hoc analysis approached significance (p = .053) suggesting that those who avoided nuts were more satisfied that written information could aid confident food choices than those avoiding gluten.

Staff as an additional information source

There was a significant main effect of 'allergen' (gluten/nuts/milk) on participants' preference for staff as an additional information source (p < .05). Participants avoiding

Table 3 Characteristics of survey population based on allergen avoided

Variable	Gluten (*n* = 66) n (%) or M (SD)	Nuts (*n* = 94) n (%) or M (SD)	Milk (*n* = 72) n (%) or M (SD)
Adult	56 (84.8)	40 (42.6)	39 (54.2)
Parent	10 (15.2)	54 (57.4)	33 (45.8)
Gender			
Adult/Parent			
Male	13 (19.7)	12 (12.8)	9 (12.5)
Female	53 (80.3)	81 (86.2)	61 (84.7)
Child[a]			
Male	4 (40.0)	32 (59.3)	19 (57.6)
Female	6 (60.0)	21 (38.9)	14 (42.4)
Age (yrs)			
Adult/Parent	41.2 (11.9)	39.6 (9.7)	37.6 (10.5)
Child	8.5 (3.8)	10.6 (4.2)	5.1 (3.8)
Food allergic	8 (12.1)	86 (91.5)	27 (37.5)
Food intolerant	58 (87.9)	8 (8.5)	45 (62.5)
Diagnosis			
Clinical diagnosis *(by GP; Dietician or Allergy specialist at hospital)*	47 (71.2)	84 (89.4)	44 (61.1)
Self diagnosis	19 (28.8)	10 (10.6)	28 (38.9)
Severity of reaction (FA only)[b]			
Mild/Moderate	5 (62.5)	28 (32.6)	23 (85.2)
Severe	3 (37.5)	58 (67.4)	4 (14.8)
Time since diagnosis (yrs)			
< 2	12 (18.2)	3 (3.2)	14 (19.2)
2–4	20 (30.3)	23 (24.5)	24 (33.3)
5–9	18 (27.3)	24 (25.5)	22 (30.6)
≥ 10	16 (24.2)	43 (45.7)	11 (15.3)
Treatment			
Avoidance	66 (100)	94 (100)	72 (100)
Antihistamines	4 (6.4)	67 (71.3)	15 (20.8)
Injectable adrenaline	1 (1.5)	66 (70.2)	2 (2.8)
Inhaler	1 (1.5)	33 (35.1)	10 (13.9)
Special diet	32 (48.5)	9 (9.6)	25 (34.7)
Support group membership	27 (40.9)	36 (38.3)	7 (9.7)

[a]Child % calculation based on total parent participants per allergen group
[b]Severity % calculation based on total FA participants per allergen group
Where % total < 100, there are missing values. Where % total > 100, participants could select multiple responses

nuts (p = .009) and those avoiding gluten (p = .001) both preferred staff as an additional source of information in comparison to those avoiding milk.

Preference for separate allergen menu

There was a significant main effect of 'allergen' (gluten/nuts/milk) on participants' preference for a separate allergen menu (p < .01). Participants avoiding nuts (p = .007) and those avoiding gluten (p = .001) had greater preference for a separate allergen menu as a potential source of information than those avoiding milk.

Menu invites you to ask staff

There was a significant main effect of 'allergen' (gluten/nuts/milk) on participants' perceptions of a statement on the menu inviting customers to ask staff about dishes (p < .05). Participants avoiding nuts were more positive

Table 4 Differences in perceptions of information provision for participants avoiding Gluten, Nuts and Milk following legislation[a]

Survey subscale	Gluten	Nuts	Milk				
		Mean (SD)		df	F	η_p^2	p
Reliance on speaking to staff	3.26 (1.25)	3.79 (1.27)	3.15 (1.22)	2, 220	4.20	.037	.016
Satisfaction with written information	3.30 (0.91)	3.59 (0.73)	3.41 (0.73)	2, 220	3.13	.028	.046
Staff as an additional information source	3.48 (1.29)	4.00 (1.02)	3.10 (1.23)	2, 220	4.13	.036	.017
Preference for separate allergen menu	4.11 (0.87)	3.93 (0.97)	3.49 (0.99)	2, 219	5.15	.045	.007
Menu invites you to ask staff about allergens	4.55 (0.79)	4.67 (0.67)	4.33 (0.87)	2, 218	3.53	.031	.031
Sign invites you to ask staff about allergens	4.59 (0.78)	4.60 (0.81)	4.29 (0.94)	2, 217	3.83	.034	.023

[a]Higher mean score indicates greater levels of agreement

about the menu inviting customers to ask about dishes than those avoiding milk (p = .016).

Sign invites you to ask staff

There was a significant main effect of 'allergen' (gluten/nuts/milk) on participants' perceptions of a sign inviting customers to ask staff about dishes ($p < .05$). Post hoc analysis approached significance (p = .056) suggesting that those avoiding nuts were more positive about the sign inviting customers to ask about dishes than those avoiding milk.

In-depth interviews

Characteristics of interview participants are shown in Table 5. Of the 57 participants who completed interviews in 2016, 49 (86%) avoided gluten, nuts and/or milk. Participants who avoided an allergen other than gluten, nuts or milk (n = 8, 14%) were excluded from analyses.

Following implementation of the legislation, three overall themes were described by participants in relation to their observations and experiences of allergen information provision when eating out. Participant responses focused on management of their FA/FI when eating out and related to: 'disparities in allergen information provision', 'understanding the needs of customers avoiding different allergens', and 'customer demand for information about specific allergens'.

Disparities in allergen information provision

Following implementation EU FIC, the majority of participants had observed general improvements in the provision of allergen information when eating out; though they noted that these improvements were largely focused on the provision of information for customers seeking to avoid nuts or gluten. For many participants, a disparity in allergen-specific information was observed, regardless of the allergen that they themselves sought to avoid (Table 6: quote 1).

For participants seeking to avoid gluten, the separate 'gluten-free' menu was seen as a gold standard which was becoming increasingly available. In the absence of this provision, the use of a symbol or letter displayed beside each dish on the main menu served as a simple and trusted indicator which facilitated food choices (Table 6: quote 2). Similarly, for participants seeking to avoid nuts, the display of a symbol or letter 'N' beside menu items had become widespread, and enabled them to make independent food choices without the need to involve staff in their decision-making process. (Table 6: quote 3).

Participants seeking to avoid milk had also observed the improvements in information provision for those avoiding nuts or gluten, but had not seen similar improvements in relation to their own dietary needs. These participants were impressed by the gluten-free provision that was now available, and wished that similar information was available for milk-free diets (Table 6: quote 4). They also noted that diets which might be deemed 'lifestyle choices' were also catered for, whilst their need for information about the milk content of foods remained largely neglected and misunderstood (Table 6: quotes 4 & 5); a scenario that they felt could be resolved with little effort on the part of eating out venues (Table 6: quote 6).

Understanding the needs of customers avoiding different allergens

Many participants seeking to avoid milk felt that their dietary needs were not well understood, and that this in turn might be leading to a lack of appropriate allergen information provision in eating out environments. Participants noted that many eating out staff failed to understand their need for avoidance of milk as a 'hidden ingredient' within many dishes. In the absence of tangible written allergen information, participants used subtle social cues to detect misunderstanding on the part of venue staff (Table 7: quote 1), and often interpreted these cues as a more generalised indicator that their needs were underestimated or undervalued (Table 7: quote 2).

For participants seeking to avoid gluten, the issue of gluten as a 'hidden ingredient' coupled with indictors of confusion exhibited by venue staff had been experienced in the past, and were now less common in light of increased staff awareness and improved information provision (Table 7: quote 3). These improvements, whilst welcomed, did not guarantee a gluten-free eating out experience however. A minority of participants expressed concern that the

Table 5 Characteristics of interview population based on allergen avoided

Variable	Gluten (*n* = 13) n (%) or M (SD)	Nuts (*n* = 14) n (%) or M (SD)	Milk (*n* = 13) n (%) or M (SD)	Multiple[a] (*n* = 9) n (%) or M (SD)
Adult	12 (92.3)	11 (78.6)	8 (61.5)	9 (100)
Parent	1 (7.7)	3 (21.4)	5 (38.5)	0
Gender				
Adult/Parent				
Male	1 (7.7)	5 (34.7)	4 (30.8)	1 (11.1)
Female	12 (92.3)	9 (64.3)	9 (69.2)	8 (88.9)
Child[a]				
Male	0	2 (66.7)	2 (40.0)	0
Female	1 (100)	1 (33.3)	3 (60.0)	0
Age (yrs)				
Adult/Parent	37.5 (18.0)	38.9 (15.2)	43.1 (10.8)	39.78 (13.3)
Child[b] < 10	0	0	1 (20.0)	0
10–14	0	2 (66.7)	0	0
> 14	1 (100)	1 (33.3)	4 (80.0)	0
Food allergic	1 (7.7)	14 (100)	2 (15.4)	5 (55.6)
Food intolerant	12 (92.3)	0	11 (84.6)	4 (44.4)
Diagnosis				
Clinical diagnosis *(by GP; Dietician or Allergy specialist at hospital)*	10 (76.9)	13 (92.9)	7 (53.8)	3
Self diagnosis	3 (23.1)	1 (7.1)	6 (46.2)	2
Severity of reaction (FA only)[c]				
Mild/Moderate	1 (100)	7 (50.0)	2 (100)	3 (60.0)
Severe	0	7 (50.0)	0	2 (40.0)
Time since diagnosis (yrs)				
< 3	0	1 (7.1)	0	0
3–7	8 (61.5)	3 (21.4)	5 (38.5)	4 (44.4)
≥ 7	5 (38.5)	10 (71.4)	8 (61.5)	1 (11.1)
Treatment				
Avoidance	13 (100)	14 (100)	13 (100)	9 (100)
Antihistamines	2 (15.4)	7 (50.0)	3 (23.1)	3 (33.3)
Injectable adrenaline	1 (7.7)	7 (50.0)	0	1 (11.1)
Inhaler	0	4 (28.6)	0	0
Special diet	8 (61.5)	2 (14.3)	5 (38.5)	1 (11.1)
Support group membership	2 (15.4)	3 (21.4)	0	2 (22.2)

[a]Two or more target allergens avoided- e.g. gluten and milk
[b]Child % calculation based on total parent participants per allergen group
[c]Severity % calculation based on total FA participants per allergen group
Where % total > 100, participants could select multiple responses. Where % total < 100, there are missing values

popularity of gluten-free diets as a 'lifestyle choice' had undermined staff perceptions of the importance of gluten avoidance for those with the medical need to remain gluten-free (Table 7: quote 4). Similarly for those seeking to avoid nuts, whilst improvements in information provision were appreciated, the risk of cross-contamination and potential for staff underestimation of that risk undermined their confidence in ensuring an nut-free eating out experience (Table 7: quote 5).

Customer demand for information about specific allergens

One participant, who worked in an eating out venue, provided insights into the relative frequency of customer

Table 6 Disparities in the provision of allergen information

1)	'I've definitely seen it [allergen information] a lot more about. It's kinda really visible in a lot of places which is alright… I think it is just a few of them [allergens]… Just nuts and gluten.' (A32, FI: Gluten)
2)	'… they have an entirely separate menu so I feel very comfortable going there… my preference is a separate gluten free menu but I realise it's probably unrealistic to expect everywhere to do that so I guess, if I'm going into a place I know doesn't have a gluten free menu it just makes things 10 times easier if they've got a little symbol… the little symbols and then a key under every dish. Just printed those symbols and then it's done, easy.' (A13, FI: Gluten)
3)	'… going out it normally says on the menu now. It will have a little 'N' next to it or something... *Is that a new thing?* It's getting better since I last saw you. Most places do it now and they do it for gluten free and things… It will say if it's got nuts in. It makes it easier for them because they're not having to answer your questions all the time. You can read the menu and say "that has got nuts in".' (A58, FA: Peanuts & tree nuts)
4)	'In my experience it's [the legislation] been ineffective for his condition and I have actually been in a restaurant with a friend that was presented with a gluten free menu for breakfast and I was so impressed that they could do that with the gluten free but [it] wasn't available for dairy- and in fact the same restaurant was able to present a different menu for [healthy weight loss] diets which I thought was amazing- that they could go to that effort but yet it wasn't available for something that seems to effect a lot of people.' (P7, FI: Milk)
5)	'… mainly vegetarian and vegan, yep, and gluten free and they were the main ones. *But not dairy?* Not dairy, nothing. I haven't come across a single place that talks about dairy free. But I think it's because it's not very well understood.' (A51, FI: Milk)
6)	'On the menu where you see the 'V' or the 'G' and all that business, to have a 'D' for dairy so that covers any type of dairy then at least you could say, actually for me, I would rule it all out…' (A44, FI: Milk)

enquiries about the allergens. They noted that such enquiries were infrequent; relating to the gluten and nuts, but not to the milk content of foods (Table 8: quote 1). Participants who sought to avoid milk speculated that their own lack of communication with staff might imply to food businesses that there was little demand for the provision of milk-related allergen information (Table 8: quote 2 & 3). Participants compared the relative impact of their milk-related symptoms with those who experience life-threatening reactions to nuts. Whilst they wished that eating out venues could appreciate the discomfort that they experienced due to accidental allergen consumption (Table 8: quote 4 & 5), they equally tended to underplay such reactions and often failed to inform the eating out venue that a problem had occurred.

