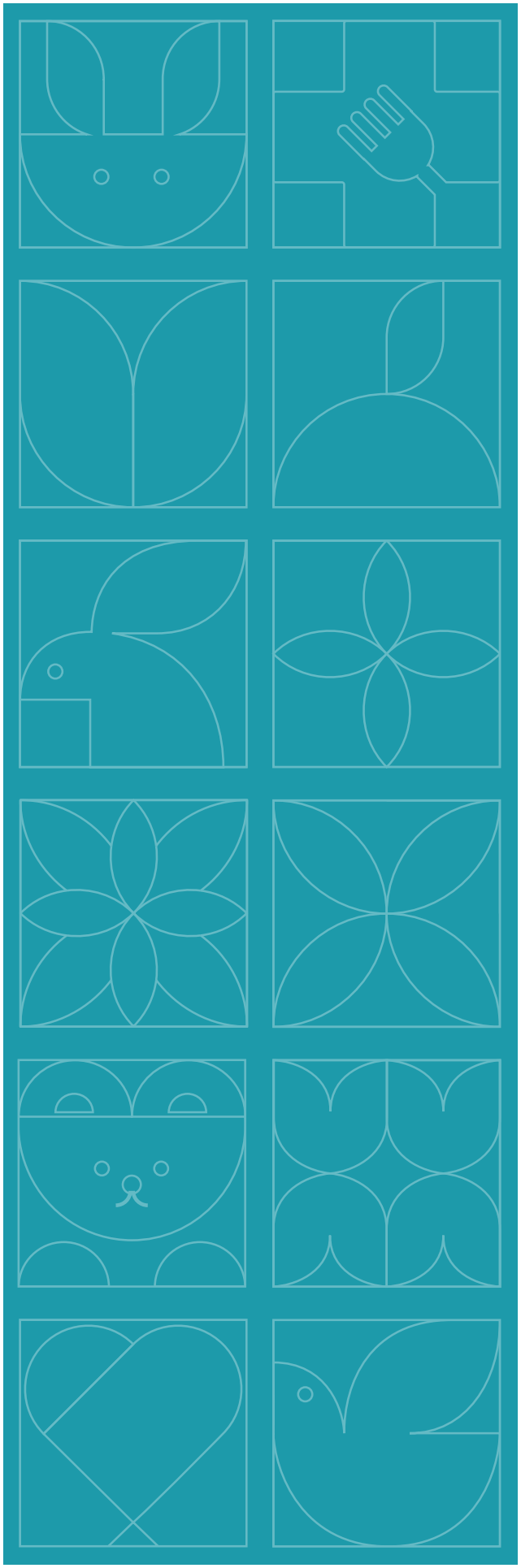

NATIONAL INDICATOR REPORT ON **FOOD ALLERGY**

FARE®

Food Allergy Research & Education

Food Allergy AWARE: Advancing Wellness, Awareness and Resources to Educate

Food Allergy AWARE is dedicated to increasing awareness and knowledge of the growing prevalence, societal cost, and burden of food allergy as a potentially life-threatening, chronic disease among public health professionals, primary care clinicians, affected patients, caregivers, and the public.

Food Allergy AWARE Advisory Council

The Food Allergy AWARE Advisory Council (FAAAC) is a diverse team of subject matter experts and thought leaders that represent the voices and perspectives of key stakeholders in food allergy, including primary care clinicians, public health professionals, and those living with or impacted by food allergy. The FAAAC provides guidance and input on surveillance and data collection, indicator report generation, education program development, awareness and promotion plan development/execution, and evaluation and monitoring of overall project reach and impact.

Authorship and drafting of this indicator report was led by Dr. Christopher Warren with extensive input and approval from members of the FAAAC.

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Introduction

Food allergy is a serious immune-mediated disease affecting more than 33 million people in the United States, across all regions and demographic groups, and can cause life-threatening anaphylaxis. Data shows that the overall burden of food allergy in the U.S. is substantial and growing, with some populations disproportionately affected. The burden of food allergy is multifaceted, encompassing not only food allergy prevalence (the proportion of people with food allergy in the general population), morbidity and mortality, but also significant psychosocial and economic effects.

Support and funding for food allergy research lags far behind other chronic diseases, such as asthma or cancer, despite food allergy affecting more people in the U.S. Nevertheless, considerable progress is being made in developing better diagnostic options, innovative therapies, and stronger support systems for patients with food allergy and their caregivers. Policies are emerging to improve daily management, expand access to diagnostic and therapeutic innovations, and reduce food allergy-related morbidity and mortality.

Epinephrine remains the only emergency treatment that can stop an anaphylactic reaction. This makes it paramount to continue improving and expanding administration options, encouraging prompt administration based on recognizing the symptoms of anaphylaxis, and increasing public awareness and the availability of unassigned or stock epinephrine.

Food allergy is a top-tier public health issue. The increasing prevalence of food allergy, coupled with the central role of food in daily life, has made food allergy a pressing concern for patients, families, clinicians, researchers, and policymakers. Variability in food allergy burden across subpopulations reflects a complex interplay of genetic, socioeconomic, and environmental factors rather than any single cause. Research in recent decades has made progress in understanding the causes of food allergy, leading to prevention strategies, but food allergy remains a challenging disease to prevent, diagnose, manage, and treat.

This report aims to provide a comprehensive overview of the current state of food allergy in the U.S., highlighting key data that can guide future research efforts. In addition, this report can be used to identify key areas that need additional investigation and insight. By strengthening food allergy surveying systems and advancing epidemiologic, clinical, and translational research in key areas, the public health burden of food allergy can continue to be systematically reduced in the years ahead, and the quality of life and health improved for patients and their families.

What Is Food Allergy?

Food allergy occurs when the immune system overreacts to a food protein or other substance, mistakenly treating it as a threat. This overreaction triggers the release of chemicals like histamine, which can cause a wide range of symptoms affecting the gastrointestinal (GI) tract, skin, lungs, and cardiovascular system (Figure 1). These reactions vary from mild to severe. The most serious type of reaction, called *anaphylaxis*, can cause trouble breathing or a sudden drop in blood pressure and requires immediate treatment with epinephrine. In rare cases, food allergy reactions can be fatal. However, avoiding triggers, considering treatment options, and acting quickly to treat food allergy reactions can make serious illness or death from food allergy unlikely.

Introduction

Not every negative reaction to food is due to food allergy. For example, lactose intolerance or sensitivity to caffeine can cause uncomfortable symptoms, but these reactions do not involve the immune system and are not classified as food allergy. Food allergy involves an immune reaction and can be divided into two main types: IgE-mediated and non-IgE–mediated.

- **IgE-mediated food allergy** involves immune proteins called *IgE antibodies*. These antibodies, which also play a role in other allergic conditions like eczema, asthma, and pet or dust mite allergies, attach to special cells in the body called mast cells. They act like lookouts, lying in wait until they spot a person's "trigger" (often a specific protein). When a food allergen is eaten, corresponding specific IgE antibodies bind to it and activate the mast cells, releasing chemicals that cause allergy symptoms. Reactions usually happen within minutes after exposure and can lead to anaphylaxis. Less commonly, food allergy reactions can take longer to appear (up to 2 hours). Other examples of Ig-E mediated reactions include alpha-gal syndrome, pollen-food allergy syndrome, and acute urticaria.

- **Non-IgE–mediated food allergy** does not involve IgE antibodies and does not cause anaphylaxis but still involves the immune system. In contrast with IgE-mediated food allergy reactions, non-IgE–mediated food allergy reactions are delayed, sometimes appearing hours or even days after eating the trigger food. Although they don't cause sudden, life-threatening symptoms, they can still lead to serious illness. Examples include eosinophilic esophagitis (EoE) and food protein-induced enterocolitis syndrome (FPIES).

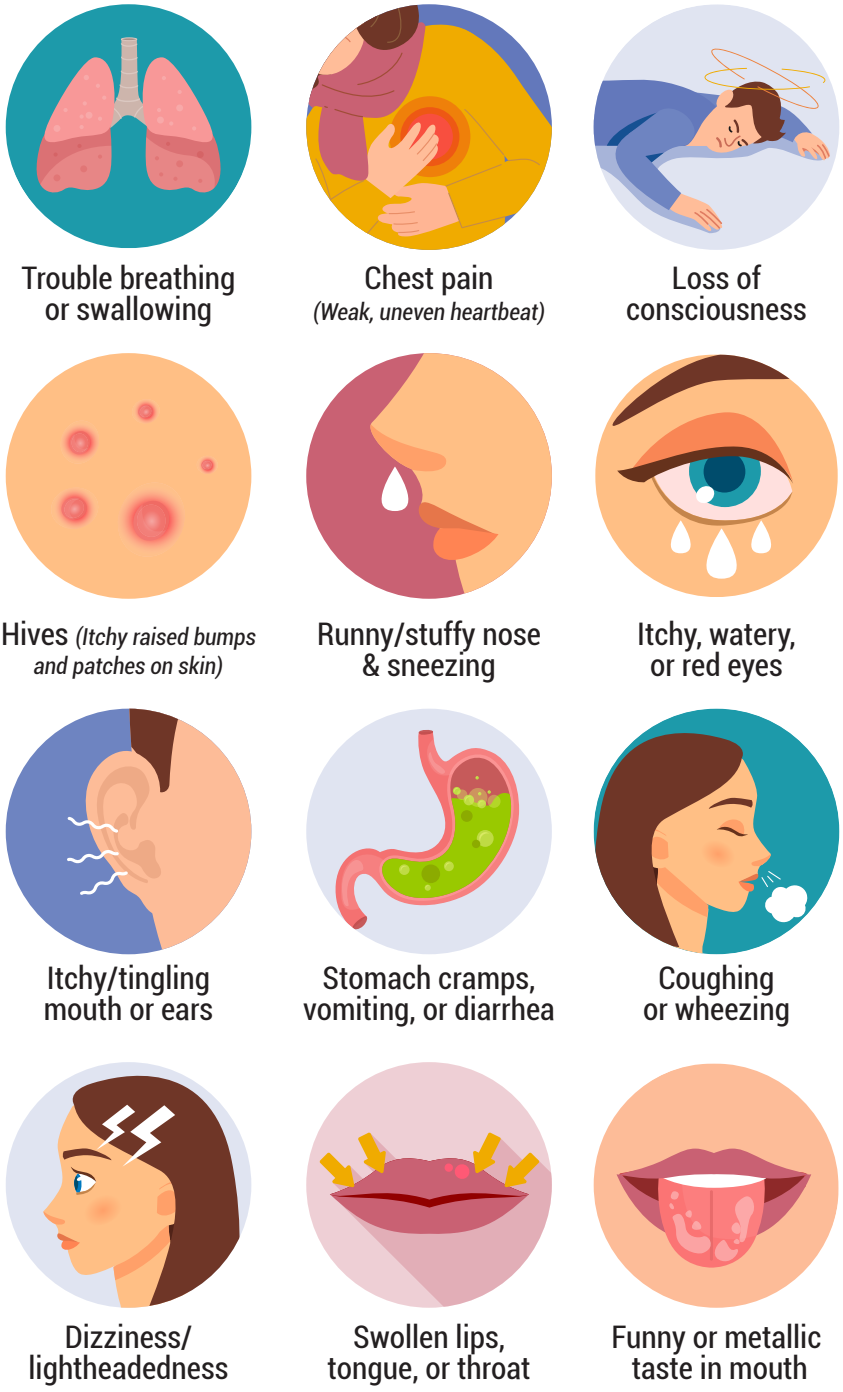


Figure 1. Possible signs and symptoms of food allergy reactions.

Prevalence of Food Allergy in the United States

Understanding the epidemiology of food allergy is essential for assessing its public health impact and guiding strategies to improve prevention, diagnosis, and management. In epidemiology, prevalence refers to the proportion of individuals in a population who have a particular condition at a given time. Tracking food allergy prevalence provides critical insights into:

- How common the condition is
- How it varies by age, sex, race, ethnicity, and geography
- How trends may be changing over time

These data points are key to identifying disparities, allocating health care resources, and informing policies that address the growing burden of food allergy in the U.S.

Challenges Estimating Food Allergy Prevalence

Accurately determining how many people in the U.S. have food allergy remains challenging. Unlike chronic conditions such as type 2 diabetes or heart disease, food allergy is not routinely screened for in medical settings and often goes undiagnosed and mismanaged.

On the other hand, surveys that rely on self-report from patients or caregivers tend to overestimate food allergy prevalence. This happens because people may mistake other issues—like lactose intolerance, enzyme deficiencies, food aversions, or even unrelated symptoms—for food allergy. Some people may have previously had food allergy but outgrown it without realizing it, especially if they haven't had confirmatory testing or recent exposure to the allergen.

Certain types of diagnostic testing for food allergy can also lead to overestimates. In most situations, blood and skin prick test results need to be considered alongside a person's medical history—and sometimes confirmed with an oral food challenge (OFC)—to make an accurate diagnosis. Although oral food challenges are the most definitive way to diagnose food allergy, they are time-intensive, carry risks, and are difficult to use in large population studies. This creates challenges for researchers trying to balance rigorous definitions of food allergy with studies that are large enough to reflect the U.S. population.

How Is Food Allergy Diagnosed in the United States?

Food allergy diagnosis begins with a detailed medical history to assess symptoms, suspected food triggers, and the timing of reactions. Skin prick tests and blood tests measuring food-specific IgE antibodies are commonly used to evaluate whether the immune system recognizes a food as a potential threat, referred to as sensitization (Figure 2). However, these tests alone cannot confirm a food allergy because it's possible to have a positive test showing sensitization without symptoms, meaning a person tolerates the food without any adverse reaction.

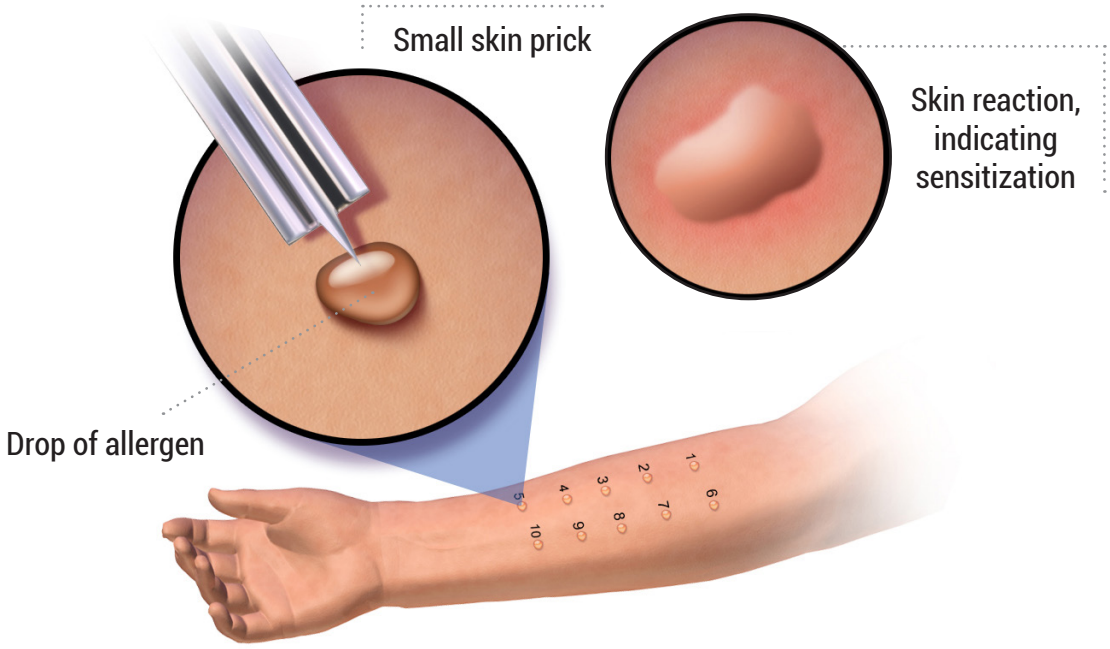


Figure 2. Skin prick test demonstrating immune sensitization.

Image adapted from BruceBlaus. July 31, 2017. https://commons.wikimedia.org/wiki/File:Skin_Prick_Test.png. (CC BY-SA 4.0).

To improve accuracy, allergists may perform a type of diagnostic test called component testing, which uses specific proteins. For example, allergists can test for sensitization to individual peanut proteins such as Ara h 1, 2, 3, 6, 8, and 9 instead of assessing for sensitization to the whole peanut, which contains many different proteins. Compared with standard testing, component testing can provide allergists with a more precise picture of allergy risk, allowing providers to better estimate a patient's risk for severe food allergy reactions and to determine the appropriateness of performing an oral food challenge. Component testing is available for several common food allergens, including peanut, milk, egg, tree nuts, wheat, and sesame.

The "gold standard" for food allergy diagnosis is the oral food challenge.[a] In this test, small, increasing amounts of the suspected food allergen are administered under close medical supervision to observe for an allergic reaction. If no symptoms occur, food allergy is ruled out. If a reaction develops, the allergy is confirmed, and the allergic reaction is treated immediately.

Food challenges are highly structured and carefully supervised to optimize safety. Because these tests can trigger allergic reactions—including, in rare cases, anaphylaxis—they are typically performed by experienced allergists in medical facilities equipped to manage emergencies. Most reactions during oral food challenges are mild, such as hives or flushing. Severe reactions are uncommon. Extensive guidelines have been developed to standardize how these tests are conducted, and studies have shown that oral food challenges are safe when performed under proper medical supervision. However, oral food challenges are time-consuming tests that may not be accessible to all patients, depending on where they live or other factors, and novel diagnostics for food allergy are currently under investigation. See the Diagnosing Food Allergy section for more information.

[a] Diagnosis of the mammalian allergy known as alpha-gal syndrome (see Selected Food Allergy Syndromes) differs from classic IgE-mediated food allergy. Alpha-gal syndrome symptoms are often delayed by several hours after contact with mammalian ingredients, making it more difficult to identify the causal food trigger with an oral food challenge. To establish an accurate diagnosis, IgE testing and correlation with post-exposure symptom presentation are critical.

Estimates of Food Allergy Prevalence

Overall, an estimated 1 in 13 children (7.6%) and 1 in 10 adults (10.8%) have at least one current IgE-mediated food allergy, equating to more than 33 million in the U.S. with convincing food allergy.[1,2]

Figure 3. Infographic describing food allergy prevalence in the U.S.

Image provided by FARE (Food Allergy Research & Education)

Current food allergy estimates are based on a U.S. survey of food allergy prevalence, which collected data from 40,443 adults and 38,408 children in 2015-2016 (Table 1) and extrapolated to current U.S. population total.[1-3] The study used three common case definitions to estimate food allergy prevalence:

- **Self- or caregiver-reported food allergy.** Relying on self- or caregiver-report alone likely overestimates true prevalence because many people who believe they have a food allergy never undergo rigorous confirmatory testing with an allergist, and others may have outgrown a previous allergy without realizing it.
- **Self- or caregiver-reported food allergy with a convincing history of an IgE-mediated food allergy reaction (*convincing food allergy*).** This estimate is considered the best available measure of the true burden of food allergy in the general U.S. population.
- **Clinician-diagnosed, convincing food allergy.** This definition likely underestimates true prevalence, since many patients do not receive clinical confirmation of their food allergy.

Prevalence of Food Allergy in the United States

Table 1. Food allergy prevalence (95% CI) by three case definitions in a 2015-2016 cross-sectional survey of the U.S. population.[1,2]

Food allergy definition	Food allergy in children (n = 38,408)	Food allergy in adults (n = 40,443)
Self- or caregiver-reported	**11.4%** (10.8%-12.0%)	**19.8%** (18.5%-19.5%)
Convincing food allergy[a]	**7.6%** (7.1%-8.1%)	**10.8%** (10.4%-11.1%)
Clinician-diagnosed, convincing food allergy	**4.7%** (4.3%-5.0%)	**5.1%** (4.9%-5.4%)

CI, confidence interval.
[a] Considered the best estimate of the true burden of food allergy in the general U.S. population.

Just because a person does not have a clinician-diagnosed or convincing food allergy does not mean that they aren't impacted by their experiences. Many people who self-report food allergy—despite not meeting diagnostic criteria—still avoid certain foods and experience stress, anxiety, and financial burdens related to avoiding perceived food allergens. At the same time, individuals can truly have food allergy but lack formal diagnoses due to barriers such as limited access to allergists or a belief that medical care for their allergy isn't necessary.

National epidemiologic studies suggest that food allergy prevalence may differ from state-to-state, although it is important to acknowledge that estimates within less populous states are generally less reliable. The latest available data indicate that at least 7% of residents in each U.S. state have at least one food allergy, with the lowest rates (7%-7.5%) observed in New Hampshire, Nebraska, Connecticut, Indiana, and Hawaii. States with particularly high prevalence estimates included Colorado (13.3%), Massachusetts (11.3%), Rhode Island (13.6%), New York (11.7%), and Virginia (12.2%).

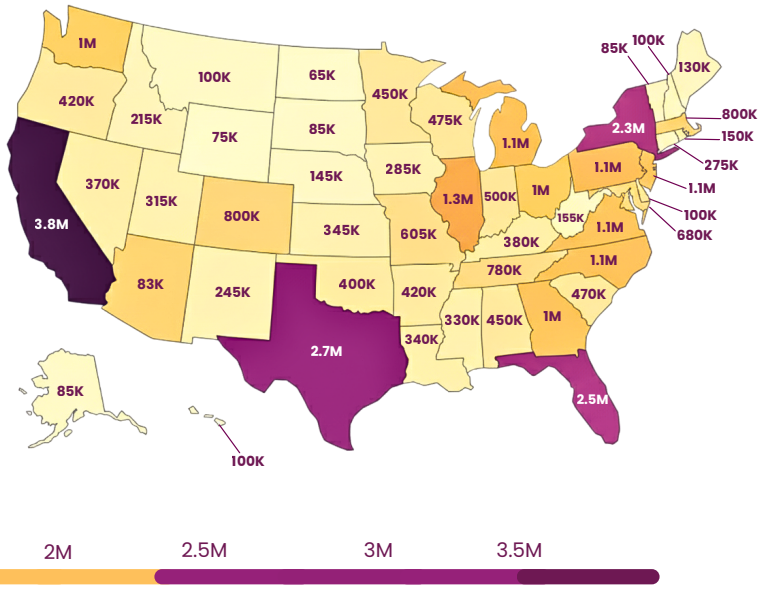


Figure 4. Estimated number of people in each state currently living with food allergy.

Prevalence of Food Allergy in the United States

In the same 2015-2016 survey described previously, the rates of convincing food allergy varied significantly by race and ethnicity (Figure 5).[4] Overall, food allergy rates were highest among non-Hispanic Asian, non-Hispanic Black, and Hispanic individuals (each around 10.5%) and slightly lower among non-Hispanic White individuals (9.5%). Among children and adolescents, non-Hispanic Black children had the highest rate of convincing food allergies (8.9%), while non-Hispanic Asian children had the lowest (6.5%). Among adults, non-Hispanic White individuals had the lowest prevalence of convincing food allergy (10.1%) relative to other racial and ethnic groups, with food allergy rates ranging from 11.2% to 15.9%.

These observed differences may reflect a complex interplay of socioeconomic, cultural, genetic, and environmental factors affecting the development and diagnosis of food allergy, such as:

- Access to health care
- Differences in food introduction practices during infancy
- Cultural perceptions of food allergy
- Environmental exposures

Understanding these patterns is important for identifying disparities in care and tailoring public health efforts to reduce the burden of food allergy across diverse communities.

Although the most comprehensive estimates of food allergy prevalence in the U.S. population are arguably from the above 2015-2016 cross-sectional survey, more recent data on clinician-diagnosed food allergy are available from the 2021 National Health Interview Survey (NHIS), conducted by the Centers for Disease Control and Prevention (CDC).[3,5] The NHIS is the largest and longest-running health survey in the United States and aims to collect data from about 35,000 households each year through confidential, face-to-face or telephone interviews.

According to data from the 2021 NHIS study, an estimated 5.8% of U.S. children and 6.2% of U.S. adults have at least one current clinician-diagnosed food allergy (Figure 6).[5,6] Among children, prevalence was similar between boys and girls. In contrast, among adults, food allergy was notably more common in women (7.8%) than in men (4.6%). Non-Hispanic Black individuals had the highest reported rates across all demographic groups, affecting 7.6% of children and 8.5% of adults. These patterns are consistent with earlier studies showing higher food allergy prevalence among women and non-Hispanic Black adults.

