

# Association between psoriasis and asthma among US adults in the 2009-2014 NHANES

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## Background

- Psoriasis, affecting approximately 2.8% of the US population, is associated with several comorbidities.<sup>1</sup>
- Research in Europe and Asia suggests a relationship between asthma and psoriasis exists.<sup>2</sup>
- This association is unexplored in the US population.
- The National Health and Nutrition Examination Survey (NHANES), conducted annually by the National Center for Health Statistics, uses a complex multistage sampling design to obtain data representative of the US population.<sup>1</sup>

## Objectives

- To investigate the relationship between psoriasis and asthma in US adults using 2009-2014 NHANES data

## Methods

- Psoriasis and asthma status were determined from “medical conditions questionnaire” responses
- Data processing and analyses were conducted using Stata/SE 16.1.
- Multivariable logistic regression models were constructed
  - Dependent variable: asthma
  - Independent variable: psoriasis
  - Covariates: age, sex, ethnicity, income, BMI, tobacco use, and history of COPD

- From 17,547 subjects  $\geq 20$  years old  $\rightarrow$  17,518 subjects with data on asthma and psoriasis status were included in the analyses

Characteristic	Asthma <sup>a</sup> , n/N (weighted percent) <sup>‡</sup>	No asthma, n/N (weighted percent) <sup>‡</sup>	P value
<i>History of psoriasis<sup>b</sup></i>			
Yes	118/2532 (5)	383/14986 (3)	<b>&lt;0.0001</b>
No	2414/2532 (95)	14603/14986 (97)	
<i>Sex</i>			
Male	1045/2532 (40)	7442/14986 (49)	<b>&lt;0.0001</b>
Female	1487/2532 (60)	7544/14986 (51)	<b>&lt;0.0001</b>
Mean age $\pm$ SE	45.3 $\pm$ 0.51	47.6 $\pm$ 0.36	<b>&lt;0.0001</b>
Mean BMI $\pm$ SE	30.2 $\pm$ 0.28	28.7 $\pm$ 0.09	
<i>Ethnicity/race<sup>c</sup></i>			
NHW	1199/2532 (69)	6278/14986 (66)	<b>&lt;0.0001</b>
Latin American	453/2532 (11)	3705/14986 (15)	
NHB	632/2532 (14)	3118/14986 (11)	
Other race/multiracial	248/2532 (6)	1885/14986 (8)	
<i>Annual household income</i>			
<\$20,000	680/2424 (19)	3107/14203 (15)	<b>&lt;0.0001</b>
$\geq$ \$20,000	1744/2424 (81)	11096/14203 (85)	
History of tobacco use <sup>d</sup>	1289/2532 (50)	6459/14978 (43)	<b>&lt;0.0001</b>
History of COPD <sup>e</sup>	539/2522 (20)	575/14959 (4)	<b>&lt;0.0001</b>

<sup>a</sup>Weighted percent using NHANES survey design parameters  
<sup>b</sup>History of asthma assessed by “Has a doctor or other health professional ever told you that you have asthma?”  
<sup>c</sup>History of psoriasis assessed by “Have you ever been told by a doctor or other healthcare professional that you had psoriasis?”  
<sup>d</sup>NHW = non-Hispanic white; Latin American = Mexican American/ Other Hispanic; NHB = non-Hispanic black  
<sup>e</sup>History of tobacco use assessed by “Have you smoked at least 100 cigarettes in your entire life?”  
<sup>f</sup>Individuals determined to have a history of COPD if answered yes to “Has a doctor or other health professional ever told you that you had emphysema?” or “Has a doctor or other health professional ever told you that you had chronic bronchitis?”  
Values that are statistically significant (2-sided P-value  $\leq 0.05$ ) are bolded  
SE = standard error

Table I. Sample characteristics of adults in the 2009-2014 NHANES

## Results

- Psoriasis subjects  $\geq 20$  years old were more likely to have asthma compared to adults without psoriasis (adjusted odds ratio [aOR] 1.67, 95% Confidence Interval [CI] 1.26 – 2.21).
- Subgroup analyses of non-obese adults; sensitivity analyses excluding participants with COPD; and sensitivity analyses excluding participants with atopic dermatitis showed no significant changes in the odds ratio.

