Incidence of psoriasis among adults in the United States: A sex- and age-adjusted population analysis

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Background: Information on recent trends in overall and subgroup incidences in psoriasis is limited.

Objective: To estimate current incidence of psoriasis in the United States, compare incidences among demographic subgroups, and evaluate recent disease trends.

Methods: Retrospective cohort analysis of psoriasis patients identified with electronic health records between 2014 and 2018.

Results: Incidence rate in the overall population (n = 2,152,192) was 63.8 (95% confidence interval [CI] 61.8-65.8) per 100,000 person-years. Incidence increased with age and peaked among individuals aged 70 to 79 years (92.3 [95% CI 85.1-100.0] per 100,000 person-years). Incidence was similar between men (62.8 [95% CI 59.8-65.9] per 100,000 person-years) and women (64.8 [95% CI 62.2-67.4] per 100,000 person-years). Standardized incidence rate for Whites (75.3 [95% CI 72.7-78.0] per 100,000 person-years) was greater than that for Hispanic/Latino patients (52.2 [95% CI 44.9-60.3] per 100,000 person-years; $P < .001$), patients of other race (54.3 [95% CI 46.5-62.9] per 100,000 person-years; $P < .001$), and Blacks (24.9 [95% CI 21.4-28.8] per 100,000 person-years; $P < .001$). Incidence appears to be stable within a recent 5-year period.

Limitations: Estimates were derived from approximately 15% of the health care–seeking US population.

Conclusion: Psoriasis incidence in the United States appears to increase with age, is similar between sexes, and is greatest among Whites. (J Am Acad Dermatol 2021;84:1023-9.)

INTRODUCTION

Accurate estimation of disease burden in psoriasis facilitates identifying at-risk population segments, planning and implementing interventions, steering education and advocacy initiatives, and developing a national health agenda with resource allocation. Worldwide incidence estimates for psoriasis vary widely, ranging from 30 to 320 cases per 100,000 person-years.[1-9]

The Centers for Disease Control and Prevention Public Health Agenda for Psoriasis and Psoriatic Arthritis identified important knowledge gaps in understanding the burden of psoriasis in the US population.[10] In the report, they identified 12 US population-based studies on psoriasis that yielded valuable information on disease burden.[10] However, the report also noted several limitations to these analyses, such as case definitions based on self-report or smaller sample sizes, which may result in remaining gaps in the understanding of disease burden among US individuals. Moreover, previous studies do not fully capture recent disease trends.[10] The objective of our analysis was to estimate current incidence of psoriasis in a large US-based sample and examine recent disease trends. In addition, we sought to compare psoriasis incidence among subgroups.

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METHODS

Data source and study population

This was a retrospective cohort analysis based on a multihealth-system research platform (Explorys) developed by IBM Watson Health. Clinical information from electronic medical records, laboratories, practice management systems, and claims systems is matched with the single set of Unified Medical Language System ontologies to create longitudinal records for unique patients.[11] Data are standardized and curated according to common controlled vocabularies and classifications systems, including *International Classification of Diseases (ICD),* Systematized Nomenclature of Medicine—Clinical Terms,[12] RxNorm,[13] and Logical Observation Identifiers Names and Codes.[14] Greater than 64 million unique lives, representing approximately 15% of the population across all 4 census regions of the United States, are captured. Patients with all types of insurance, as well as those who self-pay, are represented.

CAPSULE SUMMARY

- There are gaps in understanding disease burden for psoriasis in the United States.
- New diagnosis of psoriasis increases with age, is similar between sexes, and is greatest among Whites.

Our analysis data set consisted of a 10% random sample of the Explorys database. To be eligible for the study population in a particular year (2014-2018), patients must have been aged 18 years or older, have had at least 6 months of database activity before the year of interest, and have had at least 90 days of "observable" person-time in the year of interest. Patients were considered observable from the start of their first observed encounter until the end of their last observed encounter in the database.[15] This allowed adequate time for prevalent cases before the year of interest to be identified and excluded from analysis. Patients missing age or sex data were excluded, as well as those with psoriasis diagnosis at any time before the year of interest.