Prevalence of Food Allergy in the United States

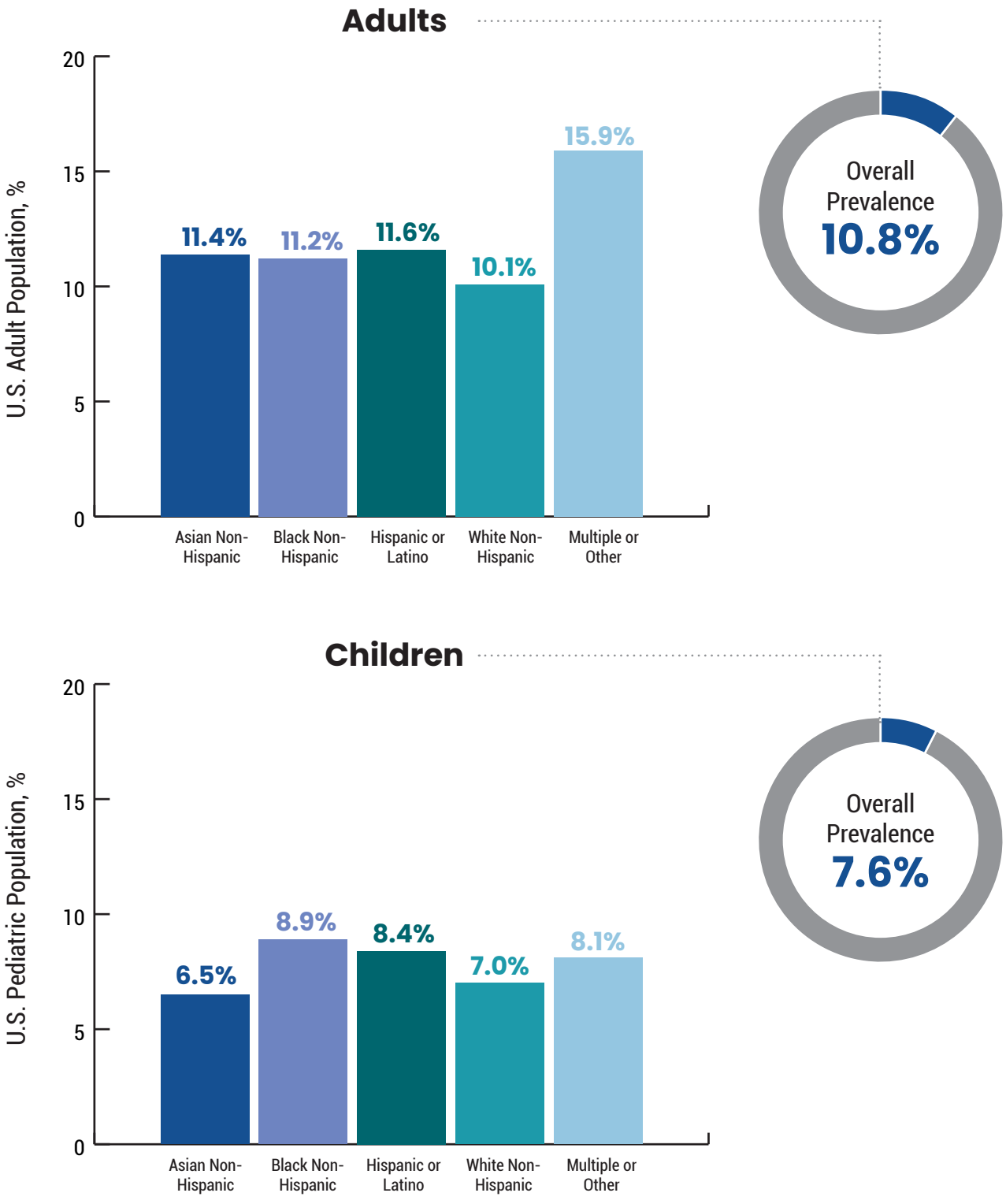


Figure 5. Prevalence of convincing food allergy in U.S. children and adults, by race and ethnicity, in a 2015-2016 cross-sectional survey.[4]

Prevalence of Food Allergy in the United States

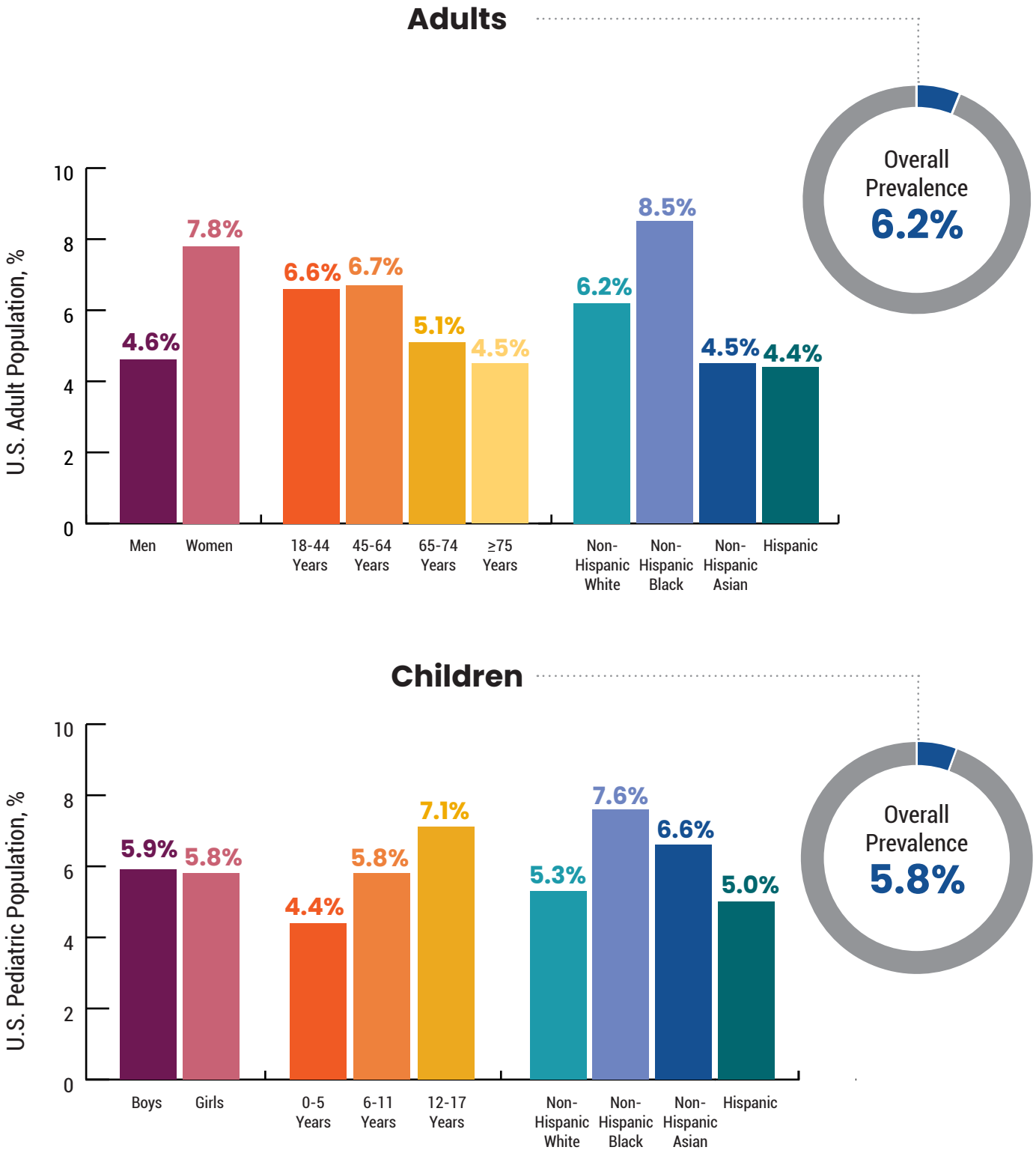


Figure 6. Prevalence of clinician-diagnosed food allergy in U.S. children and adults in the 2021 National Health Interview Survey.[5,6]

Food Allergy Prevalence by Specific Food Allergen

Although people can be allergic to any food, nine particularly common food allergens in the U.S. are shown in Figure 7 and are sometimes referred to as the "Top 9." According to the U.S. Food and Drug Administration (FDA), about 90% of food allergies in the U.S. are triggered by these top nine allergens.

Figure 7. Top nine food allergens in the U.S.

How Has Federal Law Shaped Food Allergy Management?

Federal law has significantly shaped the landscape of food allergy safety in the U.S. The Food Allergen Labeling and Consumer Protection Act (FALCPA), passed in 2004 and effective in 2006, required that packaged foods and dietary supplements list whether they contained any of the major allergens in clear, plain language. Eight major allergens were included in FALCPA: milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybeans.

The Food Allergy Safety, Treatment, Education, and Research (FASTER) Act of 2021 expanded FALCPA's foundational protections by recognizing sesame as the ninth major food allergen, beginning in January 2023. The FASTER Act goes beyond labeling—it mandates a report from Health and Human Services to Congress on food allergy prevalence, diagnosis, prevention, and treatment strategies, and establishes a pathway for adding new major allergens in the future based on scientific evidence and stakeholder input.

Together, FALCPA and the FASTER Act aim to:

- Empower individuals and caregivers with clearer information
- Help reduce accidental exposures
- Provide a legislative framework for future improvements in food allergy management and research

Using data from the same 2015-2016 survey described previously, researchers estimated the prevalence of convincing food allergy to each of the top nine food allergens among children and adults (Figure 8). Note that children and adults tend to have allergies to different types of food allergens. In children, the most common food allergen is peanuts (2.2% of the population), followed by milk (1.9%), shellfish (1.3%), tree nuts (1.2%), and egg (0.9%).[1] In adults, the most common food allergen is shellfish (2.9%), followed by milk (1.9%), peanut (1.8%), tree nuts (1.2%), and fish (0.9%).[2]

Prevalence of Food Allergy in the United States

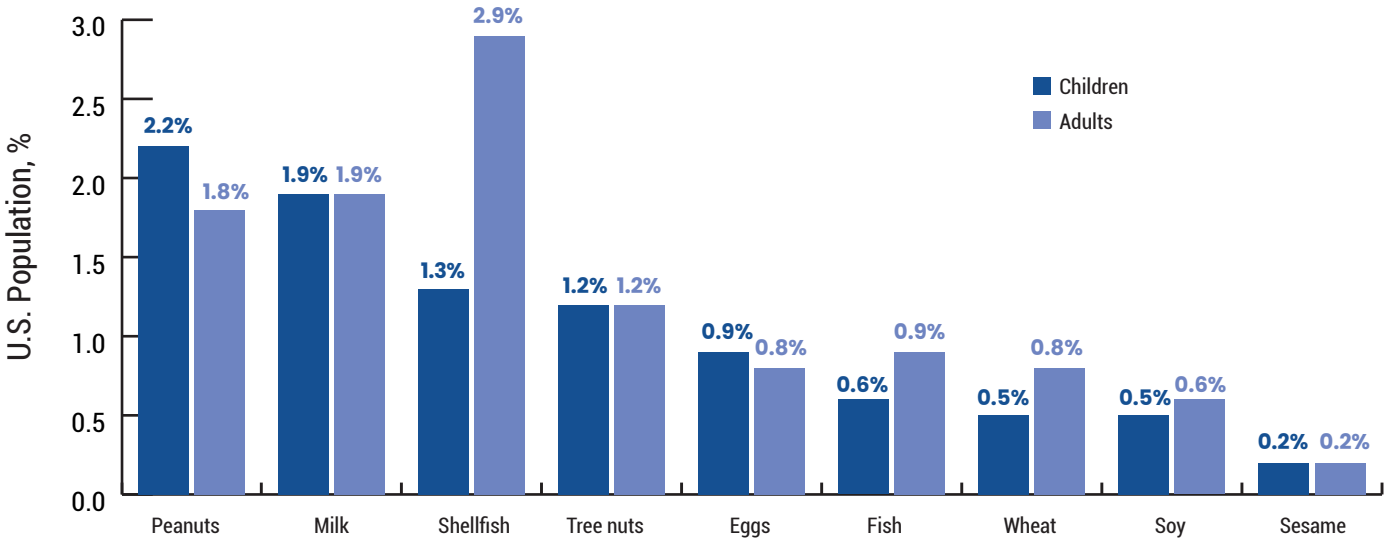


Figure 8. Prevalence of convincing food allergy, by allergen type, in a 2015–2016 cross-sectional survey of the U.S. population.[1,2]

In some cases, children can outgrow food allergy, meaning that the immune system becomes desensitized to the food allergen, which is called tolerance. As shown in Figure 9, people with food allergy are more likely to develop tolerance to certain types of food allergens (e.g., milk, egg) than others (e.g., peanut).[1] This helps explain why the prevalence of convincing milk allergy peaks at 4.3% in 2-year-olds before declining to 1.1% in 14- to 17-year-olds. In contrast, convincing peanut allergy increases to 2.2% among 1-year-olds and then remains relatively steady, ranging from 2.1% to 2.6% from ages 2 to 17 years.

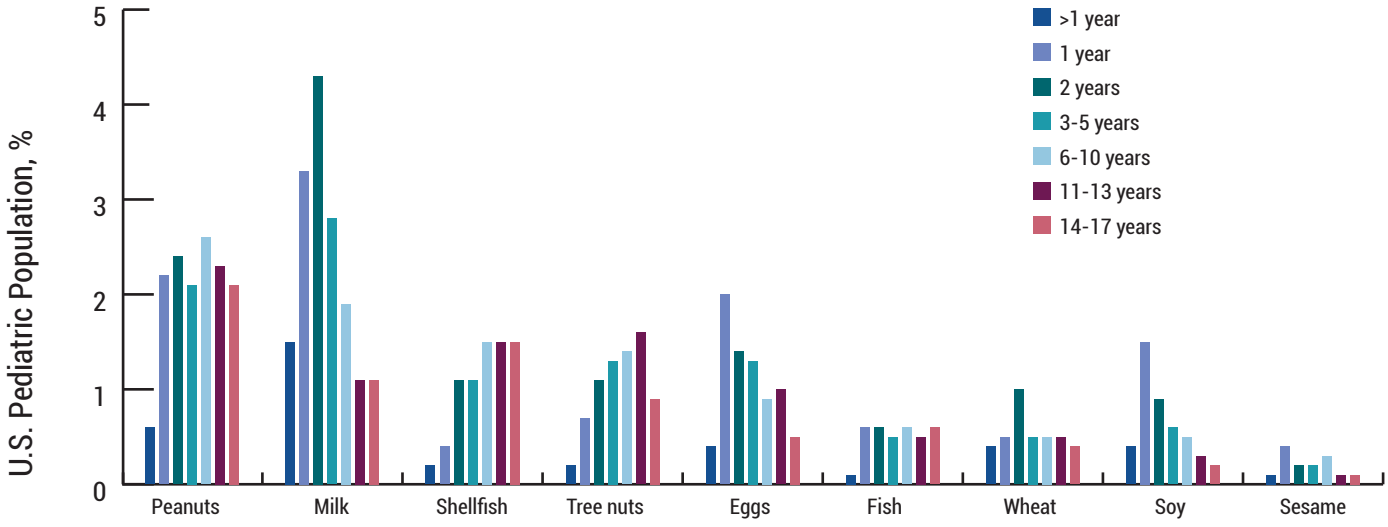


Figure 9. Prevalence of convincing food allergy, by allergen and by age, in a 2015–2016 cross-sectional survey of the U.S. pediatric population.[1]

Prevalence of Food Allergy in the United States

Given the socioeconomic, environmental, and cultural factors that likely play a role in the development of food allergy, it is unsurprising that this survey also revealed differences in types of food allergy by race and ethnicity (Figure 10).[4] Among children, Black individuals had the highest rates of peanut allergy (3.0%), egg allergy (1.6%), and finfish allergy (0.9%), and Asian children had the highest prevalence of tree nut allergy (2.0%). Asian adults had the highest rates of peanut allergy (2.9%) and shellfish allergy[a] (3.8%); Black adults had the highest prevalence of tree nut allergy (1.6%); and Hispanic adults had the highest rates of egg allergy (1.2%) and finfish allergy (1.5%).

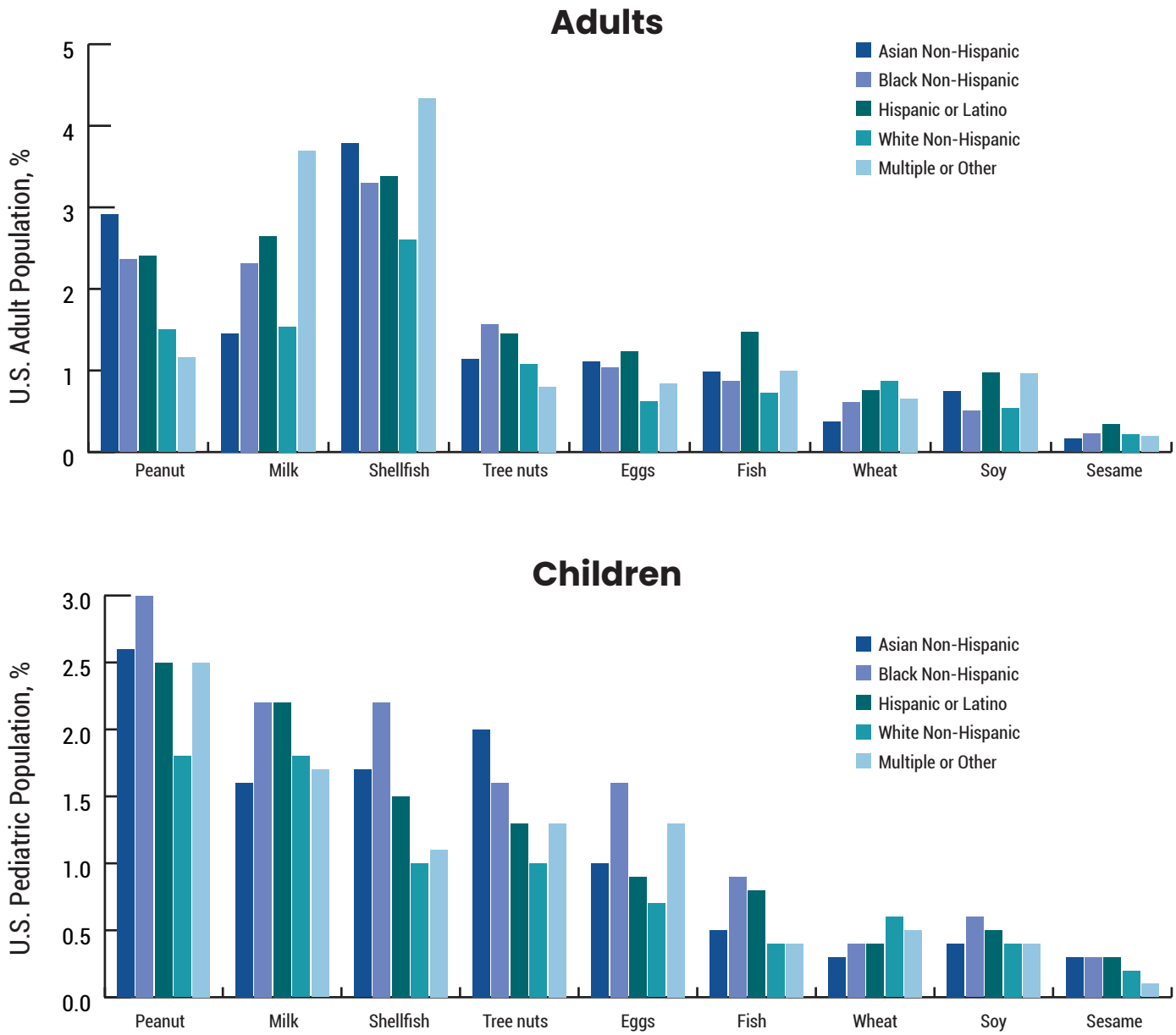


Figure 10. Prevalence of convincing food allergy, by allergen and by race and ethnicity, in a 2015–2016 cross-sectional survey of the U.S. pediatric and adult populations.[4]

[a] When noted as "shellfish," data include both crustaceans and mollusks.

These patterns align with prior studies suggesting that certain food allergens disproportionately affect specific racial and ethnic groups. The reasons behind these differences in food allergy rates are not fully understood, but research suggests complex and multifactorial contributions. For example, data show that exposure to certain environmental triggers—like dust mites or cockroaches—may play a role in developing food allergy to shellfish.[7] These exposures are more common in some communities because of long-standing inequities in housing and neighborhood conditions caused by discriminatory policies. Recently published data also suggest that racial/ethnic and socioeconomic differences in early life dietary patterns and infant feeding guidance offered by primary care providers may play a role in the differential rates of specific food allergies like peanut.[8] Note that the potentially preventive role of early diet will be further discussed in the Food Allergy Prevention section.

Multiple Food Allergies

Many children and adults with food allergy are allergic to more than one food. This is known as *multiple food allergies*, and it can significantly increase the complexity of managing the condition. Understanding the frequency of multiple food allergies is important for public health planning, allowing clinicians and researchers to identify patterns of co-occurring allergies and develop strategies to support individuals at higher risk for severe reactions or nutritional challenges.

In the 2015–2016 food allergy survey, 40% of children and 46% of adults with convincing food allergy were allergic to more than one food allergen (Figure 11).[9] This means that, of the more than 33 million people in the U.S. with food allergy, an estimated 2.2 million children and 12.4 million adults are allergic to multiple foods.[1,2,9]

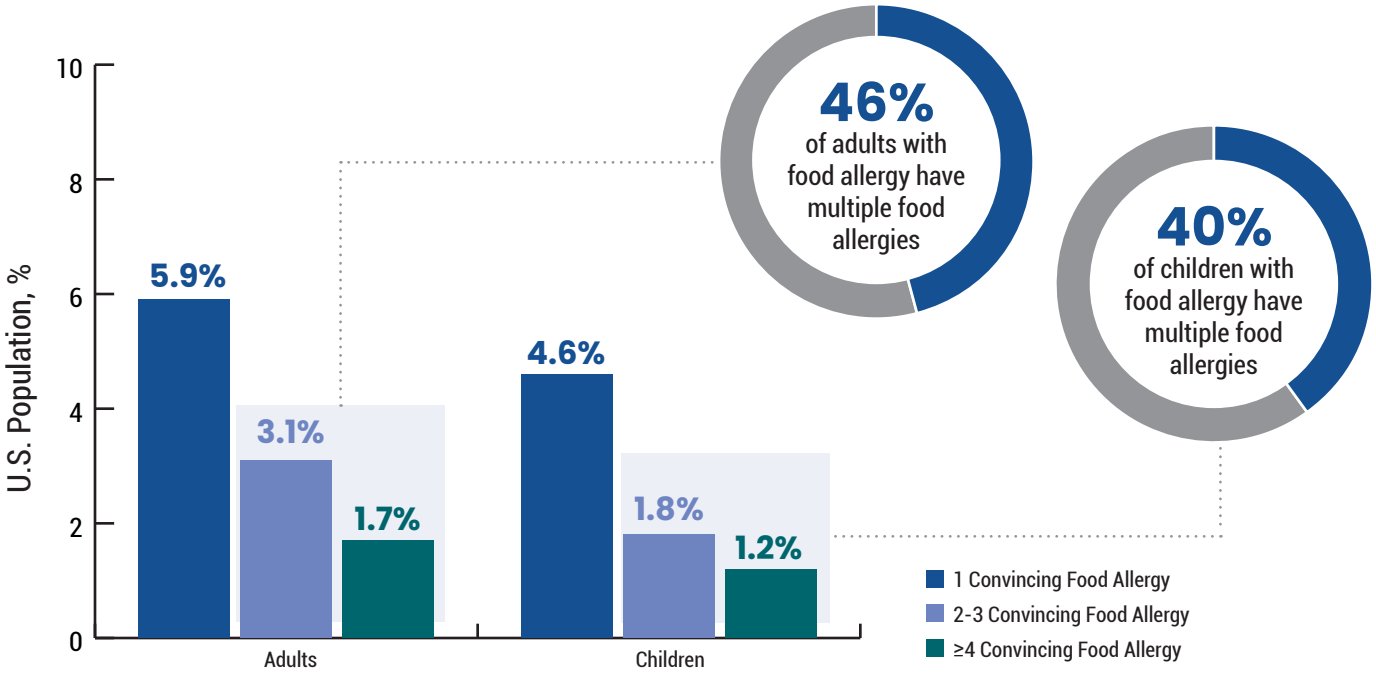


Figure 11. Prevalence of multiple food allergies among adults and children with convincing food allergy in a 2015–2016 cross-sectional survey of the U.S. pediatric and adult populations.[9]

Adult-Onset Food Allergy

Although food allergy often begins in childhood, a growing number of adults in the United States are developing new food allergy later in life. Among the more than 27 million U.S. adults with food allergy, nearly one-half (about 13.5 million people) developed at least one food allergy during adulthood, and 21% (about 5.7 million) say that all of their food allergies began after age 18 years.[2] Shellfish and wheat are the most commonly reported allergens in adult-onset food allergy; however, adult-onset food allergy can occur with any allergen (Figure 12).

