

Role of food labels in accidental exposures in food-allergic individuals in Canada

Shashank S. Sheth, MD*; Susan Waserman, MD†; Rhoda Kagan, MD‡; Reza Alizadehfar, MD§; Marie-Noel Primeau, MD§; Susan Elliot, PhD¶; Yvan St. Pierre, MA||; Rebecca Wickett, BSc||; Lawrence Joseph, PhD||#; Laurie Harada, BA**; Claire Dufresne, BScN††; Mary Allen, MA‡‡; Marilyn Allen, BA**; Samuel Benreheb Godefroy, PhD§§; and Ann E. Clarke, MD, MSc*||

Background: Little is known about the impact of food labeling on the allergic consumer.

Objective: To determine the proportion of food-allergic individuals attributing an accidental exposure to inappropriate labeling, failure to read a food label, or ignoring a precautionary statement and to identify factors associated with accidental exposures.

Methods: Food-allergic individuals or their caregivers were recruited from a Canadian registry of individuals with a physician-confirmed diagnosis of peanut allergy and from allergy awareness organizations. Participants completed questionnaires regarding accidental exposures due to specific food labeling issues. The association between accidental exposures and characteristics of food-allergic individuals or their caregivers was estimated using multivariate logistic regression models.

Results: Of 1,862 potential participants, 1,454 (78.1%) responded. Of the 47.8% (95% confidence interval [CI], 45.1%–50.5%) of respondents who experienced an accidental exposure, 47.0% (95% CI, 43.1%–50.9%) attributed the event to inappropriate labeling, 28.6% (95% CI, 25.1%–32.2%) to failure to read a food label, and 8.3% (95% CI, 6.3%–10.7%) to ignoring a precautionary statement. Food-allergic individuals who were allergic to peanut, tree nut, fish, or shellfish were less likely to experience an accidental exposure due to the allergen not being identified in plain language.

Conclusions: A considerable proportion of accidental exposures are attributed to inappropriate labeling, failure to read labels, and ignoring precautionary statements. Clear and consistent labeling of food allergens combined with increased consumer education is necessary to improve consumer confidence and compliance and to reduce accidental exposures.

Ann Allergy Asthma Immunol. 2010;104:60–65.

INTRODUCTION

Food allergy affects approximately 6.0% of children¹ and 3.5% to 4.0% of adults,² and the prevalence may be increasing.^{2–4}

Affiliations: * Division of Clinical Immunology/Allergy, Department of Medicine, McGill University Health Centre, Montreal, Quebec, Canada; † Division of Clinical Immunology/Allergy, Department of Medicine, McMaster University, Hamilton, Ontario, Canada; ‡ Department of Pediatrics, North York General Hospital, Toronto, Ontario, Canada; § Division of Clinical Immunology/Allergy, Department of Pediatrics, Montreal Children's Hospital, McGill University Health Centre, Montreal, Quebec, Canada; ¶ School of Geography and Earth Sciences, McMaster University, Hamilton, Ontario, Canada; || Division of Clinical Epidemiology, Department of Medicine, McGill University Health Centre, Montreal, Quebec, Canada; # Department of Epidemiology and Biostatistics, McGill University, Montreal, Quebec, Canada; ** Anaphylaxis Canada, Toronto, Ontario, Canada; †† Association Québécoise des allergies alimentaires, Montreal, Quebec, Canada; ‡‡ Allergy/Asthma Information Association, Montreal, Quebec, Canada; §§ Bureau of Chemical Safety, Food Directorate, Health Products and Food Branch, Health Canada, Ottawa, Ontario, Canada.

Disclosures: Authors have nothing to disclose.

Funding Sources: This study was supported by the Allergy, Genes, and Environment Network of Centres of Excellence (AllerGen NCE Inc) and the Food Allergen Program, Bureau of Chemical Safety, Food Directorate, Health Canada. Drs Joseph and Clarke are National Research Scholars of the Fonds de la recherche en santé de Québec.