Statistical analysis

Primary outcome was incidence of psoriasis, which was defined as at least 2 occurrences of any 1 of the following *ICD-9* or *ICD-10* codes in a given year: 696.1, L40.0, L40.1, L40.2, L40.3, L40.4, L40.8, and L40.9.[16] Diagnostic codes for psoriatic arthritis were not included in the case definition for incident psoriasis. Age at psoriasis diagnosis was a secondary outcome.

We assessed incidence rate during each year and during the entire 5-year period between January 1, 2014, and December 31, 2018. Incidence rates were equal to the number of new psoriasis cases divided by total person-years at risk in a particular year, or during the overall study period. Incidence rates were calculated for the overall study population, as well as for subgroups of age, sex, and race. Age was categorized into 7 groups: 18 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, 70 to 79, and 80 years or older. To enable comparison between demographic groups, incidences were standardized with the direct method and the 2010 US Census population as the standard.[17] Confidence intervals (CIs) for crude and standardized incidences were calculated according to Poisson and gamma distributions,[18] respectively. Standardized incidences were compared assuming that the incidence rate ratio followed a log-normal distribution. Temporal trends in psoriasis incidence during the study period were assessed by fitting a Poisson regression model, adjusting for age, sex, and race. To test whether time trends differed by demographic subgroup, interaction terms for calendar year and each of age, sex, and race were assessed in separate regression models.

We also compared age at psoriasis diagnosis between men and women, and across race groups. Because distribution of age at diagnosis depends on the underlying age structure of the population, it was necessary to account for differences in age structure before making comparisons across groups. Accordingly, we estimated expected counts of new psoriasis cases in men by applying the male population's observed psoriasis incidence rates with the accumulated person-time among women, stratified by single year of age. We then created a data set with 1 record per observed psoriasis case in women and 1 record per expected case in men. Age at diagnosis was compared in this data set with the Mann-Whitney U test.[19] Similarly, age at diagnosis was compared across race groups by estimating expected counts with the accumulated person-time among White patients, stratified by single years of age, as the reference. Statistical significance was determined with a 2-sided α level of .05. Analyses were performed with R version 3.5.1 (R Foundation for Statistical Computing).

RESULTS

Among 2,152,192 total eligible patients, we identified 4307 patients with new diagnosis of psoriasis

Abbreviations used:

CI: confidence interval
ICD: *International Classification of Diseases*

between January 1, 2014, and December 31, 2018. Women represented 58.5% of new cases (2518/4307), and 83.8% were White (3611/4307). Patients with new psoriasis diagnosis were most frequently aged 50 to 59 years (23.1%) and 60 to 69 years (22.2%) (Table I).

Table II lists overall and adjusted group-specific psoriasis incidence rates during the 5-year study period. Crude and standardized incidence rates in the overall population were 68.4 (95% CI 66.4-70.5) per 100,000 person-years and 63.8 (95% CI 61.8-65.8) per 100,000 person-years, respectively. There was no statistically significant difference in incidence rates between male patients (62.8 [95% CI 59.8-65.9] per 100,000 person-years) and female patients (64.8 [95% CI 62.2-67.4] per 100,000 person-years) (P = .33). Psoriasis incidence increased with age and peaked among patients aged 70 to 79 years (92.3 [95% CI 85.1-100.0] per 100,000 person-years). Standardized incidence rate for White patients (75.3 [95% CI 72.7-78.0] per 100,000 person-years) was significantly greater than that of Black patients (24.9 [95% CI 21.4-28.8] per 100,000 person-years), Hispanic/Latino patients (52.2 [95% CI 44.9-60.3] per 100,000 person-years), and those of other race (54.3 [95% CI 46.5-62.9] per 100,000 person-years). Incidence in men and women remained similar after stratifying by race (Fig 1).