Discussion

Using a mixed methods approach, this study indicates that the eating out experiences of consumers with FA/FI differ depending on the food allergen that they are seeking to avoid, and that allergen-based inequities in information provision are impacting on some consumers with FA/FI following the introduction of EU FIC legislation in December 2014. Specifically, not only do those avoiding milk have less positive experiences, but in addition they perceive that the provision made for those avoiding other allergens tends to be better. Participants seeking to avoid milk had also observed the improvements in information provision for those avoiding nuts or gluten, but had not seen similar improvements in relation to their own dietary needs. They noted that many staff in eating out venues failed to understand their need for avoidance of milk as a 'hidden ingredient' within many dishes.

In general, survey participants reported being moderately satisfied with the availability and adequacy of allergen information provision when eating out, and interview participants suggested that this provision was an improvement on the allergen information made available prior to EU

Table 7 Understanding the needs of customers avoiding different allergen

1)	'… there's so many different things it [milk] could be in so that's why I think people who work in restaurants and cafes they just sort of panic and don't fully understand… they just assume dairy for me is cheese or butter or it's got cream on it. Well no, it's not the cream I'm talking about, I'm talking about the content in the scone for example or in the cake.' (A44, FA: Milk)
2)	'I just feel that actually some people don't feel like it's actually worthy of a restaurant going out of your way for it. I still don't feel comfortable, I still don't think [milk allergy/intolerance is] an acceptable thing to legitimately have. *You think there's a stigma attached?* Yeah, I still think people have.' (A51, FI: Milk)
3)	'When I used to say coeliac or gluten free they would look at you a bit… now I think staff are more totally up on it. So I think in the majority of places they are told about it, I mean obviously there is nut allergies and things, but nut allergy is quite obvious, it's nuts. When you say gluten they think "well" you know "what's that in?"… unless you've come across it, I would have been the same. But I have found it much better.' (A57, FI: Gluten)
4)	'… things have changed and got better yet I've still had reactions- and of course with the growing increase of "fad diets" there is always the risk that you're not taken seriously and you know, yeah great, "gluten free" is getting awareness these days but it's about whether it's the "right type", or whether people just think it's… you have to be taken quite seriously as a coeliac sufferer and I don't think we are anymore. So it's kind of swings and roundabouts.' (A13, FI: Gluten)
5)	'I think what the problem is particularly with the nuts is that there are so many things made without nuts and get cross contaminated, so they tend to see it as not as problematic as someone who is coeliac. I think they look at it as "oh you've got a nut allergy", yes. I think there are places that don't tend to think it's serious.' (P2, FA: Peanuts, Tree nuts)

Table 8 Customer demand for information about specific allergens

1)	'… *out of interest what are the sort of allergies and intolerances that you hear more of, most of?* Gluten, nuts and seafood. *Okay right and very often?* No, not often at all actually. Like a lot, gluten more than anything... Nuts maybe four or five times in a year, yeah not often at all. I don't know whether it's not that common, or people just don't mention it and seafood maybe once or twice a year to be fair, not often at all.' (A59, FA: Peanuts, Tree nuts)
2)	'… I think there aren't enough people who are lactose intolerant for companies to see it as viable. Or enough people to make a fuss. So I'm part of the problem I think. There aren't enough people making a fuss about it because of people not wanting to make it a big thing so companies don't have to make a big deal about it, but if everyone who had slight lactose intolerance… pushed in restaurants I think there would be a bigger appeal for it. We are part of the problem.' (A51, FI: Milk)
3)	'Well, if everywhere could do soya milk that would be excellent, or start having optional lactose or dairy free cheese as options rather than having to not have anything that's a milk product but I don't know if there's an economic imperative for shops. If there'd be enough customers who would be interested in that, there might be. There might be plenty of people who are just avoiding these things who would buy them if they knew that they could have nachos with lactose free cheddar, then they would but I suppose until they try that they don't know.' (A10, FI: Milk)
4)	'Nut allergies I think prevail a lot. I think they are aware of nut allergies… I don't think they think anything else is… it's a killer, do you know what I mean? But I'm not going to die eating a sandwich, but I can be in pain for hours and it can have a massive effect, because you can't do anything.' (A34, FI: Gluten, Milk)
5)	'… it's not life threatening like if I had nut [allergy] or anything like that. So, I just know that night I'm going to suffer… I think if I was nut intolerant I would be very… but because it's not life threatening I think I tend to put up with it and think "I won't have that again".' (A45, FA: Milk)

FIC. However, satisfaction levels and perceived improvements in provision differed depending on whether participants sought to avoid gluten, nuts, or milk as ingredients in foods. Amongst survey participants, those seeking to avoid milk were less satisfied with the information provided for their specific dietary needs in comparison to participants avoiding nuts, and to a lesser degree those avoiding gluten. In particular, they were less likely to involve staff in their deliberations about the potential for allergen free meal options- either by asking staff directly about the allergen content of foods or as an additional information resource following inspection of the menu. They were also less likely to take a positive view of written statements inviting customers to 'ask staff'. Although this is in part unsurprising given that research prior to the implementation of EU FIC indicated that consumers with FA/FI were often reluctant to make enquiries of staff [2], crucially, such reluctance was similar across allergen groups at this earlier time-point. Prior to the legislation, there were no differences between gluten, nut or milk avoiding participants in relation to their satisfaction with the information provided for specific dietary needs or their likelihood to involve staff in deliberations about allergen-free meal options [27, 31] (see also Additional file 2). Therefore, findings suggest that these differences have arisen since the legislation.

Under the themes 'disparities in allergen information provision', 'understanding the needs of customers avoiding different allergens', and 'customer demand for information about specific allergens', in-depth interviews provided insights into the potential reasoning behind participant survey responses. Whilst participants seeking to avoid gluten and nuts reported improvements in written allergen information provision when eating out, those seeking to avoid milk observed no such improvements. It is likely that this post-legislative disparity between groups created feelings of inequity of provision that did not exist prior to the legislation's implementation, thus fragmenting allergen avoiding populations. This is an important consideration for eating out venues given that consumers with FA/FI tend to equate the adequacy of allergen information provision with wider judgements about the venue's 'understanding', 'allergen-awareness' and 'capacity' to accommodate specific dietary needs safely [2]. For participants seeking to avoid milk, an absence of relevant allergen information suggested a lack of understanding on the part of eating out venues and their staff. These participants were less likely to trust staff as an information source, and were potentially less likely to patronise such venues as a result. Furthermore, as noted in previous research consumers with FA/FI attempt to balance their need for allergen avoidance, with their wish to avoid being seen as 'making a fuss' and creating 'misunderstanding' [32, 33]. For those seeking to avoid milk, insufficient allergen information provision suggested that asking staff might indeed lead to misunderstanding and potential social embarrassment. They were less willing to speak to staff about their dietary requirements, and more likely to expose themselves to the risk of accidental allergen consumption as a consequence.

The perceived understanding of the needs of some consumers with FA/FI (nuts and gluten) in comparison to others (milk), led participants seeking to avoid milk to conclude that the implications of their accidental allergen consumption were taken less seriously, and their concerns seen as less legitimate than other allergen-avoiding groups. This distinction has been observed in FA and FI populations, where FI can be viewed as more 'socially problematic' than FA, due to the ambiguity of FI symptoms and diagnosis when compared to FA [34]. Some of

our participants who sought to avoid milk due to lactose intolerance perceived that there was 'stigma' attached to the condition and recognised that their own reticence in speaking to staff due to concerns about being seen as 'making a fuss' might in turn be viewed as a lack of 'demand' for milk allergen information provision on the part of eating out venues.

Equally, it is important for eating out venues to consider the implications of accidental allergen consumption for customers with severe FA to milk. Whilst FA to peanuts/tree nuts is more common, and the potential for anaphylaxis amongst this population more widely understood, cow's milk is the most common cause of anaphylaxis amongst UK children [5] and persistence of milk FA into adulthood is associated with greater risk of severe reactions [35].

Implications

This study is the first to provide insight into the perceived differences in allergen information provision for particular allergens, and most importantly, the difficulties that consumers with FA/FI report when seeking to avoid milk whilst eating outside the home.

Alongside their legal responsibilities to provide allergen information for consumers as a result of EU FIC, it is important that eating out providers understand that FA/FI customers are sensitive to inequities in allergen information provision and interpret these as a wider indicator of customer care and food safety in venues. Any such inequities are likely to be magnified for FA/FI customers who seek to avoid 'staple foods' (milk, wheat, eggs) which are ubiquitous in the western diet and more difficult to avoid as a result [21–23]. An absence of customer enquiries about particular allergens- in this case milk - should not be interpreted as a lack of demand for information about the allergen, and participants felt that venues can usefully convey their willingness and ability to accommodate these customers using simple, visible visual indicators such as letters/symbols on the menu. Increased staff allergen awareness training [36] and effective communication systems between food preparation and serving areas [2] will help to ensure that FA/FI customers feel more confident and secure in their food choices when eating out; regardless of the allergen that they are seeking to avoid. Normalising the notion that customers are able and entitled to make their allergen requirements known may be particularly helpful. For example, serving staff could take a proactive approach at the table, by enquiring as to whether customers have any specific dietary requirements [2]. They should be particularly aware that those seeking to avoid milk may be less confident in the ability of the venue to provide a meal without the presence of this allergen.

Health professionals (allergists, dieticians, general practitioners), support groups and charities have important contributions to make by educating and encouraging their FA/FI patients- and those avoiding milk in particular - to be confident in requesting and expecting the provision of allergen information when eating out, as they are entitled to do since the introduction of EU FIC. Patients can also be encouraged to use proactive techniques such as informing eating out venues in advance [15] or carrying an allergy/coeliac information card [37] in order to ameliorate their fears of embarrassment in the inherently social setting of the eating out environment.

Limitations

Participants self-reported their FA/FI status, and a minority were self-diagnosed alongside those who reported receiving a clinical diagnosis. Entry to the study was through the careful application of symptom-based FA/FI criteria although we recognise it is unlikely that classification of patients as FA or FI would accord with a medical diagnosis. However, our approach of making the distinction between populations based on the allergen that they were seeking to avoid rather than between FA and FI renders this limitation as less problematic. Our approach allowed us to highlight the common difficulties experienced by milk avoiding FA/FI participants, and these difficulties were particularly salient given that no allergen-based differences between FA and FI populations were shown in analyses. Furthermore, in the context of eating out, the distinction between FA and FI becomes less relevant because the legal requirement for venues to provide allergen information applies for all customers and is not contingent on their FA/FI status.

We also acknowledge that we took a conservative approach in survey analyses. In order to ensure that responses were attributable to each particular allergen avoided, we only included participants who avoided either gluten or nuts or milk and did not include those who reported avoiding multiple allergens. It is likely that participants who sought to avoid multiple allergens experienced greater difficulties when eating out [11]. Lastly, we recognise that we were unable to include other allergens in our analyses due to insufficient participant numbers. It is possible that populations seeking to avoid different allergens- and in particular those seeking to avoid eggs which are also a 'staple food' [21–23] - would have reported inequities in allergen information provision akin to those reported for milk allergen in this study. Possible limitations to generalisability of the survey results should be borne in mind in the light of these issues.

