

Data-driven assessment of mental health among children and adolescents with food allergy

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SUPPLEMENTARY MATERIALS

Table 1: Characteristics of Food Allergy cohorts vs. no Food Allergy, Asthma, Atopic dermatitis, and Type 1 Diabetes cohorts, unmatched and matched

a. FA vs. no FA

Characteristic	Pre matching			Post matching		
	No FA	FA	p-value ²	No FA	FA	p-value ²
	N = 1,130,721 ¹	N = 23,263 ¹		N = 69,789 ¹	N = 23,263 ¹	
Age	8.0 (4.0, 13.0)	5.0 (2.0, 10.0)	<0.001	5.0 (2.0, 10.0)	5.0 (2.0, 10.0)	>0.9
Age group			<0.001			>0.9
[0, 5)	375,715 (33%)	11,017 (47%)		33,051 (47%)	11,017 (47%)	
[5,10)	287,163 (25%)	6,399 (28%)		19,197 (28%)	6,399 (28%)	
[10,15)	242,766 (21%)	3,798 (16%)		11,394 (16%)	3,798 (16%)	
[15,19]	225,077 (20%)	2,049 (8.8%)		6,147 (8.8%)	2,049 (8.8%)	
Female	538,701 (48%)	10,081 (43%)	<0.001	30,243 (43%)	10,081 (43%)	>0.9
Year			<0.001			>0.9
[2000,2005)	220,129 (19%)	2,814 (12%)		8,442 (12%)	2,814 (12%)	
[2005,2010)	298,575 (26%)	6,416 (28%)		19,248 (28%)	6,416 (28%)	
[2010,2015)	333,828 (30%)	7,751 (33%)		23,253 (33%)	7,751 (33%)	
[2015,2020)	233,636 (21%)	5,292 (23%)		15,876 (23%)	5,292 (23%)	
[2020,2021]	44,553 (3.9%)	990 (4.3%)		2,970 (4.3%)	990 (4.3%)	
Outcome eating disorder	2,603 (0.2%)	95 (0.4%)	<0.001	132 (0.2%)	95 (0.4%)	<0.001
Outcome anxiety	42,533 (3.8%)	1,075 (4.6%)	<0.001	1,998 (2.9%)	1,075 (4.6%)	<0.001
Outcome depression	25,289 (2.2%)	489 (2.1%)	0.2	946 (1.4%)	489 (2.1%)	<0.001
Follow up administrative	1,777 (943, 3,096)	2,049 (1,110, 3,406)	<0.001	1,744 (933, 3,024)	2,049 (1,110, 3,406)	<0.001
Follow up anxiety	1,736 (920, 3,025)	1,997 (1,081, 3,312)	<0.001	1,715 (918, 2,971)	1,997 (1,081, 3,312)	<0.001
Follow up eating	1,774 (942, 3,092)	2,043 (1,106, 3,394)	<0.001	1,742 (932, 3,020)	2,043 (1,106, 3,394)	<0.001
Follow up depression	1,751 (929, 3,048)	2,031 (1,098, 3,366)	<0.001	1,732 (925, 3,000)	2,031 (1,098, 3,366)	<0.001

¹Median (IQR); n (%)

