Allergens, Race, Ethnicity , and Sex: Factors Associated With Asthma

Angel Jordan[1] ,Charles Samitoles[1], Musheer Abdalhuk[1], Rhogan Wagimin[1], Felix E. Rivera-Mariani PhD[1]

[1]College of Biomedical Sciences, Larkin University, Miami, FL

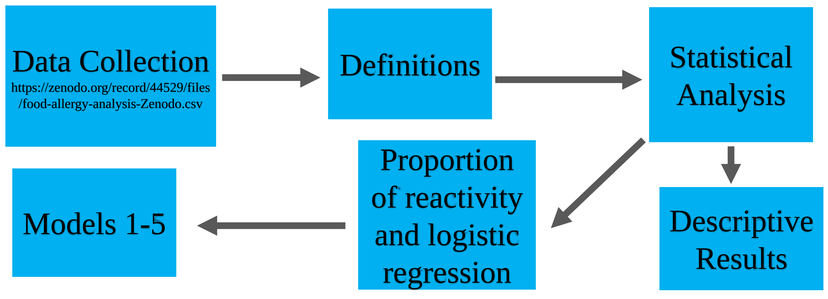
Purpose

With allergic reactions being the most common cause of pediatric asthma related hospital visits. It is found that 90% of children with asthma also suffer from allergies [3]. The purpose of this study is to find a relationship between common food allergens, gender, race, ethnicity, the response they elicit, and the onset of allergic rhinitis, atopic dermatitis, and most importantly asthma. Through statistical analysis in proportion of reactivity of common food allergens and logistic regression models between the identified factors and asthma we hope to further understand asthma and asthma related illnesses.

Introduction

- Asthma is a disease that affects nearly 330 million people worldwide [1]
- Episodes of asthma are often connected to a “complex syndrome in which allergen exposure often induces intermittent attacks of breathlessness, airway hyper-reactivity, wheezing, and coughing” [4]
- The statistics have reported a rise in asthma and allergies over the last 60 years [4] as well as asthma related illnesses namely atopic dermatitis and allergic rhinitis.
- Pediatric asthma has doubled in the last 20 years within the United States [1]
- Allergic-induced asthma is a growing problem in the health care community
    - Increase in Prevalence
    - Increase in Severity (Asthma Attacks) associated with secondary/repeated exposure to allergens
- The connection of asthma and allergens begins with the initial exposure (sensitization) to an allergen that leads to the TH2 cell pathway of an immune response.
- Secondary exposure to an allergen comes with the activation of mast cells, causing a stronger asthmatic episode
    - Putting people in danger due to the possibility of asphyxiation during asthmatic attacks.
    - The longer it takes for allergic triggers of asthma to be identified, the greater risk of increased sensitization to those triggers via repeated exposure.

Methods



Results

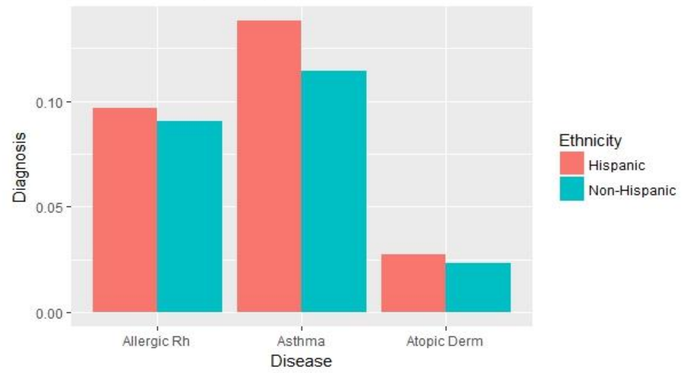
Demographic characteristics of birth and cross-sectional cohorts

	Frequency, % (n)	
Characteristic	**Birth**	**Cross-sectional**
	(29,662)	**(333,200)**
Race/ethnicity		
White	48 (14,188)	55 (183,308)
Black	40 (11,967)	29 (97,795)
Asian or Pacific Islander	3 (825)	3 (9,152)
Other	1 (166)	1 (2,005)
Unknown	8 (2,516)	12 (40,940)
Non-Hispanic	97 (28,661)	95 (317,868)
Hispanic	3 (1,001)	5 (15,332)
Gender		
Male	51 (15,044)	51 (169,032)
Female	49 (14,618)	49 (164,168)

(Hill, 2016, table 1)

