



Parental timing of allergenic food introduction in urban and suburban populations

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ABSTRACT

Background: Recommendations on timing for introduction of allergenic foods in an infant diet have changed twice during the past decade. How families with different demographic characteristics implement the change has not been studied in the United States.

Objective: To compare the age of introduction of allergenic foods between an urban Medicaid-based population and a suburban private insurance–based population in Cincinnati, Ohio.

Methods: Two hundred parent surveys were distributed at well-child checkups between 4 and 36 months of age. Data were analyzed using distribution mapping to determine the difference in the age of introduction of infant formula, infant solids, whole cow's milk, eggs, peanut, and fish. Random forest analysis was used to determine the most important factors affecting the age of introduction for both populations.

Results: There was no statistically significant difference in the age of infant solid introduction, but urban populations introduced allergenic foods earlier than suburban populations, with a statistically significant difference in the age of introduction of infant formula, whole cow's milk, eggs, peanut, and fish. The most important factor for the timing of all food introductions was the recommended age of introduction from health care professionals.

Conclusions: There is a difference between urban and suburban populations in the timing of introduction of allergenic foods but not in other infant solid foods. The reliance on physician recommendation for both populations supports the need for education and guidance to health care professionals on up-to-date guidance and recommendations.

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Introduction

The introduction of solid foods to an infant is an important pediatric milestone. Although there are recommendations for the introduction of an infant's first solid food, there are no concrete recommendations for the introduction of allergenic foods, namely, egg, cow's milk, peanut, and fish. In 2000, citing concerns about the increasing rate of food allergies in the United States, the American Academy of Pediatrics (AAP) recommended that the introduction of allergenic foods be delayed as follows: introduction of cow's milk until 1 year of age, eggs until 2 years of age, and peanuts and fish until 3 years of age.¹ In 2008, the AAP altered its recommendations

stating that solids should be introduced at 4 to 6 months of age but provided no specific schedule for introduction of common allergenic foods, citing a paucity of data to suggest that delayed introduction reduced the rates of food allergy.² In 2010, the National Institute of Allergy and Infectious Diseases–sponsored Expert Panel report agreed with these findings and recommended the introduction of solid foods between 4 and 6 months of age and the introduction of allergenic foods at any time afterward.³ At that time, health care professionals and the US population did not have clear direction on the timing of allergenic food introduction. Although subsequent recommendations have been published since then, the issue of how the families responded to the 2010 recommendations was not studied.^{4–6}

McKean et al⁷ reported on the timing of introduction of solid foods and allergenic foods in a population of infants with a family history of atopy, who were thus at higher risk for atopic disease.

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However, there are no available reported data regarding the timing of introduction of allergenic foods in a general pediatric population. In addition, prior studies have found socioeconomic differences in food introduction. Although these studies discuss the socioeconomic implications, such as enrollment in the government Women, Infants, and Children (WIC) program, the effect on allergenic food introduction has not been specifically addressed.^{8,9}

In this study, we collected data regarding food introduction by caregiver report in 2 separate populations: an urban Medicaid-based population affiliated with Cincinnati Children's Hospital Medical Center (CCHMC) and a suburban private insurance–based population in Montgomery, Ohio, a suburb located 14 miles outside Cincinnati, Ohio. The goal was to determine the timing of introduction of allergenic foods and whether there was a difference between urban and suburban populations. The primary aim was to analyze general pediatric allergenic food introduction with evaluation of timing differences between the populations, hypothesizing that urban caregivers would introduce foods at an earlier age as has been previously reported with nonallergenic foods.^{8,9} The secondary aim was to determine which factors, including maternal age, number of children, patient and family histories of atopic diseases, and recommendations by health care professionals, were considered most important in determining the age of allergenic food introduction.

