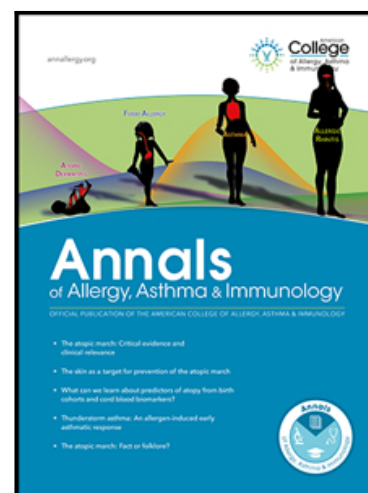


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Epinephrine auto-injector carriage and use practices among US children, adolescents, and adults

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Key Words:

food allergy; epinephrine carriage; anaphylaxis self-management;
food allergy management; chronic disease management

Abbreviations:

FA: Food Allergy
EAI: Epinephrine Auto-Injector
SEM: Structural Equation Modeling
QoL: Quality of Life
IRB: Institutional Review Board
ER: Emergency Room

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Ruchi S. Gupta receives grant support from the Allergy and Asthma Network, NIH/NIAID, Melchiorre Family Foundation and Sean N. Parker Center for Allergy & Asthma Research, UnitedHealth Group, Thermo Fisher Scientific, Rho Inc., and Aimmune Therapeutics. She serves as a consultant for DBV Technologies, Kaleo Inc., and BEFOREBrands.

J. M. Spergel serves as a consultant for DBV Technology and GlaxoSmithKline; receives grant support from DBV Technology, Aimmune Therapeutics, and Food Allergy Research & Education; receives payments for lectures from Meeting Events International and Rockpointe; receives payment for development of educational presentations from Rockpointe; holds stock options with DBV Technology; and serves on the advisory boards for the National Eczema Association, Food Allergy Research & Education, and the International Association for Food Protein Induced Enterocolitis

Christopher M Warren, Justin M Zaslavsky, and Kristin Kan have no conflicts to disclose.

Introduction

Daily management of allergies to food, medication, latex, and/or insect stings can adversely impact quality of life (QoL)^{1,2} and impose considerable economic burden³ onto affected patients and their caregivers. Studies suggest that such allergies are remarkably common in the US,^{4,5} with food allergies (FA) in particular having substantially risen in prevalence over recent decades⁶ to affect an estimated 8% of children⁷ and 5% of adults.⁸ Clinically, there is substantial variation in how allergic reactions can present and reactions to the same food can vary in severity. With no current widely available curative treatment, allergen avoidance and proper anticipatory management of anaphylaxis are essential.⁹

Epinephrine auto-injectors (EAI) are first-line treatment for anaphylaxis, and administration is recommended at the first sign of a severe allergic reaction.¹⁰ Unfortunately, research suggests that currently, daily carriage, and emergency use of EAI for treatment of anaphylaxis is inadequate,¹¹ which can lead to adverse outcomes, including hospitalization and death.¹²⁻¹⁴ Consequently, it is imperative that we better our understanding of current epinephrine carriage and usage practices in the US, including the barriers that may impair patients' ability to routinely carry and--if necessary--self-administer emergency epinephrine in a timely, efficacious manner.

The current study leverages self- and parent-proxy report survey data on a large, diverse sample of children, adolescents, and adults who had been prescribed an EAI for allergy treatment. This study characterizes current EAI prescription fill rates, EAI carriage and use behaviors, as well as common barriers, desired facilitators and key factors hypothesized to impact EAI carriage and use based on previous work. Such factors include: **1)** Knowledge of how/when to use an EAI;¹⁵ **2)** Perceived social and environmental support;¹⁶ **3)** Positive patient attitudes toward EAI carriage;¹⁷ **4)** Allergic reaction history/severity;¹⁸ and **5)** Allergy-related quality of life.¹ We employed a structural equation modeling (SEM) approach to examine whether and to what extent these factors are associated with the following behaviors: **1)** EAI prescription filling; **2)** routine carriage of a single EAI; **3)** routine carriage of multiple EAI; and **4)** using an EAI to treat a severe allergic reaction. By comprehensively modeling and characterizing these relationships, we hope to aid clinicians, FA advocates, and policy-makers alike in their efforts to improve allergy management among patients at-risk of anaphylaxis.

Methods

Survey Development and Design

The survey instrument was developed by a multi-disciplinary team comprised of pediatricians, allergists, health services researchers, parents of food-allergic children, children, adolescent and adult food allergy patients, survey methodologists, a clinical psychologist, an epidemiologist and a biostatistician, in addition to research coordinators. The final instrument assessed demographics, allergic reaction history, QoL, social support, well as practices and attitudes relating to epinephrine carriage and other FA management behaviors. Items were drawn from previous, validated population-level surveys where possible.^{7,19} Expert panel review and cognitive interviews of adults (N=5) and parents of children (N=10) with FA were conducted in batches of 2-3 individuals at a time. Consequently, 13 rounds of iterative survey modifications were made. Upon saturation, the survey was programmed for online and telephone-based administration. Additional quality control/user experience testing was conducted prior to final survey administration.

Study Participants

Eligible participants included English-speaking adults aged 18 and older who indicated they had been prescribed an EAI and/or were the parent of a child whom had been prescribed an EAI for an allergy (including but not limited to certain foods, latex, insect bites or medications).

Participants were recruited first from the probability-based *AmeriSpeak® Panel*, which utilizes a sampling frame covering $\geq 97\%$ of the U.S. population. This panel is hosted by NORC at the University of Chicago, a leading US survey research organization. Surveys were completed by 172/180 eligible *AmeriSpeak* panelists (96% completion rate). To ensure adequate sample size,

these data were augmented by additional surveys administered to a different, non-probability-based sample of adults recruited by *Survey Sampling International*. These surveys were completed by 425 of 470 eligible panelists (90% completion rate). Adult respondents answered questions pertaining to their own allergy management practices, as well as on behalf of any eligible children. Active written informed consent was obtained from each participant. All study activities were IRB approved.

Statistical Analysis

Frequencies of categorical responses were calculated and compared via chi-square tests. Hypothesis testing was conducted in Mplus 7.4 via SEM. This approach allowed us to specify an overall model simultaneously examining the four outcomes of interest, which was then fit among children (0-12 years), adolescents (13-17 years), and adults (18+ years) using a multiple-group SEM approach. The four dichotomous outcomes were responses to the following questions: **1)** *Did you fill your [EAI] prescription?* [Yes vs. No]; **2)** *How many epinephrine auto-injectors do you typically carry with you?* [responses dichotomized into: at least one vs. None]; **3)** *How many epinephrine auto-injectors do you typically carry with you?* [responses dichotomized into multiple EAI vs. one or fewer]; **4)** *Has an EAI ever been used to treat an allergic reaction you were having? (Excluding epinephrine administered in the ER)* [Yes vs. No].

SEM methods combine factor analysis and regression into a more flexible, generalized analytic framework that allows **1)** simultaneous examination of adjusted associations among the five latent constructs hypothesized to predict EAI carriage and use; **2)** simultaneous examination of

cluster- and covariate-adjusted associations between each of the five latent predictors and the four key allergy management outcomes; **3)** accounting for the fact that our constructs of interest were measured with error; and **4)** confirmatory testing of measurement invariance of each latent factor across ages to ensure that meaningful comparisons of estimates are possible across age groups.²⁰

First, measurement models were independently created and evaluated via confirmatory factor analysis for each of the five factors hypothesized *a priori* to be associated with the four EAI carriage and use outcomes described above. Relevant manifest variables were tested for each latent factor until each factor was found to demonstrate excellent fit (RMSEA<0.05; CFI>0.95; factor loadings >0.5).²¹

The following indicators were used in the final model:

Latent Factor 1: EAI Knowledge

- *I would be able to effectively use an EAI if I had a severe allergic reaction.*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree]
- *I know how to recognize the signs and symptoms of a severe allergic reaction.*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree]
- *I know the steps to use an EAI.*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree]

Latent Factor 2: Perceived social and environmental support

- *My friends and extended family support me in the management of my allergy.*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree]
- *If I experienced a severe allergic reaction at work or school I am confident that these stock epinephrine auto-injectors be available for my immediate use.*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree]

Latent Factor 3: Positive attitudes toward EAI carriage

- *Carrying epinephrine makes me feel safer in social situations involving my allergen*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree]
- *Carrying epinephrine improves my quality of life.*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree]

Latent Factor 4: Allergic reaction history

- *In the past 12 months, how many allergic reactions have you experienced?* [Integer response options, categorized to 0, 1, 2, 3+]
- *In your lifetime how many times have you visited a hospital emergency room for an allergic reaction?* [Integer response options, categorized to 0, 1, 2, 3, 4, 5+]
- *In the past 12 months, how many times have you visited a hospital emergency room for an allergic reaction?* [Integer response options, dichotomized to Yes/No]

Latent Factor 5: Allergy-related quality of life

- *My allergy affects the things I do with others*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree]
- *My allergy affects the things I do with my family*
[5-item Likert scale ranging from 1—Strongly disagree to 5—Strongly agree];
- *Food Allergy Independent Measure*
[Mean of 7 item scale]

A structural model was then fit specifying residual covariances between the five latent factors and four outcomes of interest. This structural model allows formal testing of the hypothesized relationships between these five latent factors and four EAI outcomes of interest. When standardized, these parameters reflect the relative magnitude of correlations between study constructs after accounting for effects of other covariates. See Figure 1 for a visualization of the final covariate-adjusted model, which demonstrated good fit [RMSEA=.047 (90%CI (.44-.50); CFI=.927].²¹ Once this final overall model was specified, a multiple-group approach confirmed latent factor invariance and examined associations within and across children, adolescents, and adults in two-, and three- group models, which demonstrated comparable fit. The comparable fit of the 2 (children/adolescents vs. adults) and 3 (children vs. adolescents vs. adults) group models

indicates that there is minimal additional explanatory value in analyzing children and adolescents as separate subpopulations. Consequently, the more parsimonious two-group model comparing children/adolescents vs adults is reported in the results. Nevertheless, child- and adolescent-specific parameters from the three-group model are provided in Supplemental Table 1. Estimated beta coefficients were comparable between the probability-based (N=211) and non-probability-based (N=706) samples. Consequently, further analyses were pooled. Parameter estimates account for within-household non-independence via cluster-robust standard errors.

