

Epidemiology of Food Allergy



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KEYWORDS

- Food allergy • Epidemiology • Prevalence • Age • Population • Geography
- Ethnic groups

KEY POINTS

- It is difficult to measure food allergy prevalence accurately in population-wide studies.
- In the United States, the estimated rate of self-reported food allergy is between 4.8% and 8% among children, whereas in international studies it is generally lower.
- An important exception is in Australia, where a high rate of food allergy in infants suggests that there may be substantial food allergy that is transient and not recognized.
- The rate of food allergy seems to be increasing, but data about fatalities and sensitization conflict with the increase seen in self-report and in hospitalizations.
- More data are needed to understand these trends.

In recent decades, food allergy has seemed to increase at a dizzying rate, sparking a search for the environmental factors that may underlie this increase. Understanding how many people are affected by food allergy, which groups are most at risk, and how risk has changed over time, that is, the epidemiology of food allergy, can provide clues to both genetic and environmental causes of the disease. Herein we review the epidemiology of food allergy, focusing on immunoglobulin E (IgE)-mediated allergy. Our perspective is from the United States, but we review international data to understand how geography and genetics may influence the development of allergy. We discuss the challenges inherent in efforts to estimate rates of food allergy, and summarize the conflicting evidence about whether increasing reports of food allergy reflect true increases in disease.

CHALLENGES IN UNDERSTANDING THE EPIDEMIOLOGY OF FOOD ALLERGY

Study Design

Estimating the rate of food allergy in a population is challenging because measuring food allergy on a large scale is difficult. True food allergy is defined by a specific,

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reproducible, immunologically mediated clinical response upon exposure to allergen. Only food challenge directly assesses the clinical response upon allergic exposure, but the inherent risk to patients of food challenge, combined with the fact that it is time and staff intensive, makes it untenable in general for large-scale studies of food allergy prevalence, with few exceptions.

Self-report or parental report is easiest to obtain in broad population surveys, but generally tends to overestimate prevalence, because many people mistake intolerances, such as lactose intolerance, or other conditions for food allergy. Typically, population-based surveys ask brief questions that do not distinguish between IgE-mediated allergy, non-IgE-mediated allergy and intolerance, and many positive responses are not corroborated with further investigation.^{1,2}

Surveys that use more detailed questions, such as those done by Gupta and co-workers³ or Sicherer and associates,⁴ may reduce overreporting but, because these surveys typically have food allergy as the focus and are done by telephone or Internet, they may suffer more from selection bias. Selection bias arises from the tendency for those with food allergy to be more likely to participate in surveys about food allergy. Soller and colleagues⁵ quantified this bias in a telephone survey in Canada, and found that those who did not complete a full survey were much less likely to report food allergy than those who did. They estimated that selective nonresponse could inflate prevalence rates by somewhere between 20% and 110%. Further complicating matters, both nonresponse and overreporting of food allergy may vary between groups and over time.⁶

Objective measures of sensitization, such as specific IgE levels or skin-prick tests, have also been used in some national surveys to estimate food allergy rates. However, like self-report, these tests suffer from poor specificity, making it difficult to extrapolate prevalence estimates from sensitization data. As an example, Liu and associates⁷ attempted to apply positive predictive values for food-specific IgE cutoffs to the National Health and Nutrition Examination Survey (NHANES) 2005 to 2006, the only national survey in the United States to prospectively measure food-specific IgE. Although the estimate of food allergy prevalence that they calculated, 2.5%, was similar to or less than estimates derived from self-report, the methods they used to derive this estimate may not be robust. This finding is because the positive predictive value is a function of both the inherent qualities of the test and the prevalence of disease in the population studied. Positive predictive values generated from allergy clinics with high rates of food allergy will lead to overestimates of food allergy when used in the general population. In fact, in that same survey, most of those assigned to "high probability of food allergy" reported eating the same food, making food allergy very unlikely.⁸ Combining objective measures such as skin prick test or IgE with detailed questions about food allergy history would markedly improve the accuracy of population-based estimates of food allergy, but such surveys have not been done on a population wide basis in the United States to date.