²Wilcoxon rank sum test; Pearson's Chi-squared test

b. FA vs. Type 1 Diabetes

Characteristic	Pre matching		p-value ²	Post matching		p-value ²
	No FA N = 4,835 ¹	FA N = 23,215 ¹		No FA N = 4,763 ¹	FA N = 4,763 ¹	
Age	11.0 (7.0, 14.0)	5.0 (2.0, 10.0)	<0.001	11.0 (7.0, 14.0)	11.0 (7.0, 14.0)	0.2
Age group			<0.001			0.4
[0, 5)	550 (11%)	11,009 (47%)		550 (12%)	602 (13%)	
[5,10)	1,343 (28%)	6,384 (27%)		1,343 (28%)	1,352 (28%)	
[10,15)	1,893 (39%)	3,782 (16%)		1,876 (39%)	1,822 (38%)	
[15,19]	1,049 (22%)	2,040 (8.8%)		994 (21%)	987 (21%)	
Female	2,169 (45%)	10,063 (43%)	0.054	2,162 (45%)	2,162 (45%)	>0.9
Year			<0.001			>0.9
[2000,2005)	872 (18%)	2,807 (12%)		814 (17%)	814 (17%)	
[2005,2010)	1,303 (27%)	6,404 (28%)		1,303 (27%)	1,303 (27%)	
[2010,2015)	1,379 (29%)	7,733 (33%)		1,379 (29%)	1,379 (29%)	
[2015,2020)	1,007 (21%)	5,282 (23%)		1,007 (21%)	1,007 (21%)	
[2020,2021]	274 (5.7%)	989 (4.3%)		260 (5.5%)	260 (5.5%)	
Outcome eating disorder	14 (0.3%)	95 (0.4%)	0.2	14 (0.3%)	21 (0.4%)	0.2
Outcome anxiety	378 (7.8%)	1,074 (4.6%)	<0.001	370 (7.8%)	348 (7.3%)	0.4
Outcome depression	340 (7.0%)	488 (2.1%)	<0.001	328 (6.9%)	200 (4.2%)	<0.001
Follow up administrative	2,313 (1,224, 3,762)	2,048 (1,110, 3,404)	<0.001	2,295 (1,223, 3,724)	2,091 (1,113, 3,501)	<0.001
Follow up anxiety	2,196 (1,159, 3,595)	1,996 (1,081, 3,311)	<0.001	2,184 (1,161, 3,566)	2,013 (1,063, 3,348)	<0.001
Follow up eating	2,309 (1,222, 3,758)	2,043 (1,105, 3,394)	<0.001	2,288 (1,222, 3,714)	2,083 (1,108, 3,487)	<0.001
Follow up depression	2,194 (1,174, 3,576)	2,030 (1,098, 3,364)	<0.001	2,184 (1,176, 3,548)	2,054 (1,084, 3,374)	<0.001

¹Median (IQR); n (%)

²Wilcoxon rank sum test; Pearson's Chi-squared test

c. Food allergy vs. Atopic dermatitis

Characteristic	Pre matching		p-value ¹	Post matching		p-value ¹
	No FA N = 207,575	FA N = 15,746		No FA N = 47,196	FA N = 15,732	
Age, Median (IQR)	5.0 (2.0 – 10.0)	5.0 (2.0 – 10.0)	0.001	5.0 (2.0 – 10.0)	5.0 (2.0 – 10.0)	0.93
Age group, n (%)			<0.001			>0.99
[0, 5)	96,908 (47)	7,231 (46)		21,664 (46)	7,219 (46)	
[5,10)	51,561 (25)	4,225 (27)		12,664 (27)	4,225 (27)	
[10,15)	35,438 (17)	2,697 (17)		8,092 (17)	2,695 (17)	
[15,19]	23,668 (11)	1,593 (10)		4,776 (10)	1,593 (10)	
Female, n (%)	105,987 (51)	6,799 (43)	<0.001	20,361 (43)	6,787 (43)	>0.99
Year, n (%)			<0.001			>0.99
[2000,2005)	38,733 (19)	1,878 (12)		5,634 (12)	1,878 (12)	
[2005,2010)	68,676 (33)	4,062 (26)		12,186 (26)	4,062 (26)	
[2010,2015)	65,418 (32)	5,134 (33)		15,402 (33)	5,134 (33)	
[2015,2020)	31,369 (15)	3,852 (24)		11,556 (24)	3,852 (24)	
[2020,2021]	3,379 (1.6)	820 (5.2)		2,418 (5.1)	806 (5.1)	
Outcome eating dis, n (%)	820 (0.4)	69 (0.4)	0.41	150 (0.3)	69 (0.4)	0.026
Outcome anxiety, n (%)	11,705 (5.6)	733 (4.7)	<0.001	2,178 (4.6)	733 (4.7)	0.82
Outcome depression, n (%)	6,595 (3.2)	359 (2.3)	<0.001	1,105 (2.3)	359 (2.3)	0.67
Fu administrative, Median (IQR)	2,397 (1,283 – 3,829)	1,917 (1,037 – 3,258)	<0.001	1,984 (1,058 – 3,367)	1,921 (1,039 – 3,259)	<0.001
Fu anxiety, Median (IQR)	2,326 (1,247 – 3,720)	1,868 (1,006 – 3,168)	<0.001	1,935 (1,035 – 3,263)	1,869 (1,008 – 3,168)	<0.001
Fu eating dis, Median (IQR)	2,389 (1,279 – 3,821)	1,912 (1,031 – 3,249)	<0.001	1,980 (1,055 – 3,360)	1,914 (1,034 – 3,251)	<0.001
Fu depression, Median (IQR)	2,353 (1,260 – 3,766)	1,898 (1,025 – 3,219)	<0.001	1,961 (1,047 – 3,311)	1,900 (1,027 – 3,220)	<0.001

