



Published in final edited form as:

Ann Allergy Asthma Immunol. 2014 June ; 112(6): 554–556.e1. doi:10.1016/j.anai.2014.03.020.

Prevalence of Food Allergy in New York City (NYC) School Children

Sarah A. Taylor-Black, MD¹, Harshna Mehta, MD², Elisabete Weiderpass, MD, M.Sc., Ph.D.³, Paolo Boffetta, MD, MPH⁴, Scott H. Sicherer, MD², and Julie Wang, MD²

¹The Geisel School of Medicine at Dartmouth, Keene, NH, USA ²Jaffe Food Allergy Institute, Icahn School of Medicine at Mount Sinai, New York, NY, USA ³Department of Medical Epidemiology and Biostatistics, Karolinska Institutet, Stockholm, Sweden; Cancer Registry of Norway, Oslo, Norway; Department of Community Medicine, School of Health Sciences, University of Tromsø, Tromsø, Norway; Karolinska Institutet, Stockholm, Sweden, and Samfundet Folkhälsan, Helsinki, Finland ⁴Institute for Translational Epidemiology and Tisch Cancer Institute, Icahn School of Medicine at Mount Sinai, New York, NY, USA; International Prevention Research Institute, Lyon, France

Food allergy affects up to 8% of children in the United States (1), and several studies have noted racial disparities in prevalence (1,2,3). An important limitation of several studies is the reliance on serologic assessments of food allergy, since detectable food-specific IgE levels only indicate sensitization and are not diagnostic of clinical disease (4,5). However, a recent study examining medical records of children followed at an urban hospital in New York demonstrated that rates of physician-documented food allergy in Black children were not higher than national estimates (6).

Furthermore, data also show that food allergy prevalence increases with higher income levels, suggesting socioeconomic disparities (1,7). Therefore, the aim of this study was to determine the prevalence of food allergy in school age children of contrasting racial/ethnic and socioeconomic backgrounds in New York City.

A cross-sectional study was performed with 2 private schools and 2 public charter schools that differed in racial/ethnic composition and socioeconomic status. All parents/legal guardians of elementary school students (kindergarten through 5th grade) were invited to participate. The study was approved by the Institutional Review Board at the Icahn School of Medicine at Mount Sinai and the administrations of participating schools.

© 2014 American College of Allergy, Asthma and Immunology. Published by Elsevier Inc. All rights reserved.

Corresponding author: Julie Wang, MD, One Gustave L. Levy Place, Box 1198, New York, NY 10029, Phone:212-241-7201, Fax: 212-426-1902, Julie.wang@mssm.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

A bilingual English and Spanish food allergy questionnaire was developed based on prior surveys (8). Food allergy was assessed by parental report of food allergy (“Do you believe your child currently has a food allergy?”) and physician diagnosis of food allergy (“Has a doctor ever told you that your child has a food allergy?”). Additional questions assessed demographics and exposure/reaction histories for all food allergens.

After preliminary validation with families of children seen for routine office visits, questionnaires were distributed to the schools during the 2012 spring semester. Parents/legal guardians were instructed to return the completed questionnaires in the addressed, stamped envelopes provided. A nominal gift card was offered for participation.

Statistical analysis was performed with GraphPad (GraphPad Software, La Jolla, California and VassarStats (<http://vassarstats.net/>). Comparison of categorical data was performed with Fisher’s exact test with a 2-tailed p-value, and comparison of continuous data was performed with a Mann-Whitney U test. Multivariate logistic regression analysis adjusting for sex, race, ethnicity and income was performed using STATA 11 (StataCorp, College Station, TX, 2009).

The questionnaire was distributed to 932 students. Private school children represented a population where 82% of families paid a full tuition of over \$35,000 per year. Public charter school children represented a population where 93% of children qualified for free or reduced price school lunch. The overall response rate was 43%, with a significantly higher response rate from private school families ($p < 0.0001$) (Table 1).

Survey data showed that private school children were older and had higher household incomes than public charter school children (Table 1), reflecting a wider range of grades in the private schools and higher age of cutoff for kindergarten entry. Private school students were predominantly White, whereas public charter schools students were primarily Black and Hispanic.