Received for publication June 16, 2009; Received in revised form August 14, 2009; Accepted for publication August 24, 2009.

© 2010 American College of Allergy, Asthma & Immunology.

Published by Elsevier Inc. All rights reserved.

doi:10.1016/j.anai.2009.11.008

Accordingly, public awareness of the potential morbidity and mortality associated with food allergy is heightening.

Mounting concerns from allergic consumers regarding the safety of prepackaged foods have prompted the government and food manufacturers to be more vigilant in notifying consumers about ingredients that commonly cause food allergies. However, current exemptions in Canadian food labeling regulations permit certain ingredients to be identified collectively or without acknowledging the allergenic source.⁵ For example, spice mixtures may appear on a food label without indicating that they contain wheat and soy; similarly, casein may appear without mentioning that it is derived from milk. Recently, the United States and the European Union enacted legislation that mandates the use of clearer labeling and declaration if the food is derived from a commonly allergenic source.^{6–8} Although Health Canada also recently issued amendments to ensure that sources of priority allergens are clearly identified,⁹ these are still undergoing a public consultation period before being adopted.¹⁰

In all circumstances, the revised labeling requirements refer only to ingredients that are intentional components of a food and do not relate to ingredients that are inadvertently introduced, such as through cross-contamination from shared manufacturing equipment.^{5,7,11} Since the early 1990s, Canadian food regulators have identified the need to alert consumers of the possible presence of undeclared allergens as a result of cross-contamination and have defined general conditions

for the use of such precautionary statements.¹² These statements are to be used by food manufacturers and importers voluntarily, and there is no regulatory requirement for, or prohibition of, precautionary labeling. In recent years, there has been a proliferation of these allergen precautionary statements, potentially leading allergic consumers to trivialize the message, thus compromising their safety.^{5,6,13–15}

Despite efforts to improve food labeling, there are hundreds of food recalls annually in North America due to undeclared allergens.^{5,6,16–18} However, little is known about the full impact of labeling errors on the allergic consumer. Although allergic consumers frequently experience inadvertent exposures,^{19–23} the proportion of consumers who attribute the exposure to specific labeling issues is largely unknown. The objectives of this study are (1) to determine the proportion of food-allergic individuals attributing an accidental exposure to inappropriate labeling, failure to read a food label, or ignoring a precautionary statement and (2) to identify factors associated with accidental exposures.

METHODS

This study was approved by the institutional review board of the McGill University Health Centre, and written consent was obtained from each participant (or caregiver if the participant was <18 years old) and written assent from children 7 years and older. Self-report questionnaires were mailed cross-sectionally to participants recruited from a Canadian registry of individuals with a physician-confirmed diagnosis of peanut allergy and from various allergy awareness organizations (ie, Anaphylaxis Canada, Allergy/Asthma Information Association, and Association Québécoise des allergies alimentaires). If the questionnaire was not returned within 1 month, participants were sent a second questionnaire. Participants were recruited between May 20, 2007, and April 1, 2008.

All the participants recruited from the Canadian peanut allergy registry fulfilled 1 of the following diagnostic criteria: (1) convincing clinical history of an IgE-mediated reaction to peanut and positive skin prick test reaction to peanut; (2) uncertain clinical history of an IgE-mediated reaction to peanut or never or rarely exposed to peanut and a positive skin prick test reaction to peanut and serum peanut specific IgE levels of 15 kU/L or greater; or (3) uncertain clinical history of an IgE-mediated reaction to peanut or never or rarely exposed to peanut and a positive food challenge to peanut. Full details on the recruitment procedure have been published elsewhere.^{19,24}

From the other sources, we recruited either allergic individuals 18 years and older or the parents or other primary caregivers of allergic individuals. To ensure that these participants (or their children) were allergic, they were queried about the details of their allergic reactions, including the interval between ingestion and reaction, symptoms, treatment provided for their most severe reaction, type of physician diagnosing the allergy, and whether they were prescribed an epinephrine autoinjector. Respondents with equivocal re-

sponses were contacted by telephone to clarify their responses. Only those with a convincing history of an allergic reaction or an allergist diagnosis of food allergy and prescribed an epinephrine autoinjector were included in this study (Fig 1).