¹Wilcoxon rank sum test; Pearson's Chi-squared test

d. Food Allergy vs. Asthma

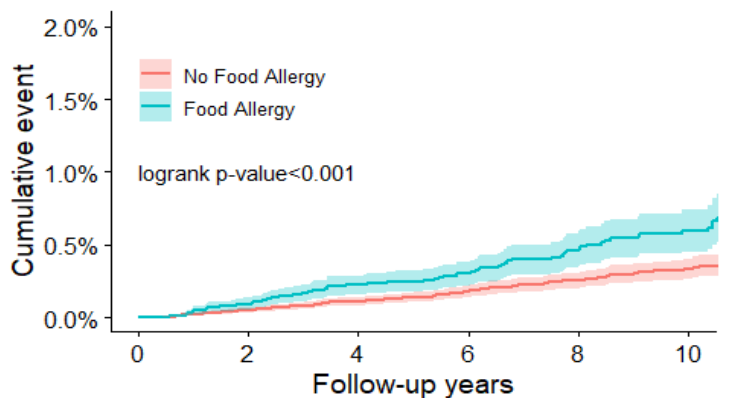
Characteristic	Pre matching			Post matching		
	No FA N = 136,453 ¹	FA N = 16,992 ¹	p-value ²	No FA N = 45,861 ¹	FA N = 15,287 ¹	p-value ²
Age	8.0 (4.0, 12.0)	5.0 (2.0, 10.0)	<0.001	5.0 (3.0, 10.0)	5.0 (3.0, 10.0)	<0.001
Age group			<0.001			0.8
[0, 5)	38,902 (29%)	8,427 (50%)		20,026 (44%)	6,730 (44%)	
[5,10)	44,212 (32%)	4,280 (25%)		12,981 (28%)	4,272 (28%)	
[10,15)	35,811 (26%)	2,675 (16%)		8,020 (17%)	2,675 (17%)	
[15,19]	17,528 (13%)	1,610 (9.5%)		4,834 (11%)	1,610 (11%)	
Female	58,549 (43%)	7,683 (45%)	<0.001	20,547 (45%)	6,849 (45%)	>0.9
Year			<0.001			>0.9
[2000,2005)	42,021 (31%)	1,745 (10%)		5,235 (11%)	1,745 (11%)	
[2005,2010)	40,664 (30%)	4,257 (25%)		12,750 (28%)	4,250 (28%)	
[2010,2015)	33,014 (24%)	5,805 (34%)		16,113 (35%)	5,371 (35%)	
[2015,2020)	18,511 (14%)	4,297 (25%)		10,203 (22%)	3,401 (22%)	
[2020,2021]	2,243 (1.6%)	888 (5.2%)		1,560 (3.4%)	520 (3.4%)	
Outcome eating dis, n (%)	652 (0.5%)	65 (0.4%)	0.086	177 (0.4%)	64 (0.4%)	0.6
Outcome anxiety, n (%)	10,767 (7.9%)	721 (4.2%)	<0.001	2,695 (5.9%)	713 (4.7%)	<0.001
Outcome depression, n (%)	6,885 (5.0%)	333 (2.0%)	<0.001	1,372 (3.0%)	333 (2.2%)	<0.001
Fu administrative, Median (IQR)	2,732 (1,451, 4,306)	1,828 (991, 3,133)	<0.001	2,155 (1,179, 3,527)	1,946 (1,057, 3,260)	<0.001
Fu anxiety, Median (IQR)	2,610 (1,384, 4,131)	1,780 (967, 3,043)	<0.001	2,091 (1,137, 3,413)	1,894 (1,028, 3,169)	<0.001
Fu eating dis, Median (IQR)	2,722 (1,444, 4,293)	1,824 (987, 3,128)	<0.001	2,150 (1,175, 3,517)	1,940 (1,052, 3,252)	<0.001
Fu depression, Median (IQR)	2,649 (1,411, 4,179)	1,808 (979, 3,100)	<0.001	2,124 (1,160, 3,466)	1,923 (1,042, 3,227)	<0.001

¹Median (IQR); n (%)