Fig 2 illustrates annual changes in overall and race-specific incidence rates between 2014 and 2018. Incidence trends during the 5-year study period differed according to race group (interaction $P < .001$). Incidence increased by 2.5% (95% CI −0.02% to 5.1%; P = .052) per year among White patients, although this increase was not statistically significant at the conventional α = .05. Yearly incidence decreased slightly, on average, among Black patients (−7.1%; 95% CI −16.7% to 3.6%; P = .19), patients of other race (−5.3%; 95% CI −15.1% to 5.6%; P = .33), and Hispanic/Latino patients (−2.5%; 95% CI −12.8% to 9.0%; P = .66), although these trends were not statistically significant. Time trends in psoriasis incidence during the 5-year study period also varied somewhat according to age group, although differences in time trend by age did not reach statistical significance (P = .07). Yearly incidence rates increased somewhat among patients aged 18 to 29 years during the study period (12.6%; 95% CI 4.3% to 21.7%; P = .003), but were relatively stable for other age groups. Trends in incidence did not differ significantly between men and women (interaction P = .19).

Table I. Characteristics of patients with incident psoriasis between January 1, 2014, and December 31, 2018

Characteristic	No. of incident psoriasis patients (%), n = 4307
Age, y	
18−29	363 (8.4)
30−39	487 (11.3)
40−49	625 (14.5)
50−59	993 (23.1)
60−69	955 (22.2)
70−79	609 (14.1)
≥80	275 (6.4)
Sex	
Women	2518 (58.5)
Men	1789 (41.5)
Race/ethnicity*	
White	3611 (83.8)
Hispanic/Latino	193 (4.5)
Black	188 (4.4)
Other†	188 (4.4)
Missing	127 (2.9)

*Hispanic/Latino includes patients who reported Hispanic/Latino alone or in combination with another race/ethnicity group. White, Black, and other race do not include patients who additionally reported Hispanic/Latino ethnicity or origin.
†Includes Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, multiracial, or other race.

Observed median age at psoriasis diagnosis was 56 years (interquartile range 43-67 years) for men and 55 years (interquartile range 41-66 years) for women (Table III). After accounting for underlying differences in age distributions of men and women in the study population, there was no significant difference in age at diagnosis between sexes (expected median = 55 years in both groups; P = .40). Observed median age at psoriasis diagnosis was 56 years (interquartile range 43-67 years) for White patients, 52 years (interquartile range 38-60 years) for Black patients, 51 years (interquartile range 37-62 years) for Hispanic/Latino patients, and 50 years (interquartile range 36-64 years) for patients of other race. With the age structure of the White population as reference, expected age at diagnosis did not differ significantly between Black and White patients (expected median 57 vs 56 years; P = .40). Age at diagnosis was somewhat lower for patients of other race compared with White patients (expected median 54 vs 56 years; $P < .001$) and somewhat higher for Hispanic/Latino patients (expected median 58 years; P = .04 vs White patients).

Table II. Crude and standardized incidence rate of psoriasis according to sex, age, and race, 2014-2018

