SUPPLEMENTARY MATERIALS

Economic burden of peanut allergy in pediatric patients with evidence of reactions to peanut in the United States

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Additional Methods – Cost of Care Analysis

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Data Source

The OptumHealth Care Solutions, Inc. database includes administrative claims for over 19.9 million insured individuals covered by 84 self-insured Fortune 500 companies in all areas of the US. The Medicaid Claims Database contains administrative claims data for approximately 26.6 million Medicaid-eligible persons from the 6 states of Iowa, Kansas, Mississippi, Missouri, New Jersey, and Wisconsin. Both data sources include detailed information on history of health plan enrollment, demographics, diagnoses, procedures, claims for medical care received across all settings, as well as pharmacy services.

Data were de-identified and complied with the Health Insurance Portability and Accountability Act (HIPAA). Therefore, no reviews by an institutional review board were required.

Study Outcomes

Comorbidity burden: In addition to a diagnosis of asthma, asthma was also identified in pharmacy claims with ≥6 prescription fills for any long-term or short-acting inhaled asthma medication in a 365-day window, or ≥4 prescription fills for the same long-term or short-acting inhaled asthma medication (excluding prednisolone/prednisone) in a 365-day window. In addition to a diagnosis of atopic dermatitis/eczema, atopic dermatitis/eczema was also identified in pharmacy claims with ≥3 prescription fills for an atopic dermatitis/eczema-related medication in a 365-day window. Depression was identified in medical claims based on ICD-9/10-CM codes defined by Elixhauser et al (1). Anxiety was identified in medical claims based on ICD-9/10-CM codes defined by the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5®) (2).

Direct healthcare costs: Medical and pharmacy costs associated with asthma were identified using medical claims with a diagnosis for asthma, procedure for asthma medications, or pharmacy costs with asthma medications [inhalation only], leukotriene receptor antagonists, or biologics indicated for asthma. Costs associated with atopic dermatitis/eczema were identified using medical claims with a diagnosis for atopic dermatitis/eczema or pharmacy costs with atopic dermatitis/eczema treatments. Costs associated with other food allergies were identified using medical claims with a diagnosis for a food allergy other than peanut allergy. Costs

associated with mental health were identified using medical claims with pharmacy costs for antidepressant/antipsychotic/psychotherapeutic agents and mental health–related services from a mental health provider or place of service for mental health; these costs were not specific to anxiety or depression and included any mental health condition requiring the above medications or services.

References

1. Elixhauser A, Steiner C, Kruzikas D. Comorbidity Software. January 2004. HCUP Methods Series Report #2004-1. ONLINE. February 6, 2004. U.S. Agency for Health care Research and Quality. p.12-15. Available: http://www.hcup-us.ahrq.gov/reports/ComorbiditySoftwareDocumentationFinal.pdf

2. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®). American Psychiatric Pub, 2013.

Supplementary Table 1. List of Codes for Symptoms of Reaction to Peanuts[1,2] From At Least One or Two Organ Systems

Organ System	Symptom	Description	ICD-10 Code	ICD-9 Code
From ≥1 Organ System				
Upper Respiratory	Laryngeal	Edema of larynx	J38.4	478.6
	Tongue	Disease of tongue	K14.X	529.X
	Uvula Edema	Other lesions of oral mucosa	K13.79	528.9
Respiratory	Respiratory failure	Acute respiratory failure, unspecified whether with hypoxia or hypercapnia	J96.00	518.81
Cardiovascular	Hypotension	Hypotension	I95.X	458.0, 458.2, 458.8, 458.9
	Cyanosis	Cyanosis	R23.0	782.5
Other	Confusion	Disorientation	R41.0	780.97
	Collapse	Syncope and Collapse	R55	780.2
	Loss of consciousness	Syncope and Collapse	R55	780.2
	Incontinence	Incontinence	N39.X	599.0, 599.89, 599.9, 625.6, 788.3
From ≥2 Organ Systems				
Cutaneous	Generalized pruritus	Generalized pruritus	L29.9	698.9
	Urticaria	Idiopathic urticaria	L50.1	708.1
	Angioedema	Angioneurotic edema	T78.3XX	995.1
	Flushing or sensation of heat or warmth	Flushing	R23.2	782.62
Lower and Upper Respiratory	Cough	Cough Variant Asthma	J45.991	493.82
	Wheezing	Wheezing	R06.2	786.07
	Asthma	Asthma	J45.XX	493.0, 493.1, 493.82, 493.9
	Shortness of breath	Shortness of breath	R06.02	786.05
	Mild dyspnea	Dyspnea	R06.0	786.02, 786.05
	Rhinitis	Allergic rhinitis due to food	J30.5	477.1
	Sneezing	Sneezing	R06.7	784.99
	Nasal congestion	Nasal congestion	R09.81	478.19
	Rhinorrhea	Other specified disorders of nose and nasal sinuses	J34.89	478.19

