

## SUPPLEMENTARY TABLES

**Supplementary Table 1.** *ICD* codes for food allergies

<b>ICD code</b>	<b>Version type</b>	<b>Short description</b>	<b>Allergy type</b>	<b>Broader allergy category</b>
99561	<i>ICD-9</i>	ANPHYLCT REACT PEANUTS	Peanut	Peanut
99562	<i>ICD-9</i>	ANPHYLCT REACT CRSTACNS	Shellfish	Shellfish/fish
99564	<i>ICD-9</i>	ANPHYL REACT TR NTS SEED	Tree nut	Tree nut
99567	<i>ICD-9</i>	ANPHYLCT REACT MILK PROD	Milk	Milk
99568	<i>ICD-9</i>	ANPHYLCT REACTION EGGS	Egg	Egg
T780	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO FOOD	Unspecified	Unspecified
T7800	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO UNSPECIFIED FOOD	Unspecified	Unspecified
T7800XA	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO UNSPECIFIED FOOD, INIT ENCNR	Unspecified	Unspecified
T7800XD	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO UNSPECIFIED FOOD, SUBS ENCNR	Unspecified	Unspecified
T7800XS	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO UNSPECIFIED FOOD, SEQUELA	Unspecified	Unspecified
T7801	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO PEANUTS	Peanut	Peanut
T7801XA	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO PEANUTS, INITIAL ENCOUNTER	Peanut	Peanut
T7801XD	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO PEANUTS, SUBSEQUENT ENCOUNTER	Peanut	Peanut
T7801XS	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO PEANUTS, SEQUELA	Peanut	Peanut
T7802	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO SHELLFISH (CRUSTACEANS)	Shellfish	Shellfish/fish
T7802XA	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO SHELLFISH (CRUSTACEANS), INIT	Shellfish	Shellfish/fish
T7802XD	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO SHELLFISH (CRUSTACEANS), SUBS	Shellfish	Shellfish/fish
T7802XS	<i>ICD-10</i>	ANAPHYL REACTION DUE TO SHELLFISH (CRUSTACEANS), SEQUELA	Shellfish	Shellfish/fish
T7803XA	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO OTHER FISH, INITIAL ENCOUNTER	Fish	Shellfish/fish
T7803XD	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO OTHER FISH, SUBS ENCNR	Fish	Shellfish/fish
T7803XS	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO OTHER FISH, SEQUELA	Fish	Shellfish/fish
T7804XA	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO FRUITS AND VEGETABLES, INIT	Fruits and vegetables	Fruits and vegetables
T7804XD	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO FRUITS AND VEGETABLES, SUBS	Fruits and vegetables	Fruits and vegetables
T7804XS	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO FRUITS AND VEGETABLES, SEQUELA	Fruits and vegetables	Fruits and vegetables
T7805	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO TREE NUTS AND SEEDS	Tree nut	Tree nut
T7805XA	<i>ICD-10</i>	ANAPHYLACTIC REACTION DUE TO TREE NUTS AND SEEDS, INIT	Tree nut	Tree nut