Methods

Study design

Three clinical sites were used for patient recruitment: Montgomery Pediatrics in Cincinnati, Ohio, representing the suburban population, and Hopple Street Health Center and the Pediatric Primary Care Center, both urban academic pediatric clinics affiliated with CCHMC. Hopple Street Health Center and the Pediatric Primary Care Center were considered together as the urban population. Caregivers of children at their 4-month to 3-year well-child checkups (WCCs) were enrolled. Data were deidentified and collected at one WCC with no longitudinal data collection or follow-up. The study was approved by the CCHMC Institutional Review Board. The institutional review board waived the requirement to obtain documentation of informed consent for all adult participants and waived the requirement to obtain documentation of assent for all child participants (parents who are minors). The institutional review board approved the study questionnaire and a cover letter that introduced the questionnaire to the parents.

Study Participants

Two hundred caregiver questionnaires were distributed between January and March 2010. A 2-month window was used to decrease the likelihood of resurveying the same family at a subsequent WCC. Of the 200 questionnaires, 100 were given to Montgomery Pediatrics, whereas 100 were split equally between Hopple Street Health Center and the Pediatric Primary Care Center. No questionnaire was excluded for incomplete data, and any given information was analyzed.

Survey Instrument

Clinic staff distributed to caregivers, coming for a WCC visit, the multiple-choice and fill-in-the-blank response questionnaire (eFig 1). The letter gave parents the option to say no to filling the questionnaire and the option to not complete it if they did not want to after starting. Clinic staff collected the questionnaires from the parents and turned them in to the study investigators.

For allergenic food introduction, caregivers were asked to fill in the age in months when the child first had the food in question. Tree nuts and shellfish outside the fish or seafood category were not addressed specifically. Baby foods were used as a surrogate for

the pureed foods we defined as infant solids. Caregivers were also asked, in the same fashion, to report at what age their pediatrician or nurse practitioner told them that their child could start eating the aforementioned foods. No parallel data were collected directly from the physicians or advanced care professionals regarding their specific instructions to families regarding allergenic food introduction practices.

History of child atopy was asked via yes or no responses for each studied atopic disease: eczema, asthma, food allergies, and environmental allergies. Caregivers were then asked if they waited longer to start foods because of their child's atopic disease. Family history of atopic diseases in primary relatives (brother, sister, mother, and father) and waiting longer to introduce foods because of the family history of atopy were also assessed.

Demographic data were obtained regarding maternal age and number of children in the family. Maternal educational level, race/ethnicity, and type of insurance were also assessed.

Statistical Analysis

Study data were collected and managed using REDCap (research electronic data capture) tools hosted at the CCHMC by the principal investigator.¹⁰ If ranges were given for fill-in-the-blank age responses (ie, stating a child had solids between 4 and 6 months of age), the mean value of 5 was used. If caregivers responded in years of age, the number of months corresponding to that age were used (ie, for 2 years, 24 months was used for data entry). Insurance was entered into the database and changed to public, private, or self-pay to group for analysis. Family history of atopy, also used along with child-reported atopy as allergy risk for the forest modeling, was defined as caregiver report of 1 or more primary family members with atopic disease.

Only the patients responding yes to specific allergenic food introduction were used for analysis of timing. For example, if a 15-month-old patient was not reported to have had egg introduced into his/her diet, s/he was not used for the calculation of mean egg introduction. Thus, the sample size for each food is reported and was used for data analysis. No analysis was performed to determine how many children at a specific age had not ingested a specific food because there is no specific time of recommended introduction by guidelines. Similarly, only those patients responding with a recommended age of introduction by a health care professional were used for analysis.

Data were read into R version 2.15.0 for statistical analysis. Ages at introduction of formula, milk, peanut butter, fish, baby food, and eggs were summarized within urban and suburban individuals using the mean and median. Empirical densities of the age at introduction of each food were plotted. The summary measures and plots revealed that the ages were not normally distributed, and comparisons across urban and suburban residence were conducted using a Wilcoxon rank sum test. It was not possible to create multiple linear regression models for the age outcome variables because the explanatory variables of interest (maternal age, maternal race, insurance type, urban residence, and educational level) were found to be highly correlated.

