

Prevalence of Psoriasis Among Adults in the U.S. 2003–2006 and 2009–2010 National Health and Nutrition Examination Surveys

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Background: A 2010 CDC-sponsored consultation of psoriasis, psoriatic arthritis, and public health experts developed a public health agenda for psoriasis and psoriatic arthritis indicating that additional population-based research is needed to better characterize psoriasis in the population.

Purpose: To better characterize the burden of psoriasis in the U.S. using recent population-based, cross-sectional data in this 2012 analysis.

Methods: A subset of 10,676 adults aged 20–59 years from the 2003–2006 and 2009–2010 National Health and Nutrition Examination Surveys was used to examine psoriasis prevalence, severity, disparities, health-related quality of life, and selected comorbidities.

Results: The overall prevalence of psoriasis was 3.1% (95% CI=2.6, 3.6); extrapolating to older adults suggests that 6.7 million adults aged ≥ 20 years are affected. Psoriasis was significantly more prevalent among non-Hispanic whites than other race/ethnicity subgroups, as well as among those with arthritis. Approximately 82% reported no/little or mild disease; the impact of psoriasis on daily life increased with disease severity ($p=0.0001$ for trend). Those with psoriasis reported significantly more frequent mental distress or mild to severe depression than those without psoriasis. Psoriasis was also significantly associated with obesity and former smoking status.

Conclusions: Psoriasis is a large public health problem. Further characterizing psoriasis from a public health perspective will require better survey questions and inclusion of these questions in national surveys.

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Introduction

Psoriasis is a chronic, inflammatory, autoimmune skin condition characterized by a wide range of symptoms including scaling, itching, redness, and burning.¹ In 2010, the CDC began a process to develop a public health agenda for psoriasis and psoriatic arthritis by focusing on assessment issues. Among the generated research priorities was one seeking to use existing, population-based data sets to better characterize the burden of psoriasis from a population perspective, including prevalence, disparities, severity, health-related

quality of life (HRQOL), and other characteristics such as comorbid conditions.

Existing public health data on these topics are relatively limited and somewhat dated. The prevalence of psoriasis has been estimated to be between 0.5% and 3.15% of the U.S. population.^{2–5} Disparities have been seen by age,^{3,6} gender,^{4–6} and race/ethnicity.^{4–7} HRQOL appears to be negatively affected by psoriasis,^{8–10} and in particular, its severity.^{4–6,11,12} Suggested comorbid conditions include several psychological and social problems such as distress, depression, anxiety, self-consciousness, impaired social functioning, and decreased work productivity or unemployment,^{1,13–16} higher BMI,^{17–22} smoking,^{19–26} and alcohol use.^{20–23,26,27}

Objective

The purpose of this analysis is to use recent, population-based, nationally representative U.S. data from the 2003–2006 and 2009–2010 National Health and Nutrition

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Examination Surveys (NHANES) to characterize psoriasis in the U.S. population, build on an earlier report using more-limited NHANES data,⁵ and expand the existing knowledge base.

Methods

Data Source and Study Design

NHANES is a population-based survey that uses a complex, multistage, stratified sampling design to assess the health and nutritional status of the non-institutionalized U.S. civilian population across all age groups. Since 1999, NHANES has been conducted annually and public-use data sets are released in 2-year cycles. The household component is administered to respondents in their homes by trained interviewers. All respondents are asked to complete physical examinations and laboratory tests, which are performed in specially designed and equipped Mobile Examination Centers (MECs).²⁸⁻³⁰

In 2012, we analyzed the most recent years with data on psoriasis (2003–2006 and 2009–2010), when questions about psoriasis were only asked of those aged 20–59 years. The NHANES 2007–2008 cycle did not include data on psoriasis. This analysis used the subset of 10,676 adults aged 20–59 years from the combined data.

Variables

Psoriasis characteristics. A respondent was defined as having psoriasis if the respondent answered *yes* to the question: *Have you ever been told by a healthcare provider that you had psoriasis?*

In the 2003–2006 cycles, psoriasis severity was assessed by a question about current patches that could be covered by the respondent's palm, where one palm corresponded to 1% body surface area (BSA) (Appendix). In the analysis, three categories were used: no/little (<1% BSA); mild (1%–2% BSA); and moderate/severe ($\geq 3\%$ BSA), combined owing to large relative SE. Impact of psoriasis was assessed by a question that asked participants to rank (from 1 to 10) how much of a problem their psoriasis was in their daily life (Appendix).