Allergic individuals (if ≥ 18 years old) or the parents or caregivers of an allergic child were then queried about accidental exposures. If there was an inadvertent exposure to an allergen, they were asked whether it was attributable to labeling problems, failure to read labels, or ignoring a precautionary statement. Respondents were queried about the following labeling problems: (1) allergen was listed in ingredients but was not noticed when read, (2) allergen was not identified in plain language, (3) allergen was listed but not clearly visible on the label or package, (4) allergen was a hidden ingredient not explicitly listed on the label, (5) there was an error in translating ingredients from one language to another, and (6) there may have been unintentional cross-contamination during manufacturing or packaging at the distribution site and there was no precautionary statement. Respondents were also queried about age, sex, level of education, date of diagnosis of food allergy, type of food allergy, availability of an epinephrine autoinjector and medical identification indicating the food allergy, and membership in an allergy awareness association.

Characteristics of food-allergic individuals and reasons for accidental exposures were summarized using frequencies and 95% confidence intervals (CIs) (where applicable). The association between accidental exposures to food allergens (regardless of the reason) and characteristics of the food-allergic individual or the primary caregiver was estimated using univariate and multivariate logistic regression analyses. The subset of respondents who experienced an accidental exposure was further examined by using univariate and multivariate logistic regression to estimate the association between specific reasons for accidental exposures and respondent characteristics. Odds ratios (ORs) and 95% CIs were calculated for each potential independent variable. Characteristics of the food-allergic individual evaluated as possible predictors of accidental exposures were (1) time elapsed since the diagnosis of food allergy, (2) type of food allergy (allergic to ≥ 1 of peanut, tree nut, fish, or shellfish), (3) availability of epinephrine autoinjector (never/at least sometimes/at least most times/always), (4) use of a medical tag that identifies the food allergy (never/at least sometimes/at least most times/always), (5) membership in a food allergy awareness association, and (6) area of residence (urban vs nonurban, determined by the first 3 digits of the postal code). Primary caregiver characteristics evaluated included sex and level of education.

RESULTS

Of 1,862 potential participants, 1,454 (78.1%) responded. Of 784 potential respondents from the peanut allergy registry, 579 (73.9%) responded (Table 1), and of 1,078 potential respondents from allergy awareness organizations, 875 (81.2%)