Random forest modeling was chosen as an alternative to multiple regression to determine those factors that are most important in determining the age at introduction of the foods under study. In the random forest method, a subset of the data is selected at random, and, in this case, a regression tree is created from the selected data set. This is done in an iterative fashion, leaving out approximately one-third of the data for each iteration. The importance of variables is measured using the Gini impurity criterion, which is calculated by leaving one variable out of the iteration and determining how many observations are misclassified by the resulting tree. Those variables whose exclusion led to the most

impurity, or incorrectly classified observations, are the most important determinants of the outcome. *P* values were also calculated for each variable by permuting the response variable, which produces a null distribution of importance metrics, such as the Gini impurity criterion, for each variable. The *p* value is then based on the observed importance metric against the null distribution. *P* < .05 is considered statistically significant. A more positive percentage increase in mean square error is found to be highly influential, whereas smaller values are less so. Negative values are to be considered not influential in the decision-making process.

Results

Survey

One hundred eighty-five questionnaires were returned, 99 from Montgomery Pediatrics (completion rate, 99%), 47 from Hopple Street Health Center, and 39 from the Pediatric Primary Care Center (total completion rate, 86%).

Demographic Characteristics

Children were younger in the urban compared with the suburban population. The urban population was primarily African American with public health insurance, whereas the suburban population was mostly composed of white non-Hispanic families with private health care insurance (Table 1).

Introduction of Infant Formula and Infant Solids

The urban population introduced infant formula at a statistically significant younger age than the suburban population. There was no statistically significant difference in the age of introduction of infant solids between the 2 populations (Table 2).

Table 1
Characteristics of the Suburban Population (Montgomery Pediatrics) and Urban Population (Hopple Street Health Center and Pediatric Primary Care Center)^a

Characteristic	Urban	Suburban	<i>P</i> value
No. of surveys	86	99	
Child age, mean (SD), mo	13 (7)	16 (10)	.02
Maternal age, mean (SD), y	26 (6)	33 (5)	<.001
Total No. of children			
1	27 (31)	37 (37)	.40
2	25 (29)	33 (33)	.54
>2	32 (37)	27 (27)	.15
Nonresponders	2 (2)	2 (2)	.89
Child history of atopy			
Eczema	24 (28)	20 (20)	.22
Asthma	7 (8)	0	.004
Food allergies	1 (1)	6 (6)	.08
Environmental allergies	0	4 (4)	.06
Family history of atopy	50 (58)	46 (46)	.11
Maternal educational level			
Less than high school diploma	12 (14)	0	<.001
High school diploma/GED	33 (38)	3 (3)	<.001
Some college	26 (30)	5 (5)	<.001
College degree or higher	10 (12)	88 (89)	<.001
Nonresponders	5 (6)	3 (3)	.35
Ethnicity			
White non-Hispanic	17 (20)	83 (84)	<.001
African American	62 (72)	1 (1)	<.001
Hispanic	1 (1)	3 (3)	.38
Asian (or Pacific Islander)	0	7 (7)	.01
Other	2 (2)	3 (3)	.77
Nonresponders	3 (3)	2 (2)	.54
Insurance			
Public	81 (94)	1 (1)	<.001
Private	2 (2)	92 (93)	<.001
Self-pay	1 (1)	2 (2)	.65
Nonresponders	2 (2)	4 (4)	.51

Abbreviation: GED, general educational development.

^aAll data are presented as number (percentage) unless otherwise indicated.

Introduction of Allergenic Foods

Overall, the urban population introduced allergenic foods earlier than the suburban population. This finding was statistically significant for all allergenic foods: whole milk (*P* = .005), peanut (*P* < .001), fish (*P* = .002), and egg (*P* < .001) (Table 2). Both populations introduced whole milk before 12 months of age. Only the urban population introduced peanut, fish, and egg before 12 months of age. The suburban population delayed egg introduction to a mean (SD) of 12 (3.03) months and peanut and fish, in comparison to other allergenic foods, with introduction at 15.60 (5.05) months and 15.59 (6.04) months, respectively.

Variables Significant for Influencing Timing of Food Introduction

Overall, the recommended age for food introduction by the child's health care professional was the most important variable in all instances and statistically significant in all foods except for infant solids (Table 3). Insurance was the second most likely influential factor in the timing of peanut introduction and was the only other factor found to be statistically significant. Allergy risk was never found to be associated with timing of food introduction and was a noninfluential variable for infant formula and fish.