Demographic characteristics. Age was analyzed using both four (20–29, 30–39, 40–49, and 50–59 years) and two categories (20–39 and 40–59 years). Gender had two categories: male and female. Race/ethnicity was analyzed as non-Hispanic white, non-Hispanic black, and Hispanic/other, which included all Hispanic groups, all other races, and those who reported being multiracial. Marital status was examined as never married, married or living with partner, and divorced/widowed/separated. Education was analyzed as less than high school, high school, and more than high school. Total household income was analyzed as median income (\$35,000–\$44,999) or less, and greater than this median income.

HRQOL measures. HRQOL was evaluated using three measures from CDC's Healthy Days Core Module³¹: general health status,³² mentally unhealthy days in the past 30 days,³³ and physically unhealthy days in the past 30 days (Appendix).³⁴ General health status was defined by the answer to a question about perceived health³²; the fair and poor categories were

combined owing to high relative SE. The two unhealthy days measures were only available from 2003 to 2006 because the 2009–2010 data had not been released at the time of analysis. Mentally and physically unhealthy days in the past 30 days estimate the overall number of days when the respondent felt that their mental or physical health was not good.

We also used a fourth calculated measure, overall unhealthy days in the past 30 days, a standard summary measure of HRQOL that estimates the overall number of days when the respondent felt that either their physical or mental health was not good, with a maximum of 30 days.³⁵ A fifth measure, frequent mental distress, defined as ≥ 14 mentally unhealthy days during the previous 30 days, was also analyzed, as it is one of the best available measures of population mental health.^{32,36} A sixth measure, impact of psoriasis on daily life, was used when analyzing severity.

Other characteristics. Arthritis was defined as a positive response to the question *Has a doctor or other health professional ever told you that you had arthritis?* Any cardiovascular disease was defined as a positive response to questions asking if the individual was ever told by a doctor or other health professional that he or she had congestive heart failure, coronary heart disease, angina, heart attack, or stroke (Appendix).

Current BMI was determined from body measurement anthropometry^{37,38} and analyzed in the following categories: underweight/healthy weight (<25.00); overweight (25.00–29.99); and obese (≥ 30.00). Current smoking status used two questions about smoking habits (Appendix) to create a three-level variable: non-smokers, former smokers, and current daily and occasional smokers. This variable was also analyzed using two categories: never and ever (current and former) smokers.³⁹

Following the recommendation of the CDC Alcohol Program (D. Kanny, CDC, personal communication, 2012) as used in other analyses,^{40,41} current alcohol use combined the responses from five questions about alcohol consumption during the past 12 months (Appendix) to develop a three-level variable: non-drinkers (no alcohol during the past year); non-excessive drinkers (average of ≤ 14 drinks per week for men, ≤ 7 drinks per week for women, and never ≥ 5 drinks in a single day during the past year); and excessive drinkers (average of > 14 drinks per week for men, > 7 drinks per week for women, or ≥ 5 drinks in a single day at least once during the past year).

Although health insurance questions (Appendix) for the 2003–2004 cycle of NHANES data were not identical to the 2005–2006 and 2009–2010 cycles, National Center for Health Statistics (NCHS) guidelines⁴² allow for the creation of a standardized comparable variable. This derived variable was then collapsed into three categories: private (anyone with private-only or both public and private insurance); public (anyone with a government- or state-sponsored health plan such as Children's Health Insurance Program, Medicaid, Medicare, or military, but no private insurance); and no insurance (anyone with single service plans such as nursing home care, dental, vision, or who did not have private or public coverage).⁴³

Whether a person saw a mental health professional in the last 12 months and depression severity (Appendix) were also examined. Depression severity was defined using the Patient Health Questionnaire-9 (PHQ-9). Available in the 2005–2006 and 2009–2010 cycles, this nine-item screening tool asks respondents about

the frequency of depressive symptoms during the previous 2 weeks (0=*not at all*, 1=*several days*, 2=*more than half the days*, and 3=*nearly every day*) and then characterizes the response as none (0); minimal (1–4); mild (5–9); moderate (10–14); moderately severe (15–19); and severe (20–27).⁴⁴ These were analyzed in three categories: no depression (0); minimal (1–4); and mild to severe (5–27).

Analysis

The survey components were acquired from the Interuniversity Consortium for Political and Social Research website (icpsr.umich.edu/icpsrweb/landing.jsp). Both the interview and MEC weights were adjusted according to NCHS standards⁴⁵ because three cycles of data were combined. All data processing was completed with SAS, version 9.1.3 (SAS Institute, Cary NC) and all statistical analyses were carried out with SAS-callable SUDAAN, version 10.0.1 (Research Triangle Institute, Research Triangle Park NC).