²Wilcoxon rank sum test; Pearson's Chi-squared test

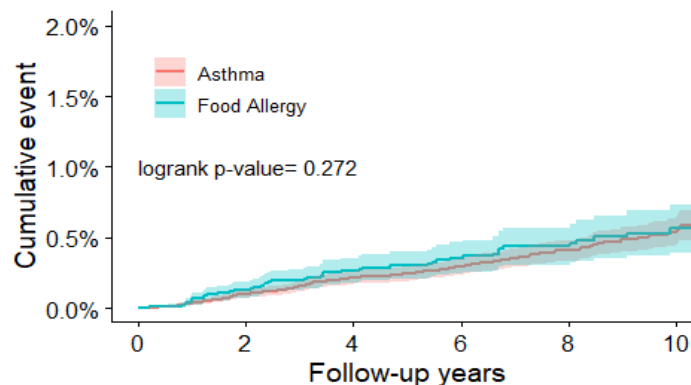
Figure 1: Kaplan Meir

a. Eating disorders



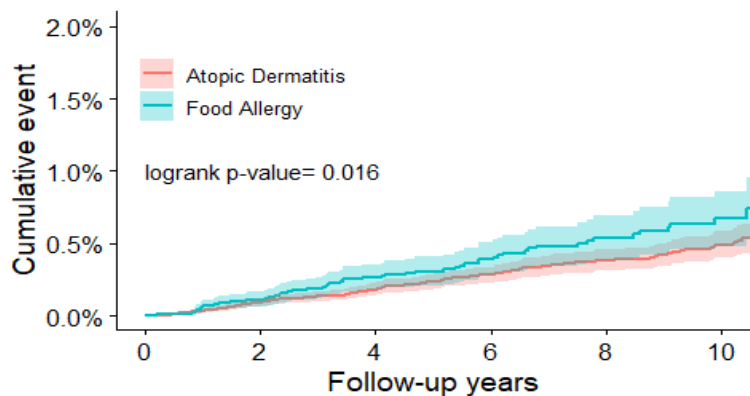
Number at risk

69789	57537	40094	27527	18365	11568
23263	20177	15079	10829	7629	5039



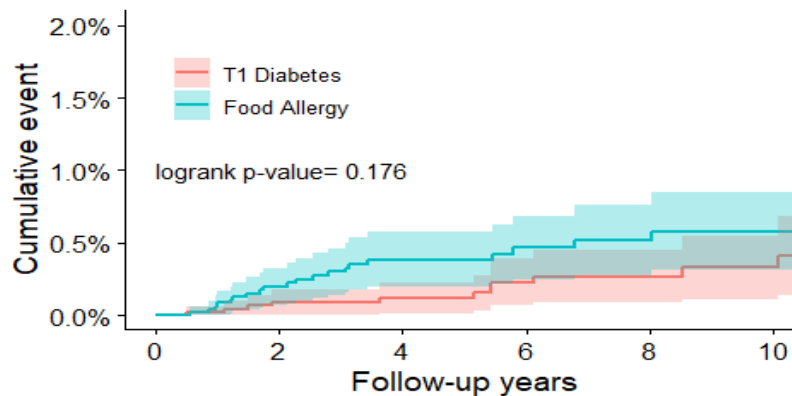
Number at risk

45861	40466	30720	22473	15858	10506
15287	13129	9571	6727	4675	3013



Number at risk

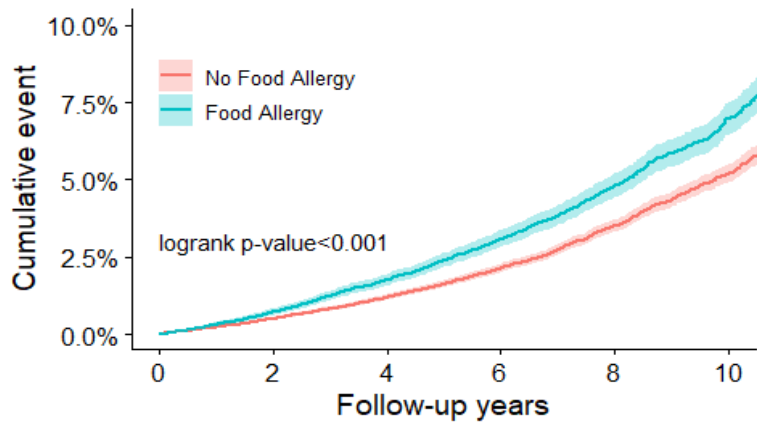
47196	40554	29838	21394	14987	9879
15732	13387	9738	6857	4781	3101