Discussion

Our study was designed to determine the mean age of introduction of formula, infant solid foods, whole milk, egg, peanut, and fish in the general pediatric urban and suburban populations of Cincinnati, Ohio. Other studies have looked at specific ages of introduction without mention of atopic outcomes as we have demonstrated. However, many of these studies use the Infant Feeding Practices Study II¹¹ and focus on breastfeeding, solid food, and whole milk introduction in the first year of life and do not discuss the introduction of highly allergenic foods, such as peanut products, egg, and fish.^{8,12} Studies not associated with the Infant Feeding Practices Study II have reported on introduction of cow's milk and wheat products with a focus on infant nutrition and do not discuss allergenic food introduction.¹³

We found no statistical difference in the introduction of infant solid foods between the 2 populations (urban and suburban), which reflects a well-established and accepted recommendation in society and among the medical profession. This finding is similar to the findings of McKean et al that mean (SD) age of introduction of infant solids is 5.4 (1.2) months in a high-risk population.⁷ Recommended age was the most significant contributing influential

Table 2
Age of Food Introduction for Each Population

Variable	No. of patients	Age of food introduction, mean (SD), mo	<i>P</i> value
Infant formula			.01
Urban	74	1.10 (1.64)	
Suburban	83	2.14 (2.79)	
Infant solids			.15
Urban	71	4.74 (1.49)	
Suburban	83	5.10 (1.14)	
Whole milk			.005
Urban	42	10.87 (2.72)	
Suburban	52	11.92 (0.74)	
Peanut			<.001
Urban	30	10.93 (5.48)	
Suburban	40	15.60 (5.05)	
Fish or seafood			.002
Urban	32	11.30 (5.07)	
Suburban	37	15.59 (6.04)	
Egg			<.001
Urban	46	9.67 (3.90)	
Suburban	53	12.0 (3.03)	

Table 3

Results of Random Forest Analysis for 7 Tested Variables Reporting Importance of Each Variable for Each Food Product Introduction Listed in Order of Most to Least Influential^a

Variable	Increase in mean square error, %	P value
Formula		
Recommended age	13.14	.02
Maternal educational level	11.61	.06
Maternal age	8.64	.25
No. of children	6.48	.07
Insurance	6.19	.19
Allergy risk	−1.85	.56
Race	−3.51	.77
Infant solids		
Recommended age	32.82	.45
Maternal educational level	7.69	.72
Race	7.12	.94
Maternal age	4.68	.94
Insurance	4.26	.35
No. of children	2.11	.22
Allergy risk	2.09	.62
Whole milk		
Recommended age	12.30	.01
No. of children	3.01	.35
Maternal educational level	2.13	.42
Insurance	0.40	.56
Allergy risk	0.32	.66
Maternal age	−1.89	.76
Race	−2.82	.81
Peanut		
Recommended age	12.62	.01
Insurance	8.91	.02
Maternal educational level	4.45	.68
No. of children	4.37	.74
Allergy risk	1.89	.66
Race	1.00	.60
Maternal age	−2.24	.88
Fish		
Recommended age	12.18	.01
Maternal age	0.75	.92
No. of children	−1.37	.45
Insurance	−1.87	.04
Allergy risk	−3.50	.66
Educational level	−4.95	.28
Race	−6.67	.36
Eggs		
Recommended age	13.79	.01
Insurance	11.72	.77
Maternal age	6.63	.65
No. of children	3.63	.83
Maternal educational level	2.52	.63
Race	1.92	.68
Allergy risk	0.70	.62

^aNegative values reflect variables of no importance.

factor for introduction of infant solids with the strongest percentage increase in mean square error in our study (32.82).

We found that the urban population, a largely public insurance and African American community, introduced allergenic foods, specifically whole milk, peanut, fish, and eggs, at an earlier age than the private insurance based, largely white non-Hispanic suburban population. This reported urban population is, on average, introducing all allergenic foods before 12 months of age, whereas the suburban population introduced later, before 16 months of age. McKean et al⁷ reported that in a mostly white, high socioeconomic class population, at 12 months of age, only 11% of infants consumed peanuts or peanut butter, 64% consumed fish, 80% consumed eggs, and only 29% reported cow's milk introduction before 11 months. Our suburban data, although analyzed in a different manner, demonstrate similar patterns. We expand on the existing knowledge by including infants not at risk and a large urban, lower socioeconomic population, which we have found to introduce allergenic foods at earlier ages.