<b>ICD code</b>	<b>Version type</b>	<b>Short description</b>	<b>Allergy type</b>	<b>Broader allergy category</b>
T7805XD	ICD-10	ANAPHYLACTIC REACTION DUE TO TREE NUTS AND SEEDS, SUBS	Tree nut	Tree nut
T7805XS	ICD-10	ANAPHYLACTIC REACTION DUE TO TREE NUTS AND SEEDS, SEQUELA	Tree nut	Tree nut
T7807	ICD-10	ANAPHYLACTIC REACTION DUE TO MILK AND DAIRY PRODUCTS	Milk	Milk
T7807XA	ICD-10	ANAPHYLACTIC REACTION DUE TO MILK AND DAIRY PRODUCTS, INIT	Milk	Milk
T7807XD	ICD-10	ANAPHYLACTIC REACTION DUE TO MILK AND DAIRY PRODUCTS, SUBS	Milk	Milk
T7807XS	ICD-10	ANAPHYL REACTION DUE TO MILK AND DAIRY PRODUCTS, SEQUELA	Milk	Milk
T7808	ICD-10	ANAPHYLACTIC REACTION DUE TO EGGS	Egg	Egg
T7808XA	ICD-10	ANAPHYLACTIC REACTION DUE TO EGGS, INITIAL ENCOUNTER	Egg	Egg
T7808XD	ICD-10	ANAPHYLACTIC REACTION DUE TO EGGS, SUBSEQUENT ENCOUNTER	Egg	Egg
T7808XS	ICD-10	ANAPHYLACTIC REACTION DUE TO EGGS, SEQUELA	Egg	Egg
T7809	ICD-10	ANAPHYLACTIC REACTION DUE TO OTHER FOOD PRODUCTS	Unspecified	Unspecified
T7809XA	ICD-10	ANAPHYLACTIC REACTION DUE TO OTH FOOD PRODUCTS, INIT ENCNTR	Unspecified	Unspecified
T7809XD	ICD-10	ANAPHYLACTIC REACTION DUE TO OTH FOOD PRODUCTS, SUBS ENCNTR	Unspecified	Unspecified
T7809XS	ICD-10	ANAPHYLACTIC REACTION DUE TO OTHER FOOD PRODUCTS, SEQUELA	Unspecified	Unspecified
V1501	ICD-9	HX-PEANUT ALLERGY	Peanut	Peanut
V1502	ICD-9	HX-MILK PROD ALLERGY	Milk	Milk
V1503	ICD-9	HX-EGGS ALLERGY	Egg	Egg
V1504	ICD-9	HX-SEAFOOD ALLERGY	Fish	Shellfish/fish
V1505	ICD-9	HX-OTHER FOOD ALLERGY	Unspecified	Unspecified
Z9101	ICD-10	FOOD ALLERGY STATUS	Unspecified	Unspecified
Z91010	ICD-10	ALLERGY TO PEANUTS	Peanut	Peanut
Z91011	ICD-10	ALLERGY TO MILK PRODUCTS	Milk	Milk
Z91012	ICD-10	ALLERGY TO EGGS	Egg	Egg
Z91013	ICD-10	ALLERGY TO SEAFOOD	Fish	Shellfish/fish
Z91018	ICD-10	ALLERGY TO OTHER FOODS	Unspecified	Unspecified

**Abbreviation:** ICD, *International Classification of Diseases*.

**Supplementary Table 2.** *ICD* codes for exclusion

<b>ICD code</b>	<b>Version type</b>	<b>Description</b>
K90.4X	<i>ICD-10</i>	Malabsorption due to intolerance, not elsewhere classified/non-celiac gluten sensitivity
579.80	<i>ICD-9</i>	Other specified intestinal malabsorption
E73.9	<i>ICD-10</i>	Lactose intolerance, unspecified
271.30	<i>ICD-9</i>	Intestinal disaccharidase deficiencies and disaccharide malabsorption
K90.0	<i>ICD-10</i>	Celiac disease
579.0	<i>ICD-9</i>	Celiac disease
E74.12	<i>ICD-10</i>	Hereditary fructose intolerance
271.2	<i>ICD-9</i>	Hereditary fructose intolerance
K52.21	<i>ICD-10</i>	Food protein-induced enterocolitis syndrome
558.3	<i>ICD-9</i>	Allergic gastroenteritis and colitis
K52.22	<i>ICD-10</i>	Food protein-induced enteropathy
K90.X	<i>ICD-10</i>	Intestinal malabsorption
K20.0	<i>ICD-10</i>	Eosinophilic esophagitis
530.13	<i>ICD-9</i>	Eosinophilic esophagitis
K52.81	<i>ICD-10</i>	Eosinophilic gastritis or gastroenteritis
535.7x	<i>ICD-9</i>	Eosinophilic gastritis
535.70	<i>ICD-9</i>	Eosinophilic gastritis, without mention of hemorrhage
535.71	<i>ICD-9</i>	Eosinophilic gastritis, with hemorrhage
558.41	<i>ICD-9</i>	Eosinophilic gastroenteritis