Number at risk

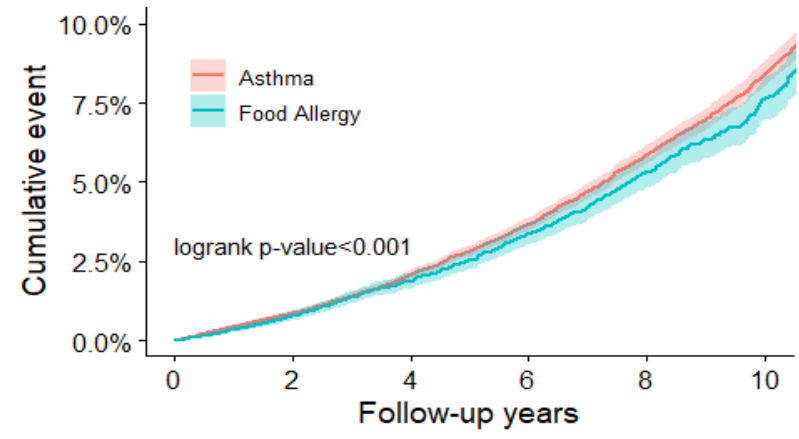
4763	4203	3269	2476	1797	1235
4763	4159	3135	2286	1608	1081

b. Anxiety



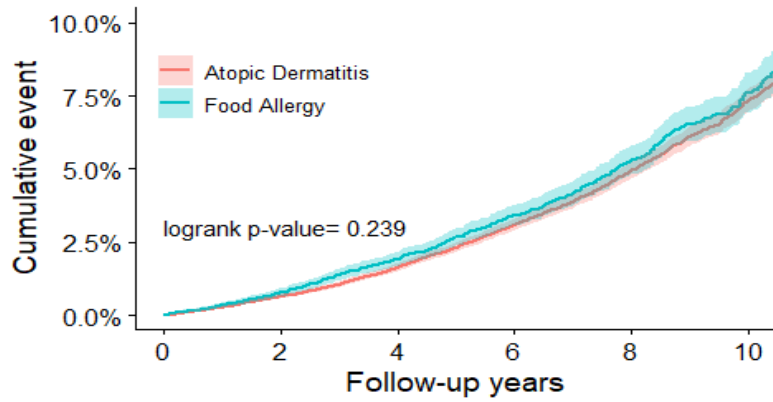
Number at risk

69426	56983	39536	26977	17846	11119
23142	19959	14812	10521	7309	4760



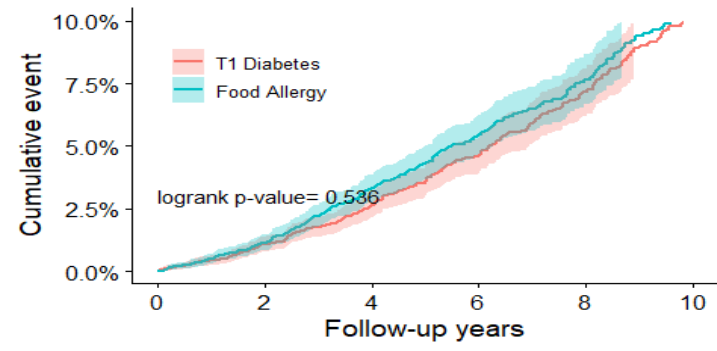
Number at risk

45597	39939	30055	21741	15068	9775
15199	12978	9395	6518	4457	2832



Number at risk

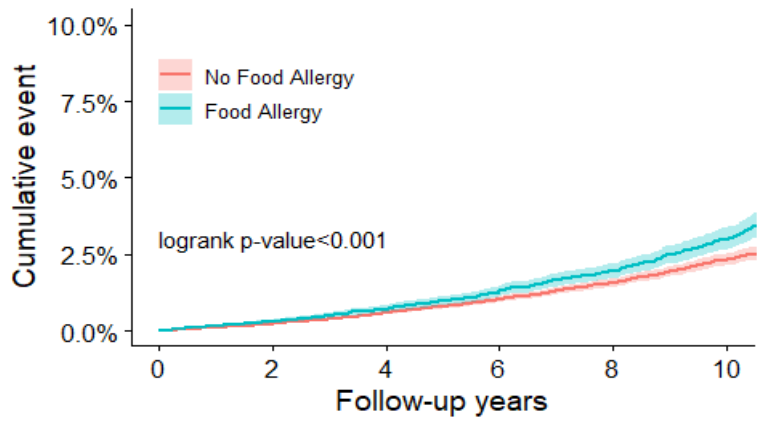
46977	40144	29329	20785	14379	9307
15659	13243	9543	6640	4560	2920