Conclusion

A mixed methods approach was valuable in exploring the experiences of those seeking to avoid gluten, milk and

nuts when eating out. Through the application of surveys and interviews, FA/FI participants reported that there were general improvements in allergen information provision in eating out venues following introduction of EU FIC legislation. However, inequities in the provision of allergen information for particular allergens (gluten, nuts, milk) led participants seeking to avoid milk to conclude that their dietary needs were less well-understood and seen as less important. These perceptions were reflected in a reluctance to involve eating out venue staff in deliberations about the potential for allergen free meal options, and limited the food choices of those seeking to avoid milk as a result. The provision of visible visual indicators on menus of the presence of milk and increased allergen-awareness training for staff can play a key role in increasing confidence in the eating out venues and improve the eating out experience of customers seeking to avoid milk. Medical professionals also have a key role to play in educating and encouraging their FA/FI patients to pursue their legal right to make allergen enquiries in order to avoid accidental milk allergen consumption when eating out.

Additional files

Additional file 1: Further demographic and background characteristics of survey participants, Description of data: Further demographic and background characteristics of survey participants. (DOCX 14 kb)

Additional file 2: Perceptions of information provision for participants avoiding Gluten ($n = 149$), Nuts ($n = 272$) and Milk ($n = 77$) prior to legislation, Description of data: Perceptions of information provision for participants avoiding Gluten ($n = 149$), Nuts ($n = 272$) and Milk ($n = 77$) prior to legislation. (DOCX 14 kb)

Abbreviations
FA: Food Allergy; FI: Food Intolerance

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Availability of data and materials
Interview and survey data on which the conclusions of the manuscript rely are presented in the main paper. Full interview transcripts and survey data are available from the corresponding author on reasonable request.

Authors' contributions
MHG provided advice as an allergic consumer to the project throughout. JSL provided clinical expertise as an allergist to the project throughout. MHG, JSL contributed to reviewing and commenting on early drafts of the paper. JB, MHG, JSL conceived and designed the project. FMB, JB analysed the data. JB, FMB wrote the paper. All authors read and approved the final manuscript, and agreed to be accountable for all aspects of the work.

Ethics approval and consent to participate
Ethical approval was gained from the University of Bath, Department of Psychology Ethics Committee (Ethical Approval Ref: 14–055/16–146). All participants were fully briefed about the nature of the study and their rights as participants before providing written informed consent prior to interview.

Consent for publication
Not applicable.

Competing interests
JB, FMB, MHG & JSL declare no competing interests.

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Author details
[1]Department of Psychology, University of Bath, Claverton Down, Bath BA2 7AY, UK. [2]Allergy Action, St Albans, UK. [3]Clinical & Experimental Sciences, Faculty of Medicine, University of Southampton, Southampton, UK.

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RESEARCH ARTICLE

Consumer Preferences for Written and Oral Information about Allergens When Eating Out

Fiona M. Begen[1]*, Julie Barnett[1], Ros Payne[2], Debbie Roy[1], M. Hazel Gowland[3], Jane S. Lucas[4]

1 Department of Psychology, University of Bath, Bath, United Kingdom, **2** Creative Research Ltd, Bishops Castle, United Kingdom, **3** Allergy Action, St. Albans, United Kingdom, **4** Clinical and Experimental Sciences, Faculty of Medicine, University of Southampton, Southampton, United Kingdom

* fiona.m.begen@bath.edu

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Abstract

Background

Avoiding food allergens when eating outside the home presents particular difficulties for food allergic (FA) and intolerant (FI) consumers and a lack of allergen information in restaurants and takeaways causes unnecessary restrictions. Across Europe, legislation effective from December 2014, aims to improve allergen information by requiring providers of non-prepacked foods to supply information related to allergen content within their foods.

Methods

Using in-depth interviews with 60 FA/FI adults and 15 parents/carers of FA/FI children, we aimed to identify FA/FI consumers' preferences for written and/or verbal allergen information when eating out or ordering takeaway food.

Results

A complex and dynamic set of preferences and practices for written and verbal allergen information was identified. Overwhelmingly, written information was favoured in the first instance, but credible personal/verbal communication was highly valued and essential to a good eating out experience. Adequate written information facilitated implicit trust in subsequent verbal information. Where written information was limited, FA/FIs depended on social cues to assess the reliability of verbal information resources, and defaulted to tried and tested allergen avoidance strategies when these were deemed unreliable.

Conclusion

Understanding the subtle negotiations and difficulties encountered by FA/FIs when eating out can serve as a guide for legislators and food providers; by encouraging provision of clear written and verbal allergen information, and training of proactive, allergen-aware staff. This, in tandem with legal requirements for allergen information provision, paves the way for

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FA/FIs to feel more confident in eating out choices; and to experience improved eating out experiences.

Introduction

For individuals who experience food allergy (FA) and food intolerance (FI) avoidance of allergens is the key recommended strategy in preventing negative health outcomes. Accidental allergen ingestion is potentially life threatening for many FA individuals [1, 2], and can account for a substantial number of 'healthy' days lost in FA/FI populations [3]. Twenty-one to 31% of such accidental allergen ingestion occurs when eating in restaurants and 13–23% occurs in other eating out environments such as work or school canteens [4]. As a result, eating out presents a particular challenge for FA/FI individuals, and is a broader public health concern for legislators, food providers, and the wider community as a whole.

In order to improve the provision of food allergen information for FA/FI consumers when eating out, Europe wide EU legislation was introduced in December 2014. This requires providers of non-prepacked foods to supply written and verbal information related to the content of one or more of 14 specified food allergens within their foods. Within the UK, the Food Standards Agency (FSA) has provided guidance on how allergen information might be provided [5]. However, the guidance regarding the format for delivery of this information is broad and at the discretion of individual eating out providers. Little is known about the preferences for such information provision from FA/FI populations' perspectives. Understanding these perspectives prior to the legislation's introduction was vital in order to provide legislators and eating out providers with insights into FA/FI's information delivery preferences; thereby informing initial and ongoing implementation of improvements in allergen information provision for the benefit of FA/FI consumers.

We explored the allergen-related information delivery preferences of FA/FI populations when eating out or ordering takeaway foods. Results serve to inform legislators in their future recommendations for allergen information provision, and act as a guide of 'good practice' for food providers who are required to supply food allergen information for FA/FI consumers.

Background

Within Europe, FA affects up to 5% of adults and 8% of children [6], and the prevalence of FI is thought to be substantially greater [7, 8]. For FAs, accidental consumption of food allergens accounts for 32.2% of anaphylaxis-related hospital admissions [9], and eating outside the home has been implicated in 50% of deaths related to food allergen consumption [10]. Whilst morbidity and mortality rates are generally low, symptom-based figures underestimate the ongoing impact of food allergen avoidance on FA/FI individuals' well-being, and decrements in quality of life have been reported alongside significant restrictions in social and behavioural outcomes for these populations [11–14].

The implications of having to exclude one or more foods from the diet can present wide-ranging and unique challenges for FA and FI populations. FA populations describe the need for constant vigilance, with no guarantee that their efforts will be effective in ensuring successful avoidance of the offending food. This has been termed 'trying to control the uncontrollable' [15](p. 284). Both FA and FI consumers express concerns regarding the risks posed when consuming foods which they have not prepared; and eating out or ordering takeaway food in particular [16–19]. This apprehension may be justified given literature suggesting a mismatch

between restaurant staff's confidence in their knowledge of food allergens, and the knowledge actually exhibited in practice [20] [21].

EU legislation [22] introduced in December 2014 affects restaurants, takeaway shops, food stalls, institutions like prisons and nursing homes as well as workplace and school canteens. The regulations require food providers to supply customers with accurate and accessible information relating to the inclusion of any of the allergens—peanuts, tree nuts, milk, soya, mustard, lupin, eggs, fish, molluscs, crustaceans, cereals containing gluten, sesame seeds, celery, and sulphur dioxide at levels above 10mg/kg, or 10 mg/litre—in their foods. Allergen information can be provided in written or verbal form. Where verbal information is provided, there must also be written information within the venue that customers can be directed to.

Whilst the intention of the legislation is to provide FA/FI populations with clearer information regarding allergenic ingredients, little is known about how consumers prefer allergen information to be delivered when they eat out—through staff or through written sources of information—or what leads to trust or distrust in these sources. Findings from research into the labelling of pre-packed foods suggest that FA customers combine information seeking strategies by using allergen advice boxes in conjunction with ingredients lists and familiarity cues to minimise their risk of accidental allergen consumption [23]. When offered the option of an information resource in addition to packet labelling, FAs favoured a telephone advice line over an information website; perhaps suggesting that verbal information—though not face to face in this instance—has a particular role in generating trust [24]. The relationship between verbal and written information preferences becomes much more significant when eating out and consuming non-prepacked foods. Although in theory FA/FI individuals have the opportunity to discuss their dietary requirements with staff when eating out, communication difficulties are common; leading to social embarrassment, misunderstanding, and misinformation [16, 17]. This can lead FA/FIs to unduly limit their food selections, or to take unnecessary risks when eating out.

We aimed to understand the preferences and trust cues used by FA/FI individuals when eating out in order to inform the provision of allergen information resources and to outline the implications of this for legislators, food providers, and the wider community. Conducted in the 6 months immediately prior to implementation of EU FIC (1169/2011) legislation, our research is the first to assess the allergen information delivery preferences of both FA and FI populations when eating out; and in particular, their preferences for written and verbal information. This research constitutes phase 1 of the project and ongoing follow-up research will assess the impact of ongoing changes in allergen information provision on FA/FI's eating out preferences and behaviours.

Methods

Recruitment and population

Ethical approval was gained from the University of Bath, Department of Psychology Ethics Committee prior to participant recruitment (Ethical Approval Ref: 14–055). A specialist market research agency recruited 75 participants to complete in-depth interviews. Of the total population, 60 were adults reporting FA/FI, and 15 were parents/carers of children aged up to 17 years with FA/FI. Within the latter group, although the experience of parents/carers was the primary focus of the interview, their FA/FI children were sometimes present and contributed to it. In order to represent the views of consumers throughout the UK, participants were recruited from England, Wales, Scotland, and Northern Ireland. A breakdown of participant characteristics is shown in Table 1.

Table 1. Characteristics of the 75 food allergy/intolerance adult participants and children of parent/carer participants.

Variable	Allergy n = 39	Intolerance n = 36	Total (%) N = 75
Sex:			
Male	7 (17.9)	9 (25.0)	16 (21.3)
Female	32 (82.1)	27 (75.0)	59 (78.7)
Age:			
<8	2 (5.1)	2 (5.5)	4 (5.3)
8–12	3 (7.7)	0	3 (4.0)
13–17	4 (10.3)	4 (11.1)	8 (10.7)
18–30	9 (23.1)	8 (22.2)	17 (22.7)
31–45	10 (25.6)	8 (22.2)	18 (24.0)
46–60	5 (12.8)	9 (25.0)	14 (18.7)
60+	6 (15.4)	5 (13.9)	11 (14.7)
Region:			
England	15 (38.5)	17 (47.2)	32 (42.7)
N Ireland	4 (10.3)	6 (16.7)	10 (13.3)
Scotland	10 (25.6)	8 (22.2)	18 (24.0)
Wales	10 (25.6)	5 (13.9)	15 (20.0)

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Prior to interview, participants completed a screening questionnaire characterising their or (for parents) their child's reactions to one or more of the 14 specified allergens. Characteristics were based on nature of reaction, speed of onset, and how FA/FI was diagnosed. This information was used to classify participants as IgE-mediated FA; or non IgE-mediated FA/FI which was either medically or non-medically/self-diagnosed. Thirty-nine participants (52%) were classified as having IgE-mediated FA, and thirty-six (48%) were classified as non IgE-mediated FA/FI. Of the 14 allergens covered by the legislation, FA/FI to peanuts, tree nuts, milk, soya, mustard, lupin, fish, crustaceans, cereals containing gluten, sesame seeds, celery, and/or sulphur dioxide were reported. No participants reported FA/FI to lupin or molluscs.