**Abbreviation:** *ICD*, *International Classification of Diseases*.

**Supplementary Table 3.** Characteristics of pediatric and adult patients with food allergies

Characteristic	Age 0–17 years ( <i>n</i> = 220,356)	Age ≥18 years ( <i>n</i> = 135,164)
Age, y, mean (SD)	8.2 (4.8)	38 (15)
Age group, <i>n</i> (%)		
0–1 y	16,390 (7.4)	-
2–5 y	60,984 (28)	-
6–10 y	66,764 (30)	-
11–17 y	76,218 (35)	-
18–25 y	-	36,977 (27)
26–30 y	-	11,365 (8.4)
31–64 y	-	82,730 (61)
≥65 y	-	4092 (3.0)
Sex, female, <i>n</i> (%)	100,403 (46)	93,125 (69)
Insured, <i>n</i> (%)		
Commercial	122,500 (56)	108,003 (80)
Medicaid	97,856 (44)	23,242 (17)
Medicare	0	3919 (2.9)
CCI score, mean (SD)	0.26 (0.48)	0.51 (1.02)
CCI score, <i>n</i> (%)		
0	166,663 (76)	91,990 (68)
1	51,974 (24)	30,063 (22)
2	1277 (0.6)	7536 (5.6)
≥3	622 (0.3)	5575 (4.1)
Comorbidities, <i>n</i> (%)		
Allergic rhinitis	49,665 (23)	27,802 (21)
Asthma	49,304 (22)	24,045 (18)
Atopic dermatitis/eczema	29,646 (13)	4675 (3.5)
Anxiety	8658 (3.9)	22,505 (17)
GERD	9672 (4.4)	17,418 (13)
Hives (urticaria, CSU)	13,757 (6.2)	8763 (6.5)
Depression	4734 (2.1)	15,579 (12)
Conjunctivitis	4102 (1.9)	3040 (2.2)
Food allergy types, <i>n</i> (%)		
Single food allergy	84,190 (38)	48,769 (36)
Multiple food allergies <sup>a</sup>	49,251 (22)	13,635 (10)
Unspecified only	86,915 (39)	72,760 (54)
Food allergen type, <i>n</i> (%)		
Peanut	70,955 (32.2)	17,248 (12.8)
Shellfish	26,758 (12.1)	33,188 (24.6)
Milk	23,117 (10.5)	5740 (4.2)
Egg	22,969 (10.4)	3923 (2.9)
Tree nut	17,186 (7.8)	6013 (4.4)
Unspecified	121,257 (55.0)	83,213 (61.6)

**Abbreviations:** CCI, Charlson Comorbidity Index; CSU, chronic spontaneous urticaria; GERD, gastroesophageal reflux disease; y, years.

<sup>a</sup>Unspecified allergy types included.

**Notes:** CCI and comorbidities were assessed during the 12-month baseline period. Race is not uniformly captured in the MarketScan databases and therefore is not included.