Results

Demographic Characteristics

The final analytic sample consisted of responses for 917 individuals, which were collected from 597 surveys as some allergic adults provided both self- and parent-proxy responses. Data were collected on 255 children ages 0-12 years old, 212 adolescents ages 13-17 years old, and 450 adults ages 18-65 years old. As described above, children and adolescents were collapsed into a single group for the reported SEM analyses. Table 1 shows that while the majority of the sample identified as White (73%), the sample was well distributed with respect to household income. Table 3 reports that peanut (30%), shellfish (22%) and milk (21%) were the most commonly reported food allergies among our sample, with peanut allergy significantly ($p < .05$) more prevalent among children/adolescents (35%) relative to adults (24%), and shellfish allergy significantly ($p < .05$) more prevalent among adults (25%) than children (19%).

EAI Prescription Filling and Carriage Behavior

Most respondents (89%) reported filling EAI prescriptions as reported in Table 2. Among adults, the most commonly cited barriers to filling their prescription were cost (47%), perception that their allergy was not severe (23%), and no history of previous allergic reactions (20%).

However, for children/adolescents, the most commonly cited barriers were no history of previous reactions (28%), followed by perceptions that an EAI wasn't needed (25%). Cost was only a barrier to obtaining an EAI for 15% of children/adolescents, while perception that their allergy was not severe was only reported as a barrier to obtaining an EAI for 8% of children/adolescents.

Half of participants (51%) reported having an EAI accessible (within 5 minutes) "all of the time," and slightly fewer (44%) claimed that they carried at least one EAI on their person "all the time." Less than a quarter (24%) of the entire sample reported carrying two or more EAI's.

Adults reporting habitual EAI carriage most often carried on their person (84%). However, only 34% of carrying children/adolescents were reported to carry an EAI on their person. Another 34% reported that a parent was most likely to carry an EAI for them. Most participants reported that carrying epinephrine improves QoL (66%) and increased perceived safety in social situations (71%).

Allergic Reaction History, EAI Utilization and Barriers

Most participants (69%) experienced at least one allergic reaction in the past 12 months, and 39% of participants experienced multiple reactions. Adults were more likely to report an allergic reaction in the past year (77% of adults vs. 62% of children/adolescents; $p < 0.001$) and were almost twice as likely to have had three or more reactions in the past year compared to children/adolescents (27% of adults vs. 14% of children/adolescents; $p < 0.001$). Eighty-eight

percent of adults and 69% of children/adolescents reported at least one lifetime visit to a hospital for an allergic reaction, but adults were more likely to have visited an emergency room in the past 12 months due to an allergic reaction than children (54% of adults vs. 43% of children/adolescents; $p<0.01$).

Sixty-five percent of respondents reported that an EAI had been used to treat an allergic reaction they were having (69% of adults vs. 57% of children; $p<.001$). Regarding respondents' most severe reported allergic reaction, slightly higher EAI usage rates were also reported amongst adults compared to children (59% vs. 52%; $p=.084$). The EAI used to treat their most severe allergic reaction was carried by the reacting individual 50% of the time. In 33% of cases the EAI used was provided by medical personnel. In 7% of cases, the first EAI used was prescribed to another individual, whereas 6% of cases involved use of stock EAI provided by an institution (e.g. school or workplace). Rates of routine carriage of at least one (93% vs. 62%; $p<0.001$) and multiple EAIs (29% vs. 16%; $p<.001$) were higher among respondents previously treated with an EAI. A majority of adults (52%) reported that an EAI was not used, even though it would have been beneficial during their most severe reaction. The most frequently given reasons for not using an EAI among respondents owning one were that an EAI was not available (45%), followed by that their allergy was undiagnosed at the time (35%), that an EAI was not necessary (26%), and that they lacked knowledge of how/when to use an EAI (21%). When surveyed, 58-59% of participants reported strong agreement with the statements: *"I know the steps to use an EAI"*; *"I can recognize the signs and symptoms of a severe allergic reaction"*; and *"I would be able to effectively use an EAI if I had a severe allergic reaction"* [Table 4].

Regarding participant's suggestions for improving management, 68% of respondents reported that lowering EAI cost would improve epinephrine access, with 50% of respondents reporting that their insurance co-pay or deductible presented a barrier to access. Other desired changes included increasing availability of stock epinephrine and public awareness about allergens (50% and 47% of respondents, respectively). Many reported that more effective patient education (61%) and more time educating patients (47%) during physician visits on how/when to use an EAI, would be beneficial.

Structural Equation Model of EAI Prescription Filling, Carriage and Use Behaviors

In the multiple-group structural equation model, significant latent predictors of filling an EAI prescription across all ages included more positive attitudes toward EAI carriage ($p < 0.01$), more serious allergic reaction history ($p < 0.05$), and greater environmental support ($p < 0.05$).

Standardized parameters for children/adolescents and adults are reported in Table 5. Greater EAI knowledge was only a significant predictor among children/adolescents ($p < 0.001$), while greater allergy-related QoL impact was only a significant predictor among adults ($p < 0.05$).

Children with allergies to peanut ($p < 0.001$), tree nut ($p < 0.01$), and insect sting/venom ($p < 0.001$) were more likely to report filling their prescription, as were older children, relative to younger children ($p < .01$). These relationships are expressed visually in Figure 1.

Each of the five aforementioned latent factors was also positively associated ($p < 0.01$) with routine carriage of at least one EAI among all participants, as well as routine carriage of multiple EAIs among children. However, only more positive attitudes toward EAI carriage ($p < 0.001$),

more serious allergic reaction history ($p < 0.001$), and allergy-related QoL impact ($p < 0.01$) were significantly associated with routine carriage of multiple EAIs among adults. Similarly, reported EAI use during participants' most severe reaction was positively associated ($p < 0.05$ for all) with each of the five latent factors among children, and all but EAI knowledge among adults. Additional, child- and adolescent-specific parameters are reported in Supplementary Table 1 and summarized in Appendix 1.

Discussion

This study characterizes demographic, psychosocial, behavioral, and clinical factors associated with epinephrine prescription fill rates, carriage, and use practices among a large, representative US sample of patients prescribed EAIs for allergy treatment.

The overall EAI prescription fill rate of 89% observed in the present study was higher than previously reported rates of 82% and 70%, which were estimated via retrospective chart reviews from one US military medical center²² and a Canadian primary care research network.²³ This suggests that most US patients are filling EAI prescriptions. However, simply filling a prescription is insufficient for ensuring EAI accessibility during a severe allergic reaction. In the present sample, roughly half of participants reported an EAI was accessible "*all of the time*", while fewer (44%) reported personally carrying at least one EAI all the time. Observed EAI carriage rates were lower than in previous studies of families recruited via advocacy groups.^{18,24} Despite recommendations by some experts that patients at risk of anaphylaxis carry multiple

EAI^{10,25} and the inclusion of multiple EAI^s in the packaging of commercially-available devices, fewer than 25% of respondents reported routinely carrying multiple EAI^s.

Within our sample, cost was a frequently-cited barrier to filling EAI prescriptions, with roughly half of participants identifying their insurance copay and/or deductible as a barrier. Approximately 70% of respondents reported that lowering EAI cost would increase access, whereas half of respondents believed that increased access would result from increasing stock EAI availability. These findings are consistent with prior work identifying rising out-of-pocket spending on medications as a barrier to chronic disease self-management.²⁶⁻²⁸ Also consistent with the broader medication adherence literature were findings that a substantial minority of participants failing to fill their EAI prescription reported that they felt the prescribed treatment to be unnecessary.²⁹

Remarkably, over 50% of adults and 30% of children reported experiencing at least one severe allergic reaction where an EAI was not used but would have been beneficial. This is consistent with a previous emergency department-based cohort study reporting that older patients with anaphylaxis were less likely to receive epinephrine than their younger counterparts.³⁰ Previous studies have also shown that even when patients routinely carry epinephrine, many still do not use it when indicated during an anaphylactic event. For example, a British survey found that when available during a severe allergic reaction, EAI^s were only used to treat 35% of reactions.³¹ A subsequent US study of food-allergic adolescents and young adults found that 37% of respondents experiencing anaphylaxis, severe symptoms, or both were not treated with an EAI and 38% were not carrying an EAI during their last reaction.²⁴ In our sample, an EAI was not

used by at least 40% of respondents' during their most severe allergic reactions due to unavailability, with greater reported unavailability among adults relative to children. This discrepancy in reported EAI availability by age may be a reflection of increasing stock EAI availability in schools. Over 50% of children in our sample reported that stock EAI is available at school or work, relative to only 38% of adults. Other, less frequently identified barriers to EAI use were that the patient's allergy was undiagnosed at the time of the reaction, that they didn't think it was necessary, and lack of knowledge how to use. This is consistent with our current findings that just over 40% of respondents did not express strong confidence that they: **1)** could effectively use an EAI in the event of a reaction; **2)** could recognize the signs and symptoms of an allergic reaction; or **3)** knew the steps for using an EAI. Similarly, an earlier, prospective study of food-allergic infants found that fewer than one-third of severe allergic reactions were treated with epinephrine, with caregivers reporting in half of cases that an EAI was never administered, even though epinephrine "should have" been used. The most commonly cited barriers to EAI use in these cases where an EAI "should have" been used were a failure to recognize signs/symptoms of an allergic reaction, followed by EAI inaccessibility.³²

While most respondents reported that they could recognize signs/symptoms of an allergic reaction, knew the steps to use an EAI, and could effectively use an EAI if necessary, a majority (61%) thought that more effective patient education during physician visits would increase understanding of how/when to use an EAI. This is compared to less than half of respondents who thought that more time spent educating patients (47%), online educational videos (40%), or PSAs/mass media campaigns (40%) would increase understanding of how/when to use an EAI. This highlights the important role that physicians play in counseling patients on allergy

management and the need for more effective clinical counseling strategies. Given respondents' expressed desire for improved EAI education in the clinical context, these findings suggest that routine preventive visits may be ideal opportunities for patient education and instruction on appropriate EAI use.