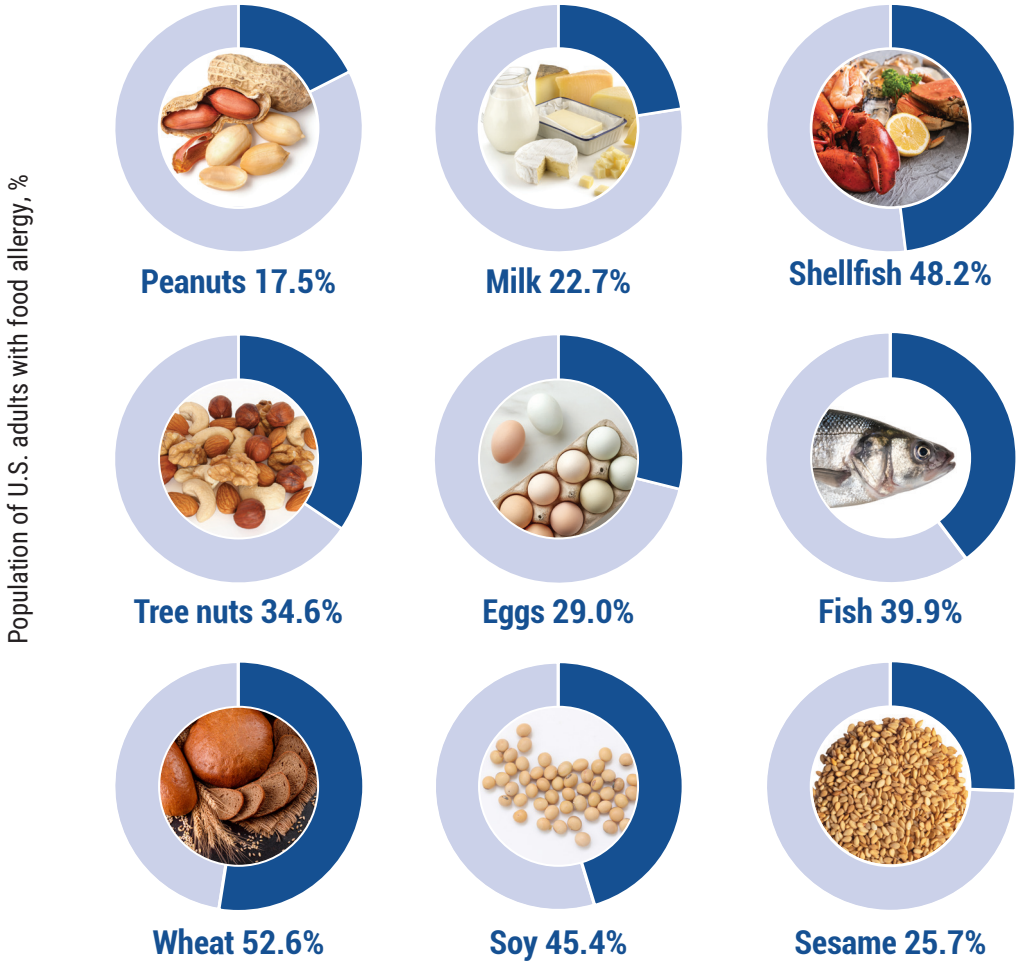


Figure 12. Prevalence of adult-onset food allergy among adults with convincing food allergy, by allergen type, in a 2015–2016 cross-sectional survey of the U.S. population.[2]

Many adults diagnose themselves with food allergy and avoid certain foods without seeking evaluation from an allergist, which can lead to unnecessary dietary restrictions, anxiety, and reduced quality of life.[10] Among those with clinician-diagnosed adult-onset food allergy, older age at diagnosis may be associated with an elevated risk for severe food allergy reactions.[11] At the same time, older adults report the lowest rates of epinephrine carriage, raising concern that individuals at risk for severe allergic reactions may be underprepared to manage anaphylaxis.[10] These patterns highlight the need for greater awareness, accurate diagnosis, and access to appropriate care for adults with suspected new-onset food allergy.

Food Allergy Reactions

Over the past several decades, rates of food-induced anaphylaxis and related health care use have steadily increased. A 2017 report from a national nonprofit organization that maintains a large database of U.S. commercial insurance claims analyzed trends in food allergy–related care over a 10-year period.[12] This analysis of allergy-related claims revealed a 377% increase between 2007 and 2016 in insurance claims listing a diagnosis of food-induced anaphylaxis (Figure 13). This trend was seen across all major health care settings, including emergency departments, physician offices, outpatient clinics, and hospitals. Among reported cases, peanuts were the most common trigger (26%), followed by tree nuts and seeds (18%).

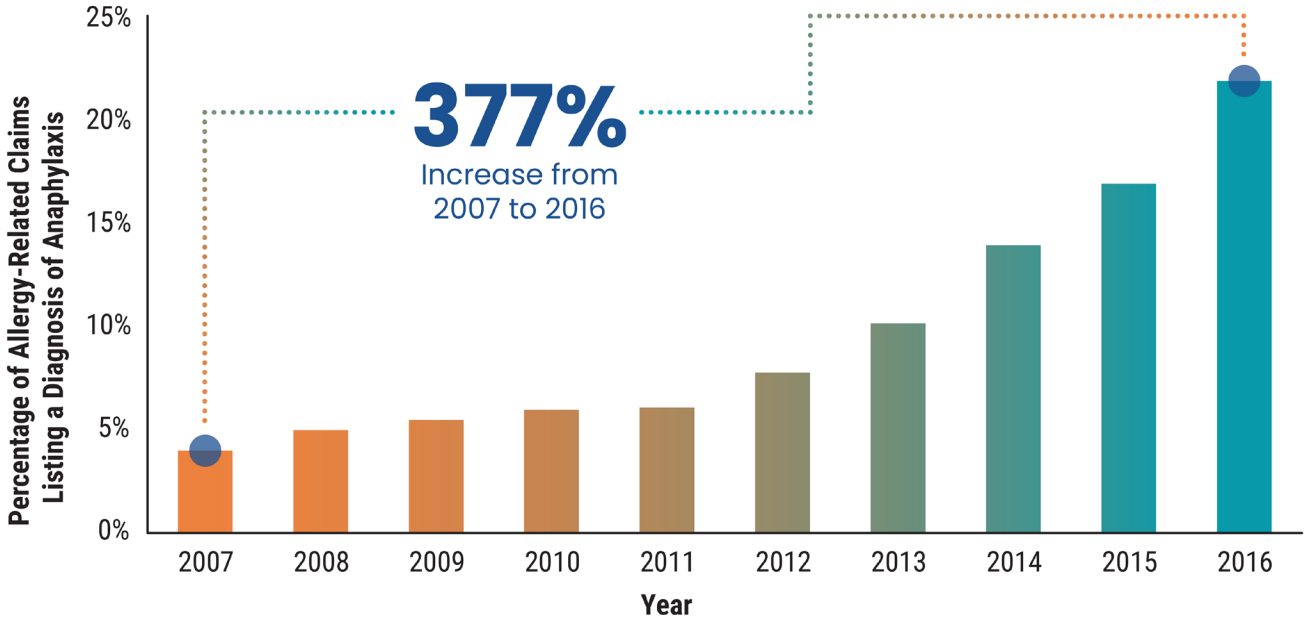


Figure 13. Private insurance claims with diagnoses of food allergy–related anaphylaxis among claims with allergy diagnoses from 2007-2016.[12]

Peanuts were also the most commonly documented cause of anaphylactic food reactions in data from the 2015-2016 cross-sectional survey. As shown in Figure 14, peanut, tree nut, and shellfish were the food allergens most associated with a history of severe food allergy reactions in both adults and children.[1,2]

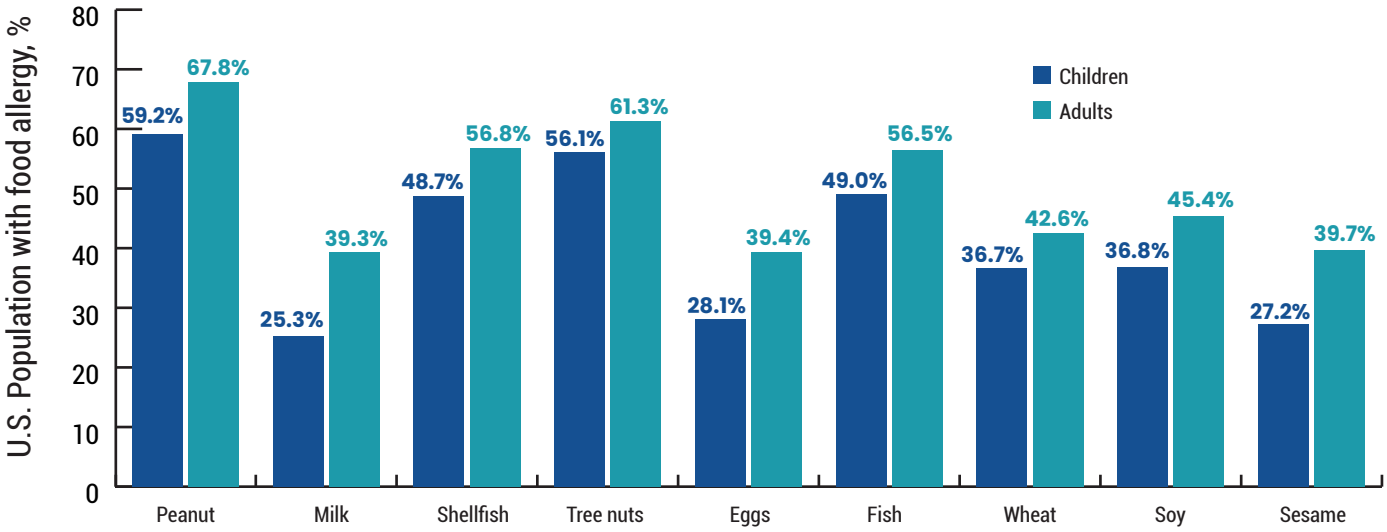


Figure 14. Prevalence of severe food allergy (defined as a history of symptoms consistent with severe food allergy reactions), by allergen type, in a 2015–2016 cross-sectional survey of the U.S. population.[1,2]

Relative to patients with food allergy to a single food, those with multiple food allergies are at elevated risk for severe food allergy and emergency department utilization (Figure 15).[9] For adults, the proportion of patients with a history of severe food allergic reactions increased from 37.3% in those with food allergy to only one allergen to 80.1% in those with food allergy to four or more allergens. Similarly, in children, the proportion of patients with severe food allergy increased from 31.3% in those with a single food allergy to 71.3% in those with multiple food allergies. These findings help explain why individuals with multiple food allergies are also more likely to require emergency care for food allergy–related reactions.

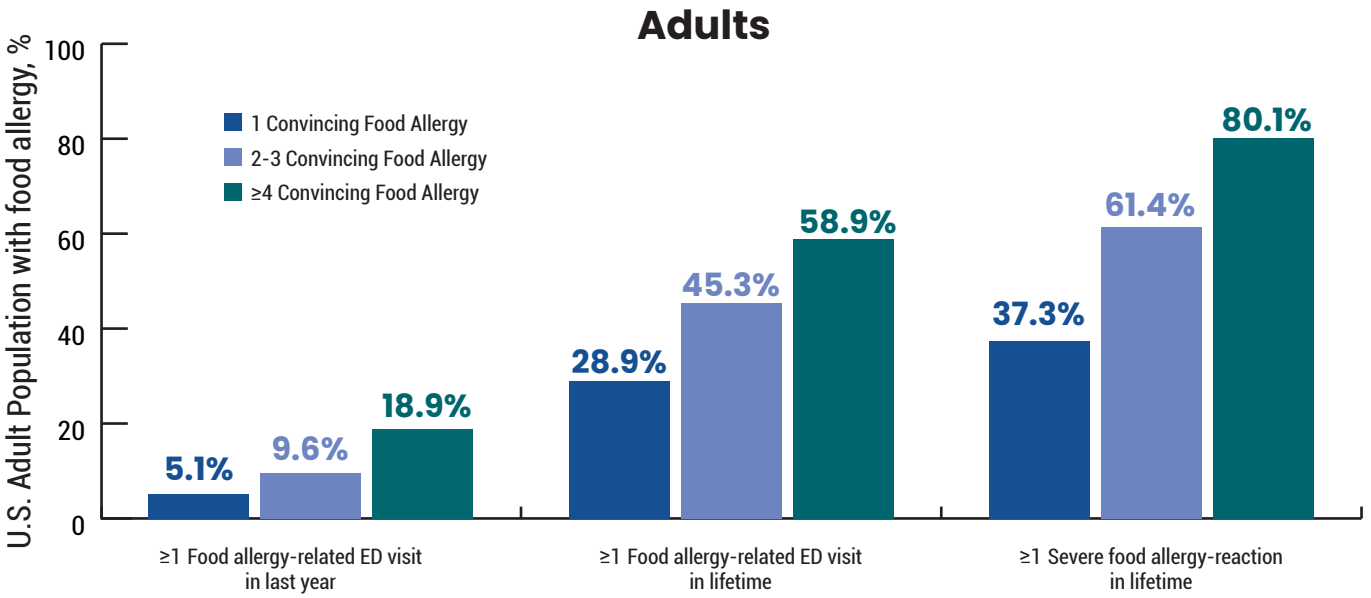


Figure 15. Prevalence of emergency department (ED) use and severe food allergy (defined as a history of symptoms consistent with severe food allergy reactions), number of food allergies, in a 2015–2016 cross-sectional survey of the U.S. population.[9]

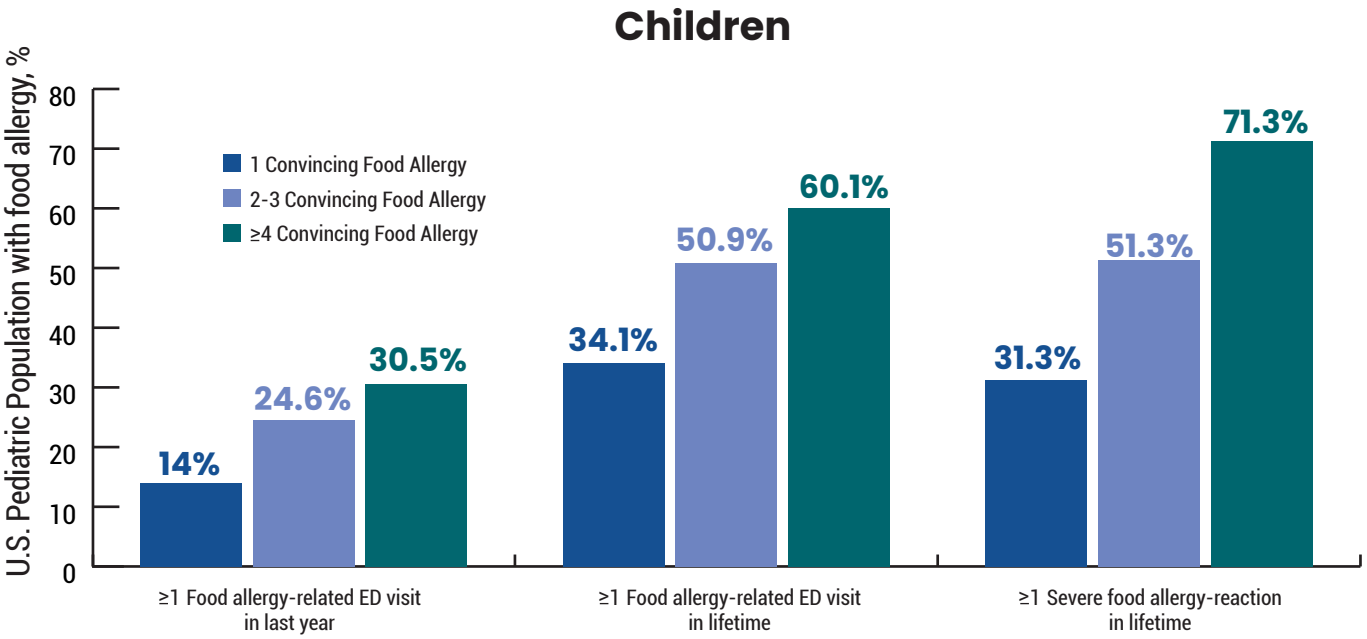


Figure 16. Prevalence of emergency department (ED) use and severe food allergy (defined as a history of symptoms consistent with at least one anaphylactic reaction to a food allergen), number of food allergies, in a 2015–2016 cross-sectional survey of the U.S. population.[9]

Economic Burden

Food allergy places a significant financial burden on families, patients, and the health care system. While the total societal cost of food allergy in the U.S. has not been fully measured, a 2013 study estimated that childhood food allergy alone costs families and society $24.8 billion per year, or about $4,184 per child—equivalent to roughly $34.5 billion in total expenditures and $5,928 per child in 2025 dollars after adjusting for inflation.[13] However, it is important to note that this is likely an underestimate of the true current economic burden, since there were no FDA-approved food allergy therapies at the time of this study's publication and few allergy practices offered any type of food allergen immunotherapy. Furthermore, the cost of epinephrine autoinjectors has far outpaced inflation across the past decade in the United States (Figure 17).[14]

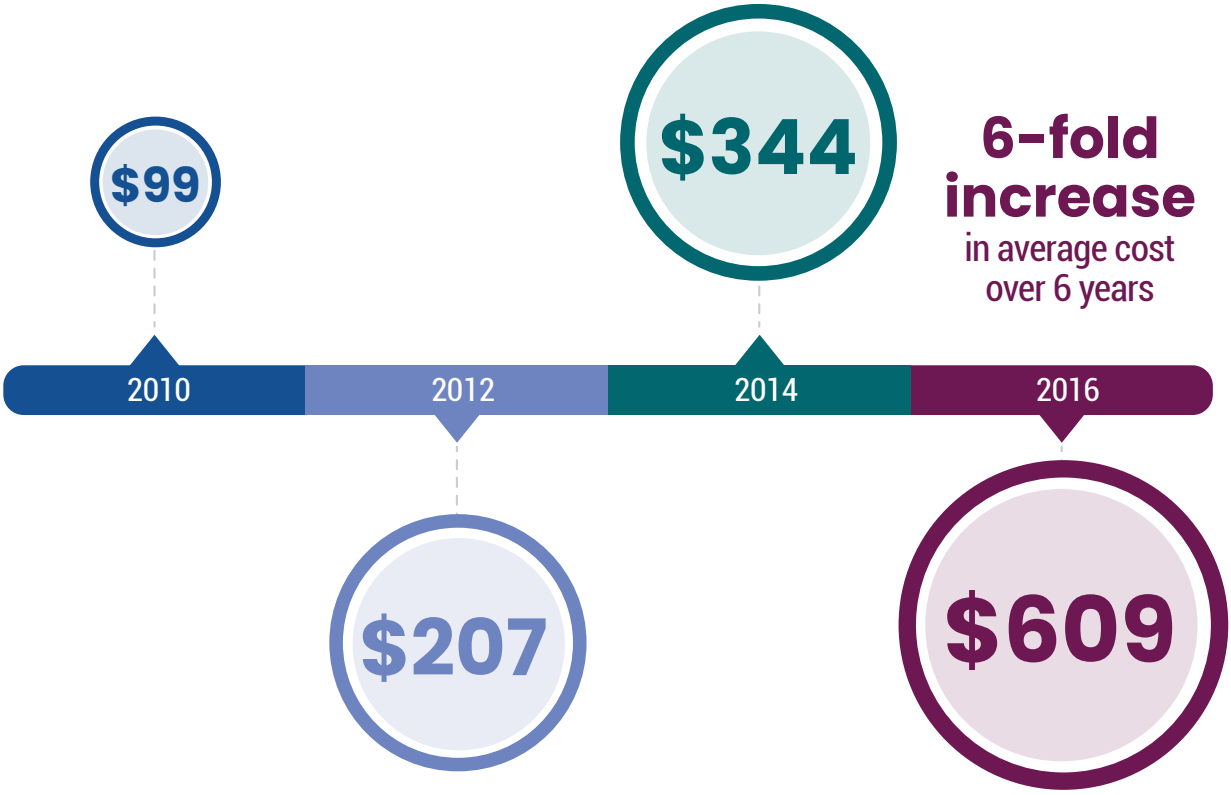


Figure 17. Average list price of brand name epinephrine autoinjector, not including manufacturer discounts or rebates.[14]

The breakdown of total costs for childhood food allergy is shown in Figure 18.[13] About 20% of the cost came from direct medical expenses, including hospitalizations for severe allergic reactions ($1.9 billion in 2013 U.S. dollars), allergist visits ($819 million in 2013 U.S. dollars), and emergency room care ($764 million in 2013 U.S. dollars). Another 25% resulted from out-of-pocket expenses not covered by insurance, with the biggest contributors being allergen-free foods and changes to childcare arrangements.

The largest share of costs—just over 50%—was due to indirect or opportunity costs. The most substantial of these was lost income when a parent or caregiver had to leave a job to care for a child with food allergy.[13] These findings illustrate the wide-ranging and often hidden financial impact of managing food allergy in daily life.