Procedure

Following written informed consent, in-depth semi-structured interviews were carried out with participants in their own homes on the basis of an interview protocol detailing questions and possible prompts (a copy of this interview protocol can be provided on request from the corresponding author). Interviews were carried out by RP, JB, or DR, and each interview was audio-recorded with participants' permission. Initial questions engaged participants with the topic of food and experiences relating to allergy/intolerance diagnoses, adaptation, and day-to-day coping strategies. The interview then focused on participants' experiences and behaviours when eating out. Participants were encouraged to discuss strategies and environmental/social cues which influenced their decision-making processes; and to consider these preferences in relation to current and future information provision within the new legislation. Interviews lasted between 60–90 minutes.

Analyses

In order to communicate the diversity of views and perspectives surrounding participants' eating out experiences, interview recordings were transcribed verbatim and explored in detail using framework analysis [25]. Framework analysis has become popular in social, policy, and

health research because it applies a systematic approach to qualitative analysis which prioritises the transparency of the analytical process; thereby maximising accessibility and strengthening confidence in subsequent results and conclusions [26, 27]. Interviews were coded and analysed using QSR NVivo (version 10). Although participants were classified based on their, or (for parents) their child's, IgE-FA or non IgE-FA/FI status, interviews were analysed across the population as a whole. The analysis was led by FMB and refined and developed in discussion with JB.

Identified themes are illustrated in results. In order to maintain anonymity, participant details are indicated in brackets as follows: A/P refers to Adult/Parent; participant number; country of residence—E = England, S = Scotland, W = Wales and NI = Northern Ireland; and food allergens associated with FA/FI responses. Italicised text reflects interviewer prompts.

Results

Participants described written food allergen information resources in terms of day to day '*use*', the '*adequacy*' of the information, and *'preferences'* for information provision. Additional theme-based quotes are available in S1 File.

Use of written information resources

Where possible, participants preferred to rely on written information in preparation for, and during, their eating out experiences. For many, particularly in relation to unfamiliar venues, written information provided the first tangible point of contact on which to base their initial food choices. Preliminary enquiries were made using venue websites to explore food options (Box 1A); and checking recipes of potential meals on the internet (Box 1B). Before committing to dine in a venue, participants gathered information about their potential food options by inspecting menus displayed in the restaurant window (Box 1C). Within the eating out venue itself, participants emphasised the role of the menu in providing detail in relation to ingredients and preparation method (Box 1D and 1E), and additional sources of written information (Box 1F).

When written information, on menus in particular, was considered to provide adequate information about ingredients and food preparation, participants reported a sense of autonomy and control when making choices. In part, this normalised the process of their food selections by allowing participants to choose their meals without recourse to additional resources. This in turn gave them greater freedom and a sense of relaxation when eating out.

Adequacy of written resources

Participants had mixed experiences in relation to the adequacy of written information resources and provided examples of good and poor practice. It was generally perceived that venues which provided more detailed allergen information would be more accommodating and caring towards FA/FI consumers (Box 2A and 2B). For some participants, the experience of poor written resources was variously a source of frustration, annoyance and anxiety; which potentially reduced their enjoyment in the entire eating out experience and caused them to avoid certain venues or eating out as a whole (Box 2C and 2D).

Preferences regarding written information provision

Within the context of the new legislation and more generally, participants had clear, though varied ideas on how best to convey allergen information in a written /visual format. As a basic principle, the overwhelming majority of respondents believed that written information

Box 1. Use of written information.

Preparation for eating out:

1. I'll look usually online—I thank God for the internet—at what their menu is. As I said, before we went to (European restaurant), I'd decided. . .I'd looked it up online and looked at their menu and gone, right, and I know I had a penne pasta dish. . ..so I knew that one was going to be fine. (A14 G2 S: Milk)
2. If you're going in a few days, you can Google what the recipe is sort of thing, a rough guide, and you think, mm, that's okay, and then you just reiterate when you get there, right, I'm allergic to this. So, you know, it's just basically Googling things. . . (A39 G1 W: Peanuts, tree nuts, celery)
3. We look in the windows and we try and read, they'll put a sample menu or whatever, or outside and you try and read what kind of things are in there and if you can see that there is something that you think would be okay then it's worth a try. (P1 G1 E: Peanuts, tree nuts, milk)

In the venue:

1. . . .I'd look at the menu. . ... I'd sort of look at the list, oh, yeah, I like that one, and then I'd look underneath, which would tell me the ingredients, most times, with most of them, and then I'd order it. (A6 G1 E: Peanuts, tree nuts, cereals containing gluten)
2. . . .it's fine because it (the menu) normally gives me, 9 times out of 10, it will tell me what's in the food. So, if I go to a restaurant and there's a fish, it will tell me how. . .it will normally say "Cooked with a white wine sauce" or cooked with whatever. It'll say how it's served. (A23 G2 NI: Milk)
3. Well pizza (chain outlet) . . ..have the thing on the menu that says if you want to make sure of anything else in the ingredients, take a picture of this QR code, and if you take a picture of the QR code, it takes you to (chain outlet's) website and you can check yourself. (A33 G1 S: Peanuts, fish)

regarding food allergen content in meals should be readily available. Ideally, information provision requiring minimal effort on the part of the consumer, whilst avoiding the potential risk of reliance on staff as intermediaries in information provision, was desired (Box 3A). Expectations regarding the levels of complexity and detail for that information differed however. Many advocated the use of abbreviations or symbols (Box 3B and 3C), or a simple notification inviting further enquiries (Box 3D); whilst others appreciated more detailed allergen information provided as a section within the menu or as a separate and comprehensive written resource (Box 3E and 3F).

Although many participants requested a more detailed menu, it was also recognised that the inclusion of such detail might pose practical problems for menu presentation and readability; particularly in the case of comprehensive ingredient lists within main menus. A minority of participants also raised concerns about their own ability to identify and recognise the relevant allergens listed (Box 3G). Similar reservations in relation to the use of abbreviations/symbols as a more simplified form of allergen warning were also highlighted. Although this was a preferred method of information delivery for many, a small number of respondents raised

Box 2. Adequacy of written resources.

1. I think it was in (chain restaurant). . ..they've just started doing a gluten-free burger. . ..with a gluten-free bun, and they even said. . .we try our best to avoid cross-contamination. . . So, when they actually mention that, it's kind of reassuring that, oh, they actually know what they're doing. (A13 G2 W: Cereals containing gluten)
2. . . .if it's clearly labelled and I don't have to be the one getting someone to search through a file or go and ask a chef. It makes a massive difference. You just feel comfortable. (A56 G1 E: Egg)
3. Very poor. . .I think they ought to provide more information. It's like they brought out that thing with calories now. They put the calories next to the menu, the meal. It's a good idea but they should do that for allergies as well. A lot of places don't do that. (P12 G2 W: Peanuts, tree nuts, milk)
4. British restaurants and those sorts of things, they just add wheat to absolutely everything, so it's impossible. . ...Things like that really aggravate me, and you find, particularly in restaurants, like the list of ingredients, it's just not adequate. (A60 G1 E: Peanuts, tree nuts, cereals containing gluten)

questions relating to the consistent use of symbols across venues and countries, and the potential for confusion and accidental allergen ingestion that might result from the inconsistent application of symbols or abbreviated messages.

Verbal information resources

As an inherently social experience, participants reported that the seeking of verbal information relating to food allergens within dishes varied based on their familiarity with the eating out venue. In regularly attended venues, where a successful track record of eating out had been established over time, participants valued the feelings of confidence and relaxation which resulted from their previous interactions with helpful and accommodating staff. In unfamiliar venues, where no such prior relationships had been established and written information was judged to be incomplete, participants used a number of cues to assess the reliability of the allergen information provided by staff. Primarily, participants based these assessments on staff knowledge and more subtle perceptions of staff interest, engagement and attitude with regard to their dietary needs. Where staff knowledge (Box 4A and 4B) and demeanour (Box 4C and 4D) were deemed to be good, trust and confidence in the safety of their meal was raised. Equally, the opposite was the case when knowledge (Box 4E and 4F) and demeanour (Box 4G and 4H) was deemed to be poor.

Participants identified other factors which inspired trust or served as barriers to their perceptions of staff members as reliable information resources. Younger staff members were viewed as inherently less reliable as information resources. This was largely due to an absence of life experience, and the potential for a lack of personal investment in their appointed roles. For some, this perceived lack of reliability did not necessarily lie with young frontline staff per se, but pointed instead to a potential systemic problem relating to eating out establishments as a whole. Better training was thought to hold the key to greater levels of trust and confidence in the information provided by staff.

Box 3. Preferences for written information.

1. If you're going to be providing information, provide the information—don't make the customer go and ask for it. . .Human beings are human and they make mistakes. . . In a busy restaurant where people are talking to you, you know, you could be given the wrong information actually, so I would like that information provided in written form somehow. . ..I wouldn't want to have to ask for it. (A52 G1 S: Tree nuts, cereals containing gluten)
2. . . .they've got the "V" and the "N" on the menu, it would need to be a symbol-based thing, I think. . ... Because if you. . .had a particular allergy, you would just be scanning the menu for that particular symbol or letter or whatever it may be. I think that would be far more useful than having the huge long list of every ingredient. (A7 G1 E: Peanut, tree nuts)
3. All it's got to have is a GF next to it and I'm happy. Or even if it says 'not GF'. It would be better. . .I think that would be really, really useful, and if it doesn't do that then I feel like I'm a pain. (P5 G2 E: Cereals containing gluten)
4. . . .if they just had a nice wee clear "We supply gluten-free" or "Ask our staff", you know, to provide a list. . .if you do have any form of intolerances, and we can leave any ingredients out or something. (A30 G3 NI: Cereals containing gluten)
5. . . .the menu, that "Oh, we've got a gluten-free section,". . .that is something that they can start doing more, because some people may be embarrassed to talk about it and, you know, not. . .ask the question. (A4 G2 E: Cereals containing gluten)
6. . . .they have the list on every single item in there—you know, dressings. . .sauces. . .all the allergy ingredients information, is listed on there. So. . .you know what you're getting and you know exactly what's in everything. . ..and they update it as well. . .so that's brilliant. (A39 G1 W: Peanuts, tree nuts, celery)
7. I would prefer a simple description, but I have been in restaurants where. . .I'm not too sure what it means. . .They maybe list about six different ingredients and. . .I can recognise so many of them, and some of them, I'm not too sure about. (A20 G1 NI: Peanuts, tree nuts)

Whilst a minority of participants sought verbal information as a safety clarification in addition to written information resources, the majority reported a sense of reluctance and embarrassment when making enquiries of staff. Although asking questions of staff was seen as a necessity by many participants; for others the perceived embarrassment of asking staff for further information led to self-imposed limitations in food selections, or unnecessary risk taking.

Discussion

Written information of sufficient quality was used as a baseline resource which liberated FA/FIs to make their food selections independently and without recourse to other information seeking strategies. Beyond the written resource itself, FA/FIs inferred a wider message of 'understanding' on the part of venues that provided adequate written allergen information, and were reassured by notices encouraging customers to ask staff about the allergen content of foods. This implied awareness gave FA/FIs permission to ask questions of staff with the

Box 4. Staff knowledge and demeanour.