Use data, such as that on hospitalizations and outpatient visits provide another window into the prevalence. However, these data are severely limited by the historical lack of specific and commonly used codes for food allergy, the fact that much food allergy may not present for medical care, and differences in health care use related to access to care.

Finally, a few population-based studies throughout the world have used food challenge to confirm food allergy. Among those efforts is the EuroPREVALL project, which sought to establish patterns of food allergy across Europe by establishing birth cohorts in 8 European countries.⁹ Suspected food allergy was evaluated clinically, including with oral food challenge. In Australia, the HealthNUTs study

surveyed 1-year-old children at immunization clinics with universal skin prick testing to select food allergens, and offered food challenge to anyone with positive skin prick tests.¹⁰ As discussed in the section on egg allergy elsewhere in this article, this study raised the interesting possibility that, in addition to conflating food intolerance and true food allergy, questionnaire surveys may also miss some true, but transient, food allergy that is elicited during food challenge.

The Spectrum of Food Allergy

Another factor that complicates our understanding of the prevalence and risk factors for food allergy is that there is a spectrum of conditions that can broadly be called food allergy, but may have very different clinical implications. In the sections on milk and egg allergy, we discuss how most people with milk or egg allergy are able to tolerate highly cooked forms of these foods, confusing population-wide assessment of disease. Perhaps more important is oral allergy syndrome (OAS, also called pollen-food allergy syndrome), a syndrome caused by cross-reactivity to pollen allergens, and typically limited to oral symptoms. The most commonly implicated foods are fruits, vegetables, and nuts, and symptoms usually start in the second decade of life or later. Because symptoms can be very mild, it is often not recognized, but can also be confused with systemic food allergy. The prevalence is estimated to be at least 8% in the United States and likely higher in Europe, but is highly dependent on both age and geographic location.¹¹ Surveys that depend on questionnaire or IgE sensitization may be poorly able to distinguish this type of allergy from systemic food allergy.

The Effect of Age on Food Allergy Estimates

Worldwide, the prevalence of food allergy is higher in younger age groups, and decreases with age. Studies of birth cohorts suggest that this pattern of younger patients having higher rates of food allergy does not represent population shifts in prevalence. Rather, patients within the same birth cohort have peak of food allergy in early pre-school years and then demonstrate a lower prevalence thereafter. For example, a birth cohort on the Isle of Wight in the UK, where food allergy was confirmed by oral food challenge, demonstrated a prevalence of 4% at 1 year of age,¹² 5% to 6% at 3 years of age,¹³ and 2.5% at 6 years of age.¹⁴ Similar results were seen in a Danish birth cohort with food allergy prevalence of 3.6% at 18 months and 1.2% at 72 months.¹⁵ This trend is not always noted in questionnaire data, perhaps because OAS becomes more common with age, or perhaps because adults may be more likely to confuse intolerances with true allergies.

BEST ESTIMATES OF THE PREVALENCE OF FOOD ALLERGIES

Current Data on the Prevalence of Food Allergy in the United States

To date, nationally representative studies of food allergy in the United States are limited to questionnaire surveys. Among children, the estimated rate of food allergy was 6.5% in NHANES 2007 to 2010,¹⁵ when food allergy questions were included in the dietary behaviors survey, 5.7% in the 2015 National Health Interview Survey, which asked about food or digestive allergy in the past 12 months¹⁶; 4.8% in the 2007 National Survey on Children's Health,¹⁷ which asked the same question; and 8% in an Internet survey by Gupta and colleagues³ focused on food allergy.