In general, SEM analyses identified strong associations between each of the five latent constructs, as well as significant associations between each latent construct and the four outcomes of interest: filling one's EAI prescription, routinely carrying at least one, or multiple EAIs, and using an EAI to treat one's most severe allergic reaction. Results from the SEM model provided empirical support for the multifactorial nature of allergy management and identified multiple intervention modalities for improvement among both children and adults. For example, associations between perceived environmental support and each management behavior were reliably stronger among children than adults. While among children self-reported carriage of multiple EAIs was significantly influenced by the degree of perceived support among friends and extended family as well as the perceived accessibility of stock EAI (the two indicators of the latent environmental support construct), this association was non-significant among adults. Interestingly, reporting that *family and friends carried an EAI for their own allergies* was a stronger, more reliable predictor of EAI carriage among adults compared to children. This is consistent with previous work suggesting that, compared to their older counterparts, food-allergic adolescents view education of their non-allergic peers as particularly important for improving food allergy management.²⁴

While numerous studies have examined psychosocial impacts of day-to-day allergy management on patients and their families,¹ few have examined relationships between EAI carriage practices and allergy-related QoL, particularly in adult populations, despite evidence that allergies appear increasingly prevalent among adults.³³ Here, we found that allergy-related QoL was significantly greater among participants reporting routine carriage of at least one EAI; participants reporting routine carriage of multiple EAIs; and participants reporting EAI use during their most severe allergic reaction. Allergy-related QoL was also greater among adults, but not children/adolescents who filled their EAI prescriptions. This suggests that efforts by clinicians to improve EAI carriage and utilization rates may improve QoL among allergic patients. Allergy-related QoL is a particularly important intervention target given the current absence of approved treatments. A previous study of food-allergic adolescents and their parents reported that the perceived burden of treatment for EAI carriage is low, but that the burden of treatment is perceived to be higher among adolescents who report inconsistent EAI carriage behavior.³⁴ The strong observed associations between the latent positive perceptions of EAI construct and EAI carriage behavior in both children and adults suggest that individuals who routinely carry EAI find that it increases perceived safety and improves QoL.

Limitations

A strength of the present study is the generalizability of its large, national sample, as most prior studies recruited participants via FA advocacy organizations or individual clinical networks. However, limitations include the cross-sectional survey design, which limits causal inference. Another is the use of parent proxy-reporting for all individuals under 18 years of age. While parent proxy-reporting is necessary for infants and young children, future work should consider

direct assessment of older children/adolescents. Additionally, this survey was only administered to English-speaking participants, which might limit generalizability. Finally, recall bias is a concern and future work should consider leveraging clinical data to confirm details regarding allergy diagnosis, reaction history, EAI prescription, prescription filling, and other management behaviors that may be captured by clinicians and/or recorded in the electronic health record.

Conclusions

In conclusion, while most US patients prescribed an EAI fill their prescription, fewer than half routinely carry at least one EAI and fewer than a quarter carry multiple EAIs. Over 40% of patients reported experiencing a severe allergic reaction where an EAI wasn't used, but would have been beneficial. Together, these data suggest that current EAI carriage practices among allergic patients are suboptimal and may be improved through reducing EAI-related out-of-pocket costs and facilitating patient education efforts aimed at increasing knowledge and self-efficacy regarding how/when to effectively use EAIs.

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Table 1. Respondent demographics

	<18 year olds (N=467)	18+ year olds (N=450)	All ages (N=917)
	% (N)	% (N)	% (N)
Gender			
Male	54 (253)	38 (170)	46 (423)
Female	47 (213)	62 (279)	54 (492)
Race/ethnicity			
Hispanic	10 (48)	12 (52)	11 (100)
Black	8 (36)	6 (25)	7 (61)
White	73 (339)	74 (331)	73 (670)
Asian	5 (24)	2 (11)	4 (35)
Multiracial-Non Hispanic	2 (9)	4 (17)	3 (26)
Other--Non Hispanic	2 (10)	3 (13)	3 (23)
Annual Household Income			
<25,000	15 (68)	16 (73)	15 (141)
25,000-49,999	21 (96)	25 (111)	23 (207)
50,000-74,999	17 (78)	18 (79)	17 (157)
75,000-99,999	25 (116)	20 (91)	23 (207)
100,000+	23 (109)	21 (96)	22 (205)
Insurance type			
HMO	50 (230)	41 (184)	46 (414)
PPO	35 (162)	37 (165)	36 (327)
Other	1 (5)	1 (6)	1 (11)
Don't Know	14 (64)	20 (89)	17 (153)
Physician-diagnosed allergies			
Peanut	35 (161)	24 (108)	30 (269)
Milk	22 (102)	19 (85)	21 (187)
Egg	16 (75)	11 (49)	14 (124)
Soy	8 (39)	9 (39)	9 (78)
Fin Fish	9 (42)	12 (52)	10 (94)
Shellfish	19 (86)	25 (112)	22 (198)
Wheat	6 (27)	10 (42)	8 (69)
Sting/Venom	32 (148)	46 (204)	39 (352)
Medication	16 (76)	46 (204)	31 (280)
Latex	10 (47)	17 (76)	14 (123)
Other	10 (43)	21 (92)	15 (135)
What is your current insurance deductible?			
\$1-100	12 (56)	15 (67)	14 (123)
\$101-500	13 (62)	15 (65)	14 (127)

\$501-1000	21 (95)	16 (73)	19 (168)
\$1001-2000	15 (68)	14 (62)	14 (130)
\$2001-3000	12 (56)	9 (38)	10 (94)
\$3001-5000	6 (28)	7 (31)	7 (59)
\$5001+	6 (27)	4 (19)	5 (46)
Don't know	5 (21)	10 (45)	7 (66)
No deductible	10 (47)	10 (43)	10 (90)
What is your current insurance co-pay for an EAI?			
\$1-10	15 (43)	19 (84)	17 (127)
\$11-20	8 (24)	8 (34)	8 (58)
\$21-30	8 (24)	8 (37)	8 (61)
\$31-40	8 (22)	6 (28)	7 (50)
\$41-50	12 (36)	8 (36)	10 (72)
\$51-60	10 (29)	7 (29)	8 (58)
\$61-70	5 (15)	4 (20)	5 (35)
\$71-80	10 (28)	6 (27)	7 (55)
\$81-90	6 (18)	3 (14)	4 (32)
\$91-100+	14 (42)	13 (59)	14 (101)
Don't know	4 (11)	13 (59)	9 (70)
No co-pay	2 (7)	4 (17)	3 (24)

Table 2. Epinephrine Carriage and Perceived Barriers

	<18 year olds (N=467)	18+ year olds (N=450)	All ages (N=917)
	% (N)	% (N)	% (N)
Did you fill your EAI prescription?			
Yes	85 (396)	93 (419)	89 (815)
No	15 (71)	7 (30)	11 (101)
If no, why?			
Already had 1+ EAI	17 (12)	10 (3)	15 (15)
Didn't think EAI was needed	25 (18)	17 (5)	23 (23)
Cost	15 (11)	47 (14)	25 (25)
Too bulky	8 (6)	3 (1)	7 (7)
Allergy not severe	8 (6)	23 (7)	13 (13)
No history of previous reaction	28 (20)	20 (6)	26 (26)
Other	6 (4)	10 (3)	7 (7)
How many EAIs do you typically carry with you?			
0	19 (86)	18 (79)	18 (165)
1	59 (269)	56 (250)	57 (519)
2	20 (93)	24 (107)	22 (200)
3	1 (4)	1 (6)	1 (10)
4	1 (5)	1 (5)	1 (10)
Don't Know	0 (1)	0 (1)	0 (2)
How often do you carry one or more individual EAIs with you?			
All of the time	45 (209)	42 (190)	44 (399)
Most of the time	22 (101)	25 (110)	23 (211)
Some of the time	12 (55)	12 (54)	12 (109)
Rarely	8 (36)	8 (37)	8 (73)
Never	11 (53)	11 (51)	11 (104)
Don't Know	2 (9)	1 (5)	2 (14)
Where do you typically store/carry your EAI?			
Parent carries (on person or in purse/bag)	62 (63)	N/A	62 (63)
On self (in person or in purse/bag)	51 (52)	84 (309)	77 (361)

In vehicle	26 (27)	30 (109)	29 (136)
Work/School	30 (31)	11 (39)	15 (70)
Other	1 (1)	4 (15)	3 (16)
Number of EAls typically carried/stored by parent on person or in purse/bag/backpack			
1	30 (19)	N/A	30 (19)
2	62 (39)	N/A	62 (39)
3	5 (3)	N/A	5 (3)
4	3 (2)	N/A	3 (2)
Number of EAls typically carried/stored on person or in purse/bag/backpack			
0	2 (1)	0 (0)	1 (1)
1	35 (18)	27 (29)	29 (47)
2	62 (31)	70 (76)	66 (107)
3	2 (1)	1 (1)	1 (2)
4	0 (0)	3 (3)	2 (3)
Number of EAls typically carried/stored in vehicle			
1	38 (10)	47 (21)	43 (31)
2	54 (14)	40 (18)	44 (32)
3	4 (1)	9 (4)	7 (5)
4	4 (1)	4 (2)	4 (3)
Number of EAls typically carried/stored at work or school			
0	0 (0)	5 (1)	2 (1)
1	30 (9)	60 (12)	41 (21)
2	57 (17)	30 (6)	45 (23)
3	10 (3)	0 (0)	6 (3)
4	3 (1)	5 (1)	4 (2)
Do you consider your insurance copayment/deductible to be a barrier to carrying an EAI?			
Yes	40 (120)	36 (160)	38 (280)