1. The (Asian restaurant), as I said, they done gluten-free. They were able to offer an alternative to soy sauce and everything. So, she was able to say, 'Well, you can't have noodles but you can have rice noodles.' So, she was actually more knowledgeable than me on coeliac, so that was good. (A48 G2 S: Cereals containing gluten)
2. (Sandwich chain) are usually quite good because I. . .went to one a couple of years ago now, and I said, "Oh can I have that, but I'm allergic to cucumbers so you're going to have to completely. . ." you know, and she said, "Well, that's cut in the same machine, so you can't have that." So, they kind of know. . .what's cut what and what's doing what. So, (Sandwich chain) are quite good for knowing what's in the products and stuff. (A39 G1 W: Peanuts, tree nuts, celery)
3. You get some people that are quite perky and cheery and. . .Also, asking specifically as well. . . So, I'd say, like I might accidently say "No milk" and they'd be like "Do you also not want cheese?" or "No prawns" and they're like, "Are you okay with..?" you know, this other thing. So, you know, you get some people that are quite on the ball in that sense. (A11 G1 S: Milk, Crustaceans)
4. . . .if a waiter is really keen on like listening and just writing all the ingredients, just to make sure she speaks or he speaks to the chef. So, yeah, just basically communication and the way they treat those things. (A9 G1 E)
5. The trust is in the staff, to begin with. I mean, they're your first contact, aren't they? If they have knowledge of the food, then I'm quite confident. If they have no knowledge of the food, then I think I'm not coming here again. (A18 G3 E: Milk)
6. Some do say, "What do you mean, dairy, what do you mean?" and I say cream, cheese, milk, anything like that, and. . .what makes me laugh, people think I'm going to be allergic to mayonnaise because it's from the eggs, and. . .I said, "Actually, it's not dairy, even though it's from the hen, it's not dairy, it's not a cow. . . (A26 G2 E: Milk)
7. There's been times in the past when I know. . .I can read people, and I know that they're thinking "Oh, for God's sake, this is a fad!" sort of thing, you know, and it's not good enough. (A18 G3 E: Milk)
8. I've had them just shrug their shoulders and say "I don't know." "Well, does the chef know?" "I don't think he will," you know, sort of thing. . .and you're thinking, you're joking. . .! (A53 G2 E: Cereals containing gluten)

expectation of an informed response; and without fear of embarrassment. At its best, accurate and trustworthy food allergen information delivered verbally by staff also enhanced FA/FI's eating out experience. Judgements regarding the potential for accidental exposure to food allergens were contingent on subtle social cues suggestive of staff knowledge; and were assessed by FA/FIs accordingly. Where doubts surrounding verbal allergen information occurred, FA/FIs retreated to their default position of reliance on written information resources, and in turn limited the potential variety of venues and food options available to them as a result. However, with adequate written allergen information, and the positive interactions of reliable allergen-aware staff; FA/FIs experienced an increase in trust and loyalty to eating out/takeaway venues concerned.

Fundamental to FA/FI's concerns surrounding allergen information provision when eating out, was the need for constant vigilance to ensure allergen avoidance, balanced against a wish to avoid 'drawing attention' [16]. EU FIC (1169/2011) legislation has the potential to address these issues by making the provision of food allergen information mandatory, thereby validating and normalising food allergies and intolerances. By empowering FA/FIs with the right to ask and expect adequate information provision, it is to be hoped that the latter fear of embarrassment and resultant social isolation will be reduced [14, 17].

Given that strict allergen avoidance is necessary for many FA/FIs [28, 18] and the risk of food allergen exposure when eating out is high [4], our research indicates that FA/FIs clearly have no coherent set of preferences for the delivery of allergen information within an eating out setting. At its best, legislators should aim to cater for this diversity of preferences by recommending a combination of written and face to face allergen information provision to accommodate the varying needs and preferences of FA/FI populations. Food providers can play a crucial role in meeting FA/FI's needs through the provision of clear written allergen information, increased allergen-awareness training for staff, and effective communication mechanisms between food preparation and serving areas. Alongside written information, our results indicate that staff use of simple, proactive face to face strategies to make enquiries and reassure customers, is favoured by FA/FIs. For example, training staff to ask diners about any food sensitivities from the outset, would convey allergen awareness, and would likely diminish much of reticence exhibited by FA/FIs within this study and in wider literature [14, 16].

In recognising the insights gained through the in-depth analysis of FA/FIs information preferences when eating out, we also acknowledge the limitations of the study. Given that we were seeking to understand the perspectives of those with both FA and FI it was necessary to use self-report measures to assess FA/FI status. Although this was done through the careful application of strict symptom-based FA/FI criteria; the assignment of some participants presented a challenge. However accuracy of allocation was less critical within the remit of the current study which sought a broader perspective on FA/FI populations' preferences for written and/or verbal food allergen information when eating out. Due to the qualitative nature of our research we were also unable to account for the impact of demographic factors such as sex, age and region of residence within the UK. These factors may have affected FA/FI's preferences in terms of allergen information provision and willingness to communicate with staff.

Conclusion

In light of EU legislation requiring that eating out providers supply consumers with information regarding the allergen content of their foods, this study is the first to gain in-depth insights into FA/FI consumers' preferences for the provision of allergen information when eating out or ordering takeaway foods. Findings indicate that FA/FI consumers were often ambivalent or conflicted in their preferences for written and verbal allergen information provision. FA/FIs overwhelmingly favoured tangible, written information in the first instance; and adequate written information often led to an implicit trust in subsequent verbal information. Where written information was limited, FA/FIs depended on social cues to assess the reliability of verbal information resources, and defaulted to tried and tested allergen avoidance strategies when these were deemed unreliable. Understanding the subtle negotiations and difficulties encountered by FA/FIs when eating out can serve as a guide for legislators and food providers; by encouraging the provision of clear written and verbal allergen information, and the training of proactive, allergen aware staff. This, in tandem with legally enforceable requirements for food allergen information provision provided by the EU legislation, paves the way for FA/FIs to feel more confident in their eating out choices; and to experience a safer eating out experience.

Supporting Information

S1 File. Additional theme-based quotes from interviews.
(DOCX)

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Author Contributions

Conceived and designed the experiments: JB MHG JSL. Performed the experiments: JB RP DR FMB. Analyzed the data: FMB JB. Wrote the paper: FMB JB. Provided advice as an allergic consumer to the project throughout: MHG. Provided clinical expertise as an allergist to the project throughout: JSL. Contributed to reviewing and commenting on early drafts of the paper: MHG JSL RP DR. Conceived and designed the project: JB MHG JSL. Collected the data: RP JB DR. Analyzed the data: FMB JB. Wrote the paper: FMB JB. Approved the manuscript for submission: FMB JB RP DR MHG JSL. Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: FMB JB RP DR MHG JSL.

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Food Allergy Knowledge and Attitudes of Restaurant Managers and Staff: An EHS-Net Study

TAYLOR J. RADKE,[1]* LAURA G. BROWN,[1] E. RICKAMER HOOVER,[1] BRENDA V. FAW,[2] DAVID REIMANN,[3] MELISSA R. WONG,[4] DAVID NICHOLAS,[5] JONATHAN BARKLEY,[6] AND DANNY RIPLEY[7]

[1]Centers for Disease Control and Prevention, National Center for Environmental Health, 4770 Buford Highway, Mailstop F58, Atlanta, Georgia 30341; [2]California Department of Public Health, Sacramento, California 95899; [3]Minnesota Department of Health, Mankato, Minnesota 56001; [4]New York City Department of Health and Mental Hygiene, New York, New York 11101; [5]New York State Department of Health, Albany, New York 12237; [6]Rhode Island Department of Health, Providence, Rhode Island 02908; and [7]Metro Nashville/Davidson County Public Health Department, Nashville, Tennessee 37209, USA

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ABSTRACT

Dining outside of the home can be difficult for persons with food allergies who must rely on restaurant staff to properly prepare allergen-free meals. The purpose of this study was to understand and identify factors associated with food allergy knowledge and attitudes among restaurant managers, food workers, and servers. This study was conducted by the Environmental Health Specialists Network (EHS-Net), a collaborative forum of federal, state, and local environmental health specialists working to understand the environmental factors associated with food safety issues. EHS-Net personnel collected data from 278 randomly selected restaurants through interviews with restaurant managers, food workers, and servers. Results indicated that managers, food workers, and servers were generally knowledgeable and had positive attitudes about accommodating customers' food allergies. However, we identified important gaps, such as more than 10% of managers and staff believed that a person with a food allergy can safely consume a small amount of that allergen. Managers and staff also had lower confidence in their restaurant's ability to properly respond to a food allergy emergency. The knowledge and attitudes of all groups were higher at restaurants that had a specific person to answer food allergy questions and requests or a plan for answering questions from food allergic customers. However, food allergy training was not associated with knowledge in any of the groups but was associated with manager and server attitudes. Based on these findings, we encourage restaurants to be proactive by training staff about food allergies and creating plans and procedures to reduce the risk of a customer having a food allergic reaction.

Key words: Food allergies; Food allergy attitudes; Food allergy knowledge; Food safety; Restaurants

Food allergies are a growing public health and food safety concern affecting an estimated 15 million U.S. residents, including 1 in every 13 children (8). A food allergic reaction occurs when the immune system overreacts to the proteins in food (2). Currently, the only way to prevent a food allergic reaction is strict avoidance of the allergen (15). Eight foods are responsible for approximately 90% of all food allergic reactions in the United States: milk, eggs, fish, shellfish, wheat, tree nuts, peanuts, and soybeans (8). Symptoms of an allergic reaction range from mild skin rashes to severe, potentially life-threatening anaphylactic reactions (10). In the case of anaphylactic reactions, administration of epinephrine within minutes is crucial to survival (15). Food-related anaphylaxis is responsible for approximately 30,000 emergency room visits, 2,000 hospi- talizations, and 150 deaths each year in the United States (13). A significant number of food allergic reactions occur in restaurants. A survey at the 2007 Food Allergy & Anaphylaxis Network conference (14) found that 34% of the 294 respondents had experienced at least one food allergic reaction in a restaurant, and of those, 36% had experienced at least three reactions. Another study revealed that nearly half of fatal food allergic reactions over a 13-year period were caused by food from a restaurant or other food service establishment (15). An investigation of peanut and tree nut allergic reactions in restaurants or other food service establishments found that in 45% of these cases, the food allergic customers had alerted the restaurant to their allergy in advance (9). The same investigation revealed that in 78% of the episodes, someone in the establishment knew that the food contained the allergen as an ingredient.

Managers, food workers, and servers all play unique and crucial roles in preventing food allergic reactions in their restaurants. Managers can provide food allergy training for staff and develop plans for serving food allergic customers. Food workers can become educated about allergens and methods to ensure allergen-free food preparation.

Servers can accurately describe menu items to the customer and alert the manager and kitchen staff to requests for allergen-free meals. Miscommunication between any of these groups can result in an unsafe meal being served (3). Benefits to restaurants that consistently provide safe meals to food allergic customers include preventing harm to their clientele, avoiding lawsuits, and gaining the loyal patronage of the food allergic community.

A key to preventing food allergic reactions in restaurants is understanding manager, food worker, and server food allergy knowledge, attitudes, and practices. Several studies have been conducted to examine these topics collectively (1, 3, 5, 6, 11, 12). However, the measures used in these studies have been limited with regard to food allergy attitudes and practices. All studies either included a regional or convenience sample (1, 6, 11) or were conducted outside of the United States (3, 5, 11, 12); thus, the generalizability of their results must be considered.

In 2014, the Centers for Disease Control and Preven- tion's (CDC) Environmental Health Specialists Network (EHS-Net) conducted a study on restaurant manager and staff (food workers and servers) food allergy knowledge, attitudes, and practices. Our measures of knowledge, attitudes, and practices were comprehensive and were primarily based on the Food Allergy Research and Education guidance document ''Welcoming Guests with Food Allergies'' (7). EHS-Net also collected data in six demographically diverse sites, providing good geographic coverage of the United States (Northeast, South, Midwest, West). The goals of this study were threefold: (i) describe restaurant manager and staff food allergy knowledge, attitudes, and practices; (ii) compare knowledge, attitudes, and practices among managers and staff; and (iii) identify factors associated with food allergy knowledge, attitudes, and practices. This article primarily focuses on knowledge and attitudes. Complete practice data will be published at a later date.

MATERIALS AND METHODS

EHS-Net is a network of environmental health specialists and epidemiologists who conduct research designed to identify and understand environmental factors associated with foodborne illness outbreaks and other food safety issues. EHS-Net is a collaborative project of the CDC, the U.S. Food and Drug Administration, the U.S. Department of Agriculture, and state and local health departments. At the time this study was conducted, six state and local health departments were funded by CDC to participate in EHS-Net. The state and local health departments (EHS-Net sites) were in California, Minnesota, New York, New York City, Rhode Island, and Tennessee.

Sample. For this study, we used a random sample from a nonrandomly selected cluster (i.e., site). In each site, EHS-Net personnel chose an area, based on convenience (reasonable travel distance), in their jurisdiction to recruit restaurants for study participation through telephone calls. SAS version 9.3 (SAS Institute, Cary, NC) was used to select a random sample of restaurants from population lists of restaurants in those areas. Data collectors (EHS-Net personnel) collected data in approximately 50 randomly selected restaurants per site. For this study, restaurants were defined as facilities that prepare and serve food or beverages to customers and are not institutions, food carts, mobile food units, temporary food stands, supermarkets, restaurants in supermarkets, or caterers. Only restaurants with English-speaking managers were included in the study.