Number at risk

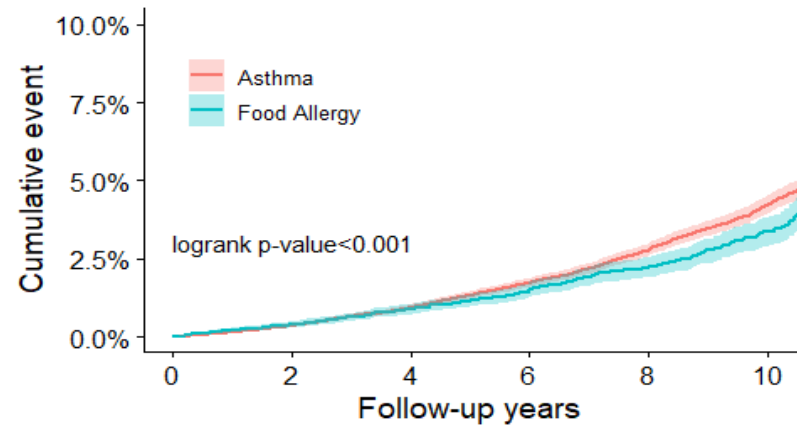
4745	4148	3188	2374	1692	1130
4745	4102	3036	2175	1510	997

c. Depression



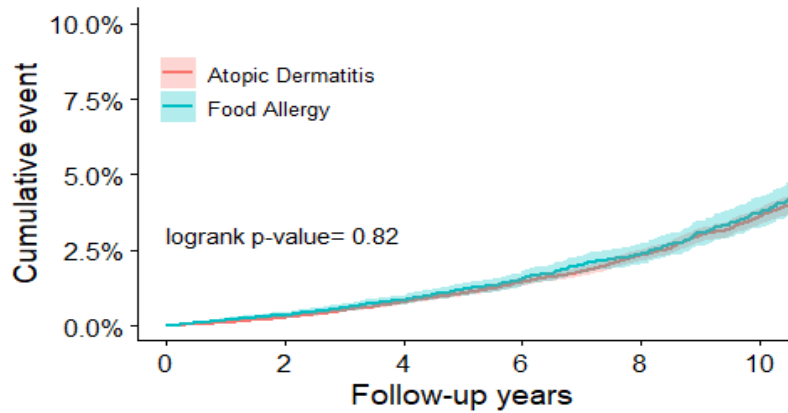
Number at risk

69654	57329	39862	27274	18128	11333
23218	20094	14984	10728	7525	4933



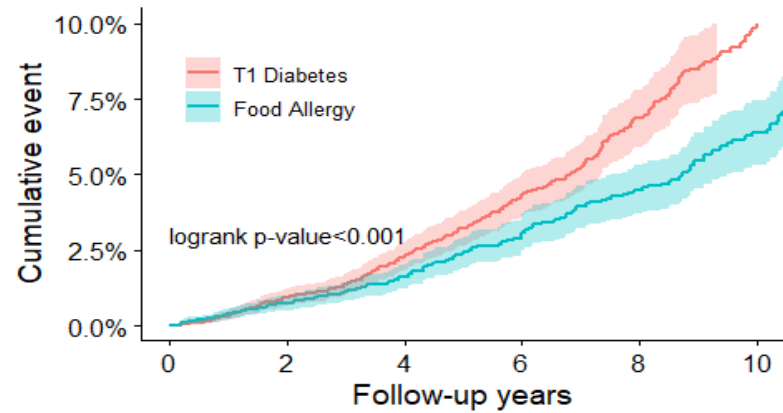
Number at risk

45789	40308	30469	22151	15499	10150
15263	13073	9501	6660	4602	2940



Number at risk

47127	40419	29610	21104	14678	9554
15709	13335	9666	6776	4693	3008



Number at risk

4754	4164	3200	2374	1682	1117
4754	4123	3090	2230	1547	1020

Table 2: Hazard ratios from Cox models of mental outcomes among Food Allergy cohort vs. No Food Allergy and vs. other chronic conditions (adjusted by age and sex)

Cohort	Eating disorders		Anxiety		Depression	
	HR	95CI%	HR	95CI%	HR	95CI%
FA vs. No FA	1.85	1.42-2.41	1.35	1.25-1.45	1.24	1.11-1.39
FA vs. Type 1 diabetes	1.58	0.81-3.10	1.03	0.89-1.19	0.64	0.54-0.76
FA vs. Atopic dermatitis	1.43	1.07-1.90	1.06	0.98-1.16	1.03	0.91-1.16
FA vs. Asthma	1.17	0.88-1.55	0.86	0.79-0.91	0.77	0.68-0.87