No	46 (138)	46 (204)	46 (342)
Somewhat	11 (32)	13 (57)	12 (89)
Don't know	3 (9)	5 (22)	4 (31)
Which of the following would be helpful to improve access to EAI when needed?			
Lowering cost	65 (198)	70 (316)	68 (514)
Increase availability of stock EAI	50 (151)	50 (224)	50 (375)
Increase public awareness about allergies	41 (126)	51 (228)	47 (354)
Which of the following would be helpful to improve understanding of when/how to use an EAI?			
More effective patient education during physician visits	62 (187)	60 (270)	61 (457)
More time spent educating patients	46 (139)	48 (215)	47 (354)
Educational videos available online	38 (114)	42 (187)	40 (301)
PSA and other mass media	35 (105)	44 (197)	40 (302)
In the past week, how often was an EAI available if needed (accessible within 5 minutes)?			
All of the time	53 (247)	49 (219)	51 (466)
Most of the time	20 (92)	24 (107)	22 (199)
Some of the time	10 (48)	11 (48)	10 (96)
Rarely	5 (23)	4 (19)	5 (42)
Never	9 (42)	11 (51)	10 (93)
Don't know	3 (12)	1 (4)	2 (16)
Does your place of work or school provide stock epinephrine auto-injectors? (Stock epinephrine is			

available in case of emergency and is not prescribed to an individual)			
Yes	52 (240)	38 (171)	45 (411)
No	48 (223)	61 (274)	54 (497)
If I experienced a severe allergic reaction at work or school I am confident that these stock epinephrine auto-injectors be available for my immediate use.			
Strongly disagree	5 (13)	9 (16)	7 (29)
Somewhat disagree	6 (15)	7 (12)	7 (27)
Neither disagree nor agree	9 (21)	4 (6)	7 (27)
Somewhat agree	29 (70)	34 (58)	31 (128)
Strongly agree	50 (121)	46 (79)	49 (200)

Table 3. Allergic Reaction and Epinephrine Use History

	<18 year olds (N=467)	18+ year olds (N=450)	All ages (N=917)
	% (N)	% (N)	% (N)
Has an EAI ever been used to treat an allergic reaction you were having?*			
Yes	57 (266)	69 (312)	65 (590)
No	39 (180)	27 (120)	34 (311)
Don't Know	5 (21)	4 (18)	1 (14)
Was an EAI used to treat the most severe allergic reaction that you've ever had?			
Yes	52 (239)	59 (263)	55 (502)
No	44 (204)	37 (166)	40 (370)
Don't Know	5 (21)	4 (18)	4 (39)
Substance eliciting most severe allergic reaction			
Peanut	24 (112)	16 (67)	20 (179)
Milk	15 (70)	10 (41)	13 (111)
Egg	9 (40)	5 (19)	7 (59)
Soy	3 (13)	4 (18)	4 (31)
Fin Fish	5 (24)	7 (27)	6 (51)
Shellfish	11 (50)	17 (72)	14 (122)
Wheat	3 (14)	2 (7)	2 (21)
Sting/Venom	22 (104)	34 (142)	28 (246)
Medication	7 (35)	23 (96)	15 (131)
Latex	3 (14)	8 (31)	5 (45)
Other	5 (25)	12 (51)	9 (76)
Number of organ systems involved in most severe allergic reaction^			
0	6 (30)	1 (5)	4 (35)
1	21 (98)	6 (26)	14 (124)
2	16 (73)	10 (45)	13 (118)
3	16 (75)	15 (66)	15 (141)
4+	41 (191)	68 (308)	55 (499)
In the past 12 months, how many allergic reactions have you			

experienced?			
0	38 (164)	23 (104)	30 (268)
1	32 (138)	28 (124)	30 (262)
2	16 (72)	22 (97)	18 (169)
3+	14 (63)	27 (122)	21 (185)
In the past 12 months, how many times have you visited a hospital emergency room for an allergic reaction?			
0	57 (256)	46 (205)	52 (461)
1	26 (118)	32 (142)	29 (260)
2	11 (50)	12 (53)	12 (103)
3+	6 (28)	10 (43)	8 (71)
In your lifetime, how many times have you visited a hospital emergency room for an allergic reaction?			
0	31 (140)	12 (55)	22 (195)
1	29 (131)	22 (96)	25 (22)
2	17 (78)	15 (68)	16 (146)
3	8 (37)	14 (61)	11 (98)
4	5 (24)	9 (41)	7 (65)
5	3 (12)	7 (29)	5 (41)
6	3 (12)	4 (19)	3 (31)
7+	4 (18)	17 (76)	10 (94)
Have you ever experienced a severe allergic reaction where an EAI was not used but you now believe an EAI would have been beneficial?			
Yes	62 (290)	52 (232)	41 (376)
No	31 (144)	39 (174)	51 (464)
Don't know	7 (31)	9 (41)	8 (72)
Thinking back to this prior severe allergic reaction, why was an EAI not used?			N=376
EAI wasn't available	41 (59)	47 (109)	45 (168)
Lack of knowledge how to use	25 (36)	19 (44)	21 (80)
Didn't think was	22 (32)	28 (66)	26 (98)

necessary			
Feared would escalate situation	14 (20)	11 (25)	12 (45)
Allergy undiagnosed	35 (50)	36 (83)	35 (133)
*(Excluding epinephrine administered in the ER)			
^Calculated via participant report of 35 possible symptoms accompanying their most severe allergic reaction.			
Symptoms were classified within skin, oral, gastrointestinal, cardiovascular, and/or respiratory systems			

Table 4. EAI Perceptions, Knowledge, and Psychosocial Aspects of Anaphylaxis Management

	<18 year olds (N=467)	18+ year olds (N=450)	All ages (N=917)
	% (N)	% (N)	% (N)
Mean Food Allergy Independent Measure Score (95%CI)			
	3.15 (1.35)	3.26 (3.14-3.37)	3.20 (1.29)
Carrying epinephrine makes me feel safer in social situations involving my allergen			
Strongly disagree	5 (24)	4 (20)	5 (44)
Somewhat disagree	6 (28)	6 (28)	6 (56)
Neither disagree nor agree	18 (84)	16 (74)	17 (158)
Somewhat agree	30 (139)	24 (106)	27 (245)
Strongly agree	41 (188)	49 (219)	44 (407)
Carrying epinephrine improves my quality of life			
Strongly disagree	5 (22)	4 (16)	4 (38)
Somewhat disagree	6 (27)	4 (17)	5 (44)
Neither disagree nor agree	23 (107)	26 (118)	25 (225)
Somewhat agree	28 (131)	30 (133)	29 (264)
Strongly agree	38 (177)	36 (161)	37 (338)
Remembering to carry an EAI is often difficult for me			
Strongly disagree	25 (115)	22 (100)	23 (215)
Somewhat disagree	18 (85)	19 (84)	18 (169)
Neither disagree nor agree	21 (97)	18 (82)	20 (179)
Somewhat agree	22 (101)	26 (119)	24 (22)
Strongly agree	14 (65)	14 (61)	14 (126)
Many of my friends and family carry an EAI for their own allergies			
Strongly disagree	15 (68)	25 (114)	20 (182)
Somewhat disagree	13 (61)	17 (11)	15 (138)
Neither disagree nor agree	31 (144)	26 (116)	28 (260)

Somewhat agree	25 (117)	19 (84)	22 (201)
Strongly agree	16 (74)	13 (56)	14 (130)
I know the steps to use an EAI			
Strongly disagree	2 (7)	2 (7)	2 (14)
Somewhat disagree	3 (14)	2 (11)	3 (25)
Neither disagree nor agree	14 (63)	7 (32)	10 (95)
Somewhat agree	26 (122)	26 (115)	16 (237)
Strongly agree	55 (255)	62 (279)	58 (534)
I know how to recognize the signs and symptoms of a severe allergic reaction			
Strongly disagree	2 (9)	1 (6)	2 (15)
Somewhat disagree	4 (19)	1 (6)	3 (25)
Neither disagree nor agree	11 (49)	6 (27)	8 (76)
Somewhat agree	27 (125)	29 (132)	28 (257)
Strongly agree	56 (621)	61 (276)	59 (537)
I feel I will be accidentally exposed to my allergen at some point in the future			
Strongly disagree	4 (20)	4 (19)	4 (39)
Somewhat disagree	6 (30)	7 (33)	7 (63)
Neither disagree nor agree	24 (112)	20 (88)	22 (200)
Somewhat agree	33 (115)	34 (154)	34 (309)
Strongly agree	32 (146)	34 (152)	33 (298)
I feel I will have a severe reaction if I am accidentally exposed to my allergen			
Strongly disagree	6 (27)	3 (14)	4 (41)
Somewhat disagree	7 (33)	8 (36)	8 (69)
Neither disagree nor agree	24 (111)	18 (80)	21 (191)
Somewhat agree	33 (154)	35 (158)	34 (312)
Strongly agree	30 (139)	35 (157)	32 (296)
I would be able to			

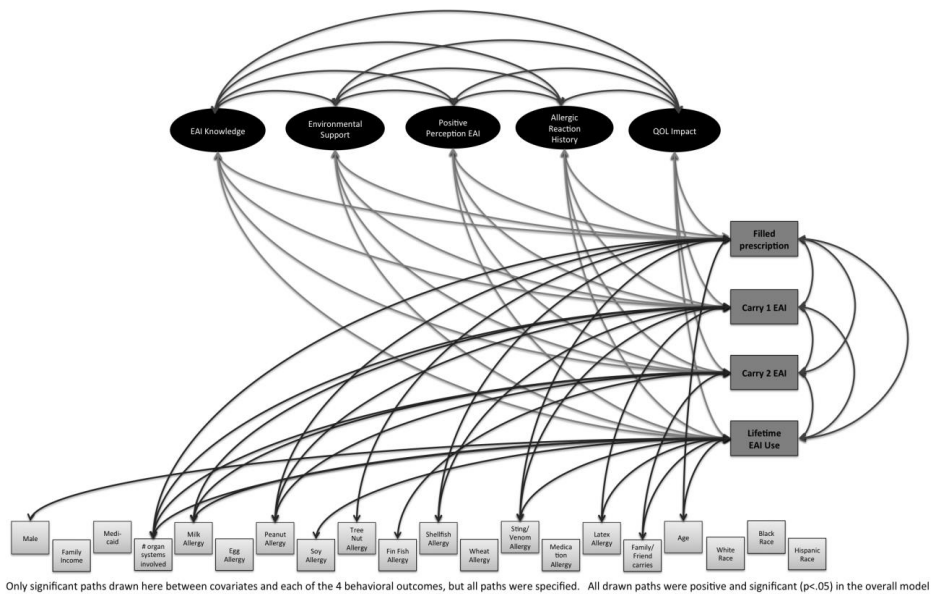
effectively use an EAI if I had a severe allergic reaction			
Strongly disagree	2 (10)	2 (8)	2 (18)
Somewhat disagree	3 (12)	2 (9)	2 (21)
Neither disagree nor agree	12 (54)	9 (42)	10 (96)
Somewhat agree	26 (122)	26 (115)	16 (237)
Strongly agree	57 (264)	60 (271)	58 (535)

