

Food allergy at 1 year predicts persistence of eczema at 6 years

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Clinical Implications

- Among children with eczema at age 1, those with challenge-confirmed egg or peanut allergy at age 1 were more likely to have persistent eczema at age 6 compared with children without sensitization to these foods.

TO THE EDITOR:

Approximately 60% of eczema cases develop in the first year of life.¹ There is a range of research suggesting that environmental food allergen exposure to eczematous skin, or skin with a poor barrier function may increase the risk of food sensitisation.^{2,3} However, whether challenged-confirmed food allergy is associated with eczema persistence or the incidence of late-onset eczema has not been well investigated. Therefore, we aimed to determine if challenge-proven food allergy at age 1 predicted persistence of eczema or late-onset eczema while taking other early-life factors into account, using the population-based HealthNuts cohort.

The HealthNuts study is a population-based cohort study involving a total of 5276 children recruited through immunization centers at 12 months of age in Melbourne, Australia.⁴ Briefly, all infants underwent assessment of their eczema and skin prick tests (SPT) at recruitment. Infants with a detectable wheal (≥ 1 mm) to egg, peanut, or sesame were invited for an oral food challenge (OFC) to ascertain their food allergy status.⁵ Eczema at age 1 was defined as having either a parent report of doctor-diagnosed eczema, history of itchy rash (other than diaper/nappy rash) treated with topical steroids, or eczema observed by trained researchers on the infants' face, back, or elbow flexures.⁵ The second longitudinal follow-up including a questionnaire survey among the entire cohort was conducted in the child's sixth year.⁶

Eczema at age 6 was determined by either having a positive response to the core question for current eczema in the validated International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire,⁷ or having a diagnosis of eczema with symptoms or with treatment by topical steroids in the last 12 months (Table E1, available in this article's Online Repository at www.jaci-inpractice.org).

Multiple logistic regression was used to compare food allergy status at age 1 between children with persistent eczema (eczema at age 1 and 6) and resolved eczema (eczema at age 1 only). Early-life factors with a *P* value smaller than .1 in univariate analyses or considered *a priori* as an important risk factor from

previous reports (eg, sex, socioeconomic status; Table E2, available in this article's Online Repository at www.jaci-inpractice.org) were included in the logistic regression model, additionally with eczema characteristics at age 1. The association between food allergy at age 1 and late-onset eczema (eczema at age 6 only) among children with no eczema at age 1 was analyzed similarly (Table E3, available in this article's Online Repository at www.jaci-inpractice.org). To account for the potential impact of loss to follow-up, we adjusted all analyses for differences in characteristics between children who participated at age 6 years and those who were lost to follow-up, using the inverse probability weighting method described by Little and Rubin.⁸ All statistical analysis was undertaken using Stata version 15.1 (StataCorp, College Station, Tex).

Ethics approval was obtained from the Human Research Ethics Committee of the Victorian State Government Office for Children (reference no. CDF/07/492) and Department of Human Services (reference no. 10/07) as well as the Royal Children's Hospital Human Research Ethics Committee (reference nos. 27047 and 32294).

Among the 5276 infants recruited at 12 months, a total of 3897 children (73.9%) had complete data on eczema at age 1 and 6 and included in the analysis (Figure E1, available in this article's Online Repository at www.jaci-inpractice.org).

Among the children with eczema at age 1, the reweighted estimate of the proportion of persistent eczema at age 6 was 29.1% (95% confidence interval [CI], 26.8% to 31.6%). Late-onset eczema occurred in 8.9% (95% CI, 7.8% to 10.2%) among children with no eczema at age 1 year.

The risk of persistent eczema was increased if the child had confirmed egg allergy (adjusted odds ratio [aOR], 2.29; 95% CI, 1.59-3.28; Table I) and marginally increased when having peanut allergy (aOR, 1.67; 95% CI, 0.99-2.81; *P* = .055), even after adjusting for eczema characteristics at age 1 year. There was little evidence of a difference in risk when comparing food allergic with food-sensitized—tolerant children, although we may have been underpowered to detect such a difference. As expected, children who had their eczema diagnosed before 6 months or those who used strong steroids had increased risk of persistence (Table E4, available in this article's Online Repository at www.jaci-inpractice.org).