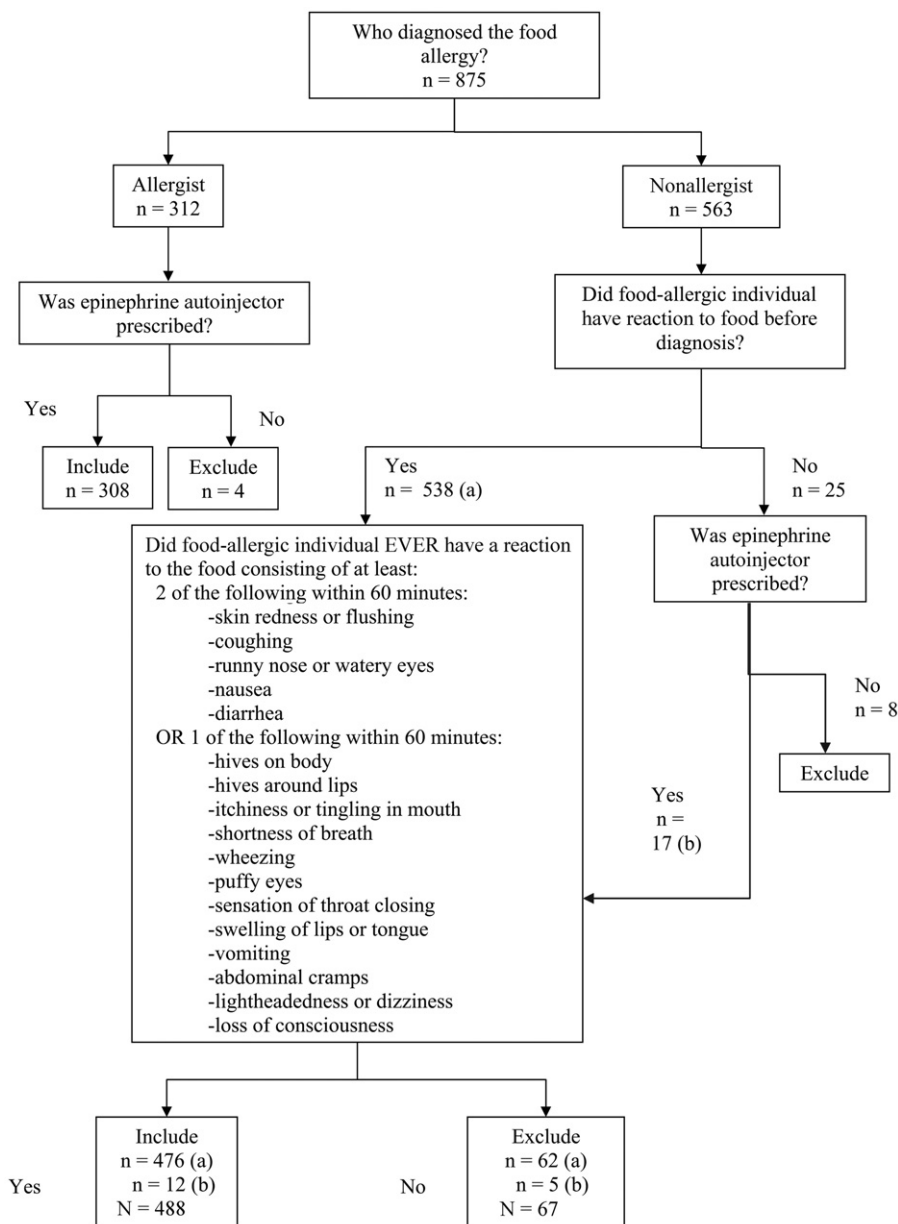


Figure 1. Algorithm for determining whether a respondent had a food allergy and was eligible for study inclusion.

responded. Respondents and nonrespondents from the peanut allergy registry were similar regarding the age and sex of the food-allergic child, the ages of the mother and father, and the primary language. However, respondents were more educated (Table 1).

Seventy-nine of 875 respondents from allergy awareness associations were excluded because they did not fulfill the criteria for food allergy (Fig 1). Nearly 17% of respondents were food-allergic individuals 18 years or older, and the remaining were parents or caregivers of children with food allergy. Almost 93% of respondents were female (mostly, mothers of

food-allergic children), and 60.1% had a university diploma. Almost 75% of respondents were associated with some type of allergy awareness organization. The mean age of the food-allergic individuals was 12.5 years, and the mean time elapsed since diagnosis of the food allergy was 8.2 years. Ninety-five percent reported an allergy to peanut, tree nut, fish, or shellfish. Approximately 86% of food-allergic individuals always carried their epinephrine autoinjector, and 50% always wore a medical tag identifying their food allergy.

A total of 47.8% (95% CI, 45.1%–50.5%) of food-allergic individuals reported having at least 1 accidental exposure to

Table 1. Characteristics of Respondents and Nonrespondents From the Peanut Allergy Registry