There are far fewer data about food allergy in adults in the United States. From the NHANES 2007 to 2010 data, the estimated rate of food allergy among adults was 9.7%⁸ and in a survey using a consumer panel conducted by the US Food and Drug Administration, the rate was 13% in 2010.¹⁸

Global Differences in Food Allergy Prevalence

As in the United States, most of the data about global food allergy rates are obtained by self-report, although there are concerted efforts by several large groups to conduct studies where food allergy is confirmed by oral food challenge. Whether obtained by self-report or confirmed by food challenge, rates of food allergy overall and to specific foods are quite variable, even within surveys, regions, and countries.

Prescott and colleagues¹⁹ recently conducted a global survey of World Allergy Organization member countries to try to understand geographic differences in the prevalence of food allergy. Using a standardized data collection tool, they estimated the prevalence of food allergy in 89 countries spanning Europe, Asia/Oceania, the Americas, Africa, and the Middle East. Among infants and preschool aged children, the estimated rate of food allergy in data derived from questionnaire or questionnaire plus sensitization ranged from 2.5% to 5% in Sweden, France, Japan, and Taiwan to highs of almost 10% in Finland and Canada, with Hong Kong and Korea somewhere in between. Among children older than 5, the estimated prevalence varied more widely, from more than 10% or even 15% in Italy, Ghana, Colombia, Lithuania, Iceland, Tanzania, and Mozambique to less than 5% in Kenya, France, Estonia, Israel, and Australia. Among adults, the self-reported rate of doctor-diagnosed food allergy in the EuroPrevall community surveys was 4.4% overall, with country-specific estimates ranging from 0.5% in Lithuania to 7.8% in Switzerland.²⁰

Far fewer studies have confirmed questionnaire report with food challenge. Among infants and preschoolers, rates of food allergy confirmed by oral food challenge range from a low of 1% in a city in Thailand,²¹ to 3% in an urban area of China,²² to a 5% cumulative incidence before the age of 2 in the UK,²³ to a high of 10% in Australia.¹⁰ Among older children, prevalence ranges from 0.16% among adolescents in Turkey,²⁴ 1.2% among 6-year-old children in Denmark,²⁵ to 2.5% among 6-year-old children on the Isle of Wight in the UK.²⁶ Very few prevalence data were derived via oral food challenge for adults, but 1 Danish study found a prevalence of 3.2% in an unselected population.²⁷

In sum, the global data are somewhat confusing. Rates of self-reported food allergy vary widely, and reach implausibly high numbers in small studies of varying methodologic rigor. In the sparse data that come from studies using food challenge, there are hints that less industrialized (or “Westernized”) countries such as Thailand and Turkey may have lower rates of food allergy, but many of these studies only examined a select set of foods and may have other methodologic concerns. One of the most rigorously designed studies, the HealthNuts study, found the highest rate of confirmed allergy, primarily attributable to very high rates of egg allergy in infancy.¹⁰ We discuss the potential reasons for this finding in the section on egg allergy. Examining prevalence trends for specific foods may give more insight into geographic differences in prevalence and the environmental exposures that contribute to food allergy.

Prevalence of Specific Food Allergies

In the United States, the most prevalent food allergies are to peanut, cow’s milk, hen’s egg, shellfish, tree nuts, wheat, fish, and soy. These 8 allergens are estimated to account for 90% of systemic food allergies in the United States.²⁸ Here we explore the epidemiology of peanut, tree nut, hen’s egg, cow’s milk, shellfish, and fish allergy because these are the foods to which allergy is both most common and most likely to involve serious reactions.