**Supplementary Table 4.** Significant ( $p < 0.05$ ) factors associated with all-cause and food allergy-related HRU

Outpatient visits		Emergency department visits		Hospitalizations	
Factor	Incident rate ratio (95% CI)	Factor	Odds ratio <sup>a</sup> (95% CI)	Factor	Odds ratio <sup>a</sup> (95% CI)
All-cause					
CCI score: $\geq 2$	2.6 (2.5–2.6)	Payer: Medicaid	4.8 (4.0–5.9)	CCI score: $\geq 2$	4.1 (3.9–4.3)
Anxiety	1.6 (1.5–1.6)	Age $\geq 18$ years	1.6 (1.6–1.6)	Age $\geq 18$ years	2.4 (2.3–2.5)
Depression	1.5 (1.5–1.6)	CCI score: $\geq 2$	1.6 (1.5–1.6)	Depression	2.0 (1.9–2.1)
CCI score: 1	1.5 (1.5–1.5)	Depression	1.5 (1.4–1.5)	Payer: Medicaid	2.0 (1.3–3.1)
Allergic rhinitis	1.4 (1.3–1.4)	CCI score: 1	1.3 (1.3–1.4)	CCI score: 1	1.9 (1.8–2.0)
Payer: Medicaid	1.4 (1.3–1.5)	Anxiety	1.3 (1.2–1.3)	Anxiety	1.4 (1.3–1.5)
Age $\geq 18$ years	1.3 (1.3–1.3)	MFA	1.1 (1.1–1.1)	Female sex	1.2 (1.1–1.2)
Allergic conjunctivitis	1.2 (1.2–1.3)	Asthma	1.1 (1.1–1.1)	Region: West	0.9 (0.9–1.0)
MFA	1.1 (1.1–1.2)	Atopic dermatitis	1.0 (1.0–1.1)	Hives	0.9 (0.9–1.0)
Unspecified FA	1.1 (1.1–1.1)	Female sex	1.0 (1.0–1.0)	Asthma	0.9 (0.8–0.9)
Hives	1.0 (1.0–1.1)	Region: North Central	1.0 (0.9–1.0)	Allergic rhinitis	0.8 (0.8–0.8)
Atopic dermatitis	1.0 (1.0–1.1)	Hives	1.0 (0.9–1.0)	Allergic conjunctivitis	0.8 (0.7–0.9)
Region: Northeast	1.0 (1.0–1.1)	Region: Northeast	0.9 (0.9–0.9)	Unspecified FA	0.8 (0.8–0.8)
Region: North Central	1.0 (1.0–1.0)	Allergic conjunctivitis	0.8 (0.8–0.9)		
Region: West	1.0 (1.0–1.0)	Allergic rhinitis	0.8 (0.8–0.8)		
Asthma	0.8 (0.8–0.8)	Region: West	0.8 (0.7–0.8)		
		Region: unknown	0.8 (0.7–1.0)		
		Unspecified FA	0.7 (0.7–0.7)		
Food allergy-related					
MFA	1.8 (1.8–1.8)	Payer: Medicaid	3.8 (2.9–5.0)	CCI score: $\geq 2$	2.9 (2.5–3.3)
Hives	1.1 (1.1–1.2)	Age $\geq 18$ years	2.4 (2.3–2.4)	Depression	2.1 (1.9–2.4)
CCI score: $\geq 2$	1.1 (1.1–1.1)	Depression	1.3 (1.2–1.3)	CCI score: 1	2.0 (1.7–2.2)
Region: West	1.1 (1.1–1.1)	MFA	1.1 (1.1–1.1)	MFA	1.4 (1.3–1.5)
Allergic rhinitis	1.1 (1.1–1.1)	Asthma	1.1 (1.0–1.1)	Anxiety	1.2 (1.1–1.3)
Allergic conjunctivitis	1.1 (1.1–1.1)	Anxiety	1.0 (0.9–1.0)	Atopic dermatitis	1.2 (1.1–1.3)
Atopic dermatitis	1.1 (1.1–1.1)	Region: Northeast	0.9 (0.8–0.9)	Age $\geq 18$ years	1.1 (1.0–1.2)
Unspecified FA	1.1 (1.1–1.1)	CCI score: $\geq 2$	0.9 (0.8–0.9)	Female sex	0.9 (0.8–1.0)
Region: North Central	1.0 (1.0–1.1)	Atopic dermatitis	0.8 (0.8–0.8)	Allergic rhinitis	0.7 (0.6–0.8)
Asthma	1.0 (1.0–1.0)	Allergic conjunctivitis	0.7 (0.6–0.7)	Unspecified FA	0.6 (0.5–0.6)
Anxiety	1.0 (1.0–1.0)	Region: North Central	0.7 (0.7–0.8)		