Characteristics	Respondents (n = 579)	Nonrespondents ^a (n = 207)	Difference between respondents and nonrespondents
Age of child in peanut registry, mean (95% CI), y	7.6 (7.3 to 7.9)	8 (7.5 to 8.5)	−0.4 (−1.0 to 0.1)
Boys in peanut registry, % (95% CI)	64.0 (59.9 to 67.9)	64.1 (57.1 to 70.6)	−0.1 (−7.8 to 7.5)
Age of mother, mean (95% CI), y	38.8 (38.3 to 39.3)	38.8 (38.0 to 39.6)	0.0 (−0.9 to 0.9)
Age of father, mean (95% CI), y	41 (40.4 to 41.5)	41.3 (40.4 to 42.2)	−0.3 (−1.4 to 0.7)
English language, % (95% CI)	61.5 (57.3 to 65.5)	55.1 (48.0 to 62.1)	6.3 (−1.5 to 14.2)
Mothers with university degree, % (95% CI)	62.9 (58.8 to 66.9)	51.0 (43.8 to 58.2)	11.9 (3.8 to 20.0)
Mothers with some college or university education, % (95% CI)	89.8 (87.0 to 92.2)	75 (68.3 to 80.9)	14.8 (8.3 to 21.4)
Fathers with university degree, % (95% CI)	53.7 (49.5 to 57.9)	50 (42.8 to 57.2)	3.7 (−4.5 to 11.9)
Fathers with some college or university education, % (95% CI)	81.1 (77.6 to 84.3)	70.1 (63.1 to 76.4)	11.0 (3.8 to 18.2)

Abbreviation: CI, confidence interval.

^a Data can be provided only for nonrespondents from the peanut allergy registry because they already existed in the registry database; comparable data were not available for nonrespondents recruited from the associations.

an allergen after being diagnosed as having a food allergy. Among those, 47.0% (95% CI, 43.1%–50.9%) attributed an inadvertent exposure to a food labeling–related issue (Table 2), 28.6% (95% CI, 25.1%–32.2%) to failure to read a food label, and 8.3% (95% CI, 6.3%–10.7%) to ignoring a precautionary statement. (These results do not total to 100% because some respondents who experienced an accidental

exposure did not attribute it to any of these 3 reasons, and some attributed the exposures to 1.) Among individuals attributing an accidental exposure to a labeling problem, unintentional cross-contamination with no precautionary statement was the most commonly reported reason for inadvertent exposures (16.6%; 95% CI, 13.8%–19.7%).

Multivariate analyses revealed that food-allergic individuals who were allergic to peanut, tree nut, fish, or shellfish (vs food-allergic individuals who do not have 1 of these allergies) were less likely to have an accidental exposure (OR, 0.33; 95% CI, 0.18–0.58) (Table 3). Of individuals experiencing an accidental exposure, those who always carry an epinephrine autoinjector were less likely to attribute an accidental exposure to failure to read a food label (OR, 0.62; 95% CI, 0.40–0.97). Those allergic to peanut, tree nut, fish, or shellfish were less likely to attribute the exposure to the allergen not being identified in plain language (OR, 0.24; 95% CI, 0.12–0.50). Individuals who were members of allergy awareness associations were more likely to attribute an accidental exposure to the allergen not being explicitly listed (OR, 2.20; 95% CI, 1.13–4.28) or to cross-contamination (OR, 3.11; 95% CI, 1.51–6.37).

DISCUSSION

We found that food-allergic individuals attribute accidental exposures to manufacturer and consumer error. Forty-seven percent of food-allergic individuals who have experienced an accidental exposure attribute at least 1 such event to a manufacturer-related error, whereas 28.6% attribute at least 1 exposure to their own error, such as failure to read labels, and 8.3% to ignoring precautionary statements. Other studies^{13–15,25} have also reported significant problems with food labeling, but, to our knowledge, the present study is the first to examine the rates of accidental exposures attributed to consuming foods with precautionary statements.