Table 5. Estimates from structural equation model of EAI prescription filling, carriage and use determinants

CHILDREN/ADOLESCENTS				ADULTS			
Construct Assessed	B	SE	P	Construct Assessed	B	SE	P
Measurement Model				Measurement Model			
Indicators of EAI KNOWLEDGE				Indicators of EAI KNOWLEDGE			
<i>I would be able to effectively use an EAI if I had a severe allergic reaction.</i>	0.942	0.012	0.000	<i>I would be able to effectively use an EAI if I had a severe allergic reaction.</i>	0.854	0.021	0.000
<i>I know how to recognize the signs and symptoms of a severe allergic reaction.</i>	0.885	0.015	0.000	<i>I know how to recognize the signs and symptoms of a severe allergic reaction.</i>	0.834	0.020	0.000
<i>I know the steps to use an EAI</i>	0.946	0.010	0.000	<i>I know the steps to use an EAI</i>	0.880	0.020	0.000
Indicators of ENVIRONMENTAL SUPPORT				Indicators of ENVIRONMENTAL SUPPORT			
<i>If I experienced a severe allergic reaction at work or school I am confident that stock epinephrine auto-injectors be available</i>	0.672	0.053	0.000	<i>If I experienced a severe allergic reaction at work or school I am confident that stock epinephrine auto-injectors be available</i>	0.694	0.062	0.000
<i>My friends and family support me in the management of my allergy.</i>	0.876	0.048	0.000	<i>My friends and family support me in the management of my allergy.</i>	0.903	0.090	0.000
Indicators of POSITIVE ATTITUDES TOWARD EAI CARRIAGE				Indicators of POSITIVE ATTITUDES TOWARD EAI CARRIAGE			
<i>Carrying epinephrine makes me feel safer in social situations involving my allergen</i>	0.832	0.020	0.000	<i>Carrying epinephrine makes me feel safer in social situations involving my allergen</i>	0.858	0.020	0.000
<i>Carrying epinephrine improves my quality of life</i>	0.877	0.016	0.000	<i>Carrying epinephrine improves my quality of life</i>	0.856	0.020	0.000
Indicators of ALLERGIC REACTION HISTORY				Indicators of ALLERGIC REACTION HISTORY			
<i>In the past 12 months, how many allergic reactions have you experienced?</i>	0.701	0.032	0.000	<i>In the past 12 months, how many allergic reactions have you experienced?</i>	0.554	0.039	0.000
<i>In your lifetime how many times have you visited a hospital emergency room for an allergic reaction?</i>	0.864	0.029	0.000	<i>In your lifetime how many times have you visited a hospital emergency room for an allergic reaction?</i>	0.686	0.037	0.000
<i>In the past 12 months, how many times have you visited a hospital emergency room for an allergic reaction?</i>	0.854	0.031	0.000	<i>In the past 12 months, how many times have you visited a hospital emergency room for an allergic reaction?</i>	0.875	0.037	0.000
Indicators of FOOD ALLERGY-RELATED QUALITY OF LIFE				Indicators of FOOD ALLERGY-RELATED QUALITY OF LIFE			
<i>My allergy affects the things I do with others</i>	0.759	0.041	0.000	<i>My allergy affects the things I do with others</i>	0.704	0.035	0.000
<i>My allergy affects the things I do with my family</i>	0.636	0.042	0.000	<i>My allergy affects the things I do with my family</i>	0.655	0.038	0.000
<i>Food Allergy Independent Measure</i>	0.705	0.037	0.000	<i>Food Allergy Independent Measure</i>	0.690	0.038	0.000
Structural Model				Structural Model			
Filled EAI Prescription <-->				Filled EAI Prescription <-->			
EAI KNOWLEDGE	0.502	0.061	0.000	EAI KNOWLEDGE	0.032	0.111	0.775
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.372	0.075	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.263	0.099	0.008
ALLERGIC REACTION HISTORY	0.609	0.070	0.000	ALLERGIC REACTION HISTORY	0.205	0.100	0.041
FOOD ALLERGY-RELATED QUALITY OF LIFE	0.115	0.090	0.199	FOOD ALLERGY-RELATED QUALITY OF LIFE	0.235	0.112	0.037
ENVIRONMENTAL SUPPORT	0.411	0.087	0.000	ENVIRONMENTAL SUPPORT	0.235	0.118	0.047
Typically carry 2+ EAI <-->				Typically carry 2+ EAI <-->			
EAI KNOWLEDGE	0.213	0.077	0.006	EAI KNOWLEDGE	0.010	0.073	0.895
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.324	0.071	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.334	0.068	0.000
ALLERGIC REACTION HISTORY	0.406	0.073	0.000	ALLERGIC REACTION HISTORY	0.467	0.067	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE	0.396	0.084	0.000	FOOD ALLERGY-RELATED QUALITY OF LIFE	0.242	0.078	0.002
ENVIRONMENTAL SUPPORT	0.248	0.081	0.002	ENVIRONMENTAL SUPPORT	0.115	0.080	0.152
Lifetime History of EAI Use <-->				Lifetime History of EAI Use <-->			
EAI KNOWLEDGE	0.193	0.069	0.005	EAI KNOWLEDGE	0.142	0.072	0.048
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.449	0.082	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.465	0.061	0.000
ALLERGIC REACTION HISTORY	0.752	0.041	0.000	ALLERGIC REACTION HISTORY	0.805	0.043	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE	0.299	0.072	0.000	FOOD ALLERGY-RELATED QUALITY OF LIFE	0.455	0.071	0.000
ENVIRONMENTAL SUPPORT	0.357	0.073	0.000	ENVIRONMENTAL SUPPORT	0.278	0.080	0.001
Typically Carry 1+ EAI <-->				Typically Carry 1+ EAI <-->			
EAI KNOWLEDGE	0.428	0.064	0.000	EAI KNOWLEDGE	0.209	0.080	0.009
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.577	0.060	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.684	0.052	0.000
ALLERGIC REACTION HISTORY	0.667	0.047	0.000	ALLERGIC REACTION HISTORY	0.676	0.056	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE	0.356	0.083	0.000	FOOD ALLERGY-RELATED QUALITY OF LIFE	0.327	0.082	0.000
ENVIRONMENTAL SUPPORT	0.467	0.072	0.000	ENVIRONMENTAL SUPPORT	0.397	0.088	0.000
ENVIRONMENTAL SUPPORT <-->				ENVIRONMENTAL SUPPORT <-->			
EAI KNOWLEDGE	0.807	0.047	0.000	EAI KNOWLEDGE	0.621	0.070	0.000
POSITIVE ATTITUDES TOWARD EAI CARRIAGE <-->				POSITIVE ATTITUDES TOWARD EAI CARRIAGE <-->			
EAI KNOWLEDGE	0.668	0.038	0.000	EAI KNOWLEDGE	0.573	0.048	0.000
ENVIRONMENTAL SUPPORT	0.901	0.051	0.000	ENVIRONMENTAL SUPPORT	0.754	0.079	0.000
ALLERGIC REACTION HISTORY <-->				ALLERGIC REACTION HISTORY <-->			
EAI KNOWLEDGE	0.197	0.063	0.002	EAI KNOWLEDGE	0.013	0.066	0.843
ENVIRONMENTAL SUPPORT	0.356	0.069	0.000	ENVIRONMENTAL SUPPORT	0.231	0.073	0.001
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.424	0.053	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.424	0.056	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE <-->				FOOD ALLERGY-RELATED QUALITY OF LIFE <-->			
EAI KNOWLEDGE	0.195	0.063	0.002	EAI KNOWLEDGE	0.167	0.064	0.009
ENVIRONMENTAL SUPPORT	0.375	0.071	0.000	ENVIRONMENTAL SUPPORT	0.435	0.073	0.000
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.642	0.050	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.694	0.049	0.000
ALLERGIC REACTION HISTORY	0.393	0.063	0.000	ALLERGIC REACTION HISTORY	0.613	0.060	0.000