Patient group	No. of psoriasis cases	Total PY of follow-up	Crude incidence rate per 100,000 PY (95% CI)	Standardized incidence rate per 100,000 PY (95% CI)*†
Overall population	4307	6,295,486.1	68.4 (66.4—70.5)	63.8 (61.8—65.8)
Sex				
Women	2518	3,696,205.9	68.2 (65.5—70.8)	64.8 (62.2—67.4)
Men	1789	2,602,280.2	68.7 (65.6—72.0)	62.8 (59.8—65.9)‡
Age, y				
18—29	363	1,011,051.7	35.9 (32.3—39.8)	35.3 (31.6—39.2)
30—39	487	915,442.3	53.2 (48.6—58.1)	53.7 (49.0—58.9)
40—49	625	997,391.9	62.7 (57.8—67.8)	61.8 (57.0—66.9)
50—59	993	1,217,278.6	81.6 (76.6—86.8)	81.6 (76.6—86.9)‡
60—69	955	1,080,917.7	88.4 (82.8—94.1)	88.4 (82.9—94.3)‡
70—79	609	660,734.4	92.2 (85.0—100.0)	92.3 (85.1—100.0)
≥80	275	412,669.5	66.6 (59.0—75.0)	66.5 (58.7—75.1)
Race/ethnicity				
White	3611	4,433,485.6	81.4 (78.8—84.1)	75.3 (72.7—78.0)
Hispanic/Latino	193	372,741.7	51.8 (44.7—59.6)	52.2 (44.9—60.3)
Black	188	720,919.5	26.1 (22.5—30.1)	24.9 (21.4—28.8)
Other race§	188	344,988.9	54.5 (47.0—62.9)	54.3 (46.5—62.9)
Missing	127	423,350.4	30.0 (25.0—35.7)	28.4 (23.5—33.9)

Incidence estimates are based on records for which age and sex information was available.
CI, Confidence interval; *PY*, person-years.
*Sex comparisons are adjusted for age. Age group comparisons are adjusted for sex. Race comparisons are adjusted for sex and age. The sex and age distribution of the 2010 US Census population was used as the standard population, with 7 age groups: 18 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, 70 to 79, and 80 years or older.
†All comparisons between standardized subgroups were significant, with $P < .001$, unless otherwise noted. Reference groups for sex, age, and race comparisons were women, aged 70 to 79 years, and White, respectively.
‡$P = .33$ for comparison between men and women; $P = .02$ for comparison between aged 50 to 59 and 70 to 79 years; and $P = .41$ for comparison between aged 60 to 69 and 70 to 79 years.
§Includes Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, multiracial, or other race.

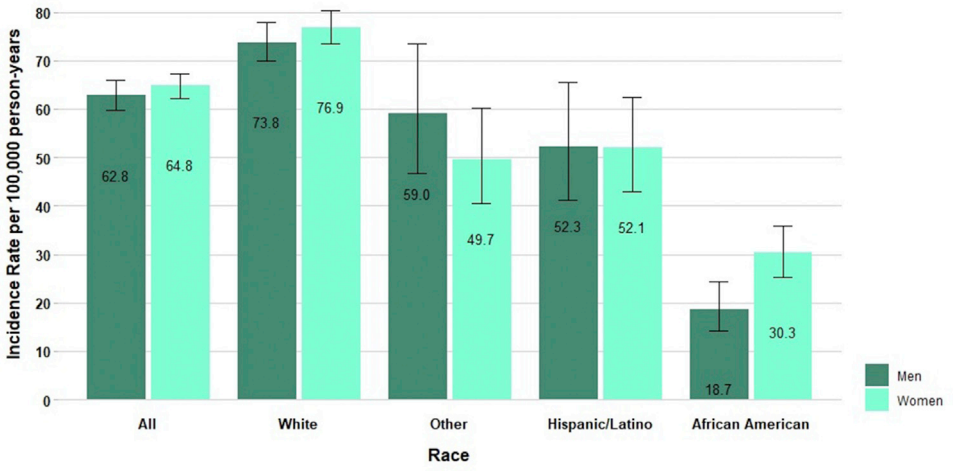

Fig 1. Age-adjusted incidence of psoriasis by race and sex among adults aged 18 years or older, 2014-2018. Error bars represent 95% confidence intervals.

DISCUSSION

We observed a standardized psoriasis incidence rate of 63.8 per 100,000 person-years in the adult population between 2014 and 2018. Incidence of psoriasis was similar between sexes and greatest among White patients and those aged 70 to 79 years. Incidence remained stable in absolute terms across all race groups.