Table 2. Food-Allergic Individuals Experiencing an Accidental Exposure Who Attribute at Least 1 Exposure to a Food Labeling–Related Issue

Food labeling–related issue	Respondents, No. (%) [95% CI] (n = 651)
Food label was read but listed allergen was not noticed	86 (13.2) [10.7–16.1]
Allergen was not identified in plain language (eg, “casein” instead of “milk”)	87 (13.4) [10.8–16.2]
Allergen was listed but not clearly visible on the label or package (eg, the allergen information was not boldfaced or listed on the main food label with the other ingredients)	87 (13.4) [10.8–16.2]
Allergen was a hidden ingredient that was not listed/declared on the food label (eg, ingredients listed “natural flavoring” but did not indicate that “milk” was part of the “natural flavoring”)	106 (16.3) [13.5–19.3]
Error in translating ingredients from one language to another	24 (3.7) [2.4–5.4]
Unintentional cross-contamination during manufacturing or packaging at the distribution site and there was no precautionary statement	108 (16.6) [13.8–19.7]
Any of the above	306 (47.0) [43.1–50.9]

Abbreviation: CI, confidence interval.

Table 3. Regression Models for Accidental Exposures Overall and Exposures Related to Specific Food Labeling Issues

	Odds ratio (95% CI)
Outcome: accidental exposure to allergen	
Predictors	
Time elapsed since diagnosis of food allergy	1.11 (1.09–1.13)
Peanut/tree nut/fish/shellfish allergy	0.33 (0.18–0.58)
Urban residence	1.31 (1.03–1.66)
Outcome: accidental exposure because label not read	
Predictors	
Always carrying an epinephrine autoinjector	0.62 (0.40–0.97)
Outcome: accidental exposure because allergen not identified in plain language	
Predictors	
Time elapsed since diagnosis of food allergy	1.03 (1.00–1.05)
Peanut/tree nut/fish/shellfish allergy	0.24 (0.12–0.50)
Outcome: accidental exposure because allergen listed but not clearly visible on label	
Predictors	
Medical tag worn at least most of the time	1.74 (1.06–2.85)
Outcome: accidental exposure because allergen was hidden ingredient not listed or declared	
Predictors	
Time elapsed since diagnosis of food allergy	1.04 (1.02–1.06)
Member of food allergy awareness organization	2.20 (1.13–4.28)
Outcome: accidental exposure because of unintentional cross-contamination during manufacturing or packaging and no precautionary statement provided	
Predictors	
Time elapsed since diagnosis of food allergy	1.03 (1.01–1.05)
Member of food allergy awareness organization	3.11 (1.51–6.37)

Abbreviation: CI, confidence interval.

Food-allergic individuals, their caregivers, and anyone involved in the purchasing, preparing, or serving of food to allergic consumers must be educated about the need to carefully read and observe food labels. Allergists and other health care providers should repeatedly remind food-allergic patients to always read food labels for all manufactured goods. Foods that were once safe to consume may contain new precautionary statements or allergens. Food-allergic individuals should be encouraged to join food allergy awareness organizations, which inform their members of product recalls

because of undeclared allergens and respond to queries regarding the allergen content of products. Food-allergic individuals should also be advised to check product Web sites or to contact manufacturers if they have concerns regarding allergens. In addition to protecting the consumer, this practice may help manufacturers identify products that may be worrisome for food-allergic individuals. Consumers should be especially cautious when eating foods manufactured and processed outside North America because labeling practices are less stringent in other countries. Vadas and Perelman²⁶ found that greater than 30% of 60 chocolate bars imported from Europe contained detectable levels of peanut protein despite not having a precautionary statement.

As anticipated, we observed in multivariate regression analysis that those who always carried their autoinjector were less likely to experience an accidental exposure due to failure to read a label. It is to be expected that allergic individuals who comply with recommendations about carrying a life-saving medication are also more likely to be prudent about reading labels. We found no such association for those wearing medical alert tags, although this practice is less common than carrying an autoinjector.

Individuals who were allergic to peanut, tree nut, fish, or shellfish were less likely to have an accidental exposure due to the allergen not being identified in plain language. Historically, these 4 allergens are known to cause more severe reactions, and, therefore, manufacturers are likely to be more prudent about clearly identifying them. Furthermore, there are few, if any, alternative terms to describe these allergens. In contrast, allergens such as milk and egg are sometimes identified by complex terminology, such as casein or ovalbumin, which are not readily recognized by the consumer.