Psoriasis Status	Asthma, n/N (weighted %) <sup>‡</sup>	Crude OR (95% CI)	P value	Adjusted OR (95% CI)	P value
<i>All participants aged 20 years or older</i>					
No	2414/17017 (14)	1.00 (reference)	<b>&lt;0.0001</b>	1.00 (reference)	<b>0.001</b>
Yes	118/501 (23)	1.73 (1.37-2.18)		1.67 (1.26-2.21) <sup>†</sup>	
<i>All non-obese participants aged 20 years or older (BMI &lt;30)</i>					
No	1258/10225 (13)	1.00 (reference)	<b>&lt;0.0001</b>	1.00 (reference)	<b>0.003</b>
Yes	57/271 (22)	1.96 (1.41-2.72)		1.82 (1.23-2.69) <sup>†</sup>	
<i>All obese participants aged 20 years or older (BMI <math>\geq 30</math>)</i>					
No	1156/6792 (17)	1.00 (reference)	<b>0.04</b>	1.00 (reference)	0.06
Yes	61/230 (23)	1.44 (1.01-2.04)		1.45 (0.98-2.13) <sup>†</sup>	
<i>Sensitivity analyses excluding participants with history of COPD</i>					
No	1907/15965 (12)	1.00 (reference)	<b>&lt;0.0001</b>	1.00 (reference)	<b>&lt;0.0001</b>
Yes	86/439 (19)	1.65 (1.31-2.09)		1.69 (1.30-2.18) <sup>††</sup>	
<i>Sensitivity analyses excluding participants with eczema using the 2003-2006 data<sup>a</sup></i>					
No	738/5801 (13)	1.00 (reference)	<b>0.03</b>	1.00 (reference)	<b>0.05</b>
Yes	29/124 (21)	1.73 (1.08-2.78)		1.66 (1.00-2.75) <sup>†</sup>	

<sup>‡</sup>Weighted percent using NHANES survey design parameters  
<sup>†</sup>Adjusted for sex, age, history of tobacco use, BMI, annual household income, ethnicity, and history of COPD  
<sup>††</sup>Adjusted for sex, age, history of tobacco use, BMI, annual household income, and ethnicity  
<sup>a</sup>Eczema and psoriasis data only available for the 2003-2006 NHANES cycles; 2003-2004 participants who responded yes to “During the past 12 months, that is since a year ago, have you had dermatitis, eczema, or any other type of red, inflamed skin rash?” were excluded from this analyses; 2005-2006 participants who responded yes to “Has a doctor or other health professional ever told you that you have eczema?” were excluded from the analyses  
Values that are statistically significant (2-sided P-value  $\leq 0.05$ ) are bolded  
CI = confidence interval

Table II. Association between asthma and psoriasis in US adults

## Conclusion

- Our results indicate a potential association between asthma and psoriasis in US adults.
- Preliminary studies suggests interleukin-17 (IL-17) may contribute to asthma in select individuals.<sup>3,4</sup>
- One study demonstrated differential expression of genes regulating epithelial barrier function and defense mechanisms in both IL-17-high asthma and psoriasis.<sup>4</sup>
- Studies examining the link between asthma, psoriasis severity, and IL-17 may be of interest as IL-17 levels have been correlated with psoriasis severity.<sup>5</sup>

## References

1. Liu J, Thatiparthi A, Martin A, Egeberg A, Wu JJ. Prevalence of Psoriasis Among Adults in the U.S. 2009-2010 and 2013-2014 National Health and Nutrition Examination Surveys. J Am Acad Dermatol. October 2020. doi:10.1016/j.jaad.2020.10.035
2. Wang J, Ke R, Shi W, et al. Association between psoriasis and asthma risk: A meta-Analysis. Allergy Asthma Proc. 2018;39(2):103-109. doi:10.2500/aap.2018.39.4109
3. Busse WW. Asthma and psoriasis: What do they have in common? IL-17A! J Allergy Clin Immunol. 2019;144(5):1169-1171. doi:10.1016/j.jaci.2019.09.006
4. Östling J, van Geest M, Schofield JPR, et al. IL-17-high asthma with features of a psoriasis immunophenotype. J Allergy Clin Immunol. 2019;144(5):1198-1213. doi:10.1016/j.jaci.2019.03.027
5. Fitz L, Zhang W, Soderstrom C, et al. Association between serum interleukin-17A and clinical response to tofacitinib and etanercept in moderate to severe psoriasis. Clin Exp Dermatol. 2018;43(7):790-797. doi:10.1111/ced.13561

**Dr. Wu** is or has been an investigator, consultant, or speaker for AbbVie, Ammirall, Amgen, Arcutis, Aristeia Therapeutics, Boehringer Ingelheim, Bristol-Myers Squibb, Dermavant, Dr. Reddy's Laboratories, Eli Lilly, Galderma, Janssen, LEO Pharma, Mindera, Novartis, Regeneron, Sanofi Genzyme, Solius, Sun Pharmaceutical, UCB, Valeant Pharmaceuticals North America LLC, and Zerigo Health.. **Dr. Egeberg** has received research funding from Pfizer, Eli Lilly, Novartis, Bristol-Myers Squibb, AbbVie, Janssen Pharmaceuticals, the Danish National Psoriasis Foundation, the Simon Spies Foundation, and the Kgl Hofbundtmager Aage Bang Foundation, and honoraria as consultant and/or speaker from AbbVie, Ammirall, Leo Pharma, Galápagos NV, Sun Pharmaceuticals, Samsung Bioepis Co., Ltd., Pfizer, Eli Lilly and Company, Novartis, Galderma, Dermavant, UCB, Mylan, Bristol-Myers Squibb, and Janssen Pharmaceuticals.