Although there were trends toward food sensitization and allergy at age 1-year increasing risk of late-onset eczema (Table II), there were limited numbers of children with food allergy in this group, and the associations were imprecise. Sensitization to any food at age 1 year was, however, associated with an increased risk of late-onset eczema (aOR, 1.79; 95% CI, 1.07-3.00).

The strength of this study is that we have conducted SPT to all participants at recruitment and used the gold standard of OFC for food allergy diagnosis among a population-based cohort. A potential limitation is the possibility of selection bias due to the loss to follow-up, even after the reweighting. In addition, eczema status was defined based on a combination of several criteria using the symptoms or treatments in the past year at both ages. To account for the possibility that we may have misclassified children with eczema at age 6 years, we have repeated the analysis using only the definition of the validated

TABLE I. Association between food allergy at age 1 and persistent eczema at age 6

	Resolved eczema (N = 1140)		Persistent eczema (N = 481)		Risks for persistent eczema												
					Unadjusted			Adjusted model 1 [*]			Adjusted model 2 [†]						
	n	Percent	n	Percent	OR	95% CI		P value	aOR	95% CI		P value	aOR	95% CI		P value	
Food allergy at age 1																	
Egg allergy status																	
Not sensitized	862	76.3	268	23.7	1.00				1.00				1.00				
Sensitized tolerant‡	39	61.9	24	38.1	1.98	1.17	3.35	.010	1.85	1.08	3.16	.025	1.26	0.62	2.56	.519	
Allergic	150	50.8	145	49.2	3.11	2.38	4.06	<.001	2.97	2.23	3.97	<.001	2.29	1.59	3.28	<.001	
Peanut allergy status																	
Not sensitized	944	73.9	333	26.1	1.00				1.00				1.00				
Sensitized tolerant‡	60	60.6	39	39.4	1.84	1.21	2.81	.010	1.75	1.09	2.82	.021	1.63	0.94	2.82	.083	
Allergic	66	52.4	60	47.6	2.58	1.78	3.74	<.001	2.32	1.56	3.47	<.001	1.67	0.99	2.81	.055	
Food allergy type																	
None	871	76.3	271	23.7	1.00				1.00				1.00				
Egg only	100	50.0	100	50.0	3.21	2.36	4.38	<.001	3.08	2.21	4.28	<.001	2.36	1.57	3.54	<.001	
Peanut only	20	51.3	19	48.7	3.05	1.61	5.81	<.001	2.51	1.24	5.06	.010	1.57	0.58	4.31	.378	
Egg and peanut	41	50.6	40	49.4	3.14	1.99	4.95	<.001	2.71	1.70	4.32	<.001	2.00	1.11	3.60	.021	
Number of food allergies§																	
None	858	76.3	266	23.7	1.00				1.00				1.00				
Single	113	49.6	115	50.4	3.28	2.45	4.40	<.001	3.07	2.25	4.20	<.001	2.32	1.57	3.42	<.001	
Multiple	46	51.7	43	48.3	3.02	1.95	4.67	<.001	2.73	1.74	4.27	<.001	2.11	1.20	3.73	.010	
Any food sensitization																	
No	811	76.6	248	23.4	1.00				1.00				1.00				
Yes	279	58.9	195	41.1	2.29	1.81	2.88	<.001	2.51	1.93	3.28	<.001	2.03	1.46	2.82	<.001	

aOR, Adjusted odds ratio; CI, confidence interval; OFC, oral food challenge; OR, odds ratio.

*For model 1, each food allergy variable is adjusted for sex, parent country of birth, season of birth, mode of delivery, family history of eczema, SEIFA (Socio-Economic Indexes for Areas is a suite of 4 summary measures including indices of relative socioeconomic advantage and disadvantage, economic resources, and education and occupation developed by the Australian Bureau of Statistics using national data from the Australian Census⁹), and dog ownership at age 1 then reweighted to account for loss to follow-up.

†For model 2, each food allergy variable is adjusted for the variables in model 1 and for eczema characteristics (age of onset and eczema treatment at age 1).

