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

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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.

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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.

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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 |