Burden of Food Allergy

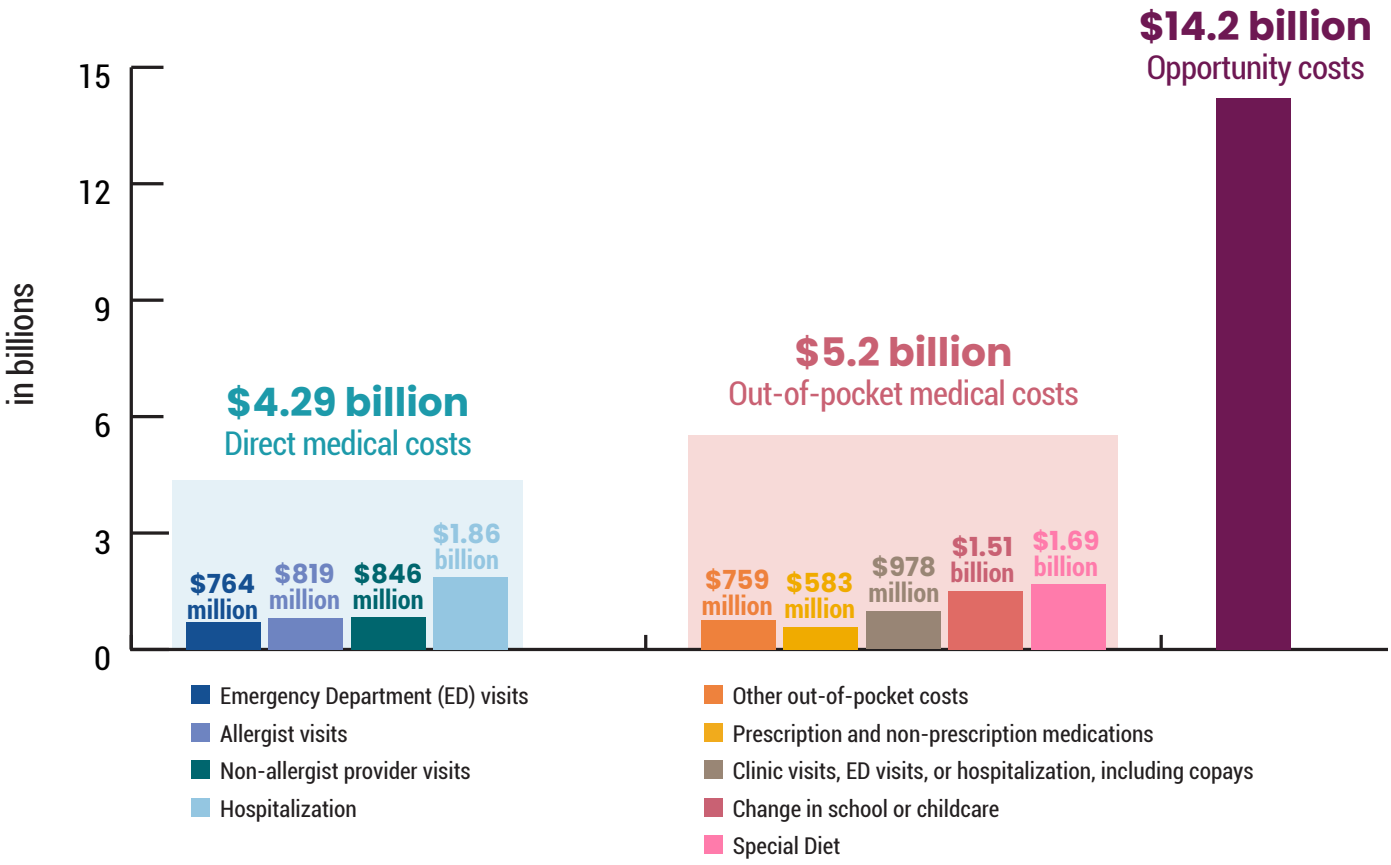


Figure 18. Economic costs of childhood food allergy in the United States, reported in 2013 U.S. dollars.[13]

To better understand the current health care burden of food allergy across age groups, a recent analysis examined insurance claims between 2015 and 2022.[15] This nationally representative dataset includes information from a broad range of healthcare settings. Among more than 355,000 individuals with a documented food allergy, 17% had at least one emergency department visit related to their food allergy within a 12-month period, and nearly 1% were admitted to the hospital. For patients with food allergy–related medical visits, the average annual out-of-pocket cost for outpatient care, emergency services, and hospital stays was $1,631—highlighting that, although food allergy–related hospitalizations and emergency department visits are relatively infrequent, the costs associated with these events can be substantial. This analysis also showed that healthcare use and costs were similar for both adults and children.[15] While national estimates suggest that up to 11% of the U.S. population has a food allergy, only a small fraction (0.9%) of those enrolled in a health plan had a documented food allergy–related health care visit during the study period. This gap likely reflects the episodic nature of food allergy care, which may occur outside of formal medical settings or go unrecorded in insurance claims. Still, the fact that nearly one in five individuals seeking care for food allergy needed emergency care in a single year underscores the serious and recurring demands food allergy places on individuals and the broader health care system.

A more recent study estimated the societal costs of food allergy among the entire U.S. population to be $370.8 billion; 15 times greater than the $24.8 billion estimate for children reported over a decade ago, with an annual cost per patient of about $22,000.[16] This increase in estimated cost can be attributed to the inclusion of adults, inflation, and indirect costs including presenteeism and fringe benefits. Like the prior study, the majority of the estimated costs were indirect, driven by lost wages, decreased productivity, absenteeism (e.g. missing work due to food allergy) and presenteeism (e.g., underperforming at work due to food allergy). These updated estimates underscore the hidden burdens of food allergy.[16]

This study also reported that when compared to adults, children had higher per-person costs, possibly due to greater risk of reaction from accidental exposures. Economic burden was disproportionately higher among specific historically under-resourced racial and ethnic minority groups (roughly 3% increase in estimated costs relative to White patients), and direct medical costs were 39.1% higher in low-income populations. This may be attributable to context-specific challenges with allergen avoidance and higher emergency healthcare utilization. The modeling in this study highlighted how if 50% of U.S. food allergy patients were desensitized, total societal costs would fall by 22% to $290.9 billion, with each additional 10% increase in the number of people desensitized reducing total costs by 4.3%. This highlights the significant societal economic savings than can accrue when appropriate food allergy management approaches and treatments that promote desensitization are implemented.[16]

Psychosocial Burden

Living with food allergy—or caring for someone who does—can cause significant emotional stress. Many aspects of food allergy diagnosis and management provoke anxiety for both patients and caregivers. Daily stressors include strict food avoidance and epinephrine carriage. In addition, clinical procedures like oral food challenges and immunotherapies often compound patient and caregiver anxiety. Outside of clinical settings, individuals with food allergy often report feeling isolated or different from their peers, and bullying is common, especially among children. According to one survey, about 1 in 3 children have been bullied, teased, or harassed about their food allergy.[17] In another survey, 17% of caregivers of children with food allergy were themselves victimized with bullying or teasing related to managing their child's food allergy.[18] Understanding the types and frequency of these psychosocial challenges is critical for improving efforts to support the mental health of patients and caregivers—while continuing to promote safe and effective allergy management.

Using data from the FARE Patient Registry—a large and growing database that contains detailed information about food allergy patients and caregivers—food allergy–related mental health concerns were evaluated for 1,680 registry members. Among patients with food allergy, anxiety (54%) and panic (32%) were the most commonly reported emotions associated with accidental ingestion of a food allergen. Furthermore, about two-thirds (62%) of patients reported mental health concerns related to food allergy, with anxiety about living with food allergy day to day being the most common concern (55%) (Figure 19). Among caregivers, food allergy was a source of fear, with 56% reporting fears trusting others with their children, and 56% reporting fears for the safety of their children.[19]

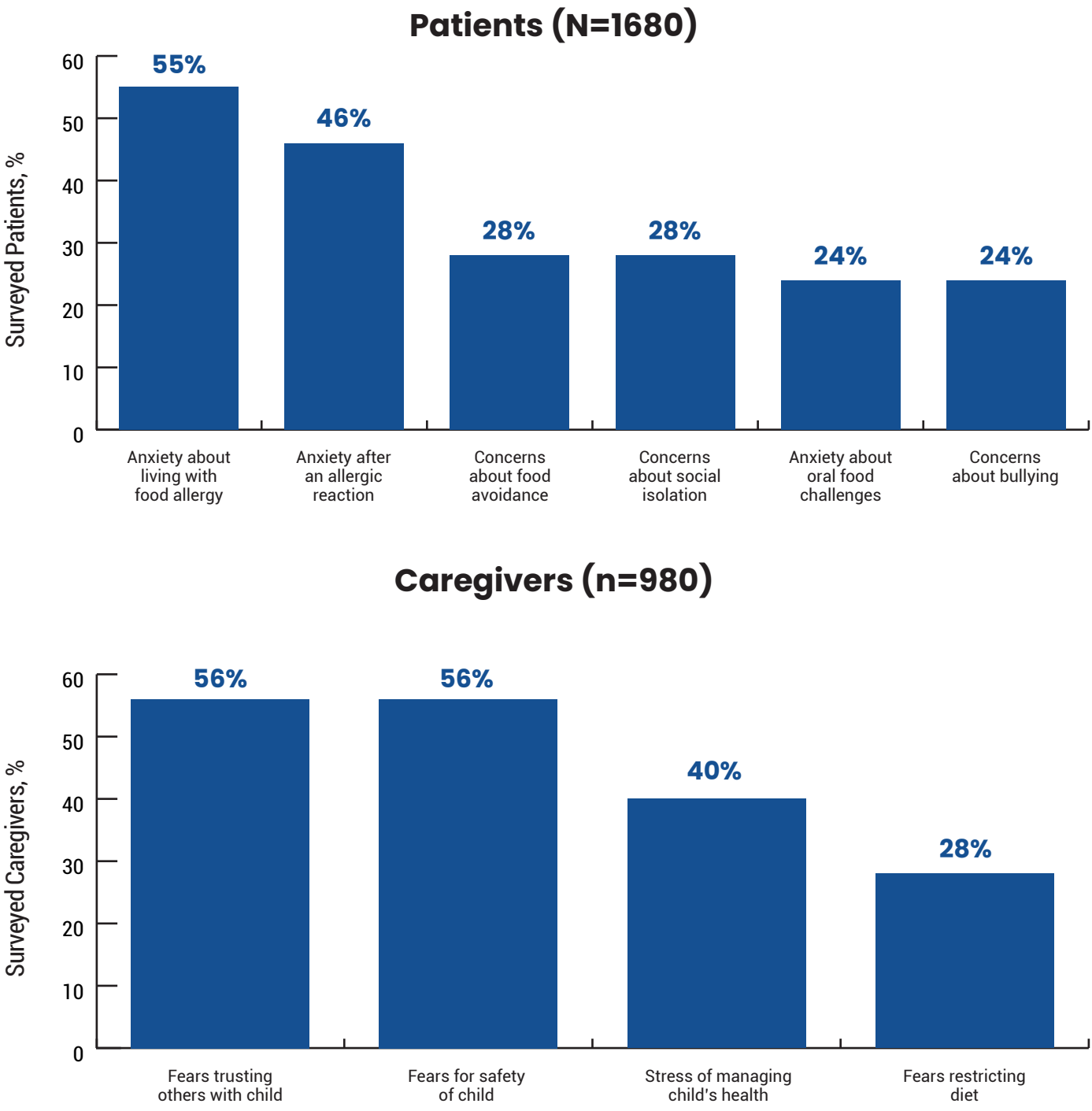


Figure 19. Food allergy–related mental health concerns among patients with food allergy and their caregivers.[19]

How Is Psychosocial Burden Measured in Patients With Food Allergy?

Psychosocial burden in patients with food allergy is often assessed using *validated questionnaires*—standardized tools designed to measure emotional, behavioral, and quality-of-life impacts. These tools rely on patient or caregiver self-report and have been tested for reliability and accuracy. A number of established validated questionnaires are available to evaluate food allergy–specific concerns, including anxiety, social limitations, and stress related to daily management. Using these tools helps researchers and clinicians better understand the emotional and psychological toll of food allergy and guides appropriate support.

One widely used tool is the Food Allergy Independent Measure (FAIM), which helps capture how much food allergy affects a person's sense of safety and control.[20,21] This questionnaire asks respondents to rate their chances from never (0% chance) to always (100% chance) of the following occurrences:

- Accidental ingestion
- Severe reaction in case of accidental ingestion
- Death in case of accidental ingestion
- Inability to treat in case of accidental ingestion

The FAIM questionnaire also includes questions about how many foods need to be avoided due to food allergy and to what extent food allergy affects a person's activities with others. Both patients and caregivers can complete the FAIM, and higher scores indicate greater psychosocial burden over time, making the FAIM questionnaire a useful tool for tracking psychosocial impact over time or evaluating the effectiveness of interventions.

In a large, nationally representative study of more than 6,000 U.S. adults with food allergy, researchers assessed psychosocial burden using the FAIM questionnaire.[22] Results showed that adults with wheat, soy, or milk allergies, as well as those allergic to multiple foods, reported significantly higher emotional and psychological burden compared to others. Greater burden was also reported among individuals with a history of severe allergic reactions, past use of epinephrine, or emergency department visits for food allergy treatment. These findings highlight how both the type and severity of food allergy can impact emotional well-being.

Access to Mental Health Support

Mental health support can play a vital role in helping individuals and families manage food allergy more effectively in daily life. This includes educating patients and caregivers on how to navigate common challenges, such as communicating their needs at school, restaurants, social events, and when leaving a child in the care of others. However, studies consistently show that many U.S. patients and caregivers struggle to access mental health professionals with expertise in food allergy.

The Global Access to Psychological Services for Food Allergy (GAPS) study surveyed adults and caregivers around the world, including 122 U.S. adults with food allergy and 659 U.S. caregivers of food-allergic children.[23] Despite high levels of food allergy–related distress, only 35% of adult patients, 54% of pediatric patients, and 27% of caregivers had ever consulted a mental health professional for food allergy–related distress. Contributing barriers to mental health care access may include cost, lack of insurance coverage, limited availability of trained providers, and stigma around seeking mental health care.

How Does Air Travel Affect People With Food Allergy?

Food allergy can significantly impact air travel experience, and accommodations promised by airlines are not always reliably implemented. This inconsistency contributes to anxiety among passengers with food allergy and caregivers. In an international survey of 4,704 patients and caregivers, nearly 98% of surveyed individuals reported that improved airline policies would reduce their anxiety, and more than 60% said improved policies would reduce anxiety by "a lot."[24] Despite the clear burden, there is a major gap in formal data collection: most food allergy incidents during air travel are self- or caregiver-reported, and only 57.4% of in-flight allergic reactions are reported to airline staff.[24] Even when reported, airlines are not required to pass this information on to public health or aviation authorities, limiting our understanding of how often these incidents occur and where system-level changes are most needed.

Missed School

Food allergy can also impose financial and emotional strain on families through missed school days, which may result in additional childcare expenses, lost work hours, and heightened stress. According to the most recent national data, more than one-third (37%) of children with food allergy in the United States miss school due to their condition, and nearly one-quarter (23%) miss more than two days per year.[25]

Missing school for food allergy–related reasons is also linked to greater psychosocial burden among children.[25] However, the reasons behind this connection are not fully understood. Because these data points are cross-sectional, they cannot establish cause and effect, and many factors may influence school absences. These include fear of experiencing an allergic reaction in an environment perceived as unsafe, worries about social exclusion, or actual allergic events that lead to staying home or being sent home. These fears may be experienced by both the child and the caregiver, who may feel a lack of control over the child's safety and school environment.

Allergic Comorbidities

It's relatively rare for someone with food allergy—especially an adult—to have no other allergic conditions. Many people with food allergy also have related issues like eczema, asthma, or seasonal allergies. One way to understand this pattern is through a concept known as the "allergic march" or "atopic march." The atopic march describes how allergic diseases often appear in a typical sequence during childhood and progress into adulthood, suggesting that these conditions may share similar underlying immune pathways.

The atopic march often begins in infancy with eczema, especially an allergic form of eczema called "atopic dermatitis" (Figure 20). Atopic dermatitis is characterized by inflamed, itchy skin and a weakened natural skin barrier, which normally protects the body from outside substances. When the skin barrier is compromised, food proteins from the environment can enter through the skin—along with other irritants—and trigger an immune response, leading to food allergen sensitization—the next step in the atopic march. Later in childhood, allergic rhinitis (commonly called hay fever or seasonal allergies) often appears, triggered by environmental allergens like pollen, dust mites, pet dander, or mold. Asthma, which is linked to inflammation of the airways, tends to develop after these conditions. Although signs of asthma may be present earlier, it is typically diagnosed once a child is old enough—around 4 or 5 years old—to reliably complete breathing tests such as spirometry.

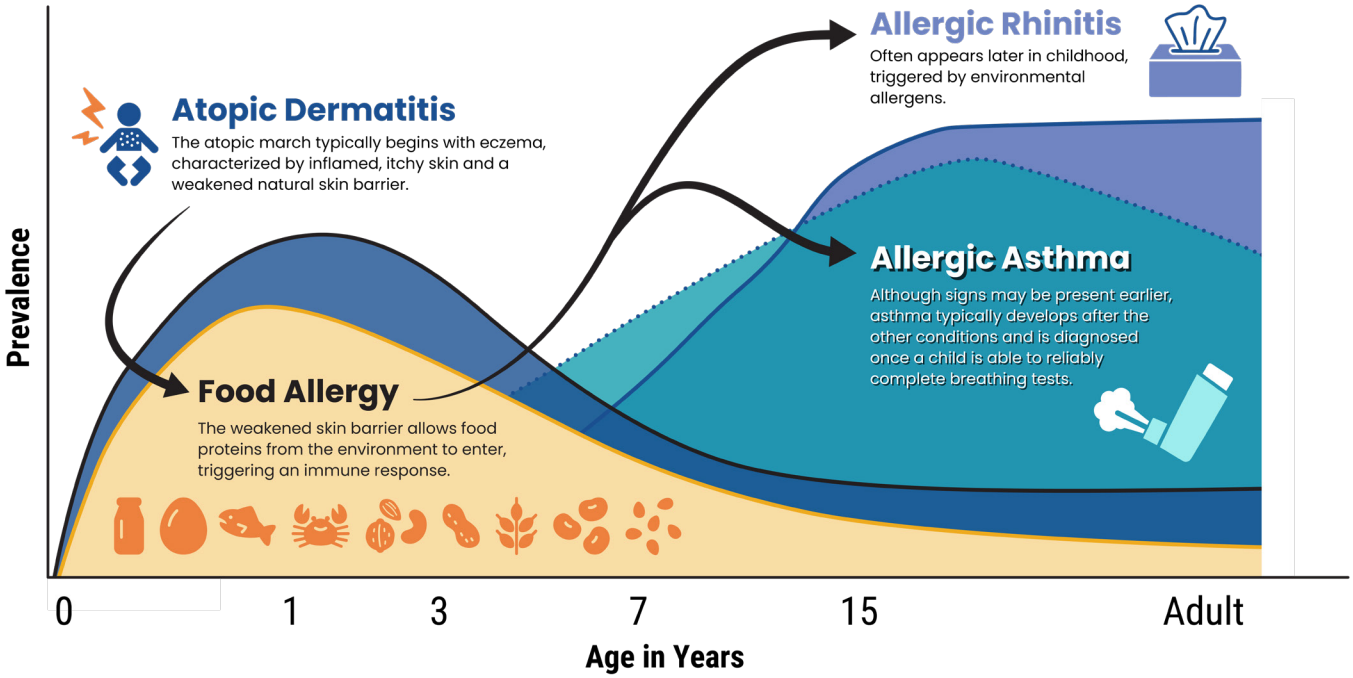


Figure 20. Schematic of the atopic or allergic march.

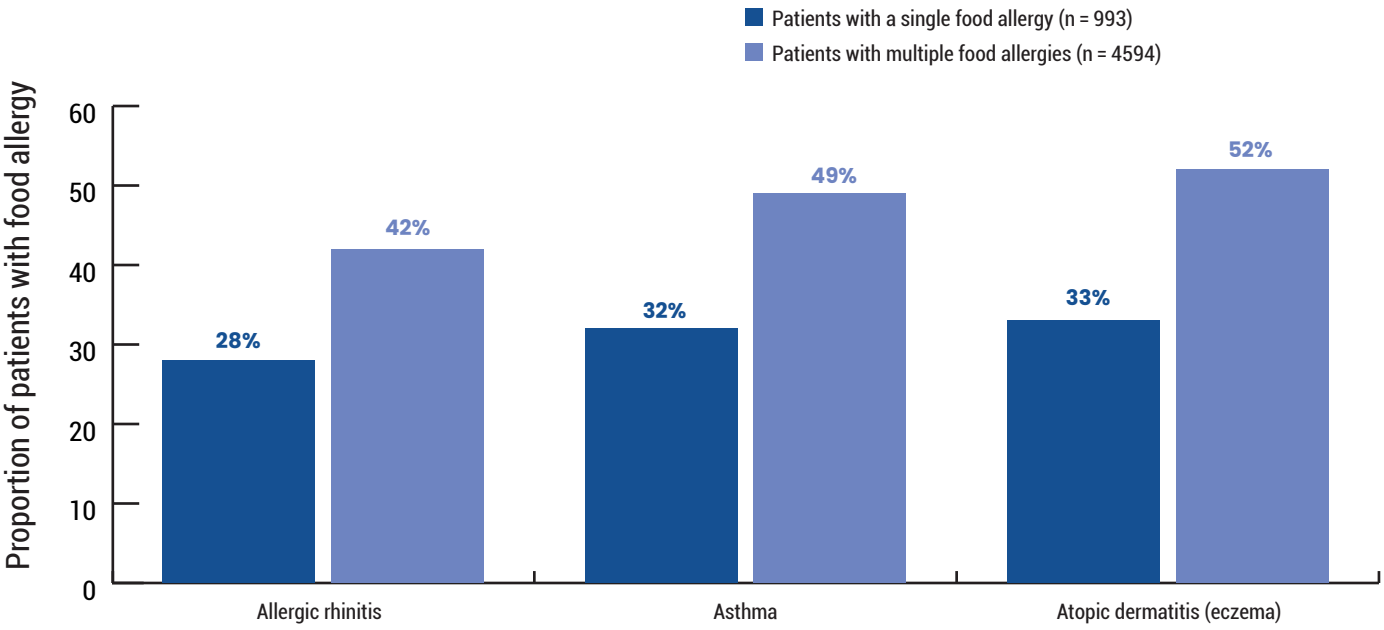


Figure 21. Prevalence of allergic comorbidities among patients with food allergy, by number of food allergies.[28]

The presence of allergic comorbidities is associated with an increased risk of experiencing severe food allergic reactions. In a 2015-2016 cross-sectional survey of U.S. adults with food allergy, comorbid asthma increased the odds of having severe food allergy by 40%, and allergic rhinitis increased the odds of severe food allergy by 30%.[2]

Anaphylaxis and Fatalities

Fatalities from food allergy are uncommon and are typically preventable with avoidance measures and prompt treatment. The annual incidence of fatal anaphylaxis from food allergy among patients with food allergy is around one in 1 million, meaning it's less common than many other population-level mortality risks (Figure 22).[29]

To track causes of death in the U.S., the CDC maintains a database based on information from death certificates.[30] Each certificate lists one main cause of death and may include up to 20 contributing causes, along with demographic details. Food allergy–related deaths are most often identified using the ICD-10 code T78.0, which stands for "Anaphylactic shock due to adverse food reaction." This code isn't allowed as the primary cause of death, so it appears only as a contributing cause in the database. Figure 23 shows how often this type of food allergy–related death was recorded from 2003 to 2022.