Data collection. Data were collected from January 2014 through February 2015. The institutional review boards of the participating EHS-Net site health departments approved the study protocol. We did not collect any data that could identify individual restaurants, managers, food workers, or servers. All data collectors participated in training designed to increase data collection accuracy and consistency. Data collectors solicited restaurant participation by contacting randomly selected restaurants within a specified geographic location via telephone using a standardized recruiting script.

After obtaining permission from the restaurant manager, data collectors conducted an on-site interview with a manager (worker with authority over the kitchen), food worker (worker who primarily prepares or cooks food), and server (worker who primarily takes orders or serves food to customers). To increase participation and cooperation, data collectors asked the manager to choose the food worker and server to be interviewed. Manager interviews lasted approximately 20 min and were focused on characteristics of the restaurant (e.g., chain versus independent ownership and number of meals served in a typical day) and the manager (e.g., years of experience in current restaurant and whether they had been food safety certified). Food worker and server interviews lasted approximately 12 min each and were focused on food worker and server characteristics (e.g., highest level of education and whether they had received food allergy training in their current restaurant).

Interviewers asked 19 questions to assess manager, food

* Author for correspondence. Tel: 770-488-7652; Fax: 770-488-7310; E-mail: tradke@cdc.gov.

worker, and server food allergy knowledge (e.g., identifying major food allergens and knowing what to do when a customer has a bad food allergic reaction). Five questions (e.g., should servers be knowledgeable about food allergies and should restaurants try to meet food allergic customers' special requests) were scored on a Likert scale to assess staff food allergy attitudes. Another 13 to 22 questions (e.g., whether the restaurant has a plan for answering questions from food allergic customers and whether the restaurant has a specific person on duty to handle food allergy questions and requests) were used to assess food allergy practices. Data collectors also observed the restaurant and examined its menu to assess additional restaurant characteristics (e.g., highest priced food item and number of critical violations on the restaurant's last inspection) and food allergy documentation (e.g., whether the menu mentioned anything about allergens and whether documentation about allergens was available in the kitchen area).

Data analysis. We initially created knowledge and attitude scores for each participant group (i.e., manager, food worker, and server). For the knowledge score, we summed the number of correct answers (out of 19) and used each group's median score to dichotomize the participants as having more or less knowledge.

For the attitude score, we assigned point values to each response as follows: strongly disagree 1/4 1, disagree 1/4 2, unsure 1/4 3, agree 1/4 4, and strongly agree 1/4 5. We then averaged each participant's response to the five attitude questions. We used each group's median score to divide participants into those having relatively positive or less positive attitudes.

We used one-way analyses of variance (ANOVAs) to test whether groups were significantly different (P 0.05) in knowledge and attitude scores. We then conducted univariate descriptive analyses of restaurant, manager, food worker, and server characteristics; food allergy knowledge, attitudes, and practices; and food allergy documentation. Some continuous variables were recoded to provide approximately even groups to facilitate interpretation. For example, managers' experience was split into ,4 years (52.0%) and !4 years (48.0%). We next conducted a series of simple logistic regressions to examine associations between potential explanatory variables (restaurant, manager, food worker, and server characteristics; food preparation and service practices; and allergen documentation) and each outcome variable (knowledge and attitude scores) for managers, food workers, and servers (data not shown).We then created multiple logistic regression models for each group and outcome using a forward selection criterion (entrance criterion of P 0.10) to further explore the relationship between 20 potential explanatory variables and the outcomes. We choose P 0.10 to allow for more inclusiveness, given the relative exploratory nature of these analyses. We used SAS version 9.3 for all analyses.

RESULTS

Restaurant characteristics. Of the 1,307 restaurants contacted for participation in the study, 852 fit the study definition, and 278 (32.6%) of those agreed to participate (Table 1). Manager interview data indicated that 60.1% of the participating restaurants were independently owned. Data collectors classified 56.9% of the restaurants as either quick service (e.g., fast food), fast casual service, or takeout only. Manager interview data indicated that 54.3% of the restaurants had complex food preparation processes (i.e., preparation that includes holding food beyond same day service or some combination of holding, cooling, reheating, and freezing). Additionally, 64.1% had American (noneth-nic) menus, 29.7% served more than 300 meals in a typical day, 50.5% had three or more managers, 50.7% employed more than 10 workers, 25.5% had a food item priced more than $20, and 23.0% were cited for more than one critical violation on the last inspection.

Manager, food worker, and server characteristics. Interview data from the 277 managers indicated that 66.4% were male, 81.2% spoke English as their primary language, 61.0% had some college education or more, 48.0% had been working at the restaurant for at least 4 years, and 80.8% had been food safety certified (Table 1). Less than half (44.7%) of managers had received training on food allergies while working at their current restaurant, and 27.8% did not recall serving any meals to food allergic customers in the past month.

Interview data from the 211 food workers indicated that 67.3% were male, 77.7% spoke English as their primary language, 37.0% had some college education or more, and 50.7% had been working at the restaurant for at least 2 years (Table 1). Less than half (44.1%) had received food allergy training while working at their current restaurant, and 21.0% did not recall preparing any meals for food allergic customers in the past month.

Interview data from the 156 servers indicated that 72.9% were female, 85.9% spoke English as their primary language, 50.0% had some college education or more, and 52.6% had been working at the restaurant for at least 2 years (Table 1). Only 33.5% had received training on food allergies while working at their current restaurant, and

12.6% did not recall serving any meals to food allergic customers in the past month.

Practices and observations. According to manager interview data, 70.8% percent of the restaurants had a plan for answering questions from food allergic customers (Table 2). Approximately half (53.3%) of the restaurants typically had a specific person on duty to handle food allergy questions and requests. Data collectors found that 22.0% of menus mentioned allergens. In 55% of these menus, the allergen information was a note for the customer to inform the restaurant whether they or someone with them had a food allergy. Food allergen documentation was available in the front of the restaurant (areas accessible to customers or the dining area) and the kitchen area in 23.1 and 36.3% of restaurants, respectively.

Manager, food worker, and server knowledge. Overall, managers correctly identified peanuts (95.0%), milk and dairy (91.0%), shellfish (92.4%), and eggs (81.6%) as major allergens (Table 3). Managers also recognized that trouble breathing (97.1%), hives or rash (98.2%), and swelling of tongue and throat (97.5%) are symptoms of an allergic reaction to food. Nearly all managers knew to call 911 (99.3%) when a customer has a bad food allergic reaction, such as trouble breathing. Managers (95.0%) knew that a person who eats food they are allergic to can die, and 92.8% of managers correctly said that taking a food allergen out of a meal after the meal had been prepared is not a way to make it safe for a food allergic customer. However, more than 1 in 10 managers (11.9%) incorrectly believed that a person allergic to a specific food ingredient can safely eat small amounts of that food.

Food workers also correctly identified peanuts (95.3%), milk and dairy (88.2%), shellfish (90.5%), and eggs (77.7%) as major allergens (Table 3). Food workers recognized trouble breathing (96.7%), hives or rash (97.2%), and swelling of tongue and throat (95.7%) as symptoms of an allergic reaction to food. Nearly all workers knew to call 911 (98.1%) when a customer has a bad food allergic reaction, such as trouble breathing. Food workers (94.8%) knew that a person who eats food they are allergic to can die, and 91.5% of food workers correctly said that taking a food allergen out of a meal after the meal has been prepared is not a way to make it safe for a food allergic customer. However, more than 1 in 10 food workers (11.8%) incorrectly believed that a person allergic to a specific food ingredient can safely eat small amounts of that food.

Servers correctly identified peanuts (95.5%), milk and dairy (93.0%), shellfish (94.2%), and eggs (72.4%) as major allergens (Table 3). Servers also recognized trouble breathing (99.4%), hives or rash (100%), and swelling of tongue and throat (100%) as symptoms of an allergic reaction to food. All servers knew to call 911 (100%) when a customer has a bad food allergic reaction, such as trouble breathing. Servers (97.4%) knew that a person who eats food they are allergic to can die, and 93.0% of servers correctly said that taking a food allergen out of a meal after the meal has been prepared is not a way to make it safe for a food

TABLE 1. Descriptive data on restaurant, manager, and staff characteristics

Parameter	n	%
Restaurant characteristics[a]		
Restaurant type (N ¼ 276)		
Chain	110	39.9
Independent	166	60.1
Service type (N ¼ 276)[b]		
Full service casual or fine dining	119	43.1
Quick service, fast casual service, or takeout only	157	56.9
Establishment type (N ¼ 278)[b]		
Prep serve or cook serve	127	45.7
Complex	151	54.3
Menu type (N ¼ 276)		
American	177	64.1
Non-American	99	35.9
No. of meals served in a typical day (N ¼ 266)		
1–100	95	35.7
101–300	92	34.6
.300	79	29.7
No. of managers or persons in charge that work in this restaurant (N ¼ 277)		
,3	137	49.5
!3	140	50.5
No. of workers other than managers that work in this restaurant (N ¼ 272)		
10	134	49.3
.10	138	50.7
Highest priced food item on the menu (N ¼ 267)[b]		
,$10	95	35.6
$10–$20	104	38.9
.$20	68	25.5
No. of critical violations received after the last inspection (N ¼ 278)[b]		
0	134	48.2
1	80	28.8
.1	64	23.0
Manager characteristics[a]		
Sex (N ¼		

277)

Male 184 66.4 Female 93 33.6 Primary language spoken (N 1⁄4 277)

English 225 81.2 Other 52 18.8 Highest level of education (N 1⁄4 277)

High school diploma or less 108 39.0 Some college or more 169 61.0 Experience as a manager in this restaurant (N 1⁄4 277) ,4 yr 144 52.0 !4 yr 133 48.0 Ever been food safety certified (N 1⁄4 276)

Yes 223 80.8 No 53 19.2 Received training on food allergies while working at this restaurant (N 1⁄4 275) Yes 123 44.7 No 152 55.3

allergic customer. However, more than 1 in 10 servers (11.5%) incorrectly believed that someone allergic to a specific food ingredient can safely eat small amounts of that food.

TABLE 1. Continued

Parameter	n	%
customers in the past month (N 1⁄4 263) 0 73 27.8 1–10 115 43.7 .10 75 28.5 Food worker characteristics[c]		
Sex (N 1⁄4 211)		
Male 142 67.3 Female 69 32.7 Primary language spoken (N 1⁄4 211)		
English 164 77.7 Other 47 22.3 Highest level of education (N 1⁄4 211)		
High school diploma or less 133 63.0 Some college or more 78 37.0 Experience in this restaurant (N 1⁄4 207)		
,2 yr 102 49.3 !2 yr 105 50.7 Received training on food allergies while working at this restaurant (N 1⁄4 209) Yes 86		
41.1 No 123 58.9 No. of meals prepared for food allergic		
customers per month (N 1⁄4 195) 0 41 21.0 1–10 105 53.9 .10 49 25.1 Server characteristics[d]		
Sex (N 1⁄4 155)		
Male 42 27.1 Female 113 72.9 Primary language spoken (N 1⁄4 156)		
English 134 85.9 Other 22 14.1 Highest level of education (N 1⁄4 156)		
High school diploma or less 78 50.0 Some college or more 78 50.0 Experience in this restaurant (N 1⁄4 156)		
,2 yr 74 47.4 !2 yr 82 52.6 Received training on food allergies while working at this restaurant (N 1⁄4 155) Yes 52 33.5 No 103 66.5 No. of meals served to food allergic		
customers per month (N 1⁄4 151) 0 19 12.6 1–10 97 64.2 .10 35 23.2		
No. of meals served to food allergic		

[a] Data were obtained from manager interviews, unless otherwise noted. [b] Data were obtained from data collector observations. [c] Data were obtained from food worker interviews. [d] Data were obtained from server interviews.

[a] Data were obtained from manager interviews, unless otherwise noted. [b] Data were obtained from data collector observations. [c] Data were obtained from food worker interviews. [d] Data were obtained from server interviews.