‡Sensitized tolerant is defined as a positive sensitization test and a negative OFC. When comparing children with confirmed allergy with those who were sensitized tolerant in the adjusted model 2, the risk of persistent eczema was aOR 1.81, 95% CI 0.86-3.81 for egg and aOR 1.03, 95% CI 0.50-2.10 for peanut.

§Number of food allergies to egg, peanut, or sesame.

TABLE II. Food allergy at age 1 and late-onset eczema at age 6

	No eczema (N = 2075)		Late-onset eczema (N = 201)		Risks for late-onset eczema					
	n	Percent	n	Percent	OR	95% CI	P value	aOR*	95% CI	P value
Egg allergy status										
Not sensitized	1911	91.7	174	8.3	1.00			1.00		
Sensitized tolerant†	33	84.6	6	15.4	2.00	0.83 4.83	.125	2.10	0.81 5.43	.126
Allergic	71	84.5	13	15.5	2.01	1.09 3.71	.025	1.66	0.85 3.23	.141
Peanut allergy status										
Not sensitized	1993	91.3	189	8.7	1.00			1.00		
Sensitized tolerant†	34	89.5	4	10.5	1.24	0.44 3.53	.686	1.22	0.36 4.13	.753
Allergic	13	76.5	4	23.5	3.24	1.05 10.0	.041	2.37	0.61 9.27	.215
Number of allergens										
None	1904	91.3	181	8.7	1.00			1.00		
Single	72	86.7	11	13.3	1.61	0.84 3.09	.154	1.43	0.71 2.89	.315
Multiple	5	62.5	3	37.5	6.31	1.50 26.6	.012	3.73	0.73 19.0	.113
Any food allergy‡										
No	1904	96.1	77	3.9	1.00			1.00		
Yes	181	92.8	14	7.2	1.91	1.06 3.45	.031	1.59	0.83 3.04	.159
Any food sensitization‡										
No	1871	92.3	156	7.7	1.00			1.00		
Yes	172	86.9	26	13.1	1.81	1.16 2.83	.009	1.79	1.07 3.00	.027

aOR, Adjusted odds ratio; CI, confidence interval; OFC, oral food challenge; OR, odds ratio.

*Each adjusted for sex, parent country of birth, mode of delivery, smoking during pregnancy, Socio-Economic Indexes for Areas, and family history of eczema, and then reweighted to account for loss to follow-up.

†Sensitized tolerant is defined as a positive sensitization test and a negative OFC. When comparing children with confirmed allergy with those who were sensitized tolerant in the adjusted model, the risk of late-onset eczema was aOR 0.79, 95% CI 0.25-2.46 for egg and aOR 1.95, 95% CI 0.32-12.0 for peanut.

‡Any food allergy or sensitization to egg, peanut, or sesame.

and widely used ISAAC questionnaire. This showed that although some estimates lost precision, likely due to reduced numbers meeting the definition of eczema, all associations were in the same direction with a similar magnitude of association (Tables E5 and E6, available in this article's Online Repository at www.jaci-inpractice.org). Using only observed or diagnosed eczema at age 1 showed similar results (Tables E7 and E8, available in this article's Online Repository at www.jaci-inpractice.org).

In conclusion, we have shown that approximately 30% of infants with eczema at age 1 will have persistent disease up to age 6 years. Confirmed food allergy at age 1 year increased the risk of persistence by 2-fold. This association between food allergy and eczema persistence may be a result of an increased predisposition to atopy, possibly causing immunologic reactions to a wider variety of allergens leading to more frequent or more severe inflammation, resulting in persistent symptoms. The difference in risk between challenge-confirmed food allergy and food sensitization for eczema persistence or late-onset eczema needs further investigation. However, our results will be useful in better prediction of children with persistent eczema, which is the group suggested to be the high-risk group of allergic comorbidities and heavy burden of the disease.