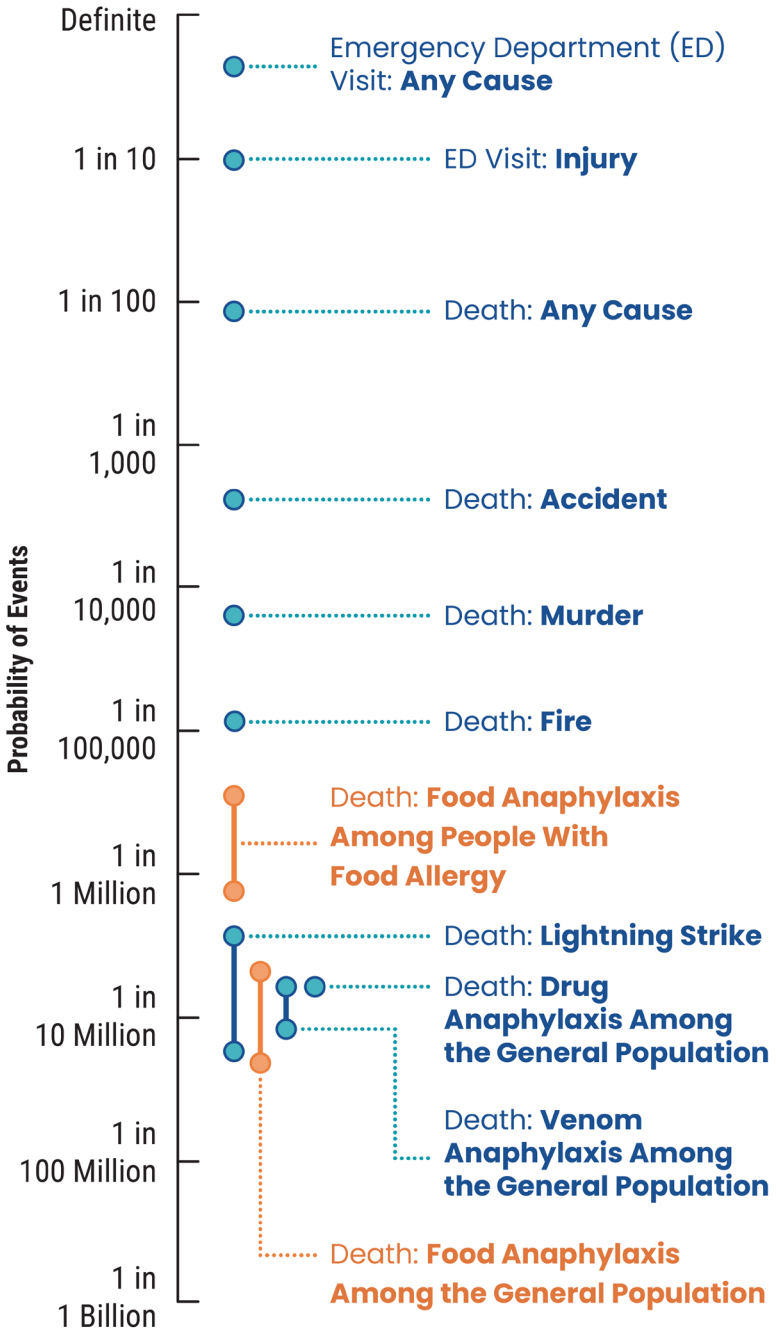


Figure 22. Estimated risk of fatal anaphylaxis from food allergy relative to other mortality risks.[29]

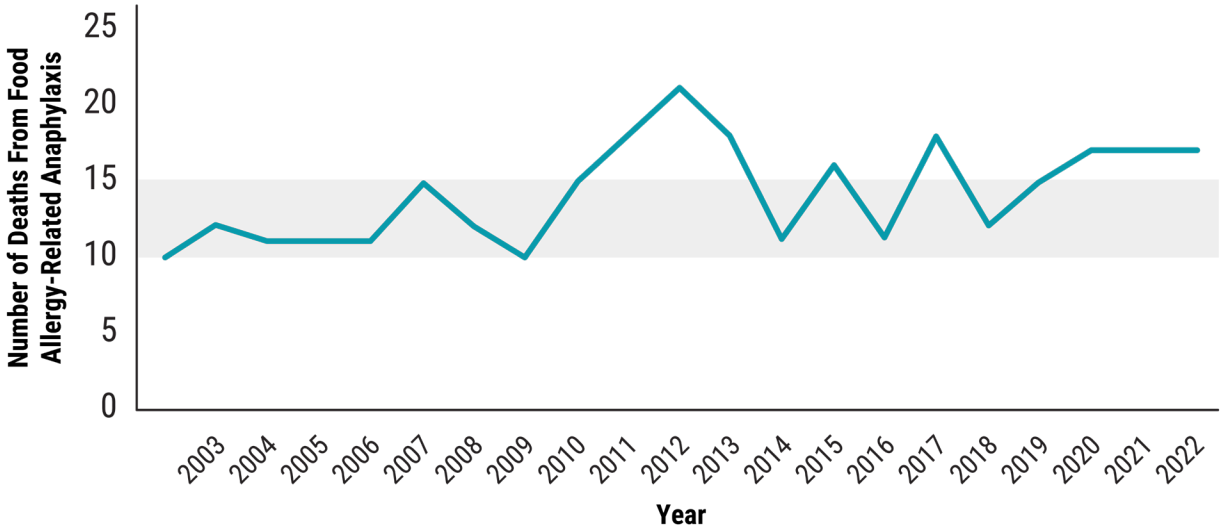


Figure 23. Number of death certificates including food allergy–related anaphylaxis (ICD-10 code T78.0) as an additional cause of death from 2003–2022.[30]

While overall rates of fatal food-induced anaphylaxis in the U.S. remained relatively stable from 1999 to 2010, national data show that mortality increased more than threefold among African American males during that time.[31] Specifically, African American boys were found to be at three times greater risk of dying from food-related anaphylaxis compared to non-Hispanic White boys, and African American girls faced nearly twice the risk compared to their White counterparts. Across all age groups during this time period, Black people had higher rates of food-related anaphylaxis deaths than non-Hispanic White people (Figure 24). However, more recent demographic trends in fatal food-related anaphylaxis have not been well characterized, highlighting the need for updated surveillance and research to better understand and address disparities.

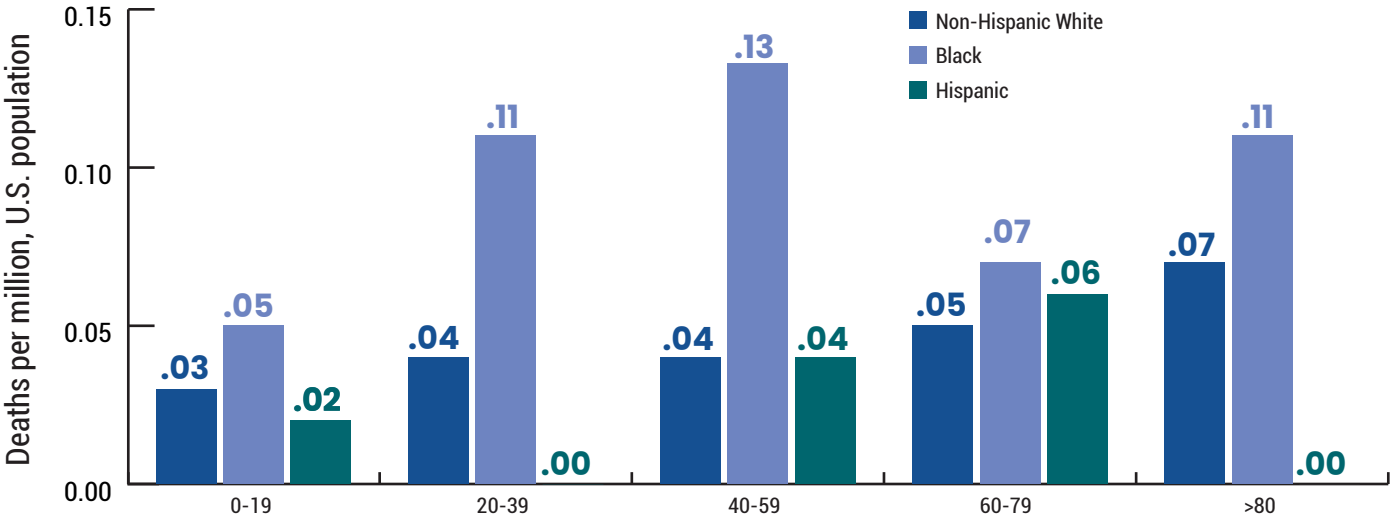


Figure 24. Average rates of fatal food-induced anaphylaxis in the U.S. from 1999–2010, by age and race and ethnicity.[31]

What Is the Likelihood of Severe, Life-Threatening Anaphylaxis in a Patient With Food Allergy?

Unfortunately, it is difficult to predict how severe a given reaction will be, but we know that more severe reactions are likelier in people with a prior history of food-induced anaphylaxis or with poorly controlled asthma.

Additionally, even within the same person, the severity of a food allergy reaction can vary, with several cofactors increasing the risk of more severe reactions:

- Consuming larger amounts of the allergen
- Eating a raw form of the allergen (instead of a cooked or baked form)
- Use of certain medications, especially nonsteroidal anti-inflammatory drugs (NSAIDs)
- Alcohol consumption around the time of ingestion
- Physical activity around the time of ingestion
- Feeling stressed and fatigued
- Ongoing illness or infection
- Menstruation at the time of ingestion

Access to Specialist Care

In the U.S., physicians who specialize in allergy and immunology—commonly referred to as allergists—are the primary specialists responsible for diagnosing and managing food allergy. As of 2025, there were 7,282 board-certified allergists, according to the American Board of Allergy & Immunology.[32] However, not all of these individuals are actively practicing or seeing patients. More conservative estimates from the Association of American Medical Colleges suggest that, in 2023, there were 5,219 practicing allergists in the United States, equating to roughly 1.6 allergists per 100,000 people.[33,34]

Geographic access to allergists is also uneven. A 2019 study using data from 3,527 physician members of the American Academy of Allergy, Asthma & Immunology (AAAAI) found that 81.5% of U.S. counties had no allergists at all (Figure 25).[35] The disparity was especially stark between rural and urban areas—only 0.3% of rural counties had an allergist compared to 23.2% of urban counties. Additionally, counties with allergists tended to be more affluent, with a median income of $58,054, compared with $47,327 in counties without allergists.

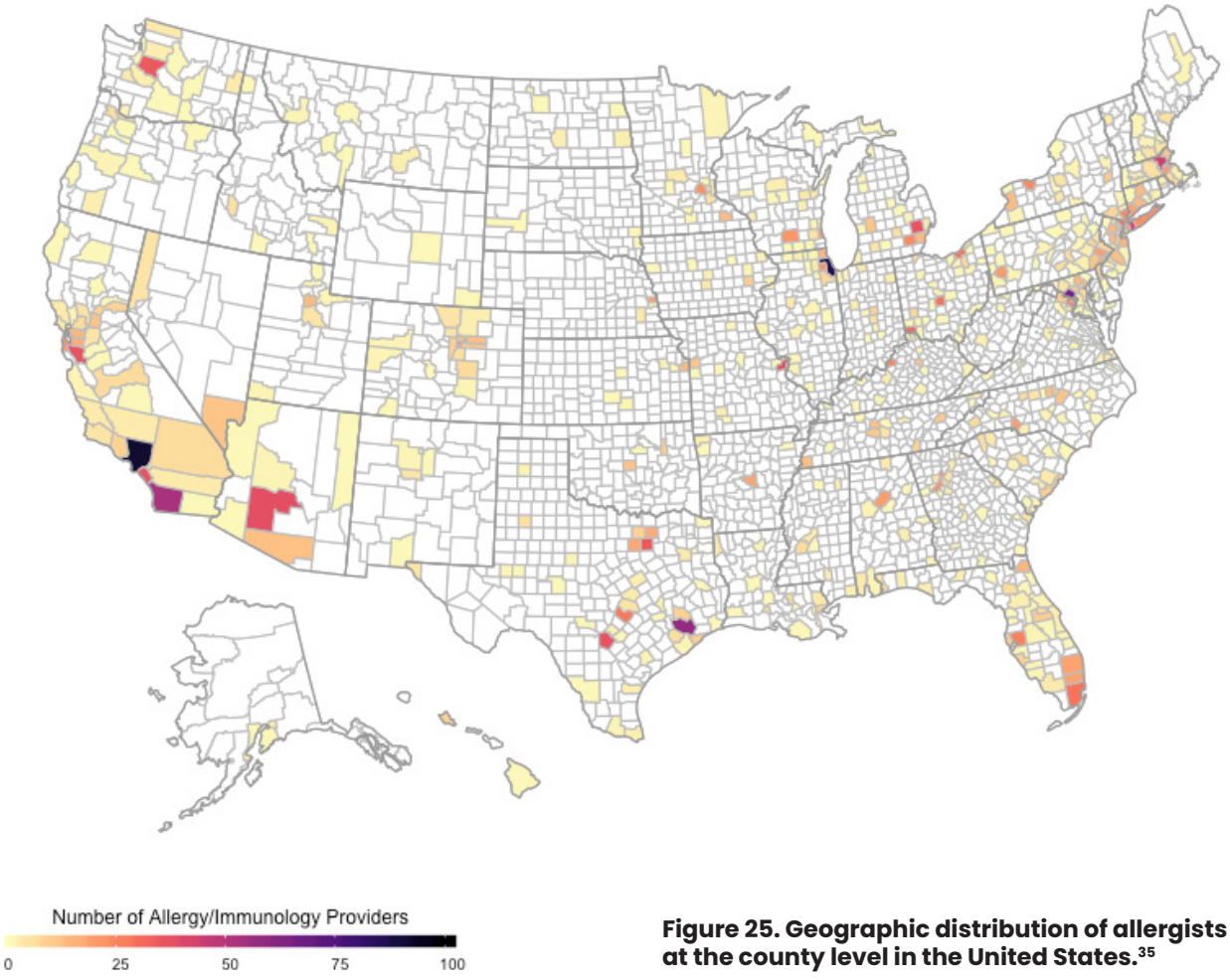


Figure 25. Geographic distribution of allergists at the county level in the United States.[35]

Allergist workforce shortages are compounded by broader systemic challenges. More than 1 in 3 children and 1 in 6 adults in the U.S. receive health coverage through Medicaid, a public insurance program that serves individuals and families with limited income. This matters for food allergy care because studies have shown that patients living in high-poverty areas are less likely to access preventive services—such as allergy testing or prescriptions for epinephrine—and are more likely to rely on emergency departments for treatment.[36] One major barrier is that many allergists do not accept Medicaid, making it difficult for patients to find providers who take their insurance. This can lead to delays in diagnosis and treatment, especially when long travel times or time off work or school are required to access specialist care.

Compared with Medicare or private insurance, Medicaid tends to reimburse providers at lower rates, and some physicians cite concerns about the complexity or perceived burden of caring for Medicaid patients. As a result, Medicaid enrollees often face greater difficulty scheduling specialty care appointments, including allergist visits. A recent national study found that only 55.5% of U.S. allergists accept Medicaid, with significant variation across states—from just 13% in New York to 90% in New Mexico (Figure 26 and Table 2).[37] This uneven access contributes to disparities in allergy care and may worsen outcomes for those already facing socioeconomic disadvantage.

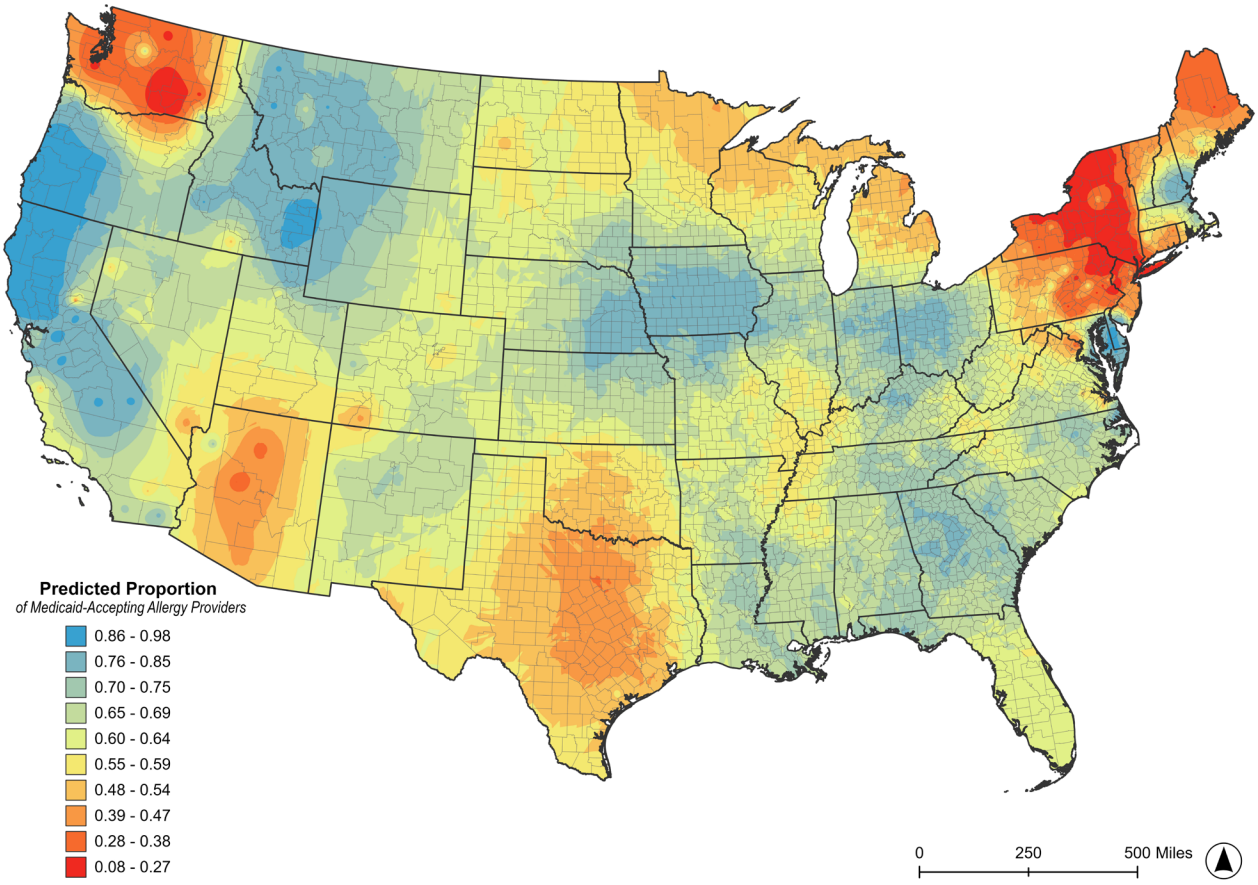


Figure 26. Geographic distribution of allergists who accept Medicaid insurance.[37]

Table 2. Proportion of allergists accepting Medicaid, by state or district.[37]

State	Number of allergists	Proportion accepting Medicaid
Alabama	50	66.0%
Alaska	9	88.9%
Arizona	94	36.2%
Arkansas	29	75.9%
California	683	72.3%
Colorado	142	55.6%
Connecticut	90	43.3%
Delaware	19	84.2%
District of Columbia	42	40.5%
Florida	303	66.3%
Georgia	149	74.5%
Hawaii	12	58.3%
Idaho	16	81.3%
Iowa	50	78.0%
Illinois	254	65.4%
Indiana	74	78.4%
Kansas	43	65.1%
Kentucky	85	77.6%
Louisiana	76	78.9%
Maine	12	58.3%
Maryland	191	54.5%
Massachusetts	191	62.3%
Michigan	179	48.6%
Minnesota	92	50.0%
Mississippi	27	81.5%
Missouri	108	53.7%
Montana	13	84.6%
North Carolina	156	77.6%
North Dakota	9	77.8%
Nebraska	23	78.3%
Nevada	23	26.1%
New Hampshire	25	76.0%
New Jersey	202	43.1%
New Mexico	19	89.5%
New York	500	13.4%
Ohio	193	73.1%
Oklahoma	31	71.0%
Oregon	40	85.0%
Pennsylvania	279	36.2%
Rhode Island	12	58.3%
South Carolina	72	63.9%
South Dakota	6	66.7%
Tennessee	123	58.5%
Texas	445	46.3%
Utah	30	66.7%
Vermont	7	57.1%
Virginia	180	47.8%
Washington	126	33.3%
West Virginia	26	65.4%
Wisconsin	131	51.9%
Wyoming	3	33.3%

What Is the Role of Non-Allergists in the Diagnosis and Management of Food Allergy?

While allergists are specialists in food allergy diagnosis and care, limited access to these providers—especially in underserved areas—means that primary care providers (PCPs), including pediatricians, family practitioners, and internists, often serve as the first point of contact for families. PCPs play a critical role in recognizing signs of food allergy, initiating a diagnosis based on clinical history, and helping families begin appropriate food avoidance and emergency planning. They also educate patients about nutrition and safety, prescribe epinephrine for anaphylaxis, and provide guidance on when to seek specialist care. For children with eczema—who may first see a dermatologist—this early involvement is especially important, as they are at increased risk for food allergy.

Given the growing number of patients with food allergy and the shortage of allergists, PCPs are essential partners in long-term management and prevention. They help monitor allergic conditions over time, implement national prevention guidelines, and identify infants at higher risk for food allergy due to moderate or severe eczema. By treating skin inflammation early and guiding families on proper skin care and hand hygiene before applying emollients (moisturizers), they help reduce allergen entry through broken skin, a pathway that can trigger sensitization. PCPs also coordinate care when more advanced testing or treatments—like oral immunotherapy or biologic therapies—are needed, ensuring timely referral for specialist evaluation. This shared care model allows more families to access timely support while ensuring those with complex needs receive specialist evaluation. However, more research is needed to define the best approaches for coordinating care and sharing responsibilities between allergy and non-allergy providers to ensure safe, efficient, and equitable care for all patients.

Diagnosing Food Allergy

Although skin prick testing and food-specific serum IgE testing can assess for food allergen sensitization, oral food challenge continues to be the "gold standard" for food allergy diagnosis. Although 90% to 95% of surveyed U.S. allergists offer oral food challenges in their practices, most allergists use oral food challenges to diagnose food allergy in only a minority of patients.[38,39] In a study conducted by AAAAI in 2017-2018 evaluating oral food challenge practices among 546 allergy providers, perceived barriers to performing oral food challenges were common and predominately included logistical concerns such as time, space, and staffing.[38] Among patients and caregivers, fear and anxiety about reactions during oral food challenges are commonly reported concerns.[40] These data highlight the challenges of diagnosing food allergy with oral food challenges and the need for more patient and caregiver support alongside access to alternative diagnostic tools.

Novel Food Allergy Diagnostics

As discussed, oral food challenges are time-consuming, resource-intensive, carry a risk of triggering anaphylaxis, and are not widely accessible. Meanwhile, skin prick tests and serum IgE tests are prone to misinterpretation by non-specialists and can lead to false-positive food allergy diagnoses—especially if a detailed clinical history is not carefully evaluated. These limitations have led to the development of next-generation diagnostic tools that aim to be safer, more accurate, and more practical. Many of these emerging tests are performed on blood samples, which is more convenient and safer for patients.

The most developed novel food allergy diagnostic method is the *basophil activation test* (also called a BAT). This test has been described as an "oral food challenge in a test tube." In basophil activation testing, patient blood samples are exposed to increasing quantities of food allergen in a systematic way (Figure 27). Then, a laboratory technique called *flow cytometry* is used to identify activated immune cells called *basophils*, which can indicate an allergic reaction is taking place. Mast cell activation testing (or MAT) is similar to basophil activation testing, but instead of evaluating samples for basophil activation, researchers use flow cytometry to look for activation of another type of immune cell called *mast cells*.

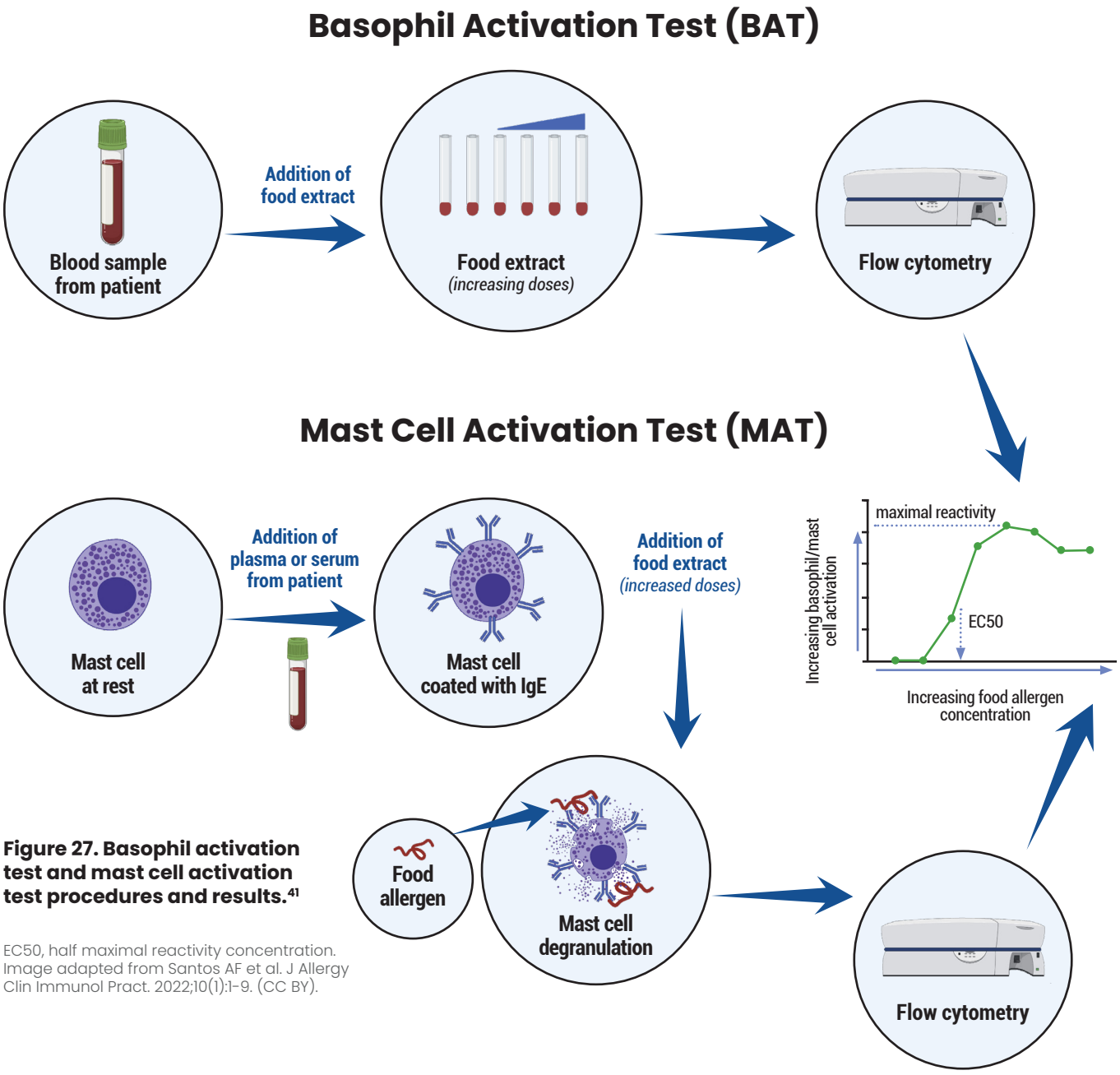


Figure 27. Basophil activation test and mast cell activation test procedures and results.[41]

EC50, half maximal reactivity concentration. Image adapted from Santos AF et al. J Allergy Clin Immunol Pract. 2022;10(1):1-9. (CC BY).