	Throat-clearing	Pain in throat	R07.0	784.1
	Marked Dysphagia	Dysphagia	R13.1X	787.2, V41.6
	Stridor	Stridor	R06.1	786.1
Conjunctival	Conjunctival erythema	Conjunctival Hyperemia	H11.4XX	372.73
	Pruritus or Tearing	Epiphora	H04.2XX	375.2
Gastrointestinal	Abdominal cramps	Abdominal and Pelvic Pain	R10.XX	789.09
	Vomiting	Vomiting	R11.1X	078.82, 536.2, 569.87, 787.03
	Nausea	Nausea	R11.0	787.02
	Uterine Cramps	Abdominal and Pelvic Pain	R10.XX	789.0, 789.6
	Diarrhea	Diarrhea	K59.1	564.5

1. Symptoms considered as being reactions to peanuts using grading system from the World Allergy Organization Guidelines (Simons FE, Ardusso LR, Bilo MB, et al. World Allergy Organ J. 2011;4(2):13-37; Simons FE, Ardusso LR, Bilo MB, et al. Curr Opin Allergy Clin Immunol. 2012;12(4):389-399).
2. Based on clinical experts' input.

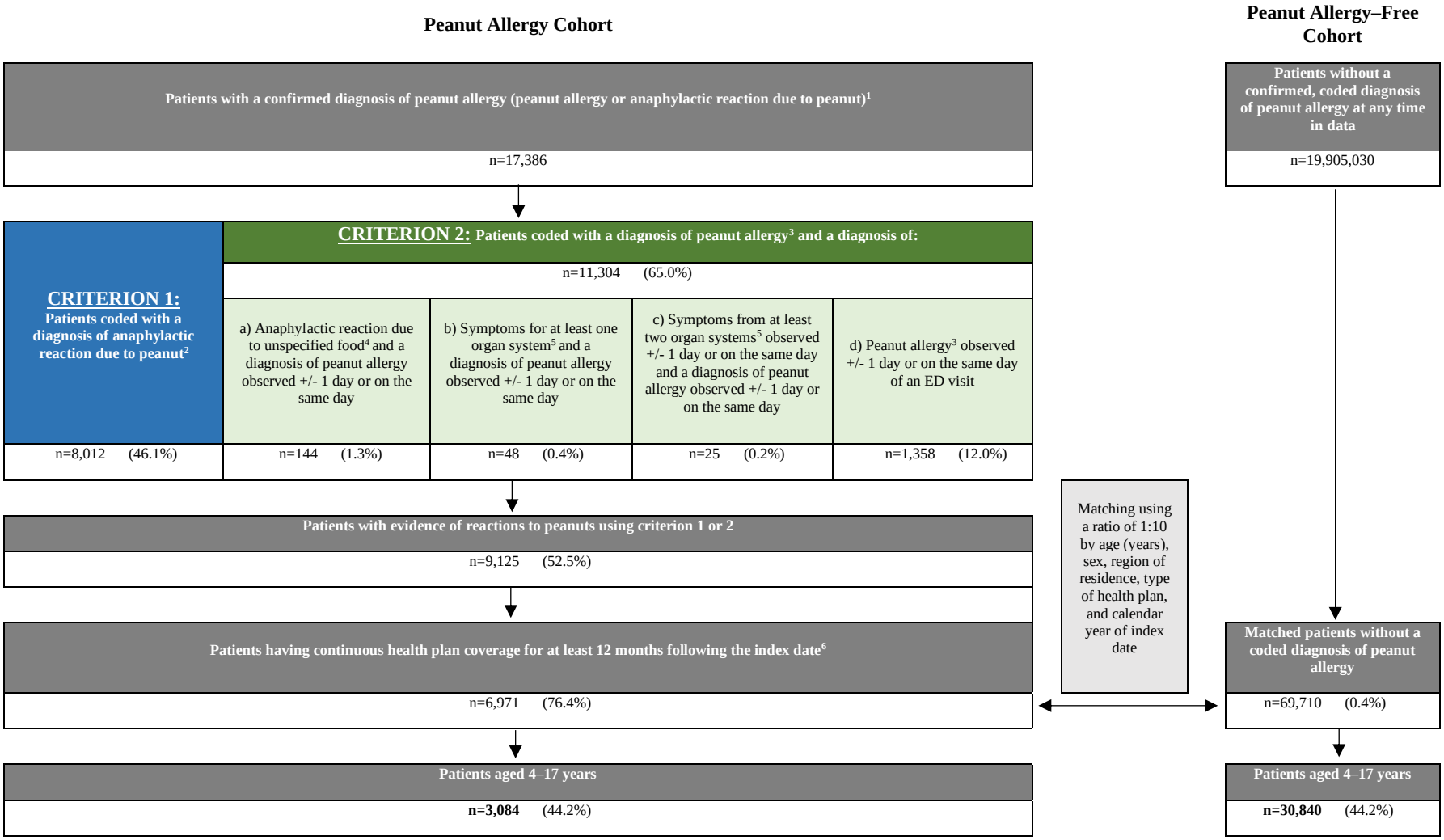
Supplementary Table 2. Comparison of HRU excluding asthma in Privately Insured Pediatric Patients in the Peanut Allergy Cohort (n=3,084) vs. Peanut Allergy–Free Cohort (n=30,840), and in Medicaid Pediatric Patients in the Peanut Allergy Cohort (n=1,245) vs. Peanut Allergy–Free Cohort (n=12,450)