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Conflicts of interest: A. J. Lowe reports grants from the National Health and Medical Research Council during the conduct of the study. M. L. K. Tang is on the Nestle Medical Advisory Board Oceania and the Danone Nutricia Global Scientific Advisory Board; received consultancy fees from Deerfield Consulting, GLG consulting, and Bayer; is employed by and has stock/employee stock options from

ProTA Therapeutics; received payment for lectures from Danone Nutricia, Abbott Australia, and Nestle Health Sciences; receives royalties from Wilkinson Publishing; has a patent through Murdoch Children's Research Institute. Her institution received grants from the National Health and Medical Research Council Australia and patents from ProTA Therapeutics for other works. K. J. Allen personally received consultancy fees from ThermoFisher, and is on the Before Brands Scientific Advisory Board. The rest of the authors declare that they have no relevant conflicts of interest.

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TABLE E1. Definitions of eczema

Status	Definition
Eczema at age 1	Either having (1) parent report of doctor-diagnosed eczema, (2) history of itchy rash (other than diaper/nappy rash) treated with topical steroids, or (3) observed eczema at recruitment (eczema observed by trained researchers on the infants' face, back, or elbow flexures)
Eczema at age 6	Either having (1) positive response to the following 3 questions based on the ISAAC questionnaire: "Has your child ever had an itchy rash that was coming and going for at least 6 months?" "Has your child had this itchy rash at any time in the past 12 months?" and "Has this itchy rash at any time affected any of the following places: the folds of the elbows, behind the knees, in front of the ankles, under the buttocks, or around the neck, ears, or eyes?" (2) positive response to both of the following questions: "Has your child been diagnosed with eczema?" and "Has your child had eczema at any time in the last 12 months?" or (3) positive response to "Has your child been diagnosed with eczema?" and "Have you used topical steroid creams or ointments in the past 12 months?"

ISAAC, International Study of Asthma and Allergies in Childhood.

TABLE E2. Association between early-life factors and persistent eczema at age 6

	Resolved eczema (N = 1140)		Persistent eczema (N = 481)		Risk for eczema persistence					
	n	Percent	n	Percent	OR	95% CI	P value	aOR*	95%CI	P value
Demographic factors*										
Sex										
Female	498	70.1	212	29.9	1.00			1.00		
Male	636	70.4	267	29.6	0.99	0.80 1.22	.899	0.97	0.77 1.24	.826
Season of birth										
Summer	281	74.9	94	25.1	1.00			1.00		
Autumn	284	71.9	111	28.1	1.17	0.85 1.61	.341	1.12	0.78 1.61	.540
Winter	292	67.0	144	33.0	1.47	1.08 2.00	.013	1.52	1.08 2.14	.016
Spring	282	68.1	132	31.9	1.40	1.02 1.91	.035	1.50	1.06 2.12	.022
Parent country of birth										
Both Australia	711	73.7	254	26.3	1.00			1.00		
Either East Asia born	139	58.4	99	41.6	1.99	1.48 2.68	<.001	2.14	1.53 2.99	<.001
Other	265	70.5	111	29.5	1.17	0.90 1.53	.237	1.12	0.84 1.49	.458
Mode of delivery										
Vaginal	723	68.1	339	31.9	1.00			1.00		
Caesarean	411	74.3	142	25.7	0.74	0.59 0.93	.009	0.78	0.60 1.01	.055
Mother's age at birth of child										
<31 y	334	68.3	155	31.7	1.00			1.00		
31-35 y	394	68.6	180	31.4	0.96	0.74 1.24	.746	0.97	0.73 1.31	.863
>35 y	410	73.9	145	26.1	0.74	0.57 0.97	.029	0.85	0.62 1.15	.289
Family history of eczema										
No	696	72.7	261	27.3	1.00			1.00		
Yes	444	66.9	220	33.1	1.32	1.07 1.64	.011	1.38	1.08 1.77	.011
Family history of asthma										
No	752	72.0	292	28.0	1.00			1.00		
Yes	388	67.5	187	32.5	1.23	0.99 1.54	.063	1.16	0.89 1.50	.267
Family history of allergic rhinitis										
No	520	72.9	193	27.1	1.00			1.00		
Yes	620	68.3	288	31.7	1.25	1.01 1.55	.042	1.03	0.80 1.32	.821
Family history of food allergy										
No	972	70.6	405	29.4	1.00			1.00		
Yes	168	68.9	76	31.1	1.09	0.81 1.46	.584	0.94	0.66 1.32	.702
SEIFA quintile†										
1	180	64.5	99	35.5	1.00		.008	1.00		.204
2	226	68.9	102	31.1	0.82	0.58 1.15		0.82	0.55 1.20	
3	260	73.0	96	27.0	0.67	0.48 0.94		0.70	0.48 1.03	
4	240	71.4	96	28.6	0.73	0.52 1.02		0.81	0.55 1.19	
5	230	72.3	88	27.7	0.70	0.49 0.98		0.74	0.50 1.11	
Dog ownership‡										
None	775	68.1	363	31.9	1.00			1.00		
Outside only	116	73.0	43	27.0	0.79	0.55 1.15	.217	0.76	0.50 1.17	.211
Allowed inside	248	77.0	74	23.0	0.64	0.48 0.85	.002	0.73	0.53 1.01	.055