Another diagnostic method that uses a slightly different approach is called a bead-based epitope assay. This test helps identify the specific parts of a food allergen to which a person's immune system is reacting. In short, microscopic beads are coated with tiny pieces of a food protein (which are also known as epitopes). When a blood sample from a patient with a corresponding food allergy is added to the beads, the allergen-specific IgE antibodies in the blood will stick to the epitopes on the beads, and flow cytometry can be used to measure the amount of IgE antibodies stuck to the beads. Since immune reactions to different epitopes are associated with different levels of food allergy severity, this can provide useful information about a patient's likelihood of outgrowing their allergy, as well as their chance of having a severe reaction.

Allergen Thresholds

One key advantage of the aforementioned diagnostic blood tests is that they don't just provide a yes-or-no answer to whether a person is allergic to a given food. They can also provide actionable information about how much allergen a person needs to ingest to experience a reaction. This is called a threshold dose. People with food allergy can have different threshold levels after which they experience symptoms to a specific food allergen.[42] This means that two patients with allergist-confirmed peanut allergy could eat the same dish containing trace amounts of peanut protein, but the person with a lower threshold may experience an allergic reaction while the person with the higher threshold may have no symptoms at all.

In general, people with higher levels of food-allergic sensitization are more likely to react to that food at lower threshold doses.

By analyzing threshold dose data from many patients with food allergy, researchers can calculate *eliciting doses* (also called ED values), which describe the specific amount of allergen predicted to cause clinically observable reactions in a given percentage of the allergic population. For example, only 5% of peanut-allergic individuals are likely to experience allergy symptoms after consuming 2 mg of peanut protein (known as the eliciting dose for 5% of the peanut-allergic population, or ED05), and 50% can consume a serving of 165 mg peanut protein without symptoms (known as the ED50) (Figure 28).[43] In other words, 95% of peanut-allergic individuals can safely consume 2 mg of peanut protein, and one-half can consume 165 mg of peanut protein without experiencing objective allergy symptoms.

How Much Peanut Protein Is in One Peanut?

A single peanut kernel has about 200 to 250 mg of peanut protein. Most peanut pods contain two peanut kernels, but some pods contain only one or three or more kernels.[44]

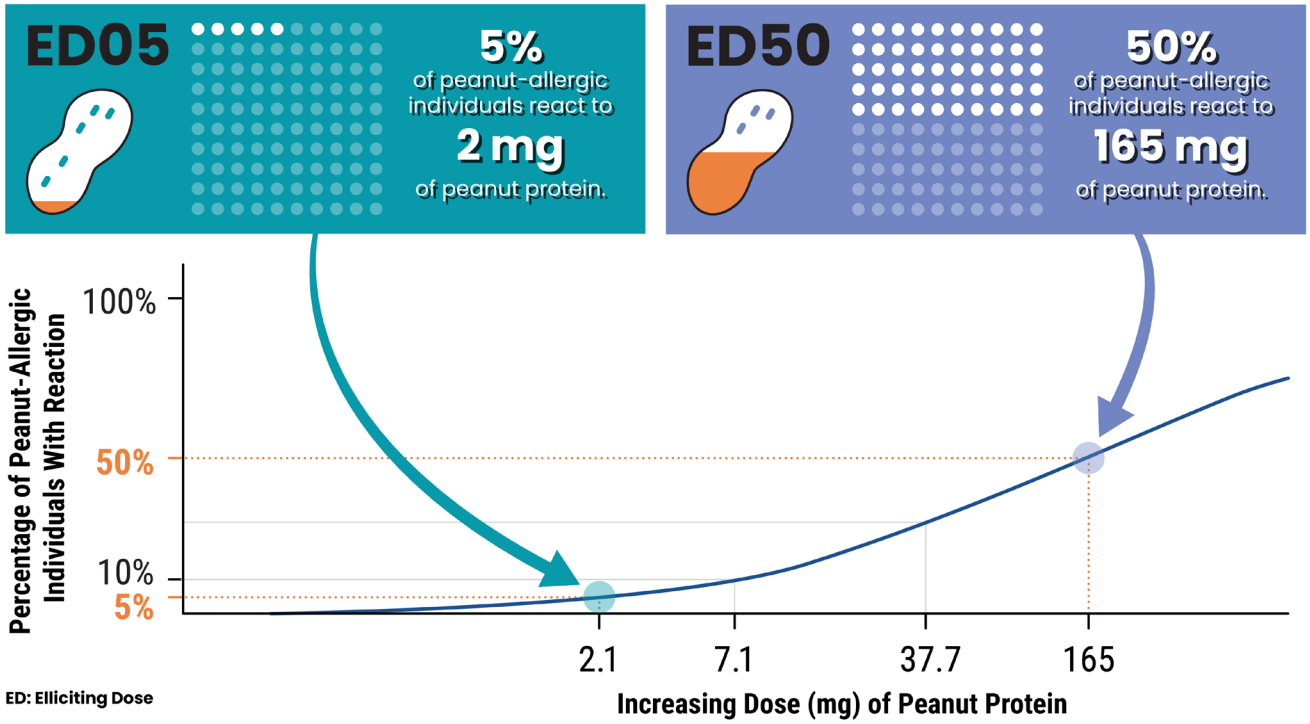


Figure 28. Eliciting dose of peanut protein in a population of peanut-allergic patients based on values from oral food challenges.[43]

ED05, eliciting dose for 5% of a population; ED50, eliciting dose for 50% of a population.

Threshold doses in patients with food allergy to egg, cow's milk, sesame, cashew, and many other tree nuts are similar to those for peanut.[43] For seafood allergens, however, the threshold doses are generally higher, meaning that people need to consume more of the allergen to experience a reaction. For example, the ED05 levels for fish and shrimp are 12 mg and 280 mg, respectively, and the ED50 levels are 400 mg and 8000 mg.

What Are Cofactors and How Do They Affect Threshold Doses?

Cofactors are circumstances that interact with the immune system and can temporarily lower the amount of allergen needed to cause a reaction. This means that the threshold dose for someone with a food allergy can change depending on the situation. For example, a person who usually reacts after eating 2 mg of peanut protein might experience symptoms after consuming even less than 2 mg if they are sick, have consumed alcohol, or have just finished intense exercise. Other common cofactors include infections, use of NSAIDs, and dehydration—all of which can make a reaction more likely at lower doses. (Refer to page 32 for more information on cofactors.)

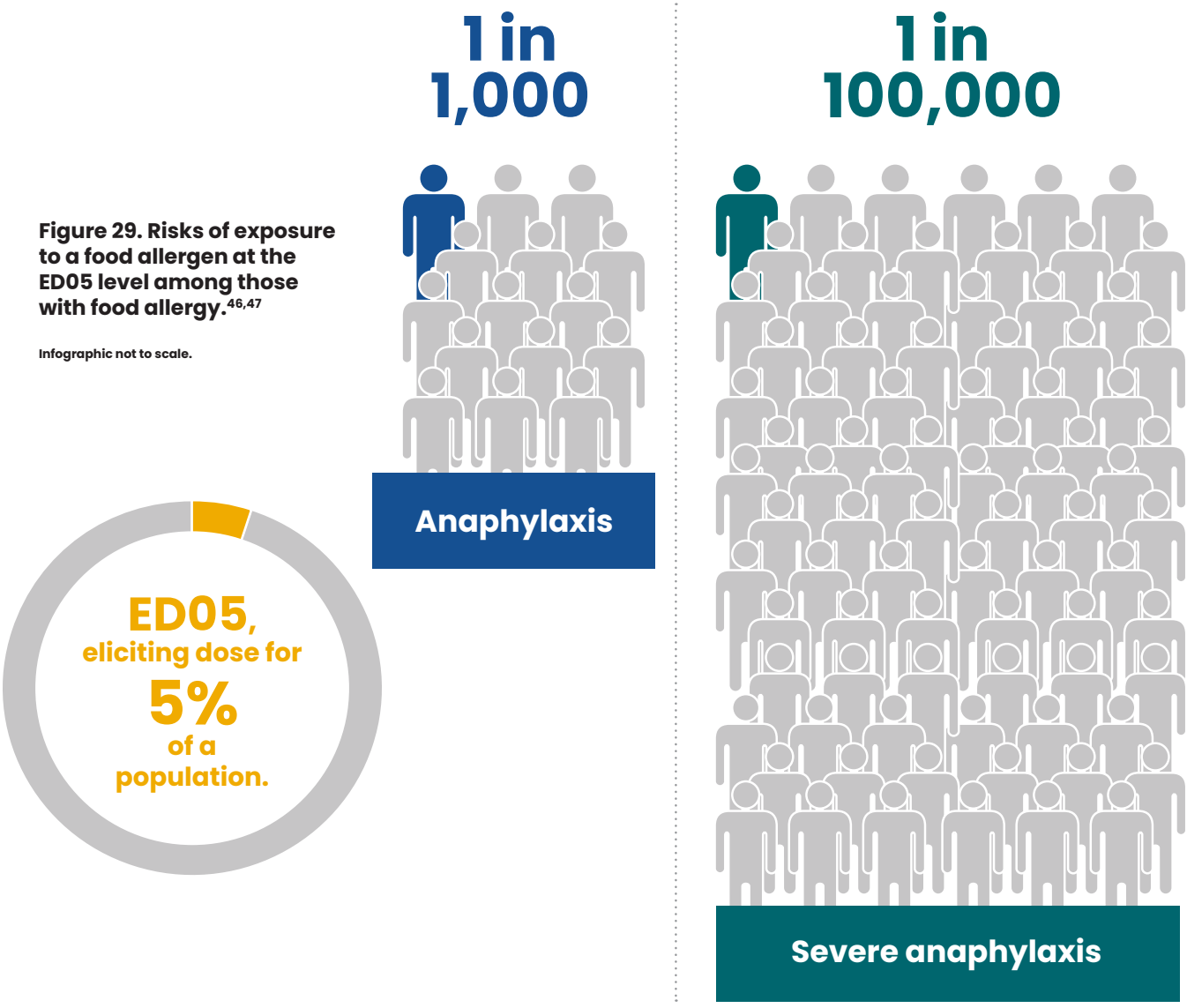
Diagnosis and Management of Food Allergy

Currently, the most common way for people with food allergy to measure their allergen thresholds is an oral food challenge. However, as novel diagnostic blood tests become more widely available, they may offer a less burdensome way for patients and their caregivers to gain valuable information about their risk of experiencing a reaction to small quantities of allergen, such as when a food has trace amounts due to cross-contact.

Since many patients do not know their threshold dose, they are often concerned that they could be in the small minority of patients who are reactive to very low doses of allergen. However, according to the World Allergy Organization, even for the 5% of individuals who are reactive at the ED05 level, the risk associated with reactions occurring to exposure at these low doses is remarkably low.[45] Among the approximately 5% of individuals who react at the ED05 dose, the majority are expected to experience mild symptoms. Within this subset, an estimated 5% may develop anaphylaxis, while the incidence of severe anaphylaxis is approximately 100-fold lower (Figure 29).

Figure 29. Risks of exposure to a food allergen at the ED05 level among those with food allergy.[46,47]

Infographic not to scale.



To help people with food allergy make informed decisions about their food intake, many food allergy experts have proposed standardizing labeling of packaged foods in the U.S. Currently, many products have precautionary allergen labeling (PAL). Since precautionary allergen labeling is unregulated at this time, different companies may include these labels using different phrasing and for products with varying levels of risk. Common precautionary allergen labeling statements added to packaging include the following:

- *May contain….*
- *May contain trace amounts….*
- *Manufactured in a facility that also processes….*
- *Not suitable for….*

Experts have suggested standardizing precautionary allergen labeling by using the ED05 as the cutoff requirement for informing consumers about the presence of allergens (Figure 30). Advantages of a more standardized approach to precautionary allergen labeling include:

- Providing clearer, more consistent guidance to help consumers make informed decisions about potential allergen risks
- Aligning food labels with actual risk (e.g., removing warnings when allergens are not present in meaningful amounts)
- Expanding food choices and dietary variety for people who currently avoid foods with precautionary labels
- Making it easier for food manufacturers to comply and for regulators to enforce rules by applying clear, objective criteria
- Harmonizing U.S. regulations with international standards

Can Threshold Doses Be Increased?

Modern food allergy treatments such as immunotherapy—where people with food allergy are systematically exposed to increasing doses of their allergen—can raise the threshold of reactivity until it is high enough to be less of a concern during daily living.

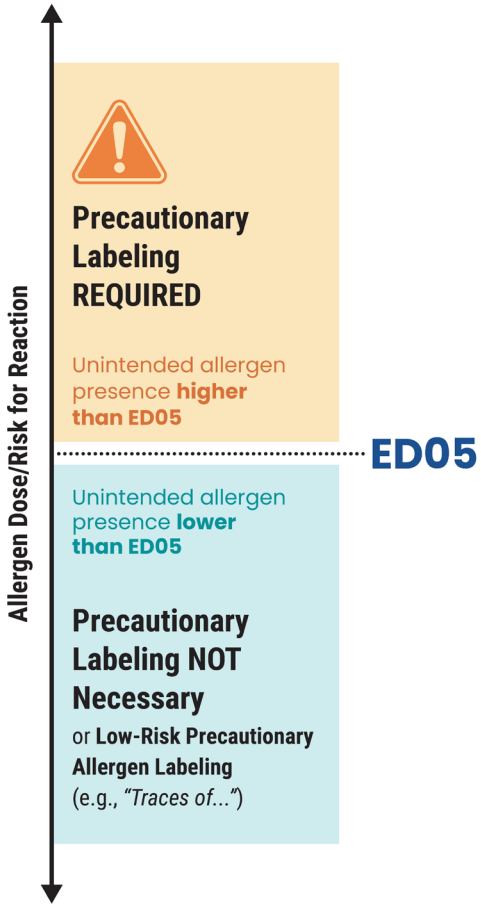


Figure 30. Example of potential requirements for standardizing precautionary allergen labeling.[45]

ED05, eliciting dose for 5% of a population.

Food Allergic Reaction Management

Epinephrine is the only first-line treatment for anaphylaxis, a severe and potentially life-threatening allergic reaction. For people with food allergy, having a current prescription for epinephrine and keeping it immediately accessible at all times—whether in the form of an autoinjector, nasal spray, or other FDA-approved method—is critical. Allergic reactions can escalate quickly, and prompt administration of epinephrine can stop the progression of symptoms, restore breathing, and stabilize blood pressure. Because the signs of anaphylaxis can vary and may appear suddenly, recognizing symptoms early and being prepared to act without delay is key to effective treatment and a full recovery.

What Are the Prescription Epinephrine Options in the United States?

Prescription epinephrine can be administered by injection or intranasal spray. The available options are reviewed below.

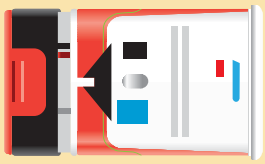
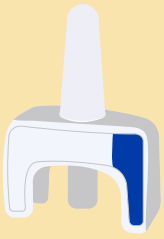
	Brand name	Generic	Dosage forms	Use
	EpiPen® and EpiPen Jr.®	Yes	Autoinjector	Adult and pediatric
	Adrenaclick™	Yes	Autoinjector	Adult and pediatric
	Auvi-Q®	No	Autoinjector	Adult, pediatric, and infants
	neffy®	No	Intranasal spray	Adult and pediatric patients aged ≥4 years weighing >33 lb

Table 3. Prescription epinephrine options in the U.S.

Epinephrine is a fast-acting, safe medication that mimics the body's own "fight-or-flight" hormone (adrenaline), helping to open airways, raise blood pressure, and support heart function during an allergic reaction.

Most patients are advised to carry two doses in case symptoms persist or the first dose is not administered correctly. Furthermore, some patients whose symptoms resolve with the first epinephrine dose may develop reaction symptoms more than an hour later, even without being re-exposed to their allergen. This is known as a *biphasic* reaction.

It's equally important that patients and caregivers know how to use their prescribed device and practice using it before an emergency arises. Despite its proven safety and effectiveness, research shows that epinephrine is often under-carried and underused. Ensuring readiness—including access, training, and confidence in recognizing anaphylaxis—is a vital part of managing food allergy.

Epinephrine Prescriptions

In a 2015–2016 cross-sectional survey of individuals with convincing food allergy, only 24.0% of adults and 40.7% of children reported having a current epinephrine prescription.[1,2] Current prescription rates varied considerably by food allergy type, with the highest rates observed among patients with sesame allergy (61.6% among adults and 64.8% among children), peanut allergy (53.8% and 73.0%), or tree nut allergy (51.5% and 70.4%). Notably, in the adult population, those aged 50 years or older were significantly less likely to report having a current epinephrine prescription (Figure 32).

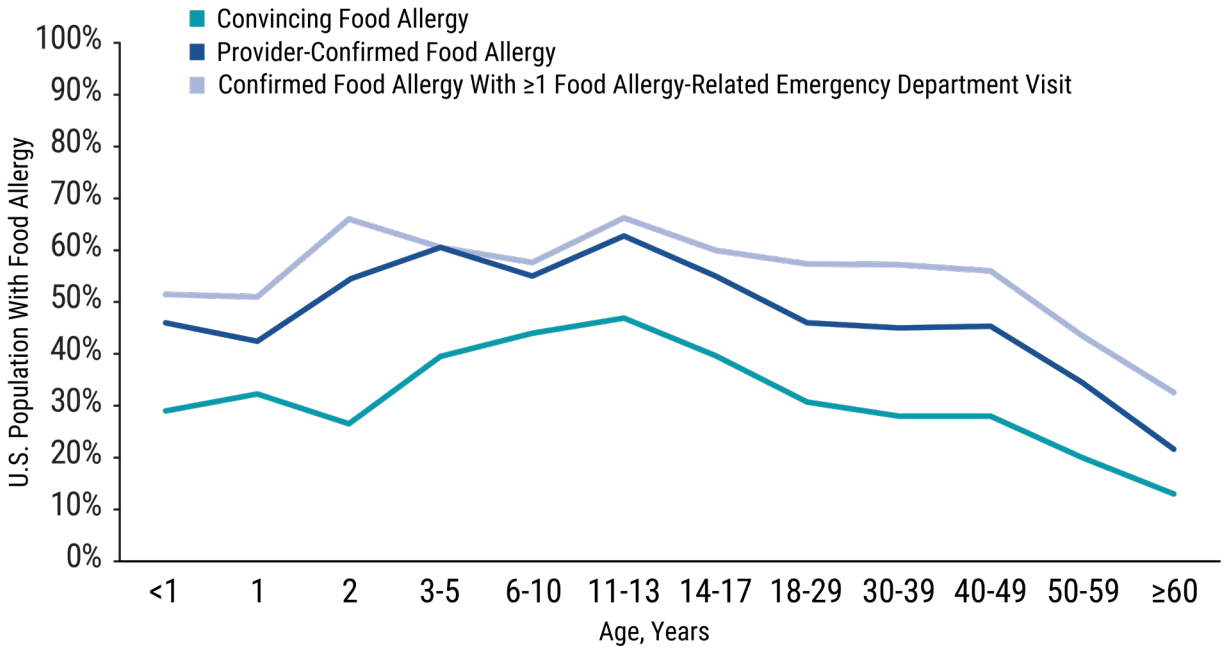


Figure 31. Current epinephrine prescription among patients with food allergy, by age, provider diagnosis, and history of food allergy–related emergency department visit.[1,2]

Although most patients with food allergy and caregivers of children with food allergy who were prescribed epinephrine filled that prescription, about 1 in 10 did not.[48] The most commonly cited reasons for not filling epinephrine prescriptions were not having a history of reactions (26%), cost (25%), and not believing it was needed (23%).

Epinephrine Carriage and Use

An important metric of whether or not patients are prepared in case of a severe food allergy reaction is whether or not they have epinephrine with them at all times. In a 2018 survey of 450 adults with food allergy and 467 caregivers of children with food allergy, epinephrine carriage and use patterns were evaluated.[48] Less than one-half of patients carried at least one epinephrine autoinjector all of the time, and only one-quarter carried multiple epinephrine autoinjectors.

What Is the Potential Impact of Needle-Free Epinephrine?

With the approval of neffy®, a nasal spray form of epinephrine, a needle-free option is now available for the treatment of anaphylaxis, with studies showing similar drug absorption and effects as intramuscular epinephrine.[49,50] Additional needle-free products are in development, including other intranasal formulations and a sublingual (under-the-tongue) option. Early studies suggest these alternatives offer similar absorption compared with traditional intramuscular injections, making them promising options for emergency use.[51,52] Many patients and caregivers report fear of needles or pain as a reason for delaying epinephrine use, so the availability of needle-free options may help reduce hesitation and improve timely treatment. Some of these needle-free forms of epinephrine are also designed to be smaller and easier to carry, have longer shelf-life, and be more stable across temperature variations than current injectable formulations. While more research is needed to understand the real-world impact of needle-free epinephrine on food allergy management, these new formats are likely to be welcomed by many food allergy patients and caregivers.

Stock Epinephrine Policies

“Stock” epinephrine policies are designed to expand access to emergency epinephrine by allowing “undesignated” doses—those not prescribed to a specific individual—to be made available in public settings. This approach is similar to how automated external defibrillators are widely placed in public areas for cardiac emergencies. Schools have been at the forefront of this effort. Since the passage of the 2013 School Access to Emergency Epinephrine Act, which incentivizes state-level adoption of stock epinephrine policies through grant preferences, all states except Hawaii have enacted laws supporting the stocking of undesignated epinephrine in schools (Figure 32).[53]

A key aspect of these policies is ensuring that school staff are properly trained to recognize signs of anaphylaxis and administer epinephrine quickly and effectively. As such, these laws also typically include legal protections for individuals who provide emergency care in good faith, helping reduce concerns about liability.

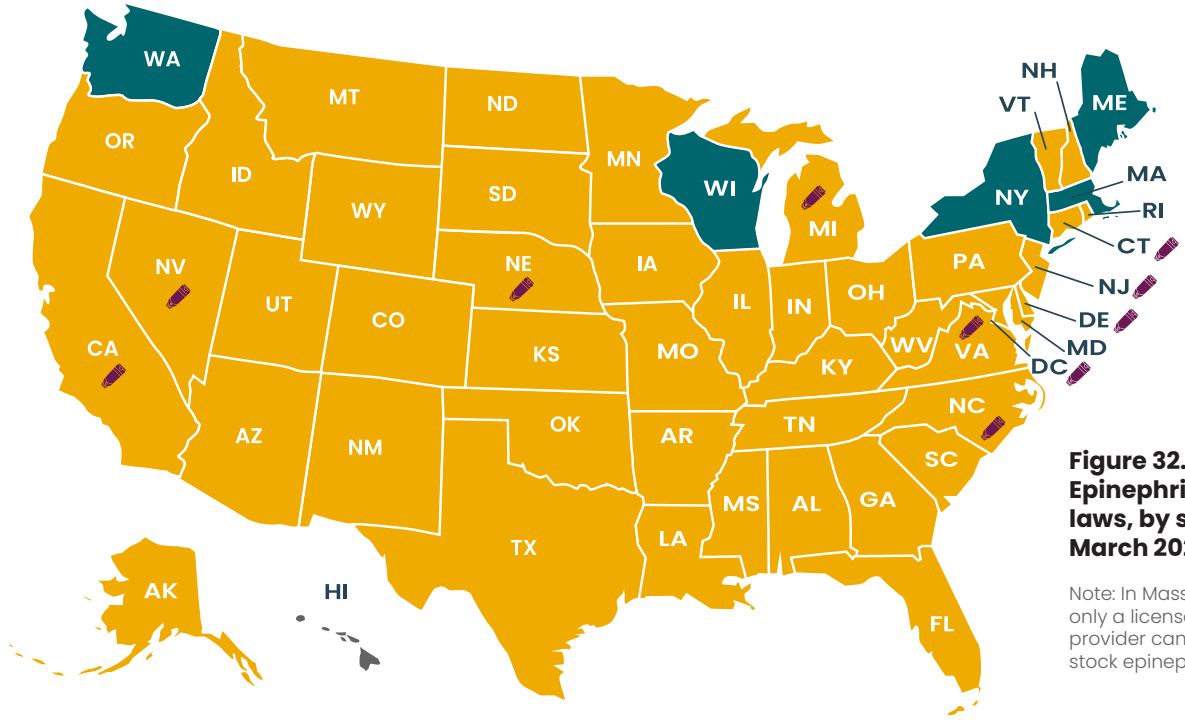


Figure 32. Epinephrine stocking laws, by state, as of March 2025.[53]

Note: In Massachusetts, only a licensed health care provider can administer stock epinephrine.