Being a member of a food allergy awareness organization was associated with an increased likelihood of attributing an accidental exposure to an undeclared ingredient or cross-contamination. One would expect that members of food allergy awareness organizations are more prudent about reading and interpreting food labels and about heeding allergen warnings. Therefore, it is anticipated that this group was more likely to attribute an accidental exposure to a presumed manufacturer error vs their own mistake in reading a label.

Although we anticipated that a higher level of parental education would have been associated with fewer accidental exposures, we found no such association. This may be because the present respondents were highly educated, and a study recruiting a population with an education level more representative of the general Canadian population may show an association between education and accidental exposures. If no such association is found, it suggests that either the terminology on food labels is sufficiently simple that the interpretation is not influenced by education level or that those with lower levels of academic education are still well informed about food allergies and interpreting food labels.

Given that the data were retrospectively collected, we acknowledge that there are potential limitations. Although respondents were contacted by telephone to verify equivocal

responses, recall bias may lead to inaccurate responses regarding the cause of accidental exposures in the distant past. Furthermore, food-allergic individuals may attribute their accidental exposures to inappropriate labeling but may not have verified whether there was truly a manufacturer error. For example, it is possible that the cross-contamination may have been the fault of the consumer rather than the manufacturer, occurring after the package was opened and introduced by those handling and serving the food. Similarly, respondents may have attributed the exposure to "allergen not clearly visible on the label" rather than acknowledging that the "listed allergen was not noticed." It was not possible to inquire about the date or symptoms or to verify the cause of the accidental exposure because it would be unlikely that participants would be able to recall these details. Ideally, data collection would be prospective, with participants contacting the research team at the time of their accidental exposure. However, this would be extremely demanding on participants and likely unsuccessful. A prospective study may also be imperfect because people may be unwilling to admit mistakes and careless behavior when reading food labels. In fact, most studies^{2,4,16} examining rates of allergic reactions are retrospective given that these events are so rare. It should also be noted that most of the participants were recruited through food allergy awareness organizations and were highly educated and, therefore, were likely better informed and more vigilant than the general population of food-allergic consumers. Consequently, these findings regarding rates of accidental exposures related to food labeling may be conservative.

In conclusion, we show that a significant proportion of accidental exposures are due to manufacturer and consumer errors. This study should encourage food regulators in Canada and worldwide to develop improved labeling practices regarding allergens in prepackaged foods. Clear and consistent labeling should increase consumer confidence and broaden food choices while reducing accidental exposures. However, improved labeling is only part of the solution. It must be combined with enhanced consumer education on the constant necessity to scrutinize food labels for allergen information and to observe precautionary statements.