aOR, Adjusted odds ratio; CI, confidence interval; OR, odds ratio; SEIFA, socio-economic indexes for areas.

*All demographic factors were adjusted for each other and reweighted to account for loss to follow-up, the P value for SEIFA quintile is shown for trend.

†SEIFA is a suite of 4 summary measures including indices of relative socioeconomic advantage and disadvantage, economic resources and education and occupation developed by the Australian Bureau of Statistics using national data from the Australian Census.^{E1}

‡Dog ownership was considered in a separate model and was adjusted for sex, parent country of birth, season of birth, mode of delivery, family history of eczema, and SEIFA.

TABLE E3. Association between early-life factors and late-onset eczema at age 6

	No eczema (N = 2075)		Late-onset eczema (N = 201)		Risk for late-onset eczema							
	n	Percent	n	Percent	OR	95% CI		P value	aOR*	95% CI		P value
Demographic factors												
Sex												
Female	1059	90.1	116	9.9	1.00				1.00			
Male	1004	92.2	85	7.8	0.77	0.58	1.04	.084	0.79	0.57	1.10	.159
Season of birth												
Summer	459	91.1	45	8.9	1.00				1.00			
Autumn	470	89.9	53	10.1	1.15	0.76	1.75	.511	1.16	0.74	1.82	.521
Winter	554	91.0	55	9.0	1.01	0.67	1.53	.953	0.95	0.60	1.51	.835
Spring	592	92.5	48	7.5	0.83	0.54	1.26	.380	0.88	0.55	1.40	.583
Parent country of birth												
Both Australia	1314	92.3	109	7.7	1.00				1.00			
Either East Asia born	148	87.1	22	12.9	1.79	1.10	2.92	.018	1.80	1.04	3.10	.035
Other	596	89.8	68	10.2	1.38	1.00	1.89	.049	1.24	0.87	1.77	.232
Mode of delivery												
Vaginal	1401	91.9	124	8.1	1.00				1.00			
Caesarean	666	89.9	75	10.1	1.27	0.94	1.72	.226	1.37	0.98	1.90	.064
Prenatal probiotics use												
No	1752	91.4	164	8.6	1.00							
Yes	148	87.6	21	12.4	1.52	0.93	2.46	.090	1.26	0.74	2.13	.396
Maternal smoking during pregnancy												
No	1988	91.4	188	8.6	1.00							
Yes	75	86.2	12	13.8	1.69	0.90	3.17	.097	1.94	0.98	3.87	.059
Family history of eczema												
No	1586	92.5	128	7.5	1.00				1.00			
Yes	489	87.9	73	13.0	1.85	1.36	2.51	.001	1.95	1.38	2.75	<.001
Family history of asthma												
No	1490	92.1	128	7.9	1.00				1.00			
Yes	585	88.9	73	11.1	1.45	1.07	1.97	.015	1.30	0.92	1.84	.140
Family history of allergic rhinitis												
No	1064	91.0	105	9.0	1.00				1.00			
Yes	1011	91.3	96	8.7	0.96	0.72	1.29	.794	0.76	0.54	1.07	.115
Family history of food allergy												
No	1813	91.7	165	8.3	1.00				1.00			
Yes	262	87.9	36	12.1	1.51	1.03	2.22	.034	1.53	1.01	2.33	.045
SEIFA quintile												
1	427	92.0	37	8.0	1.00			.881	1.00			.204
2	420	90.1	46	9.9	1.26	0.80	1.98		1.03	0.62	1.71	
3	433	91.0	43	9.0	1.14	0.72	1.81		0.96	0.57	1.60	
4	412	90.5	43	9.5	1.20	0.76	1.91		1.32	0.81	2.17	
5	380	92.2	32	7.8	0.97	0.59	1.59		0.88	0.51	1.52	
Any siblings at 1												
No	1033	90.8	105	9.2	1.00				1.00			
Yes	1039	91.5	96	8.5	0.91	0.68	1.21	.519	0.82	0.59	1.15	.249
Any childcare or family day care use during infancy												
No	1504	91.4	141	8.6	1.00				1.00			
Yes	569	90.5	60	9.5	1.12	0.82	1.54	.467	1.07	0.74	1.53	.722
Dog ownership												
No	1373	90.8	139	9.2	1.00				1.00			
Yes	702	91.9	62	8.1	0.87	0.64	1.19	.392	0.85	0.60	1.20	.349