In addition to allowing stock epinephrine in schools, many states also have laws allowing public venues (e.g., arenas, malls, theme parks) to stock epinephrine to treat severe allergic reactions. This type of legislation is known as an "entity law." At this time, 36 states have entity laws, and 3 states have pending legislation (Figure 33).[54]

- Mandates epinephrine stocking in schools
- Allows stocking of epinephrine autoinjectors and approved needle-free options
- Enacted epinephrine stocking law
- No epinephrine stocking law/legislation

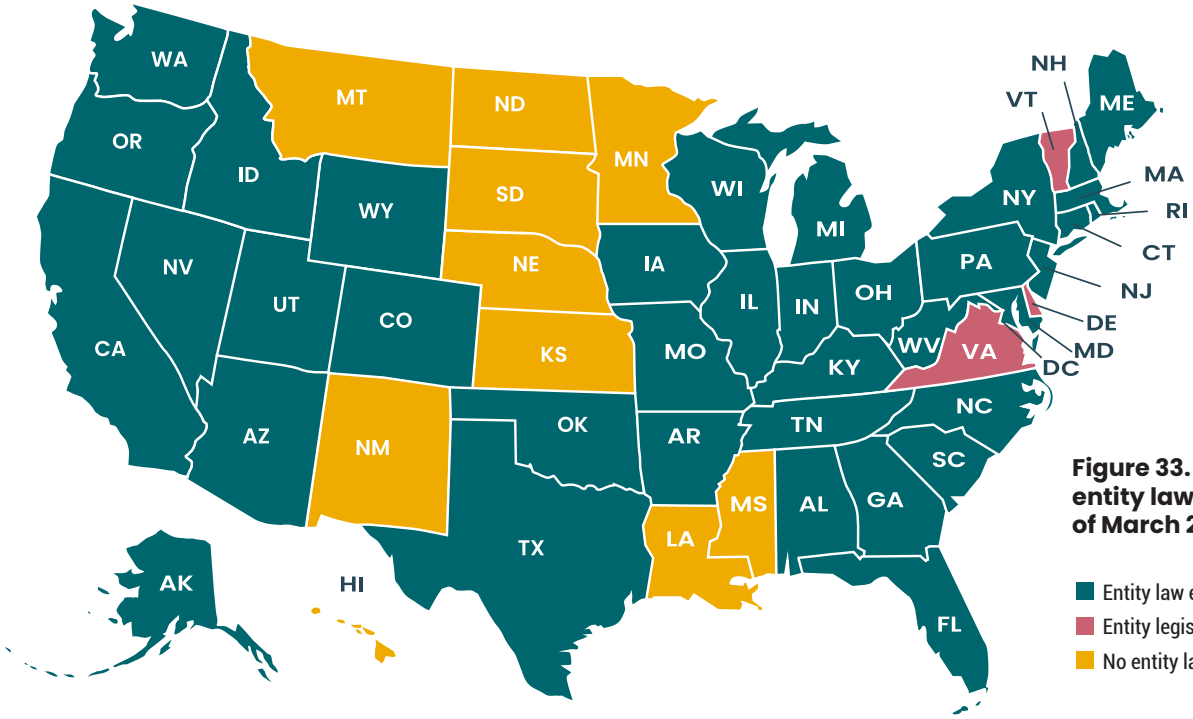


Figure 33. Epinephrine entity laws, by state, as of March 2025.[54]

- Entity law enacted
- Entity legislation pending
- No entity laws or legislation

Does Using Epinephrine Always Require Calling 911?

Over recent decades, guidance for managing anaphylaxis emphasized that individuals who administered epinephrine should promptly seek emergency medical attention. Current recommendations, as reflected in the 2023 Anaphylaxis Practice Parameters, acknowledge scenarios in which at-home management of anaphylaxis may be considered safe and appropriate. The 2023 ANA practice parameters outlined guidance on when to activate EMS or give a second epinephrine dose (Table 4).

When patients are considering options for or against at-home management of anaphylaxis, there are many factors to take into account (Table 5). There are scenarios in which the recommendation would still be to consider immediate care, including: severe cardiac or respiratory symptoms; if a person is alone; if a second epinephrine dose is not available; if a medical facility is not nearby; prior history of severe anaphylaxis; and comorbidities such as uncontrolled asthma, to name a few. Effective at-home management of anaphylaxis requires comprehensive discussion with a healthcare provider through shared decision-making during routine medical appointments. At-home management presumes that epinephrine was administered at the first sign of anaphylaxis.

Table 4. General guidance for activation of emergency medical services (EMS) and administration of a second epinephrine dose.

Consider home observation following the first dose of epinephrine	Signs and symptoms that appeared before giving epinephrine go away within a few minutes of administration and they don't come back—or the person has no symptoms at all. If the person still has scattered residual hives or a mild rash/erythema (redness), or even if newly emerging but isolated hives appear, they can be observed at home—as long as no new additional symptoms develop.
Consider EMS activation and possibly second dose of epinephrine but may continue to observe at home if comfortable	Signs and symptoms that had emerged prior to administration of the first dose of epinephrine are improving or resolving within minutes of epinephrine administration. For example, if someone still has a mild sensation of globus (feelings of having a lump or something stuck in the throat), nausea, coughing, or stomachache, he/she may be closely observed at home, provided symptoms are improving (not worsening and are perceived to be getting better) and do not persist for longer than 10-20 minutes without any additional signs of improvement.
Activate EMS immediately, consider second dose of epinephrine, do not observe at home	Signs and symptoms that had emerged prior to epinephrine administration are not resolving. Particularly concerning symptoms would include respiratory distress, stridor, altered consciousness, cardiovascular instability, cyanosis, or incontinence not typical for their age. This would also include non-skin symptoms that fail to resolve or worsen, including but not limited to repeated (>2 total) episodes of vomiting, persistent hoarseness, cough, dysphagia, wheezing, or lightheadedness.

Table 5. Considerations for and against home management of anaphylaxis.[a]

Considerations Against Home Management	Considerations for Home Management
• Patients/caregivers not comfortable with managing anaphylaxis without activating EMS/ED • No availability of epinephrine or only 1 epinephrine dose • Being alone, without immediate access to person(s) who can provide help if needed • Being unaware of the allergic symptoms that warrant the use of epinephrine • Lack of technical proficiency with administration of epinephrine • Hesitance about intramuscular injection using an EAI (needle phobia) • Concerns about the potential epinephrine adverse effects • Poor adherence to previous treatment recommendations, for example, not administering epinephrine for anaphylaxis in the past or not using controller medications for chronic conditions • History of severe/near-fatal anaphylaxis treated with more than 2 doses of epinephrine, hospitalization, intubation	• Patients/caregivers engaged in shared decision process • Immediate access to at least 2 epinephrine doses • Immediate access to person(s) who can provide help if needed • Clear understanding of the symptoms warranting the immediate use of epinephrine, availability of the anaphylaxis treatment plan • Familiarity with epinephrine administration technique • Clear understanding of the benefits of early epinephrine treatment in anaphylaxis • Good adherence to previous treatment recommendations, for example, use of epinephrine for anaphylaxis in the past or use of controller medications for chronic conditions

[a] Study refers exclusively to epinephrine autoinjectors because it was published before the FDA approval of a nasal spray epinephrine option in 2024.
EAI, epinephrine autoinjector; ED, emergency department; EMS, emergency medical services
D.B.K. Golden et al. Anaphylaxis: A 2023 practice parameter update. *Annals of Allergy, Asthma & Immunology*. 2024; 132 (2): 124 – 176.

Therapies for Management of Food Allergy

Efforts to treat food allergy have been underway for decades, with oral immunotherapy (OIT) representing the most extensively studied approach. While early OIT research was conducted primarily in academic settings using nonstandardized protocols, recent progress has brought the field to an important milestone: in 2020, the FDA approved Palforzia® as the first standardized OIT product for peanut allergy in children. This approval marked a shift from experimental practice to regulated therapy, opening the door for broader integration of OIT—and eventually other immunotherapy strategies—into clinical care.

Oral Immunotherapy

OIT is a food allergy treatment that involves gradually increasing exposure to a known allergen with the goal of raising the amount a person can tolerate before experiencing a reaction. This threshold dose is usually determined through an initial oral food challenge, followed by weeks to months of carefully monitored dose increases. The process of OIT is illustrated in Figure 34.

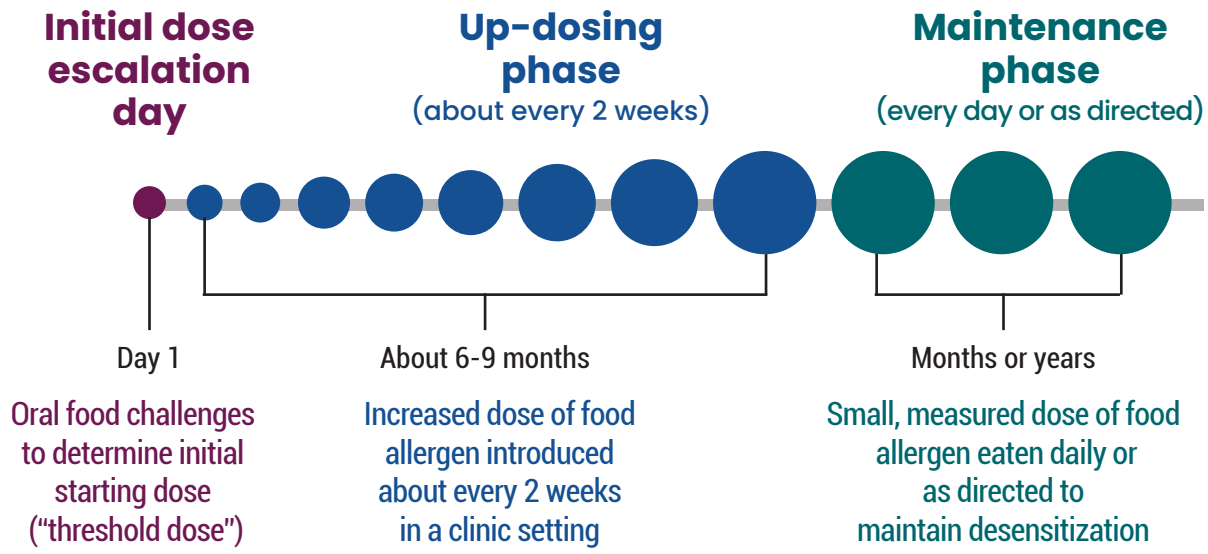


Figure 34. Oral immunotherapy process for patients with food allergy.

While OIT is not generally considered a cure for food allergy, it can significantly reduce the risk of reactions from accidental exposures and, in some cases, allow individuals to incorporate small-to-moderate amounts of the allergen into their regular diet. Patients undergoing OIT must still avoid large quantities of their allergen, read food labels carefully, and carry epinephrine at all times, OIT requires a commitment to up-dosing office visits and lifestyle considerations which include restrictions after at-home dosing that prevent an increase in body temperature (e.g. hot showers, exercise). Research on peanut, egg, and milk OIT shows that 60% to 80% of patients can achieve meaningful desensitization, but ongoing maintenance is essential to preserve this effect.[55-57]

Among common food allergens, peanut is the most studied and the only one with an FDA-approved OIT product (Palforzia, which is approved for children aged 1 to 17 years). However, access to Palforzia remains limited. The U.S. has a shortage of practicing allergists, and the FDA requires that allergists who offer Palforzia participate in a risk management program called "REMS"—a process that not all allergists complete. As shown in Figure 35, allergists authorized to prescribe Palforzia are not evenly distributed across the U.S., and many patients may have to travel hundreds of miles to see a participating allergist.[a]

[a] Palforzia production is being discontinued by the manufacturer as of July 2026.

Palforzia REMS Prescribers

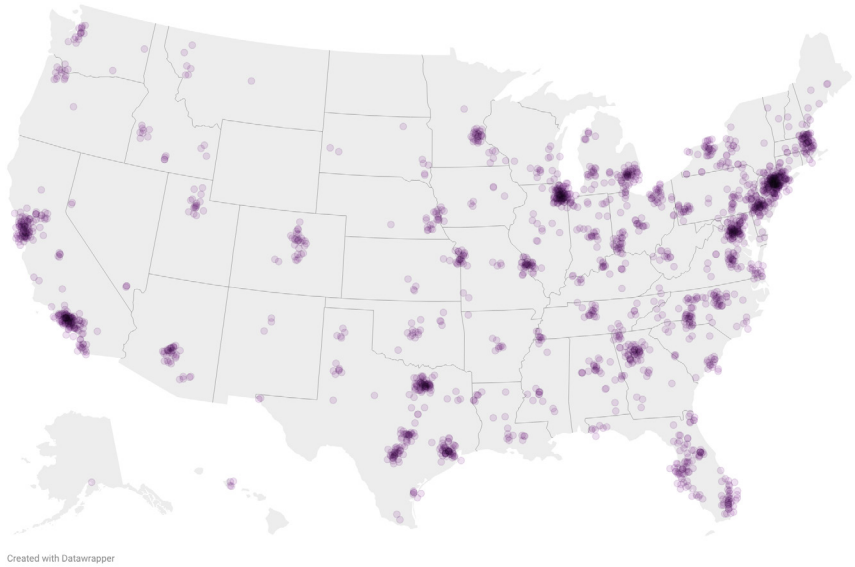


Figure 35. Locations of allergists authorized to prescribe Palforzia® in the United States, as of August 2025.

In light of the above, it is perhaps unsurprising that survey data reveal substantial gaps in awareness and use of OIT among U.S. families managing food allergy. In a 2019 national survey of 781 adult patients and caregivers conducted prior to the FDA approval of any OIT products, 72% of respondents were unfamiliar with OIT.[58] Awareness was notably higher among wealthier and more highly educated participants, indicating potential equity gaps by socioeconomic status. Similarly, in a 2024 study, Black and Hispanic/Latino caregivers were significantly less likely than non-Hispanic White caregivers to be familiar with OIT, with most reporting they had never heard of it—even though by that time, an FDA-approved peanut OIT product had been available for 4 years.[59] These caregivers were also more likely to feel uncertain or uninterested in pursuing OIT for their children. Notably, none of the Black and/or Hispanic/Latino respondents reported that their child had started OIT, compared with a small proportion of non-Hispanic White respondents. These findings underscore the need for more equitable education, outreach, and access to emerging food allergy treatments.

Other Immunotherapy Strategies

Epicutaneous immunotherapy (EPIT) and sublingual immunotherapy (SLIT) are promising, non-ingested approaches to food allergy treatment that aim to safely increase a patient's tolerance to allergens over time. EPIT uses a small patch applied to the skin—typically on the back or upper arm—to deliver microgram amounts of a single food allergen. This method is being evaluated in clinical trials for peanut and cow's milk allergy and has shown particular promise in toddlers with peanut allergy.[60,61] However, EPIT is not yet FDA approved or available outside of clinical trials, as it is classified as both an investigational drug and an experimental medical device.

SLIT involves placing tiny amounts of a liquid allergen extract under the tongue daily, and is FDA-approved as an immunitherapy for some seasonal allergens (e.g., ragweed, dust mites). While not FDA-approved for food allergy, it has been studied in clinical trials and is increasingly offered in clinical practice.[62] SLIT uses much smaller doses than oral immunotherapy (OIT), which may make it more feasible for infants and young children who struggle with ingesting larger amounts. Compared to OIT, SLIT is generally associated with fewer side effects—especially gastrointestinal symptoms—and places fewer restrictions on physical activity around dosing. It can also accommodate multiple allergens at once. Like EPIT, SLIT is not considered curative but can offer "bite-safe" protection by reducing the risk of severe reactions from accidental exposures.

Omalizumab

Omalizumab (i.e., Xolair®) is an injectable medication that targets IgE, the antibody responsible for triggering allergic reactions, which was originally approved for allergic conditions such as asthma and chronic hives. Data from the OUtMATCH (Omalizumab as Monotherapy and as Adjunct Therapy in Children and Adults) study led to omalizumab receiving FDA approval in 2024 for a new indication: preventing severe allergic reactions in adults and pediatric patients aged 1 year and older with food allergy.[63]

Unlike OIT, omalizumab does not require customization for specific food allergens and can be used to treat multiple food allergies simultaneously—a significant benefit for patients with complex allergy profiles. It is administered as a subcutaneous injection using an autoinjector, typically every two weeks. Omalizumab is also sometimes used alongside OIT in high-risk patients to reduce the likelihood of reactions during treatment. Because omalizumab is newly approved for food allergy, real-world data on how omalizumab is being prescribed and integrated into clinical care is still emerging. Ongoing research will be important to better understand its use, especially in ensuring equitable access across diverse patient populations.

Food Allergy Prevention

Research over the past two decades has significantly reshaped our understanding of how and when to introduce common food allergens during infancy to help prevent food allergies (Figure 36). For many years, expert guidelines recommended delaying the introduction of potentially allergenic foods like peanut until at least age 3 years, based on the belief that early exposure during infancy could increase allergy risk. However, as food allergy rates continued to climb and the underlying immune mechanisms became better understood, this theory came under scrutiny. In 2008, the American Academy of Pediatrics (AAP) reversed its stance, stating that delaying allergenic foods beyond 4 to 6 months of age offered no benefit in preventing allergies.[64] This shift was supported by emerging research showing that earlier introduction of certain foods—such as egg and peanut—was associated with a lower risk of developing food allergy.

In 2015, the LEAP study provided strong evidence supporting early introduction of peanut-containing foods in infants at high risk for food allergy, reducing the risk by more than 80% relative to children who did not eat peanut products until age 5 years.[65] Subsequent studies have supported similar findings for egg and other common allergens.[65] Today, leading allergy organizations recommend introducing and continuing to feed foods containing common allergens like peanut and egg starting around 4 to 6 months of age, ideally while the infant is still breastfeeding. Once introduced into the diet, experts recommend keeping these potentially allergenic foods in the diet regularly (as often as two to three times per week) to promote tolerance until age 5 years. This concept has been referred to as "eat early, eat often."

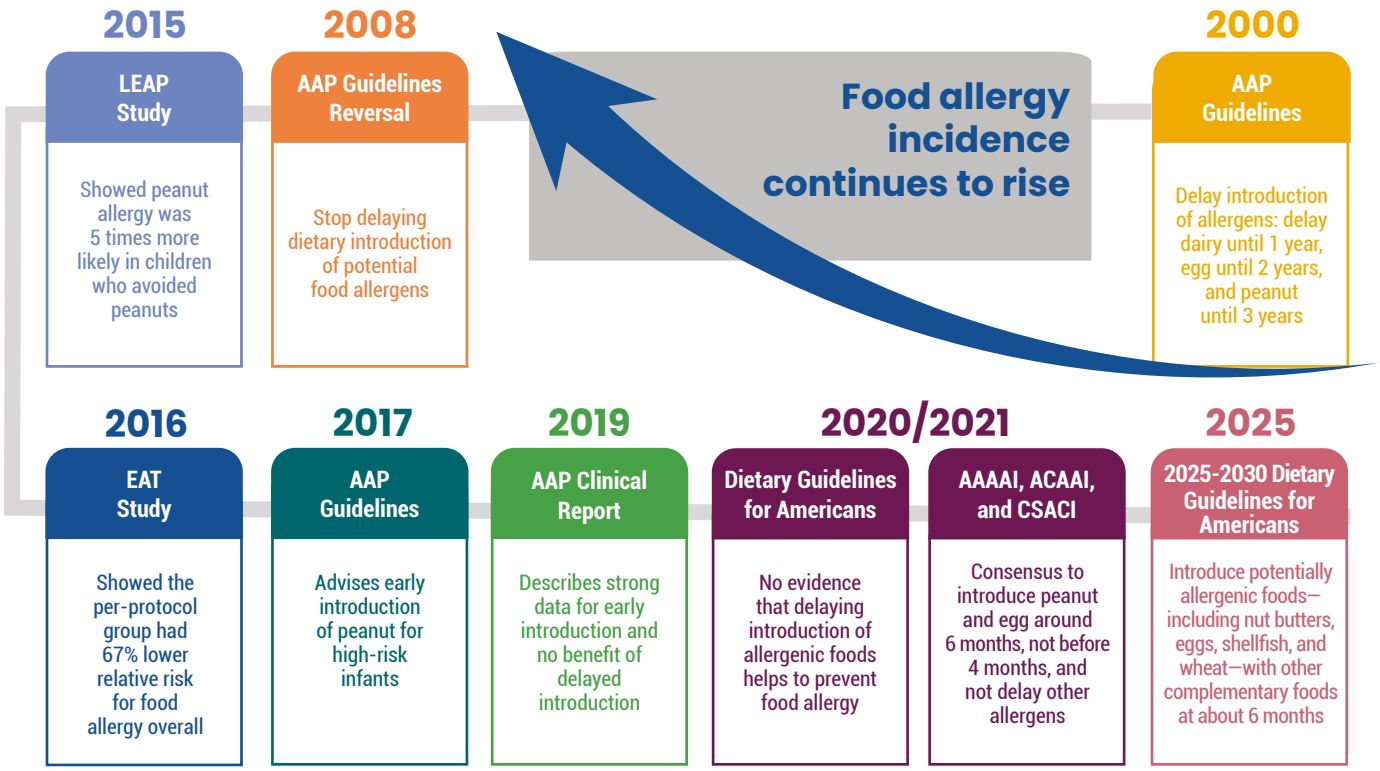


Figure 36. Timeline of "early introduction" guidance and studies for food allergy prevention.

AAAAI, American Academy of Allergy, Asthma & Immunology; AAP, American Academy of Pediatrics; ACAAI, American College of Allergy, Asthma and Immunology; CSACI, Canadian Society of Allergy and Clinical Immunology.

Despite strong evidence supporting the benefit of early introduction for preventing specific food allergies, studies have shown that early introduction recommendations have not been widely adopted by U.S. families. In a nationwide U.S. survey conducted in 2021—four years after the 2017 U.S. peanut allergy prevention guidelines were published—early introduction practices of 3,062 caregivers of children aged 7 to 42 months were evaluated.[67] The survey asked about caregiver awareness of the prevention guidelines, the child's medical history, and infant feeding practices. Results showed that fewer than 1 in 5 infants had eaten peanut-containing foods by 6 months of age, and fewer than 3 in 5 had eaten peanut-containing foods at any point in their first year (Figure 37). These findings suggest that many infants are still not being introduced to allergenic foods during the recommended 4- to 6-month age window—or even by age 12 months—despite national guidance encouraging timely introduction.