Filled EAI Prescription <-->				Filled EAI Prescription <-->			
Male Gender	0.058	0.089	0.513	Male Gender	0.096	0.119	0.420
White Race	-0.040	0.104	0.697	White Race	0.239	0.113	0.085
Black Race	0.100	0.130	0.442	Black Race	0.253	0.106	0.015
Hispanic Race	0.127	0.140	0.363	Hispanic Race	-0.252	0.130	0.053
Milk Allergy	0.155	0.112	0.164	Milk Allergy	0.082	0.171	0.632
Egg Allergy	0.211	0.136	0.123	Egg Allergy	0.052	0.216	0.809
Peanut Allergy	0.423	0.069	0.000	Peanut Allergy	0.052	0.146	0.857
Soy Allergy	-0.003	0.183	0.985	Soy Allergy	-0.141	0.191	0.458
Tree Nut Allergy	0.440	0.145	0.002	Tree Nut Allergy	0.051	0.156	0.742
Fin Fish Allergy	0.418	0.172	0.015	Fin Fish Allergy	-0.155	0.168	0.357
Shellfish Allergy	0.475	0.129	0.001	Shellfish Allergy	0.036	0.144	0.697
Wheat Allergy	-0.106	0.169	0.533	Wheat Allergy	0.185	0.248	0.456
Insect Sting Allergy	0.445	0.099	0.000	Insect Sting Allergy	0.014	0.124	0.912
Medication Allergy	0.266	0.147	0.069	Medication Allergy	-0.104	0.253	0.417
Latex Allergy	0.018	0.182	0.923	Latex Allergy	0.294	0.333	0.377
Many friends/family carry an EAI for their allergies.	-0.006	0.078	0.939	Many friends/family carry an EAI for their allergies.	-0.087	0.110	0.428
Age	0.089	0.061	0.001	Age	-0.105	0.075	0.161
Household Income	0.080	0.004	0.000	Household Income	0.076	0.086	0.372
Medicaid Insurance	-0.129	0.109	0.238	Medicaid Insurance	-0.121	0.120	0.312
# of Organ Systems Involved in Most Severe Rxn	0.575	0.044	0.000	# of Organ Systems Involved in Most Severe Rxn	0.029	0.093	0.398
Typically carry 2+ EAI	0.489	0.103	0.000	Typically carry 2+ EAI	0.389	0.132	0.003
Lifetime History of EAI Use	0.615	0.078	0.000	Lifetime History of EAI Use	0.374	0.104	0.000
Typically carry 1+ EAI	0.791	0.051	0.000	Typically carry 1+ EAI	0.710	0.074	0.000
Typically carry 2+ EAI <-->				Typically carry 2+ EAI <-->			
Male Gender	0.086	0.080	0.284	Male Gender	0.161	0.079	0.042
White Race	0.078	0.096	0.416	White Race	-0.059	0.086	0.491
Black Race	0.010	0.124	0.938	Black Race	0.100	0.129	0.438
Hispanic Race	0.258	0.133	0.053	Hispanic Race	0.110	0.102	0.281
Milk Allergy	0.313	0.100	0.002	Milk Allergy	0.418	0.095	0.000
Egg Allergy	0.184	0.111	0.095	Egg Allergy	0.081	0.141	0.566
Peanut Allergy	0.272	0.085	0.001	Peanut Allergy	0.137	0.098	0.160
Soy Allergy	0.206	0.158	0.191	Soy Allergy	-0.055	0.150	0.715
Tree Nut Allergy	0.188	0.108	0.083	Tree Nut Allergy	0.104	0.104	0.317
Fin Fish Allergy	0.219	0.125	0.079	Fin Fish Allergy	0.264	0.116	0.025
Shellfish Allergy	0.041	0.108	0.701	Shellfish Allergy	0.203	0.094	0.030
Wheat Allergy	0.115	0.162	0.475	Wheat Allergy	0.190	0.190	0.317
Insect Sting Allergy	0.000	0.099	0.998	Insect Sting Allergy	-0.030	0.087	0.730
Medication Allergy	-0.217	0.131	0.947	Medication Allergy	-0.039	0.093	0.678
Latex Allergy	0.011	0.166	0.947	Latex Allergy	0.165	0.120	0.168
Many friends/family carry an EAI for their allergies.	0.181	0.071	0.011	Many friends/family carry an EAI for their allergies.	0.245	0.063	0.000
Age	-0.025	0.069	0.714	Age	-0.130	0.068	0.000
Household Income	0.121	0.076	0.114	Household Income	0.099	0.065	0.131
Medicaid Insurance	-0.110	0.105	0.296	Medicaid Insurance	0.122	0.085	0.149
# of Organ Systems Involved in Most Severe Rxn	0.235	0.079	0.003	# of Organ Systems Involved in Most Severe Rxn	0.163	0.068	0.017
Lifetime History of EAI Use	0.262	0.087	0.002	Lifetime History of EAI Use	0.243	0.083	0.003
Typically carry 1+ EAI	0.745	0.192	0.000	Typically carry 1+ EAI	0.766	0.117	0.000
Lifetime History of EAI Use <-->				Lifetime History of EAI Use <-->			
Male Gender	-0.030	0.075	0.691	Male Gender	0.380	0.073	0.000
White Race	-0.041	0.084	0.628	White Race	-0.079	0.085	0.349
Black Race	0.158	0.113	0.079	Black Race	0.056	0.132	0.674
Hispanic Race	0.061	0.102	0.548	Hispanic Race	0.139	0.104	0.183
Milk Allergy	0.195	0.094	0.049	Milk Allergy	-0.440	0.111	0.000
Egg Allergy	0.076	0.106	0.476	Egg Allergy	0.205	0.147	0.165
Peanut Allergy	0.190	0.081	0.019	Peanut Allergy	0.368	0.095	0.000
Soy Allergy	0.207	0.157	0.187	Soy Allergy	-0.227	0.158	0.007
Tree Nut Allergy	0.174	0.105	0.096	Tree Nut Allergy	0.055	0.104	0.595
Fin Fish Allergy	0.187	0.124	0.130	Fin Fish Allergy	0.403	0.132	0.002
Shellfish Allergy	0.390	0.094	0.000	Shellfish Allergy	0.138	0.097	0.152
Wheat Allergy	-0.066	0.152	0.664	Wheat Allergy	0.005	0.201	0.882
Insect Sting Allergy	0.175	0.085	0.039	Insect Sting Allergy	0.119	0.084	0.156
Medication Allergy	-0.092	0.112	0.414	Medication Allergy	-0.162	0.087	0.064
Latex Allergy	0.139	0.154	0.366	Latex Allergy	0.219	0.124	0.078
Many friends/family carry an EAI for their allergies.	0.325	0.060	0.000	Many friends/family carry an EAI for their allergies.	0.301	0.065	0.000
Age	0.140	0.068	0.017	Age	-0.075	0.062	0.229
Household Income	-0.087	0.065	0.184	Household Income	0.057	0.064	0.370
Medicaid Insurance	0.093	0.089	0.293	Medicaid Insurance	0.015	0.085	0.857
# of Organ Systems Involved in Most Severe Rxn	0.478	0.086	0.000	# of Organ Systems Involved in Most Severe Rxn	0.312	0.061	0.000
Typically carry 1+ EAI	0.642	0.067	0.000	Typically carry 1+ EAI	0.589	0.066	0.000
Typically Carry 1+ EAI <-->				Typically Carry 1+ EAI <-->			
Male Gender	0.034	0.085	0.880	Male Gender	0.235	0.087	0.007
White Race	0.021	0.104	0.840	White Race	0.030	0.094	0.749
Black Race	0.034	0.143	0.814	Black Race	0.351	0.167	0.036
Hispanic Race	0.068	0.118	0.806	Hispanic Race	-0.191	0.106	0.072
Milk Allergy	0.178	0.100	0.304	Milk Allergy	0.263	0.134	0.050
Egg Allergy	0.348	0.129	0.124	Egg Allergy	-0.071	0.154	0.645
Peanut Allergy	0.343	0.091	0.000	Peanut Allergy	0.415	0.114	0.000
Soy Allergy	0.058	0.177	0.741	Soy Allergy	0.124	0.171	0.469
Tree Nut Allergy	0.221	0.122	0.069	Tree Nut Allergy	0.010	0.117	0.932
Fin Fish Allergy	0.267	0.160	0.005	Fin Fish Allergy	-0.098	0.137	0.475
Shellfish Allergy	0.330	0.119	0.004	Shellfish Allergy	0.049	0.109	0.651
Wheat Allergy	0.089	0.179	0.741	Wheat Allergy	-0.159	0.209	0.440
Insect Sting Allergy	0.314	0.096	0.001	Insect Sting Allergy	0.165	0.095	0.083
Medication Allergy	0.085	0.133	0.519	Medication Allergy	-0.055	0.100	0.581
Latex Allergy	0.059	0.181	0.744	Latex Allergy	0.401	0.159	0.012
Many friends/family carry an EAI for their allergies.	0.076	0.078	0.332	Many friends/family carry an EAI for their allergies.	0.152	0.071	0.033
Age	0.050	0.060	0.463	Age	-0.062	0.061	0.308
Household Income	0.052	0.078	0.505	Household Income	0.097	0.068	0.155
Medicaid Insurance	-0.175	0.102	0.087	Medicaid Insurance	-0.023	0.094	0.808
# of Organ Systems Involved in Most Severe Rxn	0.532	0.054	0.000	# of Organ Systems Involved in Most Severe Rxn	0.137	0.069	0.047
White Race <-->				White Race <-->			
Black Race	-0.909	0.054	0.000	Black Race	-0.876	0.040	0.000
Hispanic Race	-0.938	0.043	0.000	Hispanic Race	-0.952	0.024	0.000
Household Income	0.297	0.068	0.000	Household Income	0.210	0.065	0.001
Black Race <-->				Black Race <-->			
Hispanic Race	-0.413	0.186	0.026	Hispanic Race	-0.368	0.113	0.001
Household Income	-0.380	0.093	0.000	Household Income	-0.195	0.101	0.055
Household Income <-->				Household Income <-->			
Medicaid Insurance	-0.499	0.055	0.000	Medicaid Insurance	-0.559	0.043	0.000
My allergy affects the things I do with others <-->				My allergy affects the things I do with others <-->			
My allergy affects the things I do with my family	0.784	0.030	0.000	My allergy affects the things I do with my family	0.835	0.020	0.000

Figure 1. Graphical Representation of Overall Structural Equation Model



Comparing epinephrine auto-injector practices and their predictors between Children (ages 0-12) and Adolescents (ages 13-17)

Numerous studies have focused on EAI carriage behaviors among adolescents, who have been shown to be at elevated risk of fatal allergic reactions^{A1-A2} and are believed to differ substantially from younger children and adults in their anaphylaxis management behaviors^{A3}. For this reason, in the current study, we deliberately oversampled adolescents (aged 13-17 years) to ensure adequate sample size for comparisons with younger children (0-12 years) and adults (18+ years). Surprisingly, while adolescents were significantly less likely to report filling their EAI prescriptions relative to young children (11% vs. 18%; $p < 0.05$), no significant differences were identified regarding the frequency of EAI carriage or use. Furthermore, with few exceptions, the relative distributions of other predictors and covariates and their conditional effects on our target anaphylaxis management outcomes did not differ substantially between adolescents and younger children. This apparent similarity was confirmed by empirical model comparison tests, which led us to collapse adolescents and children into a single <18 years of age category for comparison with adults in our multiple group SEM model. As seen in Supplemental Table 1, the few SEM model parameters which differed substantially between younger children and adolescents included the following: **1)** EAI carriage was positively associated with family/friends' EAI carriage behavior among adolescents, but not younger children ($\beta = 0.18$ vs. $\beta = 0.001$); and **2)** The relative effect of environmental support on FAQoL was significantly greater for adolescents relative to younger children ($\beta = 0.50$ vs. $\beta = 0.30$). These findings are consistent with the idea that adolescence is a period during which peer influences on psychosocial wellbeing and behavior are paramount and suggests that efforts to improve peer support for anaphylaxis management may be particularly beneficial for adolescents.