Peanut allergy

Peanut allergy is a major cause of food-related anaphylaxis. Most peanut allergy presents early in life, and most peanut allergic children do not outgrow their peanut allergy.²⁹ The prevalence of peanut allergy by self-report in the United States varies from about 1.2% to 2% in US children and 0.6% to 0.8% in US adults, with the higher rates in children thought to represent secular trends in peanut allergy rather than resolution of allergy.^{3,4,8} Similar rates of self-reported peanut allergy were reported in various surveys in Western Europe and Canada, although, in general, rates of self-reported peanut allergy are higher in Northern Europe,³⁰ with low rates reported in the Middle East and Asia.^{22,31–34} In Europe, a metaanalysis of peanut allergy prevalence put the rate of challenge confirmed peanut allergy much lower (0.2%), but this number increased to 1.6% when food challenge and history of peanut reactions were combined.³⁰ Investigation of the low prevalence of peanut allergy in Israel led to the hypothesis that early introduction of peanut prevents peanut allergy, a finding now confirmed in a randomized, controlled trial.³³ A relative dearth of peanut allergy in East and Central Asian countries is potentially secondary to dietary or environmental differences, particularly the form of peanut consumed (boiled vs roasted).³⁵

Tree nut allergy

The tree nuts include, but are not limited to, walnut, pecan, hazelnut, cashew, pistachio, almond, pine nut, and Brazil nuts. The natural history of tree nut allergy is distinct from most other foods, with prevalence increasing over time and resolution a relatively rare occurrence (<20%).³⁶ Tree nut allergy is also unusual in that a substantial proportion of tree nut allergy falls within the category of OAS. Notwithstanding OAS, tree nut allergy is one of the most common causes of anaphylaxis, accounting for up to 40% of cases in some series,³⁷ and, together with peanut allergy, up to 90% of food-related fatalities.

In the United States, most estimates of the prevalence of tree nut allergy are around 1%.^{3,4,8} Recently, McWilliam and associates³⁷ performed a systematic review of the prevalence of tree nut allergy worldwide. Among the 7 studies that used oral food challenge, the prevalence in children was 0% to 1.4%, whereas 0% to 4.9% reported tree nut allergy, and 0.8% to 6.5% were sensitized to at least 1 tree nut. No studies of adults were done that used oral food challenge, but self-reported rates ranged from 0.18% to 8.9%. Generally, studies from Europe showed a higher prevalence of tree nut allergy, a finding thought to be related to the patterns of pollen allergy there, particularly birch allergy, and the concomitant OAS, but there are no data on the prevalence outside of North America, Asia, and Europe.³⁷

In terms of individual tree nuts, hazelnut allergy was the most common food allergy reported in outpatient clinics in the EuroPrevall study, and was strongly associated with birch pollen allergy.³⁸ In the United States, walnut and cashew allergy seem to be the most common tree nut allergies, and in the UK, Brazil nut, almond, and walnut allergies are the most common.³⁷

Egg allergy

Our understanding of egg allergy has become more nuanced in recent years, as we have come to understand that many children with egg allergy are able to tolerate extensively heated forms of egg.³⁹ Larger studies do not usually distinguish between these phenotypes.

In the United States, surveys relying on self-report place the prevalence of egg allergy among all children at 0.6% to 0.8% overall, at 1% among those 0 to 2 years of age, and at 0.5% among adults.^{3,8} The overall rate of egg allergy in the

EuroPREVALL birth cohort, which used oral food challenges, is similar, with 1.2% of 1- to 2-year-old children estimated to have an egg allergy. Within this cohort, Northwestern European countries had the highest prevalence and Mediterranean and Eastern European countries the lowest, with differences greater than 200% between some countries (ie, Greece with a rate of 0.1% and the UK, with a rate of 2.2%).⁴⁰ However, a population-based study of 1-year-old children in Australia that used oral food challenges (HealthNuts) estimated the rate at 9%,¹⁰ far higher than in any European country.