Outpatient visits		Emergency department visits		Hospitalizations
CCI score: 1	1.0 (1.0–1.0)	Region: West	0.7 (0.7–0.7)	
Region: Northeast	1.0 (1.0–1.0)	Allergic rhinitis	0.6 (0.6–0.6)	
Female sex	1.0 (1.0–1.0)	Hives	0.5 (0.5–0.5)	
Depression	1.0 (0.9–1.0)	Unspecified FA	0.4 (0.4–0.4)	
Payer: Medicaid	0.8 (0.8–0.9)			
Age ≥18 years	0.8 (0.8–0.8)			

**Abbreviations:** CCI, Charlson Comorbidity Index; CI, confidence interval; FA, food allergies; MFA, multiple food allergies (unspecified allergy types included).

<sup>a</sup>Odds of having the event compared with a reference group: age 0–17 years; sex: male; region: south; CCI score: 0; comorbid condition: absence; allergy type: single; payer: Commercial/Medicare.

**Supplementary Table 5.** Significant ( $p < 0.05$ ) factors associated with all-cause and food allergy-related health care costs

Outpatient visits		Emergency department visits		Hospitalizations	
Factor	Incident rate ratio (95% CI)	Factor	Odds ratio <sup>a</sup> (95% CI)	Factor	Odds ratio <sup>a</sup> (95% CI)
<b>All-cause</b>					
CCI score: $\geq 2$	4.8 (4.6–5.2)	CCI score: $\geq 2$	1.7 (1.6–1.8)	CCI score: $\geq 2$	1.9 (1.6–2.3)
CCI score: 1	1.8 (1.7–1.9)	Age $\geq 18$ years	1.4 (1.4–1.5)	Atopic dermatitis	1.5 (1.2–2.0)
Age $\geq 18$ years	1.8 (1.7–1.8)	Depression	1.2 (1.2–1.3)	Region: Northeast	1.3 (1.1–1.5)
Anxiety	1.5 (1.5–1.6)	CCI score: 1	1.2 (1.2–1.3)	Region: West	1.2 (1.0–1.5)
Depression	1.3 (1.3–1.4)	Anxiety	1.2 (1.2–1.3)	Female sex	0.9 (0.8–1.0)
Region: Northeast	1.2 (1.2–1.2)	Region: West	1.2 (1.2–1.2)	Asthma	0.8 (0.6–0.9)
Allergic rhinitis	1.1 (1.1–1.2)	Female sex	1.1 (1.1–1.1)		
Region: West	1.1 (1.1–1.2)	MFA	1.1 (1.0–1.1)		
MFA	1.1 (1.1–1.1)	Hives	1.1 (1.0–1.1)		
Unspecified FA	1.1 (1.0–1.1)	Region: North Central	0.9 (0.9–0.9)		
Atopic dermatitis	1.1 (1.0–1.1)				
Region: North Central	1.1 (1.0–1.1)				
Female sex	1.0 (1.0–1.1)				
Asthma	0.7 (0.7–0.7)				
<b>Food allergy-related</b>					
CCI score: $\geq 2$	1.9 (1.8–2.0)	Region: West	1.4 (1.3–1.4)	Region: Northeast	1.3 (1.1–1.7)
MFA	1.5 (1.4–1.5)	Region: Northeast	1.2 (1.1–1.2)		
CCI score: 1	1.3 (1.2–1.4)	Age $\geq 18$ years	1.1 (1.1–1.2)		
Age $\geq 18$ years	1.2 (1.1–1.2)	MFA	1.1 (1.0–1.1)		
Region: Northeast	1.1 (1.1–1.2)	Female sex	1.0 (1.0–1.1)		
Region: West	1.1 (1.1–1.1)	Hives	0.9 (0.8–1.0)		
Female sex	1.0 (0.9–1.0)				
Allergic rhinitis	0.9 (0.8–0.9)				
Allergic conjunctivitis	0.9 (0.8–1.0)				
Hives	0.9 (0.8–0.9)				
Unspecified FA	0.9 (0.9–1.0)				
Asthma	0.8 (0.7–0.8)				