Socioeconomic differences in food introduction have been found previously as well.¹⁴ Less educated mothers are more likely to not follow food introduction recommendations in regard to solid food introduction and the transition to whole milk.⁸ WIC participants are less likely to exclusively breastfeed and more likely to introduce solids before 4 months of age.⁹ We did not find a statistically significant difference in infant solids introduction, although in congruence with these studies, we found infant formula introduction earlier in the urban population. In addition, we expand on these previous findings to include the addition of early allergenic food introduction in the urban population. We speculate that the inclusion of foods, such as whole milk, eggs, and peanut butter, in the WIC program and the financial affordability of these foods promote their use earlier in the urban population. Insurance was a highly influential factor in the caregiver decision for peanut introduction.

Most importantly, these data indicate that the most influential factor associated with food introduction is the recommended age by health care professionals as opposed to maternal age, educational level, and number of children in the family. We did not directly collect data from the physicians in the practices; therefore, we cannot speculate on the advice given concerning the age of introduction of allergenic foods by each member of the different practices. However, the data collected from the questionnaire answered by the parents can be a surrogate for the advice given by the physician, although it may be subject to recall bias. Because the parents reported that the physician recommendation influenced their decision, we can assume that the difference in age of introduction is reflective of the advice given by the physicians and therefore is different depending on the practice type. A great deal of research has been performed on high-risk populations focusing on risk of atopy^{7,15}; however, allergy risk was never found to be important in decision-making by health care professionals.

The AAP guidelines revision in 2008 suggested allergenic foods did not need to be delayed but did not give specific recommendations on when introduction was appropriate.² Similarly, the most recent recommendations on allergenic food introduction, published in the *Journal of Allergy and Clinical Immunology: In Practice*, globally recommend allergenic foods be introduced after 4 months of age, after a few other complementary foods and at home.⁴ However, the specific timing of introduction of each food has yet to be defined.

To determine the appropriate timing of allergenic food introduction, many studies have looked at the timing of introduction of various foods and their implications regarding outcomes in allergic diseases.^{16–19} Data from the United Kingdom and Israel revealed that populations introducing peanut products earlier in life have a decreased frequency of peanut allergy.²⁰ Most recently, data have indicated that early introduction of peanut can decrease the incidence of peanut allergy in high-risk infants as reported by the Learning Early About Peanut Allergy trial.¹⁵ In addition, the Enquiring About Tolerance study found in the per-protocol analysis that exclusively breastfed infants from the general population who introduced allergenic foods (egg, sesame, fish, wheat, milk, peanut) before the age of 6 months had a lower prevalence of food allergies, although this finding was not significant in the intent-to-treat analysis.²¹ These studies are giving insight into the proper timing of allergenic foods to help prevent the development of food allergy and atopy.

A consensus communication recently released and published in both allergy and general pediatric journals endorses the introduction of peanut-containing products to high-risk infants between 4 and 11 months of age. However, although there is now level I evidence of early introduction of peanut products in high-risk and atopic children, specifically those with severe eczema and egg allergy, there are limited data on introduction in populations not at risk.^{21–23}

With the continued research into the proper timing of allergenic food introduction, this study highlights the importance of new and clear guidelines for physicians and families. One of the most profound findings of this study is the effect of physician and health care professional recommendations on a family's choice of allergenic food introduction in the population as a whole.

There are limitations to these data because they are self-reported by parents at various times and subject to recall bias. All data were analyzed together as one data set regardless of patient age at the time of visit. The investigators chose to include all data because the recall bias is lessened when the data are collected closer to the age of introduction. There is also a limitation because those surveys analyzed were of those who had reported introduction of foods. Those who were of the same age and had not introduced a specific food were not analyzed with that data set. No analysis was performed of those who were the same age but without food introduction on the basis that there are no distinct recommendations for timing and these data were collected at one point in time rather than longitudinally.