Comparisons of manager, food worker, and server knowledge scores. All three groups had similar knowledge scores (Table 4). Median knowledge scores were 13 for managers (mean ¼ 13.7, SD ¼ 2.0, n ¼ 277), 12 for food workers (mean ¼ 13.0, SD ¼ 2.5, n ¼ 211), and 13 for servers (mean ¼ 13.5, SD ¼ 2.2, n ¼ 156).

The overall ANOVA model suggested significant differences between groups ($F_{2,641}$ ¼ 7.45, P , 0.001). Post hoc tests revealed that managers (mean ¼ 13.75, SD ¼ 2.01, n ¼ 277) had significantly higher knowledge scores than did food workers (mean ¼ 12.96, SD ¼ 2.50, n ¼ 211). Servers had a mean score of 13.46 (SD¼2.21, n¼156), and their scores were not significantly different from those of managers or workers.

Multiple logistic regression of manager, food worker, and server knowledge. A multiple logistic regression analysis identified two characteristics that were significantly associated with manager food allergy knowledge (Table 5). Managers in restaurants that served more than 10 meals to allergic customers in the past month had greater odds of having a higher food allergy knowledge score than did managers in restaurants that served 10 or fewer such meals. Managers in restaurants that had a specific person to answer food allergy questions and requests had greater odds of having a higher food allergy knowledge score than did those managers in restaurants without such a person.

A multiple logistic regression analysis identified three characteristics that were significantly associated with server food allergy knowledge (Table 5). Servers in restaurants with a specific person to answer food allergy questions and requests had greater odds of having a higher food allergy knowledge score. Servers in full service restaurants had greater odds of having a higher food allergy knowledge score than did servers in quick service restaurants. Servers in restaurants that served more than 300 meals in a typical day had greater odds of having a higher food allergy knowledge score than did servers in restaurants that served 300 meals or less.

Manager, food worker, and server attitudes. Managers (97.5%) agreed or strongly agreed that servers should be knowledgeable about food allergies (Table 6). Nearly all managers (99.6%) agreed or strongly agreed that kitchen staff should be knowledgeable about food allergies. Managers (91.3%) agreed or strongly agreed that restaurants should try to meet food allergic customers' special requests. Most managers (87.4%) also agreed or strongly agreed that their restaurant could easily meet food allergic customers' special requests. However, fewer managers (70.7%) agreed or strongly agreed that the staff in their restaurant would know what to do if a customer had a bad food allergic reaction.

All food workers (100%) agreed or strongly agreed that servers should be knowledgeable about food allergies (Table 6). Food workers (99.5%) agreed or strongly agreed that kitchen staff should be knowledgeable about food allergies. Food workers (97.1%) also agreed or strongly agreed that restaurants should try to meet food allergic customers' special requests. Most food workers (92.9%) agreed or strongly agreed that their restaurant could easily meet food allergic customers' special requests. However, only 74.4% of food workers agreed or strongly agreed that the staff in this restaurant would know what to do if a customer had a bad food allergic reaction.

All servers (100%) agreed or strongly agreed that servers should be knowledgeable about food allergies (Table 6). Servers (100%) also unanimously agreed or strongly agreed that kitchen staff should be knowledgeable

about food allergies. Nearly all servers (98.1%) agreed or strongly agreed that restaurants should try to meet food allergic customers' special requests. Most servers (93.0%) agreed or strongly agreed that their restaurant could easily meet food allergic customers' special requests. However, only

A multiple logistic regression analysis identified four characteristics that were significantly associated with food worker food allergy knowledge (Table 5). Food workers in restaurants with a plan for answering questions from food allergic customers had greater odds of having a higher food allergy knowledge score than did workers in restaurants with no such plan. Female food workers had greater odds of having a higher food allergy knowledge score than did male food workers. Food workers with at least 2 years of experience in the restaurant had greater odds of having a higher food allergy knowledge score than did food workers with less experience. Food workers in restaurants in which the highest priced food item was between $10 and $20 had greater odds of having a higher food allergy knowledge score than did those workers in restaurants in which the highest priced food item was less than $10.

TABLE 2. Descriptive data on food allergy practices and restaurant environment observations

Parameter	n	%
Practices[a]		
Restaurant has plan for answering questions from food allergic customers (N 1/4 267)	Yes 189	70.8
	No 78	29.2
Specific person typically on duty to handle food allergy questions and requests (N 1/4 276)	Yes 147	53.3
	No 129	46.7
Observations[b]		
Menu shows anything about allergens (N 1/4 273)	Yes 60	22.0
	No 213	78.0
Documentation in the front of the house (areas accessible to customers) or dining area about allergens (N 1/4 277)	Yes 64	23.1
	No 213	76.9
Documentation about allergens in the kitchen area (N 1/4 278)	Yes 101	36.3
	No 177	63.7

[a] Data were obtained from manager interviews. [b] Data were obtained from data collector observations.

three- quarters of servers (75.7%) agreed or strongly agreed that the staff in their restaurant would know what to do if a customer had a bad food allergic reaction.

Comparisons of manager, food worker, and server attitude scores. The three participant groups had approximately equivalent median attitude scores: 4.2 for managers (mean1⁄44.3, SD1⁄40.5, n1⁄4277), 4.2 for food workers (mean 1⁄4 4.4, SD 1⁄4 0.4, n 1⁄4 207), and 4.4 for servers (mean 1⁄4 4.5, SD1⁄40.4, n1⁄4155) (Table 4). Knowledge and attitude scores were not significantly correlated in any of the respondent groups: managers, r 1⁄4 0.06, P 1⁄4 0.317, n 1⁄4 277; food workers, r 1⁄4 À0.03, P 1⁄4 0.684, n 1⁄4 207; and servers, r 1⁄4 0.04, P 1⁄4 0.653, n 1⁄4 155.

The overall ANOVA model suggested significant differences between groups ($F_{2,636}$ 1⁄4 6.31, P 1⁄4 0.002). Post hoc tests revealed that servers (mean1⁄44.46, SD1⁄40.41, n1⁄4 155) had significantly higher attitude scores than did managers (mean 1⁄44.30, SD1⁄40.50, n1⁄4277). Food workers had a mean score of 4.39 (SD 1⁄4 0.44, n 1⁄4 211), and their scores were not significantly different from those of managers or servers.

Multiple logistic regression of manager, worker, and server attitudes. A multiple logistic regression analysis identified six characteristics that were significantly associ-

TABLE 3. Descriptive data on restaurant manager and staff food allergy knowledge[a]

Question	Manager (N 1⁄4 277)		Food worker (N 1⁄4 211)		Server (N 1⁄4 156)	
	n	%	n	%	n	%
Of the following foods, which do you think are major allergens?						
Peanuts (correct)	263	95.0	201	95.3	149	95.5
Tomatoes	53	19.1	47	22.3	37	23.7
Milk or dairy (correct)	252	91.0	186	88.2	145	93.0
Strawberries	88	31.8	68	32.2	47	30.1
Shellfish (correct)	256	92.4	191	90.5	147	94.2
Eggs (correct)	226	81.6	164	77.7	113	72.4
Chocolate	64	23.1	59	28.0	27	17.3
Which of the following are symptoms of an allergic reaction to food? Trouble breathing (correct)	269	97.1	204	96.7	155	99.4
Hives or rash (correct)	272	98.2	205	97.2	156	100
Headache	154	55.6	109	51.7	72	46.2
Swelling of tongue and throat (correct)	270	97.5	202	95.7	156	100
Fever	166	59.9	122	57.8	102	65.4
Which of the following should you do if a customer is having a bad food allergic reaction, such as trouble breathing? Suggest that the customer drink water	67	24.2	59	28.0	41	26.3
Call 911 (correct)	275	99.3	207	98.1	156	100
Ask the customer if they have medicine they could take	250	90.3	193	91.5	145	93.0
Suggest that the customer throw up	42	15.2	28	13.3	9	5.8
Someone with a food allergy can safely eat small amounts of the food they are allergic to. Yes	33	11.9	25	11.8	18	11.5
No (correct)	225	81.2	159	75.4	122	78.2
Unsure or skipped	19	6.9	27	12.8	16	10.3
Someone with a food allergy can die from eating the food they are allergic to. Yes (correct)	263	95.0	200	94.8	152	97.4
No	7	2.5	6	2.8	2	1.3
Unsure or skipped	7	2.5	5	2.4	2	1.3
Taking a food allergen out of a meal after it has been made is one way to make it safe for a food allergic customer. Yes	17	6.1	12	5.7	6	3.8
No (correct)	257	92.8	193	91.5	145	93.0
Unsure or skipped	3	1.1	6	2.8	5	3.2

[a] Responses are shown in the order they were asked. n, the number of managers and workers that affirmatively answered the question.

TABLE 4. Comparisons of food allergy knowledge and attitude scores by group

Group

ated with manager food allergy attitudes (Table 7). Managers in restaurants that served more than 10 meals to food allergic customers in the past month had greater odds of having a higher food allergy attitude score than did managers in restaurants that served 10 meals or fewer. Managers in restaurants with plans for answering questions from food allergic customers had greater odds of having a higher food allergy attitude score. Managers in restaurants with a specific person to answer food allergy questions and requests had greater odds of having a higher food allergy attitude score than did managers in restaurants without such a person. Managers in restaurants that had allergen information on the menu were less likely to have a higher food allergy attitude score than did managers in restaurants without this information. Managers with at least 4 years of experience in the restaurant were also less likely to have a higher food allergy attitude score than were managers with less experience. Managers who had received food allergy training at their restaurant had greater odds of having a higher food allergy attitude score than did managers with no food allergy training.

TABLE 5. Multiple logistic regression analysis of characteristics associated with restaurant managers, food workers, and servers scoring in the top 50% of food allergy knowledge scores[a]

Characteristic	OR (90% CI)	P
Manager scored in top 50%[b]		
No. of meals served to allergic customers in the past month		0.003
1–10 vs 0	1.48 (0.89, 2.48)	0.208
.10 vs 1–10	2.33 (1.35, 4.04)	0.011
.10 vs 0	3.45 (1.87, 6.36)	0.001
Specific person to answer food allergy questions and requests		
Yes vs no	1.71 (1.09, 2.70)	0.052
Food worker scored in top 50%[c]		
Restaurant plan for answering questions from food allergic customers		
Yes vs no	4.23 (2.20, 8.12)	,0.001
Sex		
Female vs male	3.63 (1.81, 7.26)	0.002
Experience in this restaurant		
!2 vs ,2 yr	2.60 (1.43, 4.72)	0.009
Highest priced food item on the menu		0.071
$10–$20 vs ,$10	2.72 (1.33, 5.56)	0.022
.$20 vs $10–$20	0.68 (0.32, 1.42)	0.389
.$20 vs ,$10	1.84 (0.80, 4.24)	0.228
Server scored in top 50%[d]		
Specific person to answer food allergy questions and requests		
Yes vs no	2.49 (1.33, 4.66)	0.017
Service type		
Full service vs quick service	2.71 (1.40, 5.24)	0.013
No. of meals served in a typical day		0.077
101–300 vs 1–100	1.03 (0.51, 2.05)	0.953
.300 vs 101–300	2.54 (1.20, 5.38)	0.042
.300 vs 1–100	2.60 (1.19, 5.69)	0.045

[a] Overall models were created using a forward selection criterion of $P < 0.10$. Variables are presented in order of steps at which they entered the model. OR, odds ratio; CI, confidence interval. OR > 1 indicates that the odds of the outcome (knowledge score in top 50%) were greater for the first mentioned category (e.g., 1 to 10) than for the second mentioned category (e.g., 0). [b] $\chi^2 = 17.18$, df = 3, $P < 0.001$, $N = 262$. [c] $\chi^2 = 30.50$, df = 5, $P < 0.001$, $N = 192$. [d] $\chi^2 = 16.97$, df = 4, $P = 0.002$, $N = 149$.

	Mean difference	95% confidence interval
Knowledge scores[a]		
Manager vs food worker	0.785	(0.28, 1.29)[b]
Manager vs server	0.292	(À0.26, 0.84)
Server vs food worker	0.493	(À0.08, 1.07)
Attitude scores[c]		
Manager vs food worker	À0.087	(À0.19, 0.02)
Manager vs server	À0.157	(À0.27, À0.04)[b]
Server vs food worker	0.069	(À0.05, 0.19)

[a] Fisher's [b] P one-way ANOVA ($F_{2,641} = 7.45$, $P < 0.001$).