What can we make of the sky-high rates of egg allergy in Australia? It is possible that environmental or genetic differences may underlie these geographic variations, but it seems unlikely that either the genetic backgrounds of studied subjects or possible environmental risk factors (such as dietary practices, antibiotic use, etc) are so different between Australia and the United States or Europe. More likely, the ascertainment methods are to blame for these differences. In HealthNuts, all children were evaluated with egg skin prick testing, with those with a positive test offered an oral challenge with a raw egg powder, regardless of reported tolerance or reactivity. In contrast, in EuroPREVALL, it was only those with eczema or suspected egg allergy who were evaluated for sensitization, and only those who did not have a history of tolerating egg who were offered food challenge.⁴⁰ Given that 80% of those with egg allergy in HealthNuts tolerated baked egg,¹⁰ and that the vast majority of egg allergy resolved by 4 years of age,⁴¹ it is likely that many of the egg allergic cases identified in the HealthNuts study would not have ever been diagnosed with egg allergy outside of the study. The surprising take away is that underrecognition of food allergy may be as much of a factor as overreporting.

Milk allergy

There are several factors that make estimating the prevalence of milk allergy uniquely difficult. Most important is the spectrum of intolerances and allergies that are commonly caused by cow's milk exposure. Age-related lactase deficiency, which can lead to lactose intolerance, is reported to occur in up to 70% of the world's population,⁴² and is often confused for allergy. Non-IgE-mediated allergic reactions to milk are also common, including allergic proctocolitis, which presents early in infancy.⁴³ In addition, like egg allergy, the epidemiology of milk allergy is confusing because most allergy resolves early in life, and because most people with IgE-mediated milk allergy are able to tolerate extensively heated milk.⁴⁴

In the United States, about 2% of children and 2.6% of adults report a milk allergy.^{3,8} A European metaanalysis in 2014 estimated the point prevalence of self-reported milk allergy to be 2%, and 0.6% for food challenge confirmed allergy.³⁰ Similarly, in a more recent report of the EuroPrevall birth cohorts, the overall cumulative incidence of food challenge proven cow's milk allergy was 0.5% in young children, with rates varying from less than 0.3% in Lithuania, Germany, and Greece, to 1% in the Netherlands and the UK.⁴⁴ In China, the self-reported rate of cow's milk allergy among kindergarteners was 1.9%,⁴⁵ with other studies in Hong Kong³¹ and South Korea⁴⁶ finding milk allergy to be among the most commonly reported allergies. In contrast, a study of Turkish infants found a rate of only 0.1%,⁴⁷ but it was a relatively small study.

As with egg allergy, it seems that the rate of milk allergy is less in Southern than Northern Europe, but there are very few global data outside the United States and Europe.

Shellfish allergy

Shellfish are a group of foods to which individuals may be individually or multiply reactive, and include both mollusks (ie, squid, clams, and octopus) and crustaceans

(ie, crab, shrimp, and lobster). In general, shellfish allergy tends to be persistent and to present later in life than many other food allergies. Crustaceans and mollusks share some cross-reactive proteins (most notably tropomyosin proteins), but crustacean allergy tends to be more common, and the majority of those with crustacean allergy can tolerate mollusks.⁴⁸

The prevalence of any self-reported shellfish allergy among US children ranges from 0.5% to 2.0%,^{3,8,48} whereas in Europe estimates of crustacean allergy range from 0.1% in Lithuania to 5.5% in France, and mollusk allergy from 0.5% in Portugal to 1.5% in France.⁴⁹ In Asia, there is a wide range of reported crustacean allergy among children, from 0.5% in Thailand⁵⁰ to 4.0% in Taiwan,⁵¹ with fewer data about mollusk allergy. Among adults, self-reported prevalence of shellfish allergy in the United States is around 2.0% (2.0% in NHANES⁸ and 2.5% in a telephone survey⁴⁸). Worldwide, there are fewer data on adults, with an estimate of 2.0% allergic to shrimp in Denmark²⁷ and 3.3% in Taiwan.⁵¹ There are few studies that have used food challenges to confirm allergy: in Denmark none of those younger than 3 years of age and 0.3% of adults had shrimp allergy, compared with 0.3% and 0.9% in 2 studies of children in Thailand.^{21,27}

On the whole, the prevalence of shellfish allergy seems to be higher in adults than children, and may be higher in Asia, but more data are needed.