Although there is no analysis in these data regarding outcomes of food allergies or other atopic diseases, it gives a better understanding of individual family choices with regard to allergenic food introduction and the need for clear and consistent guidelines. Medical professionals should be cognizant of current data and recommendations and continue to have discussions with families regarding timing of food introduction.

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Supplementary Data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.anai.2016.04.010>.

References

- [1] AAP Committee on Nutrition. *Pediatric Nutrition Handbook*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2004.
- [2] Greer FR, Sicherer SH, Burks AW; American Academy of Pediatrics Committee on Nutrition, American Academy of Pediatrics Section on Allergy and Immunology. Effects of early nutritional interventions on the development of atopic disease in infants and children: the role of maternal dietary restriction, breastfeeding, timing of introduction of complementary foods, and hydrolyzed formulas. *Pediatrics*. 2008;121:183–191.
- [3] Burks AW, Jones SM, Boyce JA, et al. NIAID-sponsored 2010 guidelines for managing food allergy: applications in the pediatric population. *Pediatrics*. 2011;128:955–965.
- [4] Fleischer DM, Spergel JM, Assa'ad AH, Pongracic JA. Primary prevention of allergic disease through nutritional interventions. *J Allergy Clin Immunol Pract*. 2013;1:29–36.
- [5] Fiocchi A, Schunemann HJ, Brozek J, et al. Diagnosis and Rationale for Action Against Cow's Milk Allergy (DRACMA): a summary report. *J Allergy Clin Immunol*. 2010;126:1119–1128.e1112.
- [6] Muraro A, Halken S, Arshad SH, et al. EAACI food allergy and anaphylaxis guidelines. Primary prevention of food allergy. *Allergy*. 2014;69:590–601.
- [7] McKean M, Caughey AB, Leong RE, Wong A, Cabana MD. The timing of infant food introduction in families with a history of atopy. *Clin Pediatr (Phila)*. 2015;54:745–751.
- [8] Fein SB, Labiner-Wolfe J, Scanlon KS, Grummer-Strawn LM. Selected complementary feeding practices and their association with maternal education. *Pediatrics*. 2008;122(suppl 2):S91–S97.
- [9] Jacknowitz A, Novillo D, Tiehen L. Special Supplemental Nutrition Program for Women, Infants, and Children and infant feeding practices. *Pediatrics*. 2007;119:281–289.
- [10] Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap): a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42:377–381.
- [11] Fein SB, Grummer-Strawn LM, Raju TN. Infant feeding and care practices in the United States: results from the Infant Feeding Practices Study II. *Pediatrics*. 2008;122(suppl 2):S25–S27.
- [12] Grummer-Strawn LM, Scanlon KS, Fein SB. Infant feeding and feeding transitions during the first year of life. *Pediatrics*. 2008;122(suppl 2):S36–S42.
- [13] Fox MK, Pac S, Devaney B, Jankowski L. Feeding infants and toddlers study: what foods are infants and toddlers eating? *J Am Diet Assoc*. 2004;104(1 suppl 1):s22–s30.
- [14] Wen X, Kong KL, Eiden RD, Sharma NN, Xie C. Sociodemographic differences and infant dietary patterns. *Pediatrics*. 2014;134:e1387–e1398.
- [15] Du Toit G, Roberts G, Sayre PH, et al. Randomized trial of peanut consumption in infants at risk for peanut allergy. *N Engl J Med*. 2015;372:803–813.
- [16] Filipiak B, Zutavern A, Koletzko S, et al. Solid food introduction in relation to eczema: results from a four-year prospective birth cohort study. *J Pediatr*. 2007;151:352–358.
- [17] Nwaru BI, Erkkola M, Ahonen S, et al. Age at the introduction of solid foods during the first year and allergic sensitization at age 5 years. *Pediatrics*. 2010;125:50–59.
- [18] Snijders BE, Thijs C, van Ree R, van den Brandt PA. Age at first introduction of cow milk products and other food products in relation to infant atopic manifestations in the first 2 years of life: the KOALA Birth Cohort Study. *Pediatrics*. 2008;122:e115–e122.
- [19] Zutavern A, Brockow I, Schaaf B, et al. Timing of solid food introduction in relation to atopic dermatitis and atopic sensitization: results from a prospective birth cohort study. *Pediatrics*. 2006;117:401–411.
- [20] Du Toit G, Katz Y, Sasieni P, et al. Early consumption of peanuts in infancy is associated with a low prevalence of peanut allergy. *J Allergy Clin Immunol*. 2008;122:984–991.
- [21] Perkin MR, Logan K, Tseng A, et al. Randomized trial of introduction of allergenic foods in breast-fed infants [published online March 4, 2016]. *N Engl J Med*. 2016. <http://dx.doi.org/10.1056/NEJMoa1514210>.
- [22] Fleischer DM, Sicherer S, Greenhawt M, et al. Consensus communication on early peanut introduction and the prevention of peanut allergy in high-risk infants. *Ann Allergy Asthma Immunol*. 2015;115:87–90.
- [23] Fleischer DM, Sicherer S, Greenhawt M, et al. Consensus communication on early peanut introduction and the prevention of peanut allergy in high-risk infants. *J Allergy Clin Immunol*. 2015;136:258–261.