The prevalence of physician-diagnosed food allergy was 17.5% among the private school respondents and 7.4% among public charter school respondents ($p=0.006$) (Table 1). Significantly more children in the private schools reported having tree nut allergies; no significant differences were noted for other foods. Severe food allergic reactions (defined as throat tightness, cough, wheeze, trouble breathing, drop in blood pressure or passing out) were reported for 22 children total, or 38.6% of children with physician-diagnosed food allergy, with no differences seen based on type of school. There was a trend for more private school children who had a history of severe reactions having a physician diagnosis of food allergy (86.7% vs 42.9%, $p=0.05$) as compared to public charter school children.

After adjusting for sex, race, ethnicity and income, a significant difference in parental belief of current food allergies was observed in private school responders as compared to public charter school responders (OR 10.5, 95% CI 1.78–61.6), but not for physician-diagnosis of food allergy (OR 3.00, 0.65–13.6; Online repository). Multivariate analyses also indicated lower odds of asthma in private school children (0.09, 95% CI 0.01–0.71). No differences were seen for eczema and hay fever (Online repository).

These results show a high overall prevalence of parental belief of current food allergy and physician diagnosis of food allergy in this population. A higher rate of parental belief of food allergy was observed for children in private schools even after adjusting for race, ethnicity and income, suggesting that other factors, such as parental education or awareness, may be contributing to higher rates of reported food allergy in this population. Disparities in food allergy prevalence based on race and ethnicity have previously been reported in larger cohorts (1, 2). Similarly, data has also indicated that socioeconomic disparities are associated with food allergy prevalence, and access to care has been noted to be a factor for some as more children have parental report of food allergies than physician-diagnosis of food allergy (1, 7, 9).

In contrast to other studies suggesting that food allergy is more prevalent in the Black population, we did not find higher rates of food allergy in the majority Black public charter school population. **Nearly half of the children in public charter schools with a history of severe reaction lacked a physician diagnosis of food allergy, which suggests a possible disparity in access to care.**

Limitations of this study include a small sample size, differing response rates by type of school, and responder bias. The overall response rate from the private schools was comparable to that reported in another school prevalence study and other survey studies (10), but the response rates for the public charter schools were notably lower. This may lead to overestimation of food allergy prevalence as those with food allergies may be more likely to participate.

Despite these limitations, the study has unique advantages compared to prior studies. The questionnaires were distributed in schools, maximizing the ability of families with limited resources (i.e. access to telephone or internet) to participate. It was in Spanish and English, thus those literate in Spanish alone could participate. Finally, this questionnaire included a wide variety of food allergens and inquired about physician diagnosis of food allergies in addition to parental reported allergies.

In conclusion, a higher rate of food allergy is reported in the private school population as compared to the public charter school population. This disparity may reflect differing awareness of food allergy and/or access to healthcare, racial/ethnic or socioeconomic influences on childhood feeding practices, or true differences in prevalence. Further investigation is warranted to confirm whether true differences exist among varying racial/ethnic and/or socioeconomic backgrounds and to identify reasons for such disparities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Sarah Taylor-Black and Julie Wang had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of that data analysis.

The authors acknowledge support from the Leff family (funding supported compensation to participants who completed the survey).

Julie Wang is funded in part by a grant from the National Institutes of Health/National Institute of Allergy and Infectious Diseases; K23 AI083883.

The project was also supported by Grant Number UL1 TR-000067 from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH). Funding went towards cost of materials and mailing for the survey. The paper's contents are solely the responsibility of the authors and do not necessarily represent the official view of NCRR or NIH.

We thank the study participants and the school administrators and teachers who took part in the study.