**Abbreviations:** CCI, Charlson Comorbidity Index; CI, confidence interval; FA, food allergies; MFA, multiple food allergies (unspecified allergy types included).

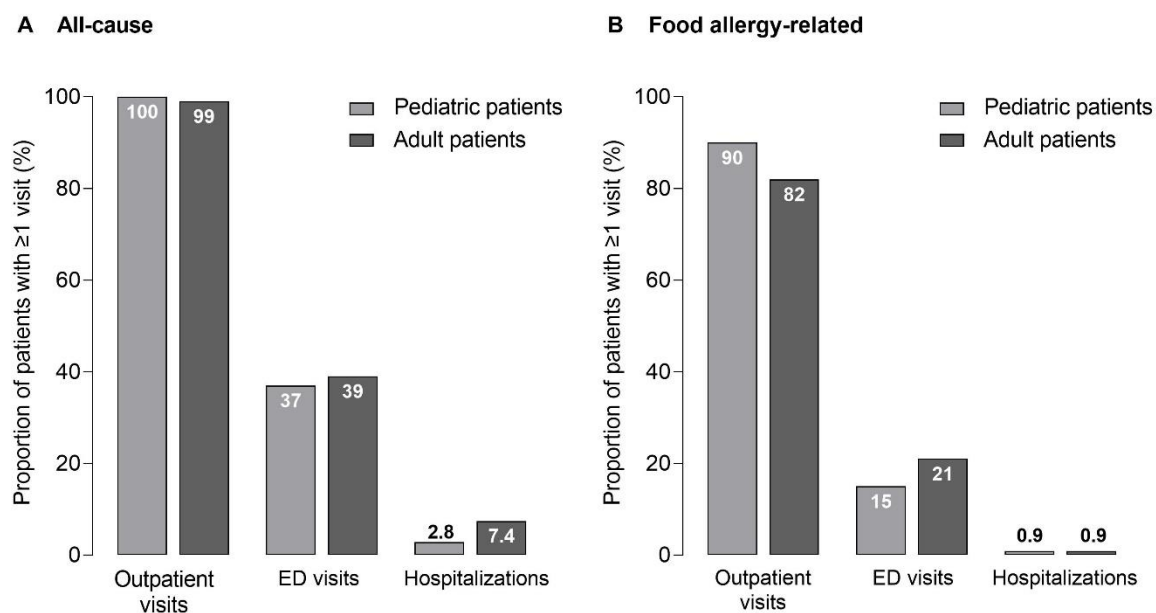
<sup>a</sup>Odds of having the event compared to a reference group: age 0–17 y; sex: male; region: south; CCI score: 0; comorbid condition: absence; allergy type: single; payer: Commercial/Medicare.

## SUPPLEMENTARY FIGURES

**Supplementary Figure 1.** Health care resource use among pediatric and adult patients with food allergies.

Proportion of patients with one or more (A) all-cause visit and (B) food allergy-related visit.