HRU Components	IR, PPPY		IRR (95% CI)
	Peanut Allergy Cohort	Peanut Allergy–Free Cohort	
Privately insured patients	n=3,084	n=30,840	
IP admissions	0.03	0.02	1.31 (1.07–1.54)*
ED visits	0.48	0.27	1.81 (1.70–1.94)*
Days with OP services	8.77	5.11	1.71 (1.60–1.85)*
Medicaid patients	n=1,245	n=12,450	
IP admissions	0.38	0.30	1.27(1.02–1.54)*
ED visits	0.73	0.42	1.74 (1.56–1.92)*
Days with OP services	18.96	15.55	1.22 (1.15–1.29)*

*$p<0.05$.

CI, confidence interval; ED, emergency department; HRU, healthcare resource utilization; IP, inpatient; IR, incidence rate; IRR, incidence rate ratio; OP, outpatient; PPPY, per-patient-per-year.

Supplementary Figure 1. Sample Selection Among Privately Insured Patients

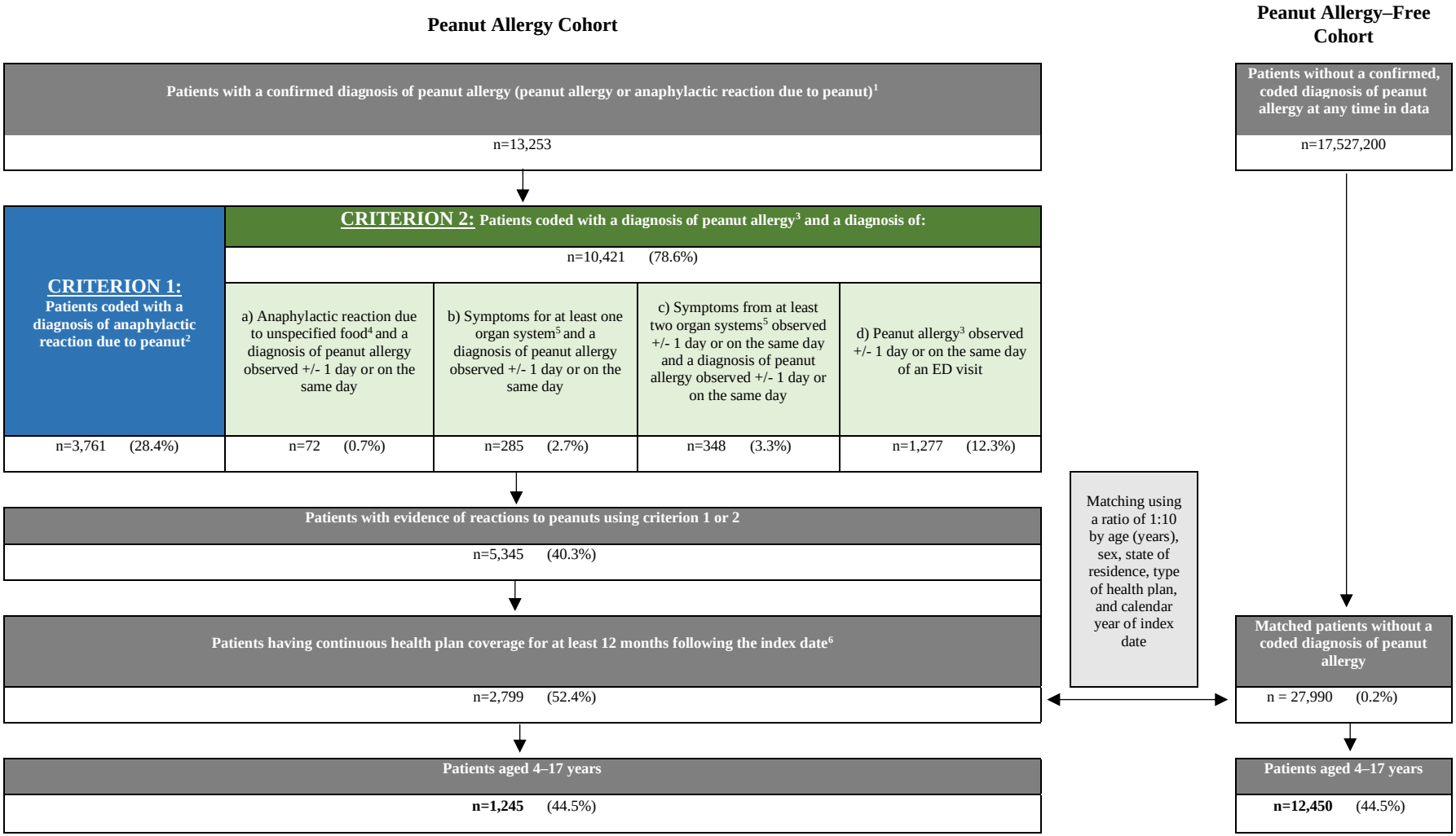


1. Confirmed peanut allergy was identified using ICD-9-CM codes 995.61 and V15.01, and ICD-10-CM codes T78.01xx and Z91.010.

2. Diagnosis for anaphylactic reaction due to peanut allergy was identified using ICD-9-CM code 995.61, or ICD-10-CM codes starting from T78.01.
3. Diagnosis for peanut allergy was identified using ICD-9-CM code V15.01, or ICD-10-CM codes starting from Z91.010.
4. Unspecified food anaphylactic reaction was identified using ICD-9-CM codes 995.6, 995.60, and V15.0; and ICD-10-CM codes T78.0, Z91.00xx, and Z91.01.
5. Symptoms considered as being reactions to peanuts using grading system (e.g., World Allergy Organization Guidelines; **Supplementary Table 1**).
6. Of 7,053 eligible patients with evidence of reactions to peanuts, 82 (1.2%) patients could not be matched and therefore were removed from the study sample.

ED, emergency department; ICD-9/10-CM, International classification of diseases, 9th/10th revision, clinical modification.

Supplementary Figure 2. Sample Selection Among Medicaid Patients



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4. Unspecified food anaphylactic reaction was identified using ICD-9-CM codes 995.6, 995.60, and V15.0; and ICD-10-CM codes T78.0, Z91.00xx, and Z91.01.
5. Symptoms considered as being reactions to peanuts using grading system (e.g., World Allergy Organization Guidelines; **Supplementary Table 1**).
6. Of 2,898 eligible patients with evidence of reactions to peanuts, 99 (3.4%) patients could not be matched and therefore were removed from the study sample.

ED, emergency department; ICD-9/10-CM, International classification of diseases, 9th/10th revision, clinical modification.