Model 1

Distribution of disease by Ethnicity

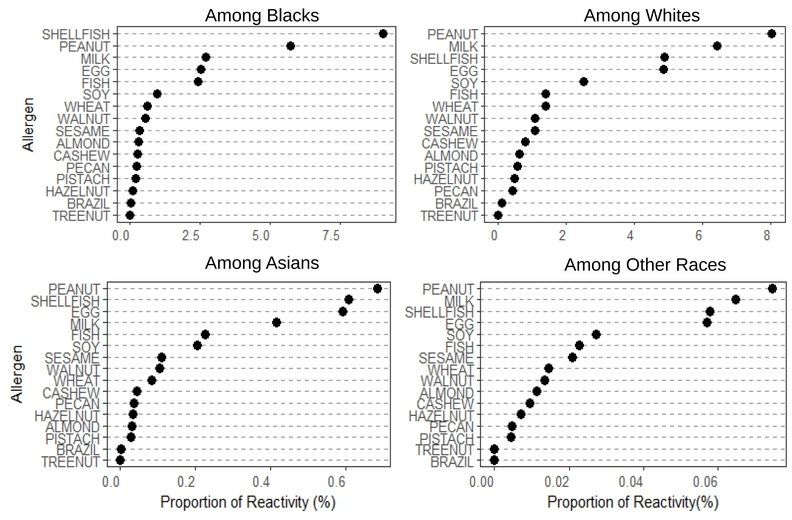


Logistic Regression of Asthma, Atopic Dermatitis, and Allergic Rhinitis per Ethnicity

Ethnicity	Disease	Estimate	SE	Z	p-value
Non-Hispanic	Asthma	-1.442	0.00451	-319.8	0
Hispanic	Asthma	0.06708	0.02062	3.253	0.001143
Non-Hispanic	Atopic Dermatitis	-1.751	0.004995	-350.4	0
Hispanic	Atopic Dermatitis	0.09999	0.02253	4.438	9.091e-06
Non-Hispanic	Allergic Rhinitis	-1.603	0.004749	-337.5	0
Hispanic	Allergic Rhinitis	-0.1374	0.02315	-5.936	2.928e-09

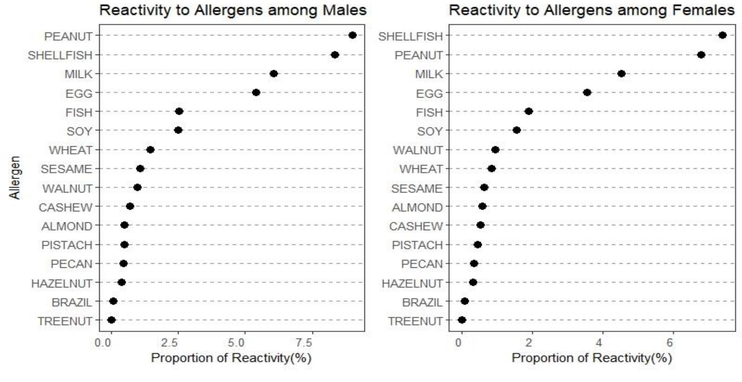
Model 2

Food Allergen Reactivity by Race



Model 3

Food allergen reactivity by gender



Model 4

Logistic Regression of Asthma by Race

Race	Estimate	SE	Z	p-value
Whites	-1.581	0.006209	-254.7	0
Blacks	0.5282	0.009586	55.1	0
Asian or Pacific Islander	-0.226	0.03067	-7.367	1.752e-13
Other	0.1732	0.05655	3.063	0.002194
Unknown	-0.2548	0.01564	-16.3	1.05e-59

Model 5

Logistic Regression of Asthma by Gender

Gender	Estimate	SE	Z	p-value
Males	-1.286	0.005905	-217.8	0
Females	-0.3272	0.008879	-36.85	3.32e-297

Discussion

A descriptive analysis was performed and the results from the cross sectional study identified that the highest amount of patients in hospital visits were Whites(55%) followed by Blacks(29%), and Asian/Pacific Islander(3%). Male(51%) hospital visits were higher than female(41%) as well according to Table 1.

The statistical analysis in this study provided various results. Starting with the proportion of reactivity (%). It was shown that race played a large role in food allergy reactions. In model 2 Blacks and Whites overall reacted to food allergens in higher percentages than did Asian/Pacific Islanders and “Others”. Blacks highest reactions were to shellfish(>7.5%) and peanuts(~6.0%). Where Whites highest reactions were to milk(~6%) and peanuts(~8%). A similar statistical analysis was run identifying relationships between sex and food allergen reactivity. Males and females had similar overall percentages in allergic reactivity to food allergens. Males had the highest percentages peanut(>7.5%) and shellfish(~7.5%) where females had the highest in shellfish(~7%) and peanut (~6%).

Logistic regressions were performed in Models 1, 4, and 5. All variables were significant (p-value<0.05) and we were able to reject the null hypothesis. In results in model 1 showed that non-Hispanics had stronger associations to atopic dermatitis, allergic rhinitis, and asthma than did Hispanics according to the estimates values. Model 4 revealed according to the estimates values that Whites had a stronger association with asthma than did any other race with Blacks coming second. Finally, in model 5, the regression showed males to have a stronger association with asthma than did females according to estimate values. These results show that possibly genetical or cultural factors could play a role in allergen sensitivity and the asthma prevalence in race and sex. Cultural foods could desensitize a child to specific allergic reactions to specific food that could not be found in other cultures as well as inheritable genes from a race could be identified to react less with certain allergens. In conclusion, we found that there is a relationship between race, sex, food allergens, and asthma onset in children. Further studies should look into what specific allergens as well as genetic factors that play a role in sensitivity of allergens that might have a higher association with asthma.

References

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Acknowledgements

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