0.05. [c] Equal variance not assumed. Welch's one-way ANOVA ($F_{2,636} = 6.31$, $P = 0.002$).

four characteristics that were significantly associated with food worker food allergy attitudes (Table 7). Food workers in restaurants with a plan for answering questions from food allergic customers were more likely to have a higher food allergy attitude score than were workers in restaurants without such a plan. Food workers with at least some college education had greater odds of having a higher food allergy attitude score than did workers with less education. Food workers in restaurants that employed fewer than five workers for every manager were more likely to have a higher food allergy attitude score than were those workers in restaurants with five workers or more for every manager. Food workers in chain restaurants had greater odds of having a higher food allergy attitude score than did workers in independent restaurants.

A multiple logistic regression analysis identified four characteristics that were significantly associated with server food allergy attitudes (Table 7). Servers with at least some college education were more likely to have a higher food allergy attitude score than were servers with less education. Servers who had received food allergy training at the restaurant had greater odds of having a higher food allergy attitude score than did servers with no food allergy training. Servers in restaurants with a plan for answering questions from food allergic customers were more likely to have a

A multiple logistic regression analysis identified

TABLE 6. Descriptive data on restaurant manager and staff food allergy attitudes[a]

t

Manager (N 1⁄4 277) Food worker (N 1⁄4 211) Serve

Statemen

Servers should be knowledgeable about food allergies Strongly agree 173 62.5 137 64.9 113 72.4 Agree 97 35.0 74 35.1 43 27.6 Unsure 0 0 0 0 0 0 Disagree 7 2.5 0 0 0 0 Strongly disagree 0 0 0 0 0 0

Kitchen staff should be knowledgeable about food allergies Strongly agree 194 70.0 147 69.7 125 80.1 Agree 82 29.6 63 29.8 31 19.9 Unsure 0 0 1 0.5 0 0 Disagree 1 0.4 0 0 0 0 Strongly disagree 0 0 0 0 0 0

Restaurants should try to meet food allergic customers' special requests Strongly agree 133 48.0 106 50.2 88 56.4 Agree 120 43.3 99 46.9 65 41.7 Unsure 7 2.6 0 0 2 1.3 Disagree 15 5.4 4 1.9 1 0.6 Strongly disagree 2 0.7 2 1.0 0 0

This restaurant can easily meet food allergic customers' special requests Strongly agree 113 40.8 82 38.9 74 47.5 Agree 129 46.6 114 54.0 71 45.5 Unsure 9 3.2 4 1.9 1 0.6 Disagree 26 9.4 10 4.7 10 6.4 Strongly disagree 0 0 1 0.5 0 0

The staff in this restaurant know what to do if a customer has a bad food allergic reaction Strongly agree 66 23.8 51 24.2 36 23.1 Agree 130 46.9 106 50.2 82 52.6 Unsure 27 9.8 29 13.7 22 14.1 Disagree 49 17.7 25 11.9 16 10.2 Strongly disagree 5 1.8 0 0 0 0

[a] Strongly disagree ¼ 1; disagree ¼ 2; unsure ¼ 3; agree ¼ 4; strongly agree ¼ 5.

restaurants with no such plan. Servers with at least 2 years of experience in the restaurant had greater odds of having a higher food allergy attitude score than did servers with less experience.

DISCUSSION

The overarching goal of this study was to describe food allergy knowledge, attitudes, and practices in restaurants. This multisite study revealed that restaurant managers and staff are knowledgeable and have positive attitudes con- cerning accommodations for food allergic customers. One positive finding was that nearly all restaurant staff could correctly identify symptoms of an allergic reaction and knew to call emergency medical services (i.e., 911) in these situations. Most managers and staff thought it was important for food workers and servers to be knowledgeable about food allergies and that their restaurant could easily meet food allergic customers' special requests. However, we identified important gaps in knowledge and attitudes. For example, restaurant staff members were less likely to recognize eggs as a major allergen, and conversely, some foods such as strawberries were incorrectly believed to be major allergens. Another troubling finding was that more than 10% of managers and staff believe that someone with a food allergy can safely consume a small amount of that allergen. These findings for food workers are particularly troubling, because their main job responsibilities include food preparation. Accurate knowledge is critical to preventing an allergic reaction. Managers and staff also had lower confidence in their restaurants' ability to properly respond to a food allergy emergency. This finding suggests that

higher food allergy attitude score than were servers in

TABLE 7. Multiple logistic regression analysis of characteristics associated with restaurant managers, food workers, and servers scoring in the top 50% of food allergy attitude scores[a]

Characteristic	OR (90% CI)	P
Manager scored in top 50%[b]		
No. of meals served to allergic customers in past month		,0.001
1–10 vs 0	1.29 (0.73, 2.28)	0.467
.10 vs 1–10	3.72 (2.00, 6.92)	0.001
.10 vs 0	4.80 (2.35, 9.77)	,0.001
Restaurant plan for answering questions from food allergic customers		

Yes vs no 2.77 (1.59, 4.81) 0.003 Specific person to answer food allergy questions and requests

Yes vs no 1.71 (1.02, 2.85) 0.085 Allergen information on menu

Yes vs no 0.42 (0.22, 0.79) 0.023 Experience in this restaurant

!4 vs ,4 yr 0.57 (0.35, 0.94) 0.061 Received food allergy training at this restaurant

Yes vs no 1.71 (1.00, 2.92) 0.099 Food worker scored in top 50%[c]

Restaurant plan for answering questions from food allergic customers

Yes vs no 2.43 (1.33, 4.43) 0.015 Highest level of education

Some college or more vs high school diploma or less 3.35 (1.83, 6.14) 0.001 Worker:manager ratio

,5:1 vs !5:1 2.44 (1.37, 4.35) 0.011 Restaurant type

Chain vs independent 2.04 (1.13, 3.70) 0.048 Server scored in top 50%[d]

Highest level of education

Some college or more vs high school diploma or less 3.33 (1.80, 6.17) 0.001 Received food allergy training at this restaurant

Yes vs no 2.60 (1.32, 5.08) 0.020 Restaurant plan for answering questions from food allergic customers

Yes vs no 2.43 (1.16, 5.12) 0.050 Experience in this restaurant

!2 vs ,2 yr 1.89 (1.01, 3.52) 0.093

[a] Overall models were created using a forward selection criterion of $P < 0.10$. Variables are presented in order of steps at which they entered the model. OR, odds ratio; CI, confidence interval. OR > 1 indicates that the odds of the outcome (attitude score in top 50%) were greater for the first mentioned category (e.g., 1 to 10) than for the second mentioned category (e.g., 0). [b] $\chi^2 = 52.00$, df = 7, $P < 0.001$, $N = 248$. [c] $\chi^2 = 27.86$, df = 4, $P < 0.001$, $N = 196$. [d] $\chi^2 = 24.43$, df = 4, $P < 0.001$, $N = 149$.

restaurant plans and trainings may not adequately prepare staff for these emergencies. Because the incidence of food allergies continues to increase, it is important for restaurants to be prepared for potential anaphylaxis emergencies.

Identifying areas of concern is only the first step in preventing food allergic reactions in restaurants. Our additional analyses quantified the associations between restaurant, manager, and staff characteristics, practices, and observations and their food allergy knowledge and attitudes. Understanding these relationships is critical to creating effective interventions.

We found that several individual characteristics were significantly associated with food allergy knowledge and attitudes, e.g., education, work experience, and sex. Food worker knowledge level was higher among female workers and those with more experience working in their current restaurant. These findings suggest that it is important for restaurants to engage less experienced workers in food allergy trainings. Work experience and education were also significantly related to attitudes for managers, food workers, and servers. Managers with less experience had positive attitudes. In this case, experience might be a proxy for age. Anecdotal information from our data collectors suggests that younger managers were more receptive to accommodating food allergens than were older managers. In contrast, servers with more experience had positive attitudes. The contradic- tion between these findings is not readily explainable. Both food workers and servers with higher levels of education had positive attitudes.

Our findings also revealed a number of restaurant characteristics associated with food allergy knowledge and attitudes. Food workers in restaurants with higher priced food and servers in full service restaurants were more knowledge- able about food allergies. These characteristics might be indicative of restaurants with more resources to hire and retain staff who are more knowledgeable in general. Servers who served more meals per day also were more knowledgeable, perhaps because they recited the ingredients in meals to customers more frequently. Food workers in chain restaurants and those in restaurants with a lower worker-to-manager ratio also had positive food allergy attitudes.

Several allergy-specific practices were consistently related to knowledge and attitudes for managers, food workers, and servers. Serving more meals to food allergic customers was positively related to manager knowledge and attitudes but not to food worker and server knowledge and attitudes. Although staff are all involved in the process

of serving food allergic customers, managers have more of the burden to ensure a meal is allergen free, especially if they are designated as the specific person in the restaurant to handle food allergy questions and requests. Having a plan for answering questions from food allergic customers or having a specific person to answer food allergy questions and requests was positively related to food allergen knowledge and attitudes for all staff groups. Both of these practices are recommended by the Food Allergy Research and Education group (8) as part of a restaurant's food allergy management plan. Research concerning the direction of the relationship between restaurant practices and food allergy knowledge and attitudes should be explored.

Food allergy training was associated with positive manager and server attitudes but not with knowledge in any staff group. These findings suggest that food allergy trainings influence attitudes but either do not impart enough food allergy knowledge or do not result in retention of that knowledge. Relevant material for these trainings can include information on major food allergens, menu items containing food allergens, symptoms of an allergic reaction, interacting with food allergic customers, preparing for a food allergic reaction, and preventing cross-contact with allergens. Food allergy training can also be provided to new employees, and existing staff can be retrained periodically. Further research could explore which training techniques are most effective and result in long-term retention of important food allergy information.

Counterintuitively, the presence of allergen information on the menu was associated with less positive attitudes for managers. In 55% of these menus, the allergen information was a note for the customer to inform the restaurant if they or someone with them had a food allergy. In at least one of the data collection sites, legislation requires restaurants to state in the menu that customers should notify the server of any food allergies. Such legislation may produce situations in which even managers with less positive food allergy attitudes still include such notices on their menus. As more states and cities adopt food allergy laws, the extent to which these laws affect restaurants' food allergy practices can be evaluated. In any case, alerting customers to menu items containing allergens or encouraging these customers to notify staff regarding their allergies might help prevent allergic reactions. Only 22% of restaurant menus mentioned anything about allergens; we encourage more restaurants to include information about allergens on their menus.

This study had several limitations. Because we included only English-speaking managers, food workers, and servers in the study, the findings might not generalize to non- English speakers. Similarly, because the interviewed food workers and servers were chosen by managers rather than randomly, the food worker and server data might not be representative of these groups as a whole. This study also had a low participation rate (32.6%). The low response rate might have resulted in an overrepresentation of better and safer restaurants in the sample. In reporting results of a food allergen survey that also had a low response rate (4), the authors suggested that a lack of participation might reflect ''a general discomfort in responding to an inquiry regarding food allergies.'' In comparison to other food safety topics, food allergies have emerged more recently, and managers might not feel as comfortable participating in research. Almost all participants in the present study had very favorable food allergy attitudes. This range restriction limited our ability to investigate the relationship between explanatory variables and attitudes. We also were not able to make causal inferences about the relationships between explanatory and outcome variables. For example, knowl- edgeable managers may attract and retain more customers with food allergies, or an increase in customers with food allergies may compel staff to acquire additional knowledge about allergens. We cannot determine whether serving more customers with food allergies leads to higher knowledge levels. Thus, although our data suggest significant relationships between several restaurant, manager, and staff characteristics and food allergy knowledge and attitudes, more research is needed to determine the causal nature of those relationships.

Overall, these findings suggest that managers, food workers, and servers are knowledgeable and have positive attitudes about accommodating customers with food allergies. We encourage restaurants to develop plans and Rte a specific person to handle food allergy requests. Such practices were consistently associated with better knowledge and more positive attitudes. Food allergy training is also recommended for new and existing managers and staff.

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