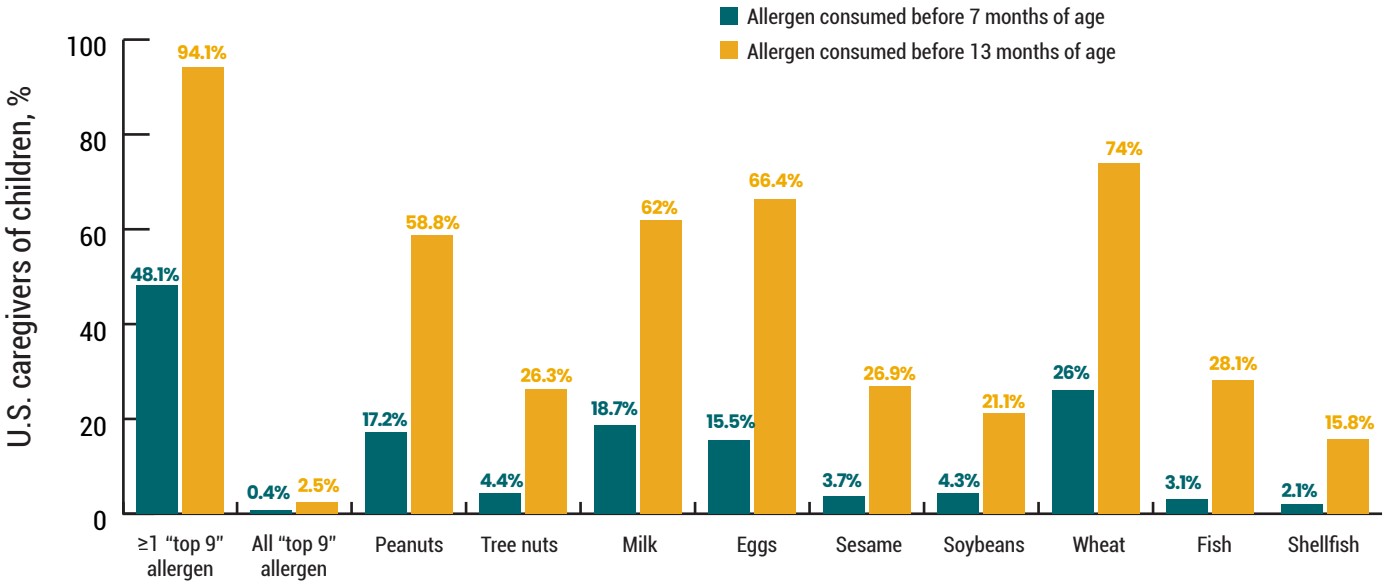


Figure 37. Proportion of U.S. infants with reported consumption of foods containing common food allergens by 6 and 12 months of age in a 2021 survey.[66]

In the same survey, caregivers were asked about the information they received from their child's PCP about early introduction of peanut-containing foods.[68] Only 57.8% of all respondents and 69.5% of respondents whose child had eczema—putting the child at elevated risk for developing food allergy—had received counseling regarding when to start feeding their child peanut-containing foods. Of those caregivers whose PCPs provided recommendations about feeding peanut-containing products, only 1 in 4 were told to start feeding peanut-containing products at 4 to 6 months of age.

This survey also suggested that racial, ethnic, and socioeconomic factors play a role in how and when peanuts are introduced during infancy.[8] Non-Hispanic White caregivers were more likely to introduce peanut-containing foods in the first year of life compared with non-Hispanic Black caregivers, and were also more likely to view early peanut introduction as both safe and effective for preventing allergy (Figure 38). In contrast, Black caregivers were less likely to report receiving timely guidance from their child's health care provider on peanut allergy prevention. These gaps were further influenced by socioeconomic factors, with caregivers from lower-income or lower-educational attainment households showing less confidence in reporting the potential benefits of early introduction and reporting less support from healthcare providers.

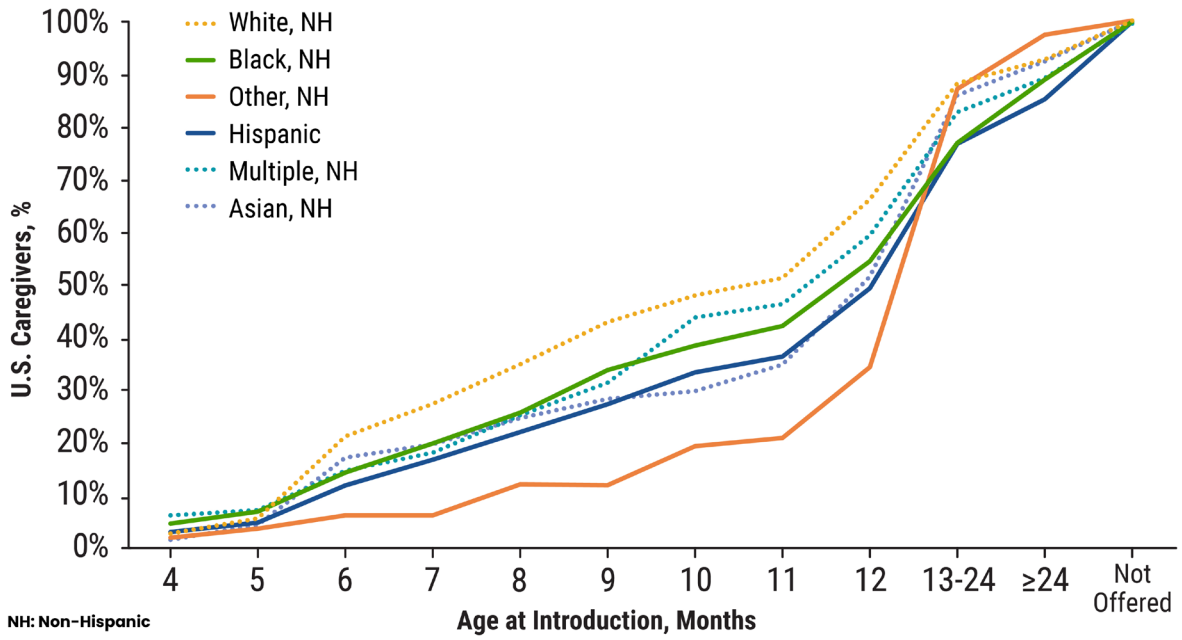


Figure 38. Cumulative proportion of U.S. infants with reported consumption of peanut-containing foods, by race, in a 2021 survey.[8]

Recent real-world evidence further strengthens the case for early allergen introduction. A large analysis published in October 2025 used electronic health record data from a multi-state pediatric cohort of children aged 0 to 3 years to compare the rates of diagnosis of IgE-mediated food allergy in the periods before and after the publication of U.S. early-introduction guidelines.[69] The researchers observed a 43% drop in peanut allergy incidence and a 29% decrease in any IgE-mediated food allergy from the pre- to post-guideline eras (2012-2014 to 2017-2019, respectively). While these data are observational and cannot establish causation, they align with the intent of the landmark guidelines and suggest that the public health shift toward introducing allergenic foods at around 4 to 6 months of age may be yielding measurable benefits.

Alpha-gal Syndrome

Alpha-gal syndrome (AGS) is an under-recognized IgE-mediated food allergy that begins with a tick bite and has emerged as a growing public health concern in the U.S. Unlike most types of food allergy, which are triggered by immune reactions to proteins, alpha-gal syndrome is caused by a reaction to a sugar molecule called *galactose-α-1,3-galactose* (or alpha-gal). The alpha-gal molecule is found in meats from mammals such as beef, pork, lamb, and venison, as well as their derivatives such as milk, cheese, and gelatin. Alpha-gal syndrome is frequently described as a "red meat allergy" but this label does not adequately encompass all of the sources of alpha-gal. In the United States, this condition is most often associated with bites from the lone star tick (*Amblyomma americanum*), although other ticks such as the black-legged tick (*Ixodes scapularis*) may also play a role in its development.[70] The tick's saliva may contain alpha-gal molecules and can prompt the immune system to produce IgE antibodies against alpha-gal (Figure 39)[71,72] After this sensitization, exposure to mammalian ingredients can trigger allergic reactions, which often occur 4 to 6 hours after exposure and range from mild to severe, including anaphylaxis and, in rare cases, fatality.

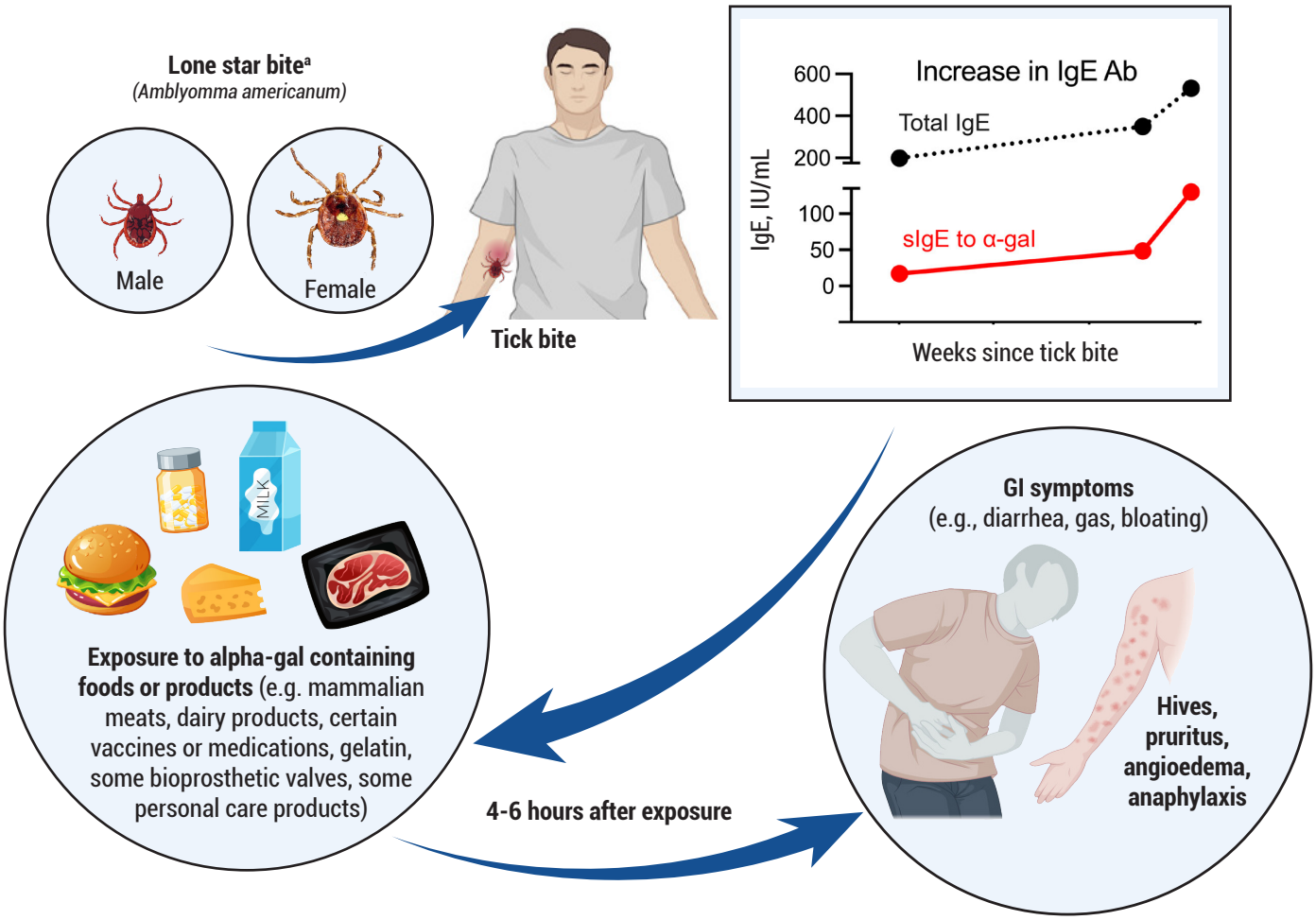


Figure 39. Development of alpha-gal syndrome.[73]

Ab, antibody; IgE, immunoglobulin E; sIgE, specific immunoglobulin E.

[a] Other ticks found in the United States are known to have caused alpha-gal syndrome in regions outside of the United States.
Image adapted from Platts-Mills TAE et al. *Immunol Rev.* 2025;332(1):e70035. (CC BY-NC-ND).

Selected Food Allergy Syndromes

From 2017 to 2022, between 90,018 and 450,000 estimated cases of alpha-gal syndrome were identified in the United States through laboratory testing and clinical suspicion.[74,75] As shown in Figure 40, alpha-gal syndrome has the highest prevalence in areas where the lone star tick is most abundant—particularly the southeastern, mid-Atlantic, and south-central United States. The prevalence and distribution of cases is likely to change in the future as a result of:

- Increased recognition of and testing for alpha-gal syndrome in symptomatic patients
- Improved understanding of the contribution of other tick species to the development of alpha-gal syndrome
- Northward and westward spread of tick species across the United States due to warmer temperatures, shifts in land use, and movement of host animals such as white-tailed deer[76,77]

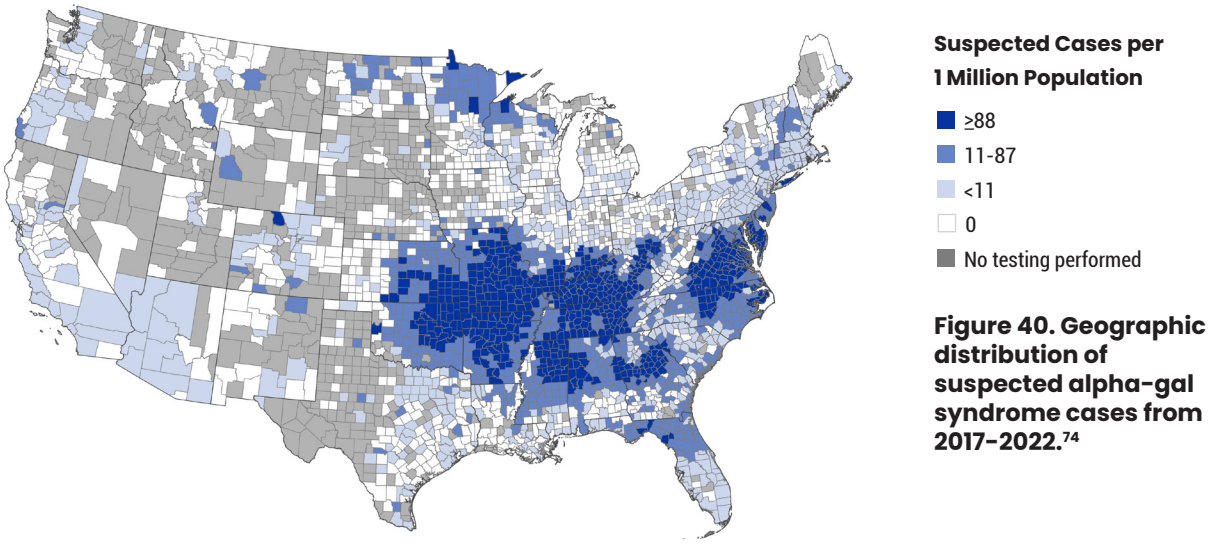


Figure 40. Geographic distribution of suspected alpha-gal syndrome cases from 2017–2022.[74]

To monitor case trends, multiple states (AR, DE, IA, KY, ND, NE, OR, SC, TN, VA, WV) along with Manhattan, a borough of New York City, now mandate alpha-gal syndrome case reporting to state health departments. New Jersey, Minnesota, Rhode Island, and Wisconsin allow voluntary reporting and surveillance of alpha-gal syndrome.

Unlike many food allergies that begin in childhood, alpha-gal syndrome often develops in adulthood.[78,79] The reasons for this pattern are not yet fully understood. Adults may experience more cumulative exposure to ticks due to factors such as increased time spent in areas with higher risk of tick bites and specific, repetitive activity patterns; however, AGS can occur at any age. Individuals who spend significant time outdoors (such as hunters, hikers, park rangers, farmers, military personnel, and forestry workers) or live or travel in areas with the lone star tick may be at greater risk of tick bites and may face an elevated risk of developing alpha-gal syndrome.

In addition to food reactions, individuals with alpha-gal syndrome may also react to non-food sources of alpha-gal, including certain intravenous (IV) medications like cetuximab and some drugs or vaccines with mammalian ingredients (e.g., gelatin, glycerin).

Eosinophilic Esophagitis

Eosinophilic esophagitis (EoE) is a chronic non-IgE–mediated food allergy characterized by abnormally high levels of specific types of white blood cells called *eosinophils* within the esophagus, which then leads to inflammation and esophageal dysfunction. It was first described three decades ago and has risen rapidly in prevalence to the point that it is now a leading cause of upper gastrointestinal (GI) dysfunction. In a 2015-2016 cross-sectional nationwide survey, EoE was estimated to affect 0.16% of children and 0.18% of adults in the U.S. population.[80] Overall, this corresponds to an estimated 0.17% of people in the U.S.—approximately 549,000 people—having been diagnosed with EoE at some point in their lives.

More recently, trends in EoE prevalence were estimated using two large U.S. administrative databases—Merative MarketScan (for individuals younger than 65 years) and Medicare (for adults 65 years and older).[81] Based on these data, the prevalence of EoE was estimated at approximately 1 in 617 people younger than 65 years in 2022 and 1 in 1562 people older than 65 years in 2017 (Figure 41). Combined, these figures correspond to an estimated nationwide prevalence of about 1 in 700 people—a nearly five-fold increase since 2009.

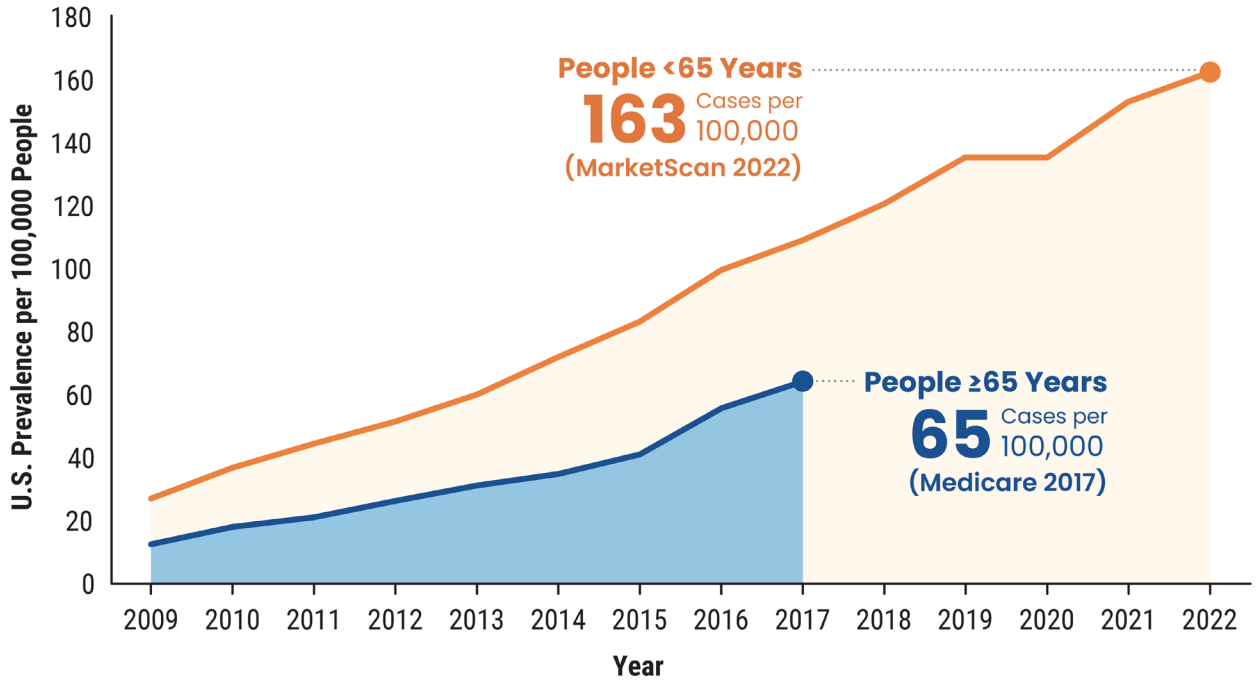


Figure 41. Rising prevalence of eosinophilic esophagitis in two nationwide administrative databases from 2009 to 2017 (Medicare; people 65 years and older) or 2022 (MarketScan; people younger than 65 years).[81]

In addition to rising prevalence, EoE imposes a significant financial burden. Total EoE-related health care costs in the U.S. were estimated at $1.32 billion in 2024, reflecting both the increasing number of affected individuals and the complexity of managing this condition.[81]

Data suggest that EoE may be a later phase of the atopic march, putting patients with IgE-mediated food allergy at elevated risk for developing EoE.[82]

Food Protein–Induced Enterocolitis Syndrome

Food protein–induced enterocolitis syndrome (FPIES) is a non-IgE–mediated food allergy characterized by delayed GI symptoms (typically profuse vomiting) without the skin or respiratory symptoms seen in classic IgE-mediated food allergy reactions. The first diagnostic code for FPIES was not introduced until October 1, 2016, highlighting how recently this condition has been formally recognized in health care systems.
Acute FPIES is the most common form of the disease and typically presents in infancy with repetitive vomiting one to four hours after ingesting a trigger food—most often cow's milk, soy, or grains—without prior warning signs. A formal diagnosis requires at least one episode of repetitive, severe vomiting (sometimes called "projectile" vomiting) in this time window along with three or more of the following:[83]

- Recurrence of repetitive vomiting 1 to 4 hours after eating the same food
- Episode of repetitive vomiting 1 to 4 hours after eating a different food
- Extreme lethargy during a reaction
- Need for an emergency department visit during a reaction
- Need for IV support during a reaction
- Diarrhea within 24 hours of a reaction
- Low blood pressure (also called *hypotension*) during a reaction
- Low body temperature (also called *hypothermia)* during a reaction

In older children and adults, GI symptoms commonly include severe abdominal pain, cramping, and diarrhea, and vomiting may or may not be present. This makes diagnosing FPIES in older children and adults more challenging. In general, FPIES diagnosis in these individuals is based on identifying a pattern of GI symptoms within one to four hours after ingesting a specific food while also ruling out other potential conditions.

Chronic FPIES is less common than acute FPIES and develops after ongoing exposure to the trigger food, leading to intermittent vomiting, watery diarrhea, poor weight gain, and even failure to thrive. Removal of the trigger food typically resolves symptoms, but reintroduction can provoke acute reactions. Atypical FPIES occurs when patients show IgE sensitization to their trigger foods—typically identified via skin prick or blood testing—and is more common in children with other atopic conditions like eczema or wheezing.

The first estimate of FPIES prevalence in the United States was published in 2019 and was based on the results of a 2015-2016 cross-sectional survey.[84] FPIES is estimated to affect about 0.5% of children and 0.2% of adults in the United States, or roughly 900,000 individuals. Higher rates of FPIES were reported in Asian and non-Hispanic individuals relative to people of other races and ethnicities. These figures underscore the need for more comprehensive epidemiologic research to fully understand the scope, burden, and healthcare needs of this often underrecognized condition.

Pollen-Food Allergy Syndrome

Pollen-food allergy syndrome (PFAS), which is a subtype of *oral allergy syndrome* (OAS), is a form of IgE-mediated food allergy that typically affects older children, adolescents, and adults who have an existing allergy to pollen.[85] PFAS arises when the immune system—already primed to react to specific pollens—mistakenly identifies structurally similar proteins in certain raw fruits, vegetables, and nuts as harmful. This cross-reactivity results in allergic reactions that are often limited to the mouth and throat, with symptoms such as itching, tingling, or mild swelling of the lips, tongue, and throat immediately after eating the allergenic food.[86]

OAS describes symptoms that are localized to the oral mucosa. PFAS more broadly includes symptoms that go beyond the oral mucosa.[85] In most cases of PFAS, symptoms are mild and resolve quickly without treatment. As a result, PFAS is generally not associated with a high risk of anaphylaxis, and management does not usually require prescription of epinephrine unless recommended by your physician. Instead, avoidance of raw trigger foods and patient education are the mainstays of care. However, exceptions exist—systemic reactions, including anaphylaxis, have been reported in rare cases, particularly in individuals with high levels of sensitization or those consuming large quantities of the offending food.

Despite its clinical relevance, the epidemiology of PFAS in the general U.S. population remains poorly characterized. Its prevalence is thought to be substantial among individuals with seasonal allergies. The most common PFAS food triggers vary by pollen sensitization pattern but often include apples, peaches, melons, carrots, celery, and hazelnuts. Due to its high prevalence among those with seasonal allergies and the potential for misdiagnosis or under-recognition, PFAS represents an important but understudied aspect of food allergy care. Further population-based studies are needed to better understand its distribution, burden, and risk factors in the U.S. context.

Looking Ahead

This report underscores the severity, chronic nature, and broad impact of food allergy. The need for coordinated efforts across research, advocacy, clinical practice, and policy to address these challenges is critical. Recent and emerging developments in diagnosis, treatment, and management offer a promising future for improved patient care. Nevertheless, substantial work remains.

With coordinated action, the vision of a world without food allergy is possible. Until then, education and awareness can improve the safety and quality of life for those living with food allergy.

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Notes

Notes

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