All aspects unique to analyzing complex survey designs were accounted for in these analyses. Analyses were limited to participants who were asked the psoriasis questions (aged 20–59 years). The analyses abided by the NCHS Analytic Guidelines,³⁰ which require that statistically reliable published estimates have a relative SE less than a designated value (30%) and a sample size greater than a fixed number of individuals (30).

Variables in the analysis that came from the interview portion of NHANES had <10% missing data; however, variables found in the MEC portion of NHANES had ≤13% missing data because not all survey participants completed the MEC portion of the survey. In the various analyses, we excluded records with missing relevant data.

The differences in demographic distributions between those with and without psoriasis were assessed using the stratum-adjusted Cochran–Mantel–Haenszel test of independence. *p*-values were obtained using the Satterthwaite-adjusted *F*-test as recommended by NCHS.⁴⁶ Linear contrasts for pairs were also calculated and *t*-tests were used to assess pairwise differences. Prevalence and covariate data were reported as percentages or means, as appropriate, along with associated 95% CIs. To adjust for age, the direct method of standardization was used when calculating psoriasis prevalence

Table 1. Weighted distribution of selected characteristics among adults aged 20–59 years by psoriasis status, NHANES 2003–2006, 2009–2010, % (95% CI) unless otherwise noted

Characteristic	Psoriasis (n=275 ^a)	No psoriasis (n=10,401 ^a)
DEMOGRAPHICS		
Age, mean	40.9 (39.6, 42.2)	39.2 (38.8, 39.5)
Gender, % male	49.9 (43.3, 56.6)	49.2 (48.4, 50.1)
Race/ethnicity		
Non-Hispanic white	82.0 (76.4, 86.4)	66.7 (62.7, 70.6)
Non-Hispanic black	7.7 (5.4, 10.8)	12.3 (10.5, 14.5)
Hispanic/other	10.3 (6.8, 15.5)	21.0 (18.0, 24.8)
Marital status		
Never married	18.2 (13.5, 24.1)	21.7 (20.0, 23.5)
Married/living with partner	69.3 (63.6, 74.5)	64.5 (62.7, 66.2)
Divorced/widowed/separated	12.5 (8.5, 18.0)	13.8 (12.8, 15.0)
Education		
Less than high school	12.5 (8.9, 17.4)	16.5 (15.1, 17.9)
High school	23.3 (18.5, 29.0)	24.0 (22.7, 25.4)
More than high school	64.2 (57.6, 70.3)	59.6 (57.7, 61.4)
Total household income		
Median income or less	34.1 (28.0, 40.7)	40.0 (37.6, 42.4)
Greater than median income	65.9 (59.4, 72.0)	60.0 (57.6, 62.4)
Health insurance coverage		
Private	66.8 (59.4, 73.5)	65.0 (63.3, 66.8)
Public	13.6 (9.6, 18.8)	11.2 (10.3, 12.1)
No insurance	19.6 (14.0, 26.8)	23.8 (22.2, 25.5)
HRQOL MEASURES		
General health status		
Fair/poor	15.2 (11.3, 20.1)	15.1 (14.0, 16.2)
Good	35.4 (30.0, 41.2)	33.3 (32.0, 34.5)
Very good	32.4 (25.2, 40.5)	32.2 (30.4, 33.9)
Excellent	17.1 (12.9, 22.2)	19.5 (18.4, 20.7)
Unhealthy days, mean^b		
Mentally unhealthy days	5.2 (3.7, 6.6)	3.9 (3.6, 4.2)
Physically unhealthy days	4.0 (2.4, 5.7)	3.1 (2.8, 3.4)
Overall unhealthy days	7.9 (6.0, 9.9)	6.2 (5.8, 6.7)
Frequent mental distress	18.5 (13.7, 24.5)	11.3 (10.1, 12.6)
OTHER CHARACTERISTICS		

(continued on next page)

Table 1. Weighted distribution of selected characteristics among adults aged 20–59 years by psoriasis status, NHANES 2003–2006, 2009–2010, % (95% CI) unless otherwise noted (*continued*)