Fish allergy

Fish also encompass a wide range of foods, with variable cross-reactivity between species. Epidemiologic studies typically use cod as the prototypical fish or do not differentiate between species. The rate of self-reported fish allergy among children in the United States is relatively low, at 0.2% in a telephone survey⁴⁸ and 0.43% in NHANES,⁸ whereas in Europe and the Middle East the self-reported rate ranges from 0% in Israel to 9% in Finland,⁴⁹ and in Asia, rates ranged from 0.2% in Hong Kong to 4.3% in the Philippines.⁴⁹ In European studies confirming diagnosis with food challenge, the rate of fish allergy in children was 0.2% or less in Denmark,²⁷ Turkey,⁵² the UK,¹⁴ Thailand,²¹ and Finland,⁵³ and 0.3% or less in adults in Denmark²⁷ and Turkey.⁵² Thus, the overall prevalence of fish allergy seems to be low, except perhaps in certain specific countries.

CHANGES OVER TIME IN FOOD ALLERGY

Survey data in the United States clearly show an increase in the prevalence of self-reported food allergy in general, and peanut allergy in particular, among children over the past several decades. In a metaregression of studies sponsored by the Centers for Disease Control and Prevention, the estimated increase in food allergy prevalence was 1.2% per decade, such that the rates estimated by the National Health Interview Survey increased from 3.4% in 2000% to 4.6% in 2010.⁵⁴ Similarly, in the survey of peanut allergy conducted by Sicherer and colleagues,⁴ the rate increased from 0.4% in 1997% to 1.4% in 2008.

Health care use for food allergy has also increased over the same period. In Illinois, there was an increase in food allergy-related visits to the emergency department and hospitalizations from 6.3 per 100,000 children in 2008 to 17.2 per 100,000 in 2012.⁵⁵ In Olmstead, Minnesota, estimates of peanut allergy from chart review increased from 0.2% to 0.7% between 1999 and 2007.⁵⁶ In the UK, an increase of 500% in food-related hospitalizations between 1990 and 2004 was seen,⁵⁷ whereas in Australia, hospital admissions for food-related anaphylaxis increased by 10% per year between 1997 and 2013.⁵⁸ Despite the clear increase in emergency department visits and hospitalizations for food allergy, the data on fatal food reactions are mixed.

Food allergy-related fatalities remained stable or even decreased in the UK, the United States, Brazil, and Canada during the same period that hospitalizations increased.^{59–61} It is only in Australia where food allergy-related fatal reactions have increased during this time.⁵⁸ Interestingly, in that study, the vast majority of fatal reactions to foods occurred in individuals older than 20 years of age, and reactions to shellfish accounted for one-half of the fatalities.

In contrast with the striking increase in the prevalence of food allergy reflected in self-reported data and health care use, birth cohorts in the Isle of Wight in the UK established in 1989 and 2001 did not show changes in peanut allergy over time.⁶² Even more surprising, comparison of IgE sensitization to milk, egg, and peanut in stored blood from children in NHANES III (collected between 1988 and 1994) with samples from NHANES 2005 to 2006 did not show any differences in rates of sensitization to those foods, which were high in both surveys. Indeed, shrimp sensitization actually decreased significantly between the surveys.⁶³

Thus, although there is overwhelming evidence for increased perceived and diagnosed food allergy over the past several decades, the sparse data that we have from objective measures such as fatal reactions and IgE sensitization generally conflict with that trend. To understand whether changes are due to greater recognition or to other environmental changes, we need high-quality studies that incorporate objective measures with clinical data and are done repeatedly over time. Unfortunately, these kinds of studies require both foresight and significant resources.