Supplementary Data

1) How long was the child seeing the doctor today breastfed?

- ☐ Never
- ☐ < 1 month
- ☐ 1–2 months
- ☐ 2–4 months
- ☐ 4–6 months
- ☐ > 6 months
- ☐ Still breast feeding

2) How old was the child when they **first** had

- Baby Formula _____ Months Old ☐ Never Had
- What is the name of the formula? _____
- Baby Foods _____ Months Old ☐ Never Had
- Whole or Vitamin D Milk _____ Months Old ☐ Never Had
- Eggs _____ Months Old ☐ Never Had
- Peanut or Peanut Butter _____ Months Old ☐ Never Had
- Fish or Seafood _____ Months Old ☐ Never Had

3) At what age did your **pediatrician or nurse practitioner** say your child could start eating

- Baby Formula _____ Months Old ☐ Never Had
- Baby Foods _____ Months Old ☐ Never Had
- Whole or Vitamin D Milk _____ Months Old ☐ Never Had
- Eggs _____ Months Old ☐ Never Had
- Peanut or Peanut Butter _____ Months Old ☐ Never Had
- Fish or Seafood _____ Months Old ☐ Never Had

4) Does this child have

- Eczema ☐ Yes ☐ No
- Asthma ☐ Yes ☐ No
- Food Allergies ☐ Yes ☐ No
- Environmental Allergies ☐ Yes ☐ No

5) Because of the Eczema, Allergies, or Asthma in the **child**, did you wait longer to start foods?

- ☐ Yes ☐ No

6) Who else in the family has Eczema, Asthma, Seasonal or Food Allergies?

- ☐ Child's Mother ☐ Child's Brother ☐ Child's Grandmother
- ☐ Child's Father ☐ Child's Sister ☐ Child's Grandfather
- ☐ Nobody

7) Because of the Eczema, Allergies, or Asthma in your **family**, did you wait longer to start foods for your child?

- ☐ Yes ☐ No

Family Demographics

8) How old is your child seeing the doctor today?

- ☐ 4–5 months ☐ 18–23 months (1½–2 years)
- ☐ 6–8 months ☐ 24–30 months (2–2½ years)
- ☐ 9–11 months ☐ 31–36 months (2½–3 years)
- ☐ 12–17 months (1–1½ years) ☐ >36 months (3 years old)

9) How old is the child's mother? _____

10) How many children do you have? _____

11) What is your zip code? _____

12) How much school has the child's Mother done?

- ☐ Some High School ☐ High School Diploma/GED ☐ Some College ☐ College Degree or higher

13) What is your race or ethnicity?

- ☐ Hispanic ☐ Asian (or Pacific Islander) ☐ White Non-Hispanic
☐ African American ☐ Other

14) What kind of insurance do you have?

- ☐ Public (Caresource, Amerigroup, Molina, Medicaid)
☐ Private (Anthem, Aetna, Humana, etc)
☐ None, I pay for everything out of pocket

Thank you for completing the survey, your help is appreciated!
Please give the survey to a staff member when you are done