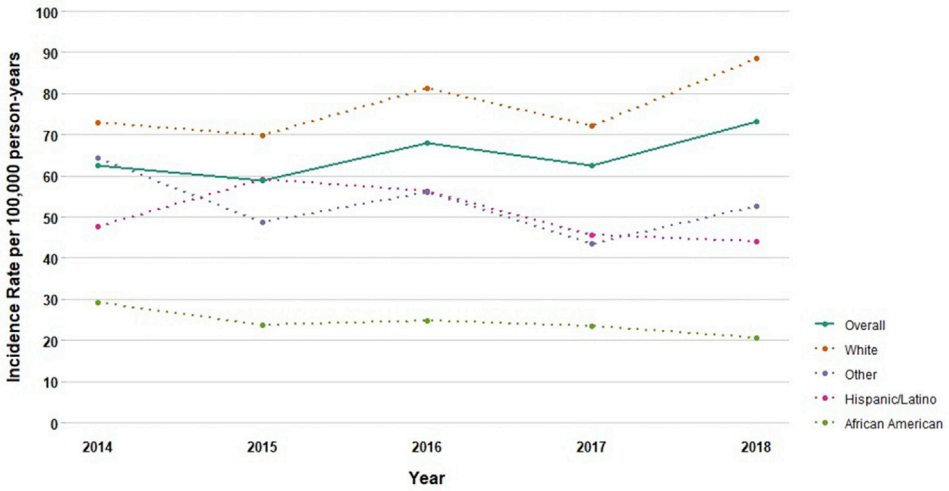

Fig 2. Age- and sex-adjusted incidence of psoriasis by race and year among adults aged 18 years or older, 2014-2018.

Table III. Analysis of age of psoriasis diagnosis

	Age at psoriasis diagnosis, years		
	Observed median (Q1, Q3)	Expected median* (Q1, Q3)	*P* value†
Race/ethnicity			
White (n = 3604)	56 (43, 67)	56 (43, 67)	Reference
Hispanic/Latino (n = 201)	51 (37, 62)	58 (46, 66)	.04
Black (n = 194)	52 (38, 60)	57 (45, 67)	.40
Other‡ (n = 198)	50 (36, 64)	54 (42, 66)	<.001
Sex			
Women (n = 2519)	55 (41, 66)	55 (41, 66)	Reference
Men (n = 1806)	56 (43, 67)	55 (41, 66)	.40

Patients receiving a diagnosis before aged 18 years were included when median age at psoriasis diagnosis was calculated. Incident cases occurring in patients younger than 18 years were identified with the same approach described in the "Methods." Patients born in 1929 or earlier were excluded because exact year of birth was not available.

Q1, First quartile; *Q3*, third quartile.

*Expected medians for race groups assume the same age distribution as the White population. Expected median for men assumes the same age distribution as the female population.

†*P* value from Mann-Whitney *U* test.

‡Includes Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, multiracial, or other race.

There are a limited number of studies describing incidence of psoriasis in the United States. Icen et al[1] reported an incidence of 78.9 per 100,000 (95% CI 75.0-82.9) during 1970-2000 in Olmsted County, Minnesota. Using data from the same county between 1980 and 1983, Bell et al[2] found a sex- and age-adjusted incidence rate of 60.4 per 100,000 person-years. Incidence of psoriasis was 82 per 100,000 person-years in a cohort of US women from the Nurses' Health Study II between 1991 and 2005.[4] According to a recent study of the Ontario, Canada, population, psoriasis incidence was 69.9 cases (95% CI 68.4-71.6) per 100,000 in 2015.[20]

Studies evaluating sex differences in psoriasis incidence describe slightly differing results. Icen et al[1] reported a higher incidence of psoriasis for men than women (85.5 vs 73.2 per 100,000; $P = .003$), whereas Bell et al[2] observed that women had a higher rate than men (60.2 vs 54.4 per 100,000, respectively). However, absolute size of these sex differences was small, which is in accordance with our observation of no significant incidence difference between sexes. Eder et al[20] also noted a similar psoriasis distribution between sexes (male:female ratio 1.03).