References

1. Gupta RS, Springston EE, Warriar MR, Smith B, Kumar R, Pongracic J, Holl JL. The prevalence, severity, and distribution of childhood food allergy in the United States. *Pediatrics*. 2011 Jul; 128(1):e9–17. [PubMed: 21690110]
2. Liu A, Sicherer SH, Wood RA, et al. In the United States, black male children have an increased risk of food allergy: Results from NHANES 2005–2006. *J Allergy Clin Immunol*. 2009; 123:S267.
3. Kumar R, Tsai HJ, Hong X, et al. Race, ancestry, and development of food allergen sensitization in early childhood. *Pediatrics*. 2011; 128:e821–e829. [PubMed: 21890831]
4. Keet CA, Wood RA, Matsui EC. Limitations of reliance on specific IgE for epidemiologic surveillance of food allergy. *J Allergy Clin Immunol*. 2012 Nov; 130(5):1207–1209.e10. [PubMed: 22964106]
5. Du Toit G, Roberts G, Sayre P, et al. Identifying infants at high risk of peanut allergy: The Learning Early About Peanut Allergy (LEAP) screening study. *J Allergy Clin Immunol*. 2012; 131(1):135–143. [PubMed: 23174658]
6. Taylor-Black S, Wang J. The prevalence and characteristics of food allergy in urban minority children. *Ann Allergy Asthma Immunol*. 2012; 109:431–437. [PubMed: 23176883]
7. Kotz D, Simpson CR, Sheikh A. Incidence, prevalence, and trends of primary clinician-recorded diagnosis of peanut allergy in England, 2001–5. *J Allergy Clin Immunol*. 2011; 127 (3):623–630. [PubMed: 21236479]
8. Sicherer SH, Munoz-Furlong A, Godbold JH, Sampson HA. US prevalence of self-reported peanut, tree nut, and sesame allergy: 11-year follow-up. *J Allergy Clin Immunol*. 2010; 125(6):1322–1326. [PubMed: 20462634]
9. Gupta RS, Springston EE, Smith B, Pongracic J, Holl JL, Warriar MR. Parent report of physician diagnosis in pediatric food allergy. *J Allergy Clin Immunol*. 2013 Jan; 131(1):150–6. [PubMed: 22947345]
10. Kagan RS, Joseph L, Dufresne C, Gray-Donald K, Turnbull E, Pierre YS, Clarke AE. Prevalence of peanut allergy in primary-school children in Montreal, Canada. *J Allergy Clin Immunol*. 2003 Dec; 112(6):1223–8. [PubMed: 14657887]

Table 1

Results of questionnaire by school type

	Private Schools (total 495 students)	Public Charter Schools (total 437 students)	p-value
Response rate, n (%)	263 (60%)	135 (27%)	<0.0001
Age, median (range)	8 yrs (4–12 yrs)	6 yrs (6–10 yrs)	<0.001
Female, n (%)	126 (48%)	65 (48%)	0.8
Race, n (%)			
White	196 (74.5%)	8 (5.9%)	<0.0001
Black	12 (4.6%)	67 (49.6%)	<0.0001
Asian	19 (7.2%)	0 (0%)	0.0006
Hispanic	18 (6.8%)	74 (54.8%)	0.0001
Median income	>\$150,000/yr	\$25–49,000/yr	<0.0001
Has a doctor ever told you that your child has a food allergy?			
Yes	46 (17.5%)	11 (7.4%)	0.006
Unsure	5 (1.9%)	5 (4.4%)	0.19
Do you believe your child currently has a food allergy?			
Yes	36 (13.7%)	11 (8.1%)	0.14
Unsure	26 (9.9%)	17 (12.6%)	0.40
Parental report of food allergy by food:			
Egg	3 (1.1%)	2 (1.5%)	1
Milk	3 (1.1%)	1 (0.7%)	1
Peanut	15 (5.7%)	5 (3.7%)	0.5
Tree nuts	16 (6.1%)	1 (0.7%)	0.02
Wheat	3 (1.1%)	1 (0.7%)	0.6
Soy allergy	1 (0.4%)	1 (0.7%)	1
Beans	0	0	1
Fish	0	2 (1.5%)	1
Shellfish	2 (0.8%)	2 (1.5%)	0.6
Fruit	14 (5.3%)	5 (3.7%)	0.6
Vegetables	3 (1.1%)	2 (1.5%)	1
Seeds	1 (0.4%)	1 (0.7%)	1

	Private Schools (total 495 students)	Public Charter Schools (total 437 students)	p-value
Meats	0	0	1
Multiple food allergies	11 (4.0%)	5 (3.7%)	1
History of severe food allergic reaction	15 (5.7%)	7 (5.2%)	1