REFERENCES

1. Bock SA. Prospective appraisal of complaints of adverse reactions to foods in children during the first 3 years of life. *Pediatr*. 1987;79:683–688.
2. Sicherer SH, Munoz-Furlong A, Sampson HA. Prevalence of seafood allergy in the United States determined by a random telephone survey. *J Allergy Clin Immunol*. 2004;114:159–165.
3. Grundy J, Matthews S, Bateman B, Dean T, Arshad SH. Rising prevalence of allergy to peanut in children: data from 2 sequential cohorts. *J Allergy Clin Immunol*. 2002;110:784–789.
4. Sicherer SH, Munoz-Furlong A, Sampson HA. Prevalence of peanut and tree nut allergy in the United States determined by means of a random digit dial telephone survey: a 5-year follow-up study. *J Allergy Clin Immunol*. 2003;112:1203–1207.
5. Zarkadas M, Scott FW, Salminen J, Pong AH. Common allergenic foods and their labelling in Canada: a review. *Can J Allergy Clin Immunol*. 1999;4:118–141.
6. Taylor SL, Hefle SL. Food allergen labeling in the USA and Europe. *Curr Opin Allergy Clin Immunol*. 2006;6:186–190.
7. Mills EN, Valovirta E, Madsen C, et al. Information provision for allergic consumers: where are we going with food allergen labelling? *Allergy*. 2004;59:1262–1268.
8. Humieres J, Wal JM. EU regulation: what's new in terms of labelling of food allergens? *Allergy*. 2004;59:1259–1261.
9. Health Canada urges food manufacturers to label priority food allergens, gluten sources and added sulphites in the pre-publication period of the Food Allergen Labelling Regulatory Amendments. Health Canada Web site. http://www.hc-sc.gc.ca/fn-an/label-etiquet/allergen/guide_ligne_direct_indust-eng.php.
10. Regulations amending the food and drug regulations (1220—enhanced labeling for food allergen and gluten sources and added sulfites). *Canada Gazette*. 2008;142:2277–2305.
11. Boden M, Dadswell R, Hattersley S. Review of statutory and voluntary labelling of food allergens. *Proc Nutr Soc*. 2005;64:475–480.
12. The use of food allergen precautionary statements on prepackaged foods. Health Canada Web site. http://www.hc-sc.gc.ca/fn-an/label-etiquet/allergen/precaution_label-etiquette-eng.php.
13. "May Contain" Labelling: The Consumer's Perspective. London, England: Foods Standard Agency Publications; May 2002.
14. Hefle SL, Furlong TJ, Niemann L, Lemon-Mule H, Sicherer S, Taylor SL. Consumer attitudes and risks associated with packaged foods having advisory labeling regarding the presence of peanuts. *J Allergy Clin Immunol*. 2007;120:171–176.
15. Vierk KA, Koehler KM, Fein SB, Street DA. Prevalence of self-reported food allergy in American adults and use of food labels. *J Allergy Clin Immunol*. 2007;119:1504–1510.
16. Food allergens still pose a threat in US foods. Food Quality News Web site. <http://foodqualitynews.com/news/ng.asp?id=70587>.
17. Vierk K, Falci K, Wolyniak C, Klontz KC. Recalls of foods containing undeclared allergens reported to the US Food and Drug Administration, fiscal year 1999. *J Allergy Clin Immunol*. 2002;109:1022–1026.
18. Schappi GF, Konrad V, Imhof D, Etter R, Wuthrich B. Hidden peanut allergens detected in various foods: findings and legal measures. *Allergy*. 2001;56:1216–1220.
19. Yu JW, Kagan R, Verreault N, et al. Accidental ingestions in peanut allergic children. *J Allergy Clin Immunol*. 2006;118:466–472.
20. Bock SA, Atkins FM. The natural history of peanut allergy. *J Allergy Clin Immunol*. 1989;83:900–904.
21. Sicherer SH, Burks AW, Sampson HA. Clinical features of acute allergic reactions to peanut and tree nuts in children. *J Pediatrics*. 1998;102:e6.
22. Vander Leek TK, Liu AH, Stefanski K, Blacker B, Bock SA. The natural history of peanut allergy in young children and its association with serum peanut-specific IgE. *J Pediatr*. 2000;137:749–755.
23. Ewan PW, Clark AT. Efficacy of a management plan based on severity assessment in longitudinal and case-controlled studies of 747 children with nut allergy: proposal for good practice. *Clin Exp Allergy*. 2005;35:751–756.
24. Ben-Shoshan M, Kagan R, Primeau MN, et al. Availability of the epinephrine autoinjector at school in children with peanut allergy. *Ann Allergy Asthma Immunol*. 2008;100:570–575.
25. Simons E, Weiss CC, Furlong TJ, Sicherer SH. Impact of ingredient labeling practices on food allergic consumers. *Ann Allergy Asthma Immunol*. 2005;95:426–428.
26. Vadas P, Perelman B. Presence of undeclared peanut protein in chocolate bars imported from Europe. *J Food Prot*. 2003;66:1932–1934.

Requests for reprints should be addressed to:

Ann E. Clarke, MD, MSc
 McGill University Health Centre
 687 Pine Ave W
 V Building, Room V2.05
 Montreal, QC H3A 1A1, Canada
 E-mail: ann.clarke@mcgill.ca