aOR, Adjusted odds ratio; CI, confidence interval; OR, odds ratio; SEIFA, Socio-Economic Indexes for Areas.

*All factors were simultaneously included in the model and reweighted to account for loss to follow-up.

TABLE E4. Association between eczema characteristics at age 1 and persistent eczema at age 6

	Resolved eczema (N = 1140)		Persistent eczema (N = 481)		Risks for persistent eczema					
	n	Percent	n	Percent	OR	95% CI	P value	aOR*	95% CI	P value
Eczema characteristics at age 1										
Doctor diagnosis of eczema										
Diagnosed between 6 and 12 mo	148	69.8	64	30.2	1.00			1.00		
Diagnosed by 6 mo	497	63.6	285	36.4	1.33	0.96 1.84	.091	1.72	1.12 2.64	.013
Undiagnosed observed eczema†	381	80.5	92	19.5	0.56	0.39 0.81	.002	0.92	0.58 1.47	.735
Eczema treatment in the first year‡										
None	562	80.2	139	19.8	1.00			1.00		
Moisturizer only	59	67.8	28	32.2	1.92	1.18 3.12	.010	1.75	0.97 3.17	.064
Mild steroid	180	65.2	96	34.8	2.16	1.58 2.94	<.001	2.00	1.40 2.86	<.001
Strong steroid	107	55.4	86	44.6	3.25	2.31 4.56	<.001	2.38	1.58 3.60	<.001

aOR, Adjusted odds ratio; CI, confidence interval; OR, odds ratio; SEIFA, Socio-Economic Indexes for Areas.

*Eczema characteristics are adjusted for each other, sex, parent country of birth, season of birth, mode of delivery, family history of eczema, SEIFA, dog ownership at age 1, and then reweighted to account for loss to follow-up.

†These children had a parent-reported history of itchy rash requiring steroid treatment (excluding nappy rash) in the first year of life or nurse-observed eczema at recruitment but did not have parent report of eczema diagnosis.

‡Topical steroid treatment was categorized as mild (available without prescription) and strong (requiring a prescription in Australia) as categorized in our previous publication.^{E2}

TABLE E5. Association between food allergy at age 1 and persistent eczema at age 6 by ISAAC definition

	Resolved eczema by ISAAC (N = 1052)		Persistent eczema by ISAAC (N = 370)		Risks for persistent eczema		
	n	Percent	n	Percent	aOR*	95% CI	P value
Egg allergy status							
Not sensitized	777	78.3	215	21.7	1.00		
Sensitized tolerant	35	63.6	20	36.4	1.39	0.61-3.15	.432
Allergic	169	61.5	106	38.5	1.74	1.18-2.58	.005
Peanut allergy status							
Not sensitized	849	76.5	261	23.5	1.00		
Sensitized tolerant	61	67.0	30	33.0	1.28	0.71-2.53	.410
Allergic	71	59.7	48	40.3	1.51	0.87-2.63	.142
Food allergy type							
None	786	78.4	217	21.6	1.00		
Egg only	110	60.1	73	39.9	1.81	1.17-2.79-	.007
Peanut only	19	52.8	17	47.2	2.07	1.74-5.75	.164
Egg and peanut	48	61.5	30	38.5	1.52	0.81-2.85	.193
Number of food allergies†							
None	775	78.4	213	21.6	1.00		
Single	121	58.2	87	41.8	1.96	1.29-2.96	.002
Multiple	53	61.6	33	38.4	1.56	0.85-2.85	.152
Any food sensitization							
No	731	78.9	195	21.1	1.00		
Yes	265	64.0	149	36.0	1.83	1.28-2.62	.001

aOR, Adjusted odds ratio; CI, confidence interval; ISAAC, International Study of Asthma and Allergies in Childhood; SEIFA, Socio-Economic Indexes for Areas.

