



## Are children and adolescents with food allergies at increased risk for psychopathology?



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### ABSTRACT

**Objective:** Living with food allergy is a unique and potentially life-threatening stressor that requires constant vigilance to food-related stimuli, but little is known about whether adolescents with food allergies are at increased risk for psychopathology—concurrently and over time.

**Methods:** Data came from the prospective-longitudinal Great Smoky Mountains Study. Adolescents ( $N = 1420$ ) were recruited from the community, and interviewed up to six times between ages 10 and 16 for the purpose of the present analyses. At each assessment, adolescents and one parent were interviewed using the Child and Adolescent Psychiatric Assessment, resulting in  $N = 5165$  pairs of interviews.

**Results:** Cross-sectionally, food allergies were associated with more symptoms of separation and generalized anxiety, disorder, attention deficit and hyperactivity disorder, and anorexia nervosa. Longitudinally, adolescents with food allergy experienced increases in symptoms of generalized anxiety disorder and depression from one assessment to the next. Food allergies were not, however, associated with a higher likelihood of meeting diagnostic criteria for a psychiatric disorder.

**Conclusion:** The unique constellation of adolescents' increased symptoms of psychopathology in the context of food allergy likely reflects an adaptive increase in vigilance rather than cohesive syndromes of psychopathology. Support and guidance from health care providers is needed to help adolescents with food allergies and their caregivers achieve an optimal balance between necessary vigilance and hypervigilance and unnecessary restriction.

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### Introduction

Food allergies are increasingly prevalent and pose a significant public health burden [1,2]. Prevalence estimates range from 2 to 8% [3], and vary within that range depending on the food allergen(s) assessed, the methodology used, and the region and historical period studied [4,5]. A recent National Health and Nutrition Examination Survey (NHANES) study, using specific serum IgE levels as an indicator, estimated the prevalence of clinical food allergies to four common allergens (peanut, milk, egg, shrimp) at about 2.5% in the US population, with higher rates in 1–5 year-olds (4.2%) and 6–19 year-olds (3.8%) than among older age groups [6].

Living with food allergies constitutes a unique stressor: Daily meals and snacks can trigger a rapidly-progressing, life-threatening allergic reaction. This stressor is both chronic and acute: For years, youth face the daily threat of accidental allergen ingestion compounded by acute stress during allergy-related health crises [7]. Strict allergen avoidance

is the best known strategy to manage food allergies [8]. Consequently, successful management requires careful attention to external food-related cues, such as being offered food, and internal, somatic cues associated with food-induced allergic reactions, including skin, gastrointestinal, respiratory, and cardiovascular symptoms. Despite the significant number of US families affected by stressors experienced in the course of this chronic illness, and the constant vigilance to food-related stimuli that is required, relatively little research has focused on the psychological sequelae of living with food allergies. Indeed, a recent meta-analysis of 340 studies that tested associations between chronic physical illness and depressive symptoms in children and adolescents did not include data on food allergies [9].

One extant line of research has examined how quality of life is impacted by food allergies, with a recent review [7] indicating that youth with food allergies reported lower health-related quality of life, more physical symptoms, and higher scores on select anxiety inventories [10–13]. Specific fears reported included separation anxiety, fear of adverse events, and anxiety about eating [14,15]. The majority of this work, however, was based on relatively small samples that were recruited in specialty clinics and hospitals, thus limiting the generalizability of the findings. To our knowledge, only one study has examined linkages between food allergies and a range of psychiatric diagnoses in a

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larger-scale community-based study [16]. Using the Canadian Community Health Study with participants aged 15 and older, it found that self-reported food allergies were associated with an increased 12-month prevalence of several mood and anxiety disorders (major depression, panic disorder/agoraphobia, bipolar disorder). This study was cross-sectional, however, and, while informative, did not address the longitudinal impact of food allergy on psychopathology.

The present study examined cross-sectional and longitudinal associations between food allergy and psychopathology symptoms and diagnoses and extended extant research in several ways. First, we used a community-based epidemiological sample of adolescents. Adolescents in this study were recruited from the community; thus generalizability of findings will not be limited to care-seeking clinic-based samples. Second, we expanded the range of psychiatric symptoms and diagnoses examined to include disruptive and eating disorders. The extension to eating disorders is important considering the constant food-related vigilance required in the context of food allergies. The extension to disruptive disorders is important, because this group of disorders tends to be comorbid with internalizing disorders [17], and also often precedes later internalizing disorders [18]. Third, in order to better understand whether—given the unique stressor that they encounter—adolescents with food allergies present a specific pattern of psychopathology symptoms, we conducted a symptom-by-symptom analysis. Fourth, we tested whether associations between food allergies and psychopathology differed by sex. Sex differences have been suggested by other work on atopy/allergy, but are only rarely tested in work on food allergy [19]. Finally, in order to rule out alternative explanations, we adjusted for the presence of other atopic conditions and medication use when testing associations between food allergies and psychopathology. We focused on ages 10 to 16, an age-range at which responsibility for the management of food allergies is increasingly transferred from caregivers to their children, and toward the end of which risk for serious anaphylactic reactions peaks [20].