**Abbreviation:** ED, emergency department.

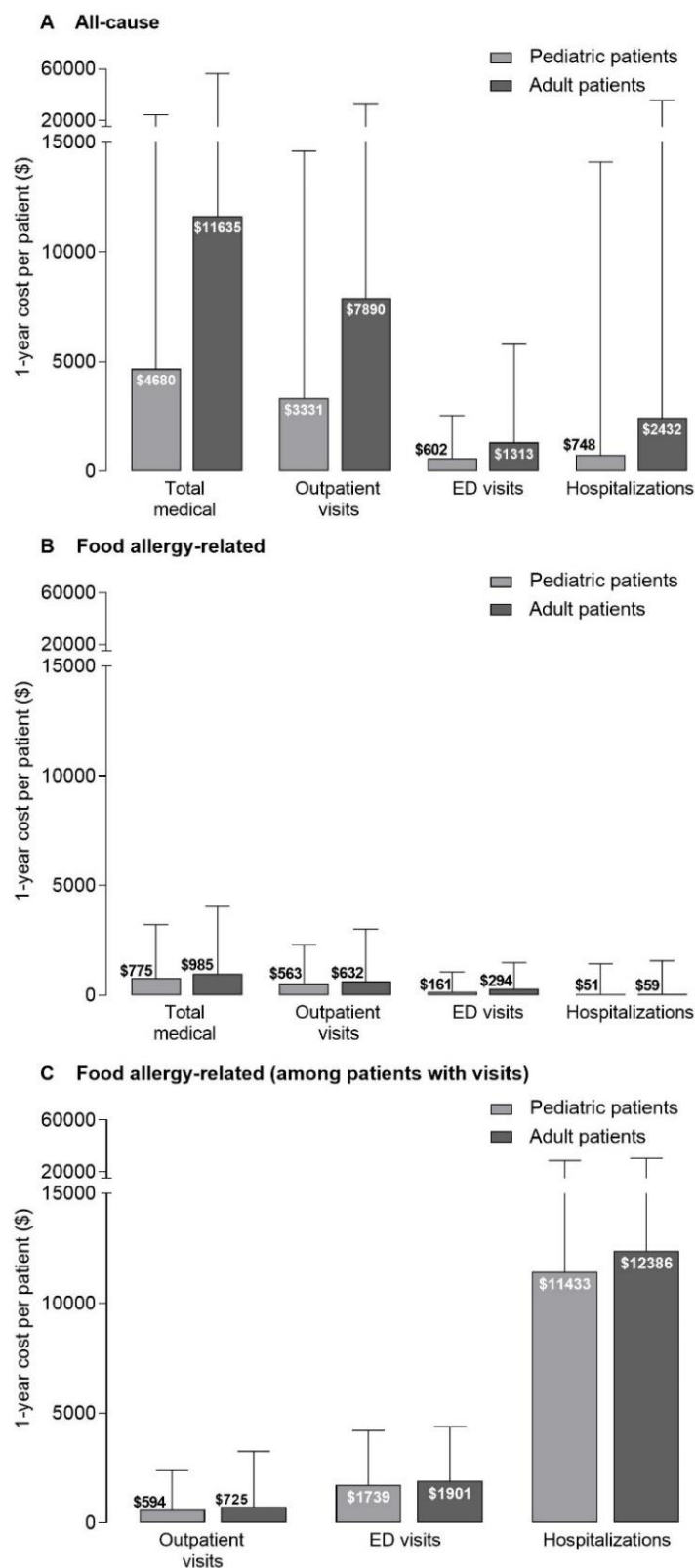




**Supplementary Figure 2.** Estimated mean (SD) 1-year direct medical cost per pediatric and adult patient with food allergies (2022 USD).

(A) All-cause cost, (B) food allergy-related cost, and (C) food allergy-related cost among patients with visits (outpatient visits, ED visits, and hospitalizations).

**Abbreviations:** ED, emergency department; USD, United States dollars.



**Supplementary Figure 3.** Estimated mean (SD) 1-year out-of-pocket cost per pediatric and adult patient with food allergies (2022 USD).

(A) All-cause cost, (B) food allergy-related cost, and (C) food allergy-related cost among patients with visits (outpatient visits, ED visits, and hospitalizations).

**Abbreviations:** ED, emergency department; USD, United States dollars.