*Each food allergy variable is adjusted for sex, parent country of birth, season of birth, mode of delivery, family history of eczema, SEIFA, eczema characteristics, and dog ownership at age 1, and then reweighted to account for loss to follow-up.

†Number of food allergies to egg, peanut, or sesame.

TABLE E6. Food allergy at age 1 and late-onset eczema at age 6 by ISAAC definition

	No eczema by ISAAC (N = 1769)		Late-onset eczema by ISAAC (N = 168)		Risks for late-onset eczema		
	n	Percent	n	Percent	aOR*	95% CI	P value
Egg allergy status							
Not sensitized	1630	91.8	145	8.2	1.00		
Sensitized tolerant	29	85.3	5	14.7	1.98	0.70-5.63	.197
Allergic	65	85.5	11	14.5	1.74	0.86-3.50	.122
Peanut allergy status							
Not sensitized	1696	91.5	157	8.5	1.00		
Sensitized tolerant	32	91.4	3	8.6	0.81	0.19-3.50	.782
Allergic	12	75.0	4	25.0	2.57	0.64-10.30	.183
Number of allergens							
None	1632	91.5	151	8.5	1.00		
Single	65	87.8	9	12.2	1.51	0.72-3.17	.277
Multiple	5	62.5	3	37.5	3.81	0.75-19.3	.106
Any food allergy							
No	1632	91.5	151	8.5	1.00		
Yes	70	85.4	12	14.6	1.68	0.86-3.32	.131
Any food sensitization							
No	1596	91.8	143	8.2	1.00		
Yes	134	85.9	22	14.1	1.83	1.06-3.17	.030

aOR, Adjusted odds ratio; CI, confidence interval; ISAAC, International Study of Asthma and Allergies in Childhood; SEIFA, Socio-Economic Indexes for Areas.

*Each adjusted for sex, parent country of birth, mode of delivery, smoking during pregnancy, SEIFA, and family history of eczema, and then reweighted to account for loss to follow-up.

TABLE E7. Association between food allergy at age 1 and persistent eczema at age 6 (using observed or diagnosed eczema for the definition of eczema at age 1)

	Resolved eczema (N = 1031)		Persistent eczema (N = 442)		Risks for persistent eczema		
	n	Percent	N	Percent	aOR*	95% CI	P value
Egg allergy status							
Not sensitized	778	76.3	241	23.7	1.00		
Sensitized tolerant	37	61.7	23	38.3	1.31	0.64-2.69	.466
Allergic	134	49.8	135	50.2	2.36	1.63-3.44	<.001
Peanut allergy status							
Not sensitized	856	73.9	303	26.1	1.00		
Sensitized tolerant	50	58.8	35	41.2	1.80	1.03-3.16	.039
Allergic	60	51.7	56	48.3	1.74	1.01-3.02	.047
Food allergy type							
None	787	76.1	247	23.9	1.00		
Egg only	89	49.4	91	50.6	2.45	1.61-3.73	<.001
Peanut only	19	54.3	16	45.7	1.79	0.65-4.93	.259
Egg and peanut	36	48.0	39	52.0	2.03	1.09-3.79	.025
Number of food allergies							
None	774	76.2	242	23.8	1.00		
Single	101	49.5	103	50.5	2.44	1.63-3.65	<.001
Multiple	41	49.4	42	50.6	2.15	1.18-3.92	.012
Any food sensitization							
No	730	76.6	223	23.4	1.00		
Yes	254	58.4	181	41.6	2.14	1.52-3.02	<.001

aOR, Adjusted odds ratio; CI, confidence interval; SEIFA, Socio-Economic Indexes for Areas.