SPECIFIC RISK POPULATIONS

Disparities Between African American and Other Racial Ethnic Groups in Food Allergy

Very significant racial and ethnic disparities in other allergic diseases, such as asthma, have long been noted, with African American children and adults experiencing much higher rates of asthma and asthma complications than white, Hispanic, or Asian children and adults.^{64,65} There are fewer data about food allergy, but what is currently available suggests significant differences in sensitization to foods between racial and ethnic groups in the United States and in several other Westernized countries. Whether these sensitization differences are accompanied by differences in clinical food allergy is less clear.

In the NHANES 2005 to 2006 survey, the survey that included measurement of food specific IgE, non-Hispanic Black subjects were nearly twice as likely to be sensitized to food as non-Hispanic white subjects, and 27% more likely than Hispanic subjects.⁷ Other, localized studies have also found higher rates of sensitization to foods among African American children, including in a Boston birth cohort,⁶⁶ a Michigan birth cohort,⁶⁷ and in an academic allergy practice in New York City.⁶⁸ Non-nationally representative cohorts of various groups, including those attending allergy clinics in New York, Chicago, and Cincinnati,⁶⁸ and those enrolled in a high-risk inner-city birth cohort,⁶⁹ have also suggested very high rates of food allergy among at least some African American pediatric populations. However, national data drawn from health care use data and self-reported surveys show a more complicated story.

Analyses of New York State hospital admissions, the National Hospital Ambulatory Medical Care Survey, and the National Electronic Injury Surveillance System found no significant racial or ethnic disparities in emergency room visits or hospitalizations for food allergy in years collectively spanning 1990 to 2006,^{70–73} although there were more emergency room visits for anaphylaxis among African American children in Florida between 2005 and 2006.⁷⁴ Interestingly, in the yearly National Health Interview Survey, food allergy was reported in non-Hispanic African American children at rates

less than or equal to that reported by non-Hispanic white children until the mid-2000s, when reported rates among African American children began to consistently exceed that of other ethnic groups.⁵⁴

Thus, although sensitization to foods is higher among African American children, self-reported food allergy has only recently become more prevalent in this group. This is not likely due to increasing sensitization, because non-Hispanic Black children had higher levels of food-specific IgE in both NHANES III (collected between 1988 and 1994) and the later NHANES 2005 to 2006 data than other racial and ethnic groups, and there were no significant changes over time in any racial or ethnic group.⁶³ Interestingly, in NHANES III, it was only non-Hispanic white subjects who had a relationship between IgE sensitization to foods and reported history of acute reactions to food, suggesting at least an historical difference by race and ethnicity in the relationship between sensitization and perceived allergy.⁶ Although these results suggest that historically African American children had less recognition of food allergy, it is possible that these findings represent true differences in the relationship between IgE and clinical allergy. More, and more recent, data are needed to truly understand racial and ethnic disparities in food allergy.

Role of Immigration on Food Allergy Rates

It is not only African American children who seem to have particularly high rates of food allergy. In the United States and Australia, children of immigrants from less developed countries are noted to have a higher risk of food allergy than either children of native-born populations or immigrants themselves. In Australia, children with Asian-born mothers had more than twice the odds of nut allergy compared with non-Asian children, whereas those born in Asia had 10 times less nut allergy.⁷⁵ In the United States, children of immigrants had a 50% higher odds of food sensitization than children of nonimmigrants, even accounting for race and ethnicity, whereas those who were born outside the United States had a 50% lower odds.⁷⁶ It is likely that these findings are due to gene-by-environment interactions that leave some children with specific genetic backgrounds more at risk for allergy development under specific environmental conditions found in Western countries. More research is needed to identify causal genetic and environmental factors that drive these differences.

SUMMARY

Food allergy is a highly prevalent problem. There is some evidence that food allergy prevalence is increasing, although the data to support this trend are mixed. Geographic and temporal differences in food allergy prevalence suggest the importance of environmental factors in the development of food allergy. More research is needed to identify the most important factors.

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