## Methods

### Sample and procedures

The Great Smoky Mountains Study (GSMS) is a longitudinal study of the development of psychiatric disorder in rural youth and urban youth. The accelerated cohort, two-phase sampling design and measures are described in detail elsewhere [21,22]. Briefly, a representative sample of three cohorts of children, aged 9, 11, and 13 years at intake was recruited from 11 counties in western North Carolina. Potential participants were selected from the population of about 12,000 eligible children using a household equal probability, accelerated cohort design. All children scoring above a predetermined cutpoint (the top 25% of the total scores) on a behavioral problems screening questionnaire [23], plus a 1 in 10 random sample of the rest (i.e., the remaining 75%) were recruited for detailed interviews. Importantly, in all statistical analyses, participants were assigned a weight inversely proportional to their probability of selection into the sample. Thus, results are representative of the population from which the sample was drawn, and results are not biased from the oversampling procedure. Of all children recruited, 80% ( $N = 1420$ ) agreed to participate.

About 8% of the area residents and the sample are African American; less than 1% are Hispanic. American Indians constituted only about 3% of the population of the study area, but, because they are an understudied group, they were oversampled to constitute 25% of the study sample. This oversampling strategy has provided a sufficient sample of American Indian children for computing epidemiological estimates and testing risk pathways for this understudied group using the GSMS. However, race/ethnic differences were not a primary focus of the present paper. Therefore, and, as explained above, oversampling of the American Indian group was adjusted for in the analyses by using sampling weights in the current analyses. Thus, the results reported

here are not biased from the oversampling procedure. Participants were assessed annually to age 16. Across waves/assessments, participation rates ranged between 74 and 94%. The parent (typically the mother) and child were interviewed separately by trained interviewers. Before the interviews began, parent and child signed informed consent forms approved by the Duke University Medical Center Institutional Review Board. Each parent and child received a small honorarium for their participation.

### Measures

#### Food allergies

Food allergies were assessed from parents beginning at Wave/Assessment 2, using a physical health problems survey adapted from the CDC National Health Interview Survey (NHIS) Child Supplement (1988). The questions asked were: “Has s/he ever had any kind of food or digestive allergy? Has s/he had it in the last 12 months?” The parent reported in a binary “yes/no” format whether the child had “any kind of food or digestive allergy” in the past year. In the present analyses, a binary variable coded whether food or digestive allergies were present in the past year.

#### Psychiatric symptoms and disorders

Psychiatric symptoms and disorders were measured at the same assessment as food allergies, using the Child and Adolescent Psychiatric Assessment (CAPA), a structured interview [24]. Two-week test-retest reliability of diagnoses assessed with the CAPA is comparable to that of other highly-structured child psychiatric interviews [25]; construct validity is good to excellent [24]. The time frame for ascertaining the presence of most symptoms was the past three months to minimize forgetting and recall biases. A symptom was counted as present if reported by either parent or child, as is standard clinical practice (with the exception of Attention Deficit Hyperactivity Disorder (ADHD), for which only the more reliable parent report was used).

Symptoms for any given diagnosis were aggregated into two variables. First, we summed symptoms for each diagnosis, creating continuous scales of symptoms (e.g., a scale with a possible range of 0–8 for separation anxiety symptoms). Second, we created dichotomous diagnostic variables. Scoring programs written in SAS combined information about the date of onset, duration, and intensity of each symptom to create diagnoses according to the fourth edition of the Diagnostic and Statistical Manual of the American Psychiatric Association [26]. We also computed one non-overlapping total symptoms score summing all psychopathology symptoms, and one binary variable indicating whether criteria for any DSM-IV disorder had been met. We focused on relatively common anxiety disorders of childhood (generalized anxiety, separation anxiety), depressive disorders (major depression, dysthymia, depressive disorder not otherwise specified), conduct disorder, oppositional defiant disorder, ADHD, and anorexia and bulimia nervosa. All symptoms assessed can be viewed at: <http://devepi.duhs.duke.edu/codebooks.html> (with the exception of anorexia and bulimia nervosa). Symptoms for anorexia and bulimia nervosa were assessed in a manner consistent with DSM-IV criteria and included underweight status for age and height; cognitive symptoms such as fear of gaining weight and body image disturbance, including unrealistic feelings of fatness; amenorrhea in post-menarcheal females; eating binges; and unhealthy weight control behaviors that had the specific intent to reduce body weight.

#### Alternative explanatory variables

Alternative explanatory variables included the presence of other atopic diseases (asthma, respiratory allergies, hayfever, eczema), which was also assessed using the adapted CDC NHIS Form (1988). A summary variable counted how many additional atopic conditions were reported for each adolescent. Medication use during the prior year was assessed with the Child and Adolescent Services Assessment [27]. A binary

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