*Each food allergy variable is adjusted for sex, parent country of birth, season of birth, mode of delivery, family history of eczema, SEIFA, eczema characteristics, and dog ownership at age 1 and then reweighted to account for loss to follow-up.

TABLE E8. Food allergy at age 1 and late-onset eczema at age 6 (using observed or diagnosed eczema for the definition of eczema at age 1)

	No eczema (N = 2246)		Late-onset eczema (N = 241)		Risks for late-onset eczema		
	n	Percent	n	Percent	aOR*	95% CI	P value
Egg allergy status							
Not sensitized	2051	91.0	202	9.0	1.00		
Sensitized tolerant	38	84.4	7	15.6	2.22	0.91-5.44	.081
Allergic	92	80.0	23	20.0	2.32	1.25-3.97	.002
Peanut allergy status							
Not sensitized	2141	90.6	221	9.4	1.00		
Sensitized tolerant	46	83.6	9	16.4	2.00	0.79-5.03	.142
Allergic	20	76.9	6	23.1	2.52	0.89-7.20	.083
Number of allergens							
None	2046	90.8	208	9.2	1.00		
Single	90	81.1	21	18.9	2.18	1.25-3.80	.006
Multiple	10	71.4	4	28.6	2.89	0.80-10.5	.105
Any food allergy							
No	2046	90.8	208	9.2	1.00		
Yes	100	80.0	25	20.0	2.26	1.35-3.79	.002
Any food sensitization							
No	2006	91.0	199	9.0	1.00		
Yes	189	82.9	39	17.1	2.23	1.44-3.47	<.001

aOR, Adjusted odds ratio; CI, confidence interval; SEIFA, Socio-Economic Indexes for Areas.

*Each adjusted for sex, parent country of birth, mode of delivery, smoking during pregnancy, SEIFA, and family history of eczema, and then reweighted to account for loss to follow-up.

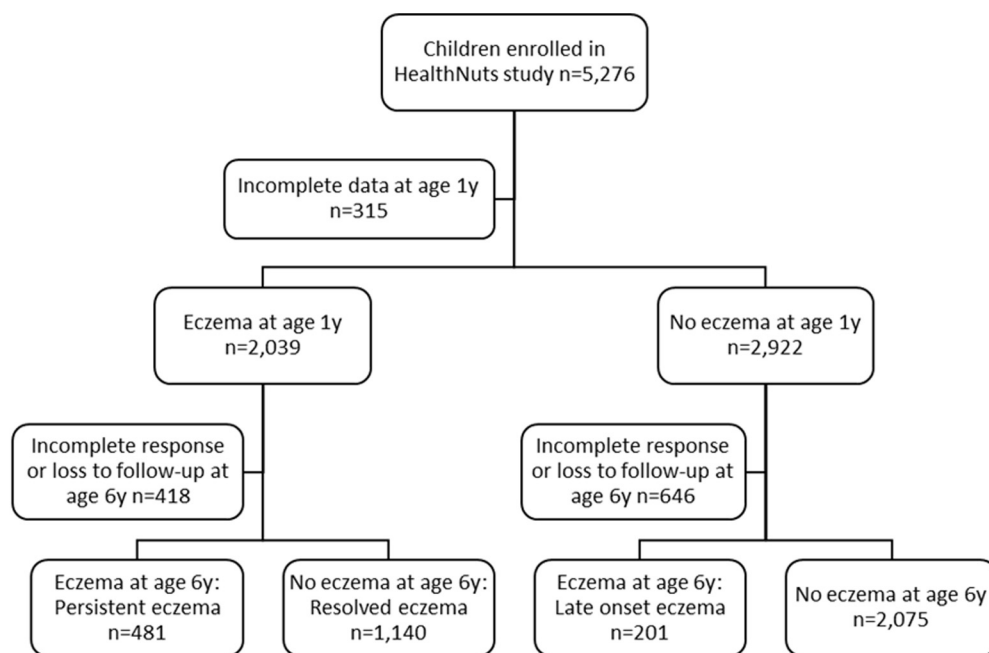


FIGURE E1. Overview of participants included in the analysis.

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