Overall mean age at first psoriasis diagnosis has been reported to be 43 years in Olmsted County, Minnesota, with similar mean age at onset for men (43.0 years) and women (43.4 years).[1] We observed a higher mean age at diagnosis in our sample, although this observation was largely influenced by the underlying age distribution of the study population. Prior literature has reported a bimodal age pattern of psoriasis incidence: 16 to 22 years and 57 to 60 years.[21,22] Previous studies that have found a bimodal age at onset distribution have been based on samples of prevalent cases and have not accounted for the underlying age distribution of the

source population, likely producing downward bias toward younger ages.[23] However, we observed a gradual increase in incidence from aged 18 to 79 years. Icen et al[1] similarly did not find a bimodal distribution, with the highest incidence occurring in the group aged 60 to 69 years (94.2 per 100,000). Bell et al[2] also reported the highest incidence in the group aged 60 to 69 years (112.6 per 100,000).

Analyses of time trends in psoriasis incidence in the United States have been limited to Olmsted County, Minnesota, in which a 2-fold increase was observed from 1970-1974 to 1995-1999 (50.8 vs 100.5 per 100,000; P = .001).[1] Eder et al[20] observed a gradually decreasing rate of incidence from 2000-2015 in Ontario, Canada (standardized incidence rates per 100,000: 111.1 in 2000 and 68.7 in 2015). However, these trends represent varying timeframes, and the ability to compare to our results is limited because we assessed change during a shorter period.

There are limitations to this analysis that warrant consideration. We were unable to record psoriasis patients who were not treated at the health systems composing the database, or cases of psoriasis that were undiagnosed. Accordingly, requiring 2 diagnosis codes for psoriasis may have led to underestimation of incidence. Incidence rates in older age groups may also be influenced by a higher frequency of health care encounters in the elderly population, allowing a greater opportunity for psoriasis to be detected. There may also be a discrepancy between the onset of a disease and a patient's first diagnosis. However, we do not believe this introduced substantial bias into our results. Patients with incident psoriasis diagnoses in the present analysis had a median of 8.7 years of previous health care use data before their first psoriasis diagnosis (interquartile range 4.9 to 13.2 years), which represents a durable period for preexisting psoriasis to be recognized. For the same reason, we do not believe there are a significant number of pediatric-onset cases that would have been misclassified as adult cases. Our preexisting exclusion window of 6 months could fail to capture patients with prevalent psoriasis who entered the database population just before the year of interest. We tested this in a sensitivity analysis by lengthening the requirement of preexisting patient activity from 6 months to 1 year and observed nearly identical results, with an overall incidence rate of 63.7 (95% CI 61.7-65.8) per 100,000 person-years. Psoriasis cases were not confirmed via biopsy and were not required to be diagnosed by a dermatologist, which may decrease the positive predictive value of a diagnosis. To improve the positive predictive value of our case ascertainment definition, we required at least 2 diagnoses within a given year. The current analysis is strengthened by inclusion of a large, demographically heterogeneous patient population, which enabled estimation of incidence across patient subgroups. Furthermore, this is the first analysis to our knowledge to compare age at psoriasis diagnosis by race, accounting for differences in underlying age distribution.

Psoriasis is a potentially debilitating disease that affects a wide range of individuals. Incidence rate in the United States appears to increase with age, is similar between sexes, and is greatest among Whites. Psoriasis incidence appears to have remained stable between 2014 and 2018.

Conflicts of interest

Dr Garg is an advisor for AbbVie, Amgen, Boehringer Ingelheim, Incyte, Janssen, Novartis, Pfizer, UCB, and Viela Bio, and receives research grants from AbbVie and the National Psoriasis Foundation. Authors Burshtein and Strunk have no conflicts of interest to declare.

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