REFERENCES

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- ^{A2} Bock SA, Muñoz-Furlong A, Sampson HA. Further fatalities caused by anaphylactic reactions to food, 2001-2006. *Journal of Allergy and Clinical Immunology*. 2007 Apr 30;119(4):1016-8.
- ^{A3} Marrs T, Lack G. Why do few food - allergic adolescents treat anaphylaxis with adrenaline? - reviewing a pressing issue. *Pediatric Allergy and Immunology*. 2013 May 1;24(3):222-9.

Supplementary Table 1. Child- and Adolescent-specific estimates from structural equation model of EAI prescription filling, carriage and use determinants

CHILDREN (0-12 YEARS)				ADOLESCENTS (13-17 YEARS)			
Construct Assessed	B	SE	P	Construct Assessed	B	SE	P
Measurement Model				Measurement Model			
Indicators of EAI KNOWLEDGE				Indicators of EAI KNOWLEDGE			
<i>I would be able to effectively use an EAI if I had a severe allergic reaction.</i>	0.936	0.016	0.000	<i>I would be able to effectively use an EAI if I had a severe allergic reaction.</i>	0.951	0.016	0.000
<i>I know how to recognize the signs and symptoms of a severe allergic reaction.</i>	0.872	0.021	0.000	<i>I know how to recognize the signs and symptoms of a severe allergic reaction.</i>	0.907	0.020	0.000
<i>I know the steps to use an EAI</i>	0.939	0.016	0.000	<i>I know the steps to use an EAI</i>	0.950	0.014	0.000
Indicators of ENVIRONMENTAL SUPPORT				Indicators of ENVIRONMENTAL SUPPORT			
<i>If I experienced a severe allergic reaction at work or school I am confident that stock epinephrine auto-injectors be available</i>	0.691	0.057	0.000	<i>If I experienced a severe allergic reaction at work or school I am confident that stock epinephrine auto-injectors be available</i>	0.603	0.078	0.000
<i>My friends and extended family support me in the management of my allergy.</i>	0.948	0.055	0.000	<i>My friends and extended family support me in the management of my allergy.</i>	0.767	0.092	0.000
Indicators of POSITIVE ATTITUDES TOWARD EAI CARRIAGE				Indicators of POSITIVE ATTITUDES TOWARD EAI CARRIAGE			
<i>Carrying epinephrine makes me feel safer in social situations involving my allergen</i>	0.804	0.026	0.000	<i>Carrying epinephrine makes me feel safer in social situations involving my allergen</i>	0.865	0.025	0.000
<i>Carrying epinephrine improves my quality of life</i>	0.871	0.023	0.000	<i>Carrying epinephrine improves my quality of life</i>	0.892	0.021	0.000
Indicators of ALLERGIC REACTION HISTORY				Indicators of ALLERGIC REACTION HISTORY			
<i>In the past 12 months, how many allergic reactions have you experienced?</i>	0.663	0.039	0.000	<i>In the past 12 months, how many allergic reactions have you experienced?</i>	0.752	0.044	0.000
<i>In your lifetime how many times have you visited a hospital emergency room for an allergic reaction?</i>	0.862	0.039	0.000	<i>In your lifetime how many times have you visited a hospital emergency room for an allergic reaction?</i>	0.860	0.039	0.000
<i>In the past 12 months, how many times have you visited a hospital emergency room for an allergic reaction?</i>	0.860	0.035	0.000	<i>In the past 12 months, how many times have you visited a hospital emergency room for an allergic reaction?</i>	0.855	0.050	0.000
Indicators of FOOD ALLERGY-RELATED QUALITY OF LIFE				Indicators of FOOD ALLERGY-RELATED QUALITY OF LIFE			
<i>My allergy affects the things I do with others</i>	0.790	0.048	0.000	<i>My allergy affects the things I do with others</i>	0.718	0.055	0.000
<i>My allergy affects the things I do with my family</i>	0.666	0.049	0.000	<i>My allergy affects the things I do with my family</i>	0.592	0.056	0.000
<i>Food Allergy Independent Measure</i>	0.748	0.044	0.000	<i>Food Allergy Independent Measure</i>	0.659	0.048	0.000
Structural Model				Structural Model			
Filled EAI Prescription <-->				Filled EAI Prescription <-->			
EAI KNOWLEDGE	0.489	0.078	0.000	EAI KNOWLEDGE	0.514	0.089	0.000
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.344	0.098	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.419	0.101	0.000
ALLERGIC REACTION HISTORY	0.623	0.089	0.000	ALLERGIC REACTION HISTORY	0.599	0.093	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE	0.186	0.118	0.115	FOOD ALLERGY-RELATED QUALITY OF LIFE	0.015	0.117	0.898
ENVIRONMENTAL SUPPORT	0.460	0.103	0.000	ENVIRONMENTAL SUPPORT	0.336	0.141	0.017
Typically carry 2+ EAI <-->				Typically carry 2+ EAI <-->			
EAI KNOWLEDGE	0.302	0.092	0.001	EAI KNOWLEDGE	0.096	0.124	0.436
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.341	0.089	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.311	0.110	0.005
ALLERGIC REACTION HISTORY	0.329	0.101	0.001	ALLERGIC REACTION HISTORY	0.492	0.102	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE	0.232	0.115	0.044	FOOD ALLERGY-RELATED QUALITY OF LIFE	0.614	0.108	0.000
ENVIRONMENTAL SUPPORT	0.301	0.099	0.002	ENVIRONMENTAL SUPPORT	0.175	0.141	0.214
Lifetime History of EAI Use <-->				Lifetime History of EAI Use <-->			
EAI KNOWLEDGE	0.173	0.087	0.047	EAI KNOWLEDGE	0.206	0.094	0.028
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.405	0.083	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.501	0.083	0.000
ALLERGIC REACTION HISTORY	0.749	0.050	0.000	ALLERGIC REACTION HISTORY	0.764	0.063	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE	0.317	0.093	0.001	FOOD ALLERGY-RELATED QUALITY OF LIFE	0.293	0.106	0.006
ENVIRONMENTAL SUPPORT	0.266	0.088	0.003	ENVIRONMENTAL SUPPORT	0.497	0.119	0.000
Typically Carry 1+ EAI <-->				Typically Carry 1+ EAI <-->			
EAI KNOWLEDGE	0.407	0.088	0.000	EAI KNOWLEDGE	0.453	0.081	0.000
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.592	0.077	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.554	0.080	0.000
ALLERGIC REACTION HISTORY	0.666	0.065	0.000	ALLERGIC REACTION HISTORY	0.672	0.065	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE	0.339	0.110	0.002	FOOD ALLERGY-RELATED QUALITY OF LIFE	0.393	0.106	0.000
ENVIRONMENTAL SUPPORT	0.491	0.081	0.000	ENVIRONMENTAL SUPPORT	0.455	0.126	0.000
ENVIRONMENTAL SUPPORT <-->				ENVIRONMENTAL SUPPORT <-->			
EAI KNOWLEDGE	0.793	0.050	0.000	EAI KNOWLEDGE	0.846	0.103	0.000
POSITIVE ATTITUDES TOWARD EAI CARRIAGE <-->				POSITIVE ATTITUDES TOWARD EAI CARRIAGE <-->			
EAI KNOWLEDGE	0.695	0.048	0.000	EAI KNOWLEDGE	0.635	0.055	0.000
ENVIRONMENTAL SUPPORT	0.850	0.052	0.000	ENVIRONMENTAL SUPPORT	1.008	0.124	0.000
ALLERGIC REACTION HISTORY <-->				ALLERGIC REACTION HISTORY <-->			
EAI KNOWLEDGE	0.331	0.070	0.000	EAI KNOWLEDGE	0.048	0.091	0.596
ENVIRONMENTAL SUPPORT	0.398	0.083	0.000	ENVIRONMENTAL SUPPORT	0.317	0.120	0.008
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.503	0.067	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.337	0.081	0.000
FOOD ALLERGY-RELATED QUALITY OF LIFE <-->				FOOD ALLERGY-RELATED QUALITY OF LIFE <-->			
EAI KNOWLEDGE	0.244	0.082	0.003	EAI KNOWLEDGE	0.131	0.091	0.147
ENVIRONMENTAL SUPPORT	0.299	0.082	0.000	ENVIRONMENTAL SUPPORT	0.498	0.130	0.000
POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.660	0.062	0.000	POSITIVE ATTITUDES TOWARD EAI CARRIAGE	0.626	0.078	0.000
ALLERGIC REACTION HISTORY	0.378	0.079	0.000	ALLERGIC REACTION HISTORY	0.408	0.091	0.000

Filled EAI Prescription <-->				Filled EAI Prescription <-->			
Male Gender	0.052	0.117	0.657	Male Gender	0.021	0.145	0.885
White Race	-0.024	0.126	0.852	White Race	-0.133	0.160	0.406
Black Race	-0.071	0.168	0.672	Black Race	0.342	0.205	0.095
Hispanic Race	0.190	0.148	0.200	Hispanic Race	0.040	0.201	0.843
Milk Allergy	0.181	0.151	0.231	Milk Allergy	0.101	0.177	0.566
Egg Allergy	0.164	0.164	0.317	Egg Allergy	0.285	0.193	0.141
Peanut Allergy	0.429	0.122	0.000	Peanut Allergy	0.463	0.167	0.005
Soy Allergy	0.169	0.223	0.448	Soy Allergy	-0.315	0.293	0.282
Tree Nut Allergy	0.509	0.230	0.027	Tree Nut Allergy	0.210	0.218	0.336
Fin Fish Allergy	0.343	0.179	0.056	Fin Fish Allergy	0.268	0.188	0.153
Shellfish Allergy	0.435	0.211	0.039	Shellfish Allergy	0.365	0.190	0.054
Wheat Allergy	-0.262	0.199	0.188	Wheat Allergy	0.096	0.135	0.475
Insect Sting Allergy	0.387	0.131	0.003	Insect Sting Allergy	0.518	0.155	0.001
Medication Allergy	0.324	0.192	0.092	Medication Allergy	0.180	0.223	0.421
Latex Allergy	0.109	0.237	0.646	Latex Allergy	-0.108	0.271	0.690
Many friends/family carry an EAI for their allergies.	0.048	0.112	0.666	Many friends/family carry an EAI for their allergies.	-0.045	0.087	0.606
Age	0.192	0.083	0.020	Age	0.035	0.124	0.777
Household Income	0.098	0.095	0.299	Household Income	0.034	0.119	0.773
Medicaid Insurance	-0.126	0.138	0.363	Medicaid Insurance	-0.161	0.144	0.264
# of Organ Systems Involved in Most Severe Rxn	0.550	0.059	0.000	# of Organ Systems Involved in Most Severe Rxn	0.595	0.060	0.000
Typically carry 2+ EAI	0.518	0.130	0.000	Typically carry 2+ EAI	0.454	0.167	0.007
Lifetime History of EAI Use	0.618	0.094	0.000	Lifetime History of EAI Use	0.597	0.111	0.000
Typically carry 1+ EAI	0.748	0.072	0.000	Typically carry 1+ EAI	0.868	0.056	0.000
Typically carry 2+ EAI <-->				Typically carry 2+ EAI <-->			
Male Gender	0.094	0.105	0.370	Male Gender	0.084	0.127	0.509
White Race	0.045	0.123	0.715	White Race	0.134	0.146	0.360
Black Race	0.011	0.172	0.950	Black Race	0.011	0.174	0.950
Hispanic Race	-0.259	0.154	0.093	Hispanic Race	-0.259	0.236	0.273
Milk Allergy	0.128	0.134	0.339	Milk Allergy	0.496	0.129	0.000
Egg Allergy	0.074	0.142	0.603	Egg Allergy	0.355	0.178	0.046
Peanut Allergy	0.306	0.112	0.006	Peanut Allergy	0.223	0.132	0.091
Soy Allergy	0.229	0.190	0.227	Soy Allergy	0.141	0.296	0.635
Tree Nut Allergy	0.304	0.138	0.027	Tree Nut Allergy	0.011	0.175	0.950
Fin Fish Allergy	0.188	0.178	0.291	Fin Fish Allergy	0.253	0.171	0.140
Shellfish Allergy	0.105	0.165	0.524	Shellfish Allergy	0.005	0.145	0.971
Wheat Allergy	0.079	0.224	0.725	Wheat Allergy	0.157	0.232	0.499
Insect Sting Allergy	0.139	0.131	0.288	Insect Sting Allergy	-0.150	0.143	0.292
Medication Allergy	-0.389	0.180	0.031	Medication Allergy	-0.187	0.190	0.325
Latex Allergy	0.030	0.210	0.885	Latex Allergy	-0.025	0.272	0.928
Many friends/family carry an EAI for their allergies.	0.144	0.094	0.125	Many friends/family carry an EAI for their allergies.	0.227	0.096	0.018
Age	0.016	0.091	0.857	Age	-0.115	0.093	0.218
Household Income	0.156	0.097	0.110	Household Income	0.082	0.113	0.465
Medicaid Insurance	-0.084	0.132	0.522	Medicaid Insurance	-0.138	0.141	0.329
# of Organ Systems Involved in Most Severe Rxn	0.226	0.111	0.043	# of Organ Systems Involved in Most Severe Rxn	0.251	0.107	0.019
Lifetime History of EAI Use	0.224	0.119	0.059	Lifetime History of EAI Use	0.325	0.128	0.011
Typically carry 1+ EAI	0.712	0.223	0.001	Typically carry 1+ EAI	0.671	0.211	0.001
Lifetime History of EAI Use <-->				Lifetime History of EAI Use <-->			
Male Gender	-0.021	0.101	0.833	Male Gender	-0.078	0.116	0.500
White Race	-0.181	0.106	0.086	White Race	0.128	0.123	0.298
Black Race	0.355	0.156	0.023	Black Race	0.040	0.159	0.801
Hispanic Race	0.217	0.122	0.077	Hispanic Race	-0.131	0.155	0.401
Milk Allergy	0.138	0.127	0.277	Milk Allergy	0.232	0.148	0.117
Egg Allergy	-0.034	0.135	0.803	Egg Allergy	0.338	0.174	0.051
Peanut Allergy	0.194	0.106	0.067	Peanut Allergy	0.203	0.122	0.095
Soy Allergy	0.302	0.182	0.097	Soy Allergy	0.029	0.291	0.921
Tree Nut Allergy	0.131	0.142	0.357	Tree Nut Allergy	0.238	0.156	0.127
Fin Fish Allergy	0.306	0.180	0.088	Fin Fish Allergy	0.073	0.174	0.675
Shellfish Allergy	0.280	0.152	0.064	Shellfish Allergy	0.452	0.127	0.000
Wheat Allergy	0.011	0.210	0.957	Wheat Allergy	-0.156	0.218	0.475
Insect Sting Allergy	0.092	0.120	0.445	Insect Sting Allergy	0.252	0.120	0.036
Medication Allergy	-0.119	0.160	0.456	Medication Allergy	-0.072	0.159	0.649
Latex Allergy	0.225	0.195	0.249	Latex Allergy	0.032	0.227	0.887
Many friends/family carry an EAI for their allergies.	0.313	0.080	0.000	Many friends/family carry an EAI for their allergies.	0.373	0.077	0.000
Age	0.134	0.081	0.100	Age	0.022	0.085	0.795
Household Income	-0.037	0.084	0.655	Household Income	-0.169	0.091	0.063
Medicaid Insurance	0.109	0.112	0.330	Medicaid Insurance	0.060	0.123	0.623
# of Organ Systems Involved in Most Severe Rxn	0.424	0.077	0.000	# of Organ Systems Involved in Most Severe Rxn	0.544	0.065	0.000
Typically carry 1+ EAI	0.598	0.097	0.000	Typically carry 1+ EAI	0.693	0.079	0.000
Typically Carry 1+ EAI <-->				Typically Carry 1+ EAI <-->			
Male Gender	0.100	0.114	0.381	Male Gender	-0.055	0.132	0.677
White Race	0.023	0.132	0.863	White Race	0.014	0.141	0.923
Black Race	-0.077	0.174	0.657	Black Race	0.165	0.188	0.381
Hispanic Race	0.195	0.154	0.207	Hispanic Race	-0.036	0.175	0.837
Milk Allergy	0.110	0.148	0.457	Milk Allergy	0.260	0.162	0.108
Egg Allergy	0.180	0.161	0.263	Egg Allergy	0.248	0.219	0.259
Peanut Allergy	0.270	0.124	0.030	Peanut Allergy	0.471	0.139	0.001
Soy Allergy	0.183	0.221	0.409	Soy Allergy	-0.190	0.296	0.522
Tree Nut Allergy	0.266	0.168	0.112	Tree Nut Allergy	0.166	0.190	0.382
Fin Fish Allergy	0.354	0.177	0.045	Fin Fish Allergy	0.388	0.186	0.037
Shellfish Allergy	0.158	0.172	0.358	Shellfish Allergy	0.494	0.161	0.002
Wheat Allergy	0.087	0.243	0.720	Wheat Allergy	0.027	0.260	0.917
Insect Sting Allergy	0.322	0.135	0.017	Insect Sting Allergy	0.307	0.136	0.024
Medication Allergy	0.176	0.182	0.334	Medication Allergy	-0.010	0.188	0.959
Latex Allergy	0.122	0.236	0.604	Latex Allergy	-0.028	0.277	0.920
Many friends/family carry an EAI for their allergies.	0.001	0.104	0.993	Many friends/family carry an EAI for their allergies.	0.178	0.097	0.066
Age	0.080	0.090	0.376	Age	0.021	0.101	0.836
Household Income	0.046	0.101	0.645	Household Income	0.050	0.100	0.612
Medicaid Insurance	-0.144	0.126	0.250	Medicaid Insurance	-0.214	0.129	0.099
# of Organ Systems Involved in Most Severe Rxn	0.515	0.078	0.000	# of Organ Systems Involved in Most Severe Rxn	0.560	0.064	0.000
White Race <-->				White Race <-->			
Black Race	-0.854	0.085	0.000	Black Race	-0.918	0.050	0.000
Hispanic Race	-0.912	0.066	0.000	Hispanic Race	-0.931	0.046	0.000
Household Income	0.371	0.086	0.000	Household Income	0.179	0.100	0.075
Black Race <-->				Black Race <-->			
Hispanic Race	-0.323	0.211	0.126	Hispanic Race	-0.299	0.201	0.136
Household Income	-0.376	0.156	0.016	Household Income	-0.396	0.114	0.000
Household Income <-->				Household Income <-->			
Medicaid Insurance	-0.486	0.068	0.000	Medicaid Insurance	-0.531	0.069	0.000
My allergy affects the things I do with others <-->				My allergy affects the things I do with others <-->			
My allergy affects the things I do with my family	0.681	0.055	0.000	My allergy affects the things I do with my family	0.900	0.023	0.000