Characteristic	Psoriasis (n=275 ^a)	No psoriasis (n=10,401 ^a)
Arthritis	29.1 (22.2, 37.1)	15.6 (14.5, 16.8)
Any cardiovascular disease^c	4.7 (2.9, 7.6)	3.8 (3.2, 4.4)
Current BMI		
Underweight–healthy weight	25.4 (20.3, 31.3)	34.1 (32.4, 35.9)
Overweight	32.3 (25.9, 39.4)	32.2 (30.8, 33.6)
Obese	42.3 (36.0, 48.9)	33.7 (32.0, 35.5)
Current smoking status		
Nonsmoker	41.3 (35.5, 47.4)	54.1 (52.3, 56.0)
Former smoker	28.5 (22.4, 35.4)	19.2 (17.9, 20.6)
Current smoker	30.2 (24.8, 36.2)	26.6 (25.1, 28.3)
Current alcohol use		
Non-drinker	25.8 (18.5, 34.7)	29.7 (27.6, 31.9)
Non-excessive drinker	37.6 (30.1, 45.7)	34.0 (32.3, 35.6)
Excessive drinker	36.7 (28.9, 45.2)	36.3 (34.3, 38.3)
Saw mental health professional in the last year	13.8 (9.5, 19.6)	8.9 (8.2, 9.7)
Depression severity^d		
No depression	25.4 (18.5–33.9)	32.8 (30.9–34.8)
Minimal	40.9 (33.8–48.3)	44.5 (43.0–45.9)
Mild, moderate, or severe	33.7 (26.5–41.8)	22.7 (20.9–24.7)

Note: Boldface indicates statistical significance relative to the comparison group.

^aUnweighted counts

^b2003–2006 NHANES only; psoriasis, unweighted n=162; no psoriasis, unweighted n=6,370

^cResults may be statistically unreliable, as estimate is based on cell size <30 and the sample comes from <12 variance strata with observations in both primary sampling units.

^d2005–2006 and 2009–2010 NHANES only; psoriasis, unweighted n=198; no psoriasis, unweighted n=7,346

HRQOL, health-related quality of life; NHANES, National Health and Nutrition Examination Survey

among subgroups, adjusting weights according to the age distribution of the projected 2000 U.S. Census population aged 20–59 years.

The stratum-adjusted Cochran–Mantel–Haenszel test of trend was used to examine whether there was a trend between psoriasis severity and impact on daily life as well as other demographic variables. The Wald *F*-test was used to obtain the test statistics and *p*-values. An age–gender-adjusted test of trend was also conducted using the full cross of age categories with gender categories (eight gender by age strata).

Logistic regression models were constructed to obtain both unadjusted and adjusted ORs and 95% CIs for the odds of having psoriasis. All models were restricted to using the observations that were available for the model adjusted for age, gender, race/ethnicity, and arthritis (i.e., all observations had to have non-missing values for these variables).

Results

As shown in Table 1, a total of 10,676 individuals were included in the analyses, of whom 275 reported having ever been diagnosed by a healthcare provider as having psoriasis. Significant findings from analysis of the unadjusted, weighted distributions showed those with psoriasis to have a higher mean age, to more often be non-Hispanic white, have frequent mental distress, have arthritis, be obese, be former smokers, and have a greater severity of depression. The remaining HRQOL measures of general health status and unhealthy days were worse for those with psoriasis, although none were statistically significant.

Additionally, these findings showed that those with psoriasis were less often Hispanic/other, underweight or healthy weight, and non-smokers (Table 1). Among those with psoriasis, frequent mental distress was significantly more common among women (24.5%, 95% CI=17.2, 33.5) than men (11.6%, 95% CI=6.5, 19.7).

The overall age-adjusted prevalence of psoriasis among adults aged 20–59 years was 3.1% (95% CI=2.6, 3.6). Psoriasis prevalence was significantly higher among non-Hispanic whites and those with arthritis and significantly lower among non-smokers. Psoriasis prevalence was also non-significantly higher among

alcohol drinkers and the obese. Prevalence increased as BMI increased, with underweight healthy individuals having the lowest prevalence (2.4%) followed by overweight (3.1%) and obese (3.7%) individuals (Table 2).

Psoriasis severity was generally mild: 54.5% (95% CI=44.8, 63.9) reported no or little disease; 27.3% (95% CI=21.1, 34.6) reported mild disease; and 18.2% (95% CI=12.4, 25.9) reported moderate or severe disease. Severity was not associated with the analyzed demographic characteristics or current smoking status (Table 3).

Among HRQOL measures, the mean score for the impact of psoriasis on daily life increased with disease severity (*p*=0.0001 for trend), even after adjusting for age

Table 2. Weighted, age-adjusted^a prevalence of psoriasis among adults aged 20–59 years, by selected characteristics, NHANES 2003–2006, 2009–2010

Characteristic	% (95% CI)
Overall prevalence	3.1 (2.6, 3.6)
Gender	
Male	3.1 (2.5, 3.9)
Female	3.0 (2.5, 3.7)
Race/ethnicity	
Non-Hispanic white	3.7 (3.1, 4.4)*
Non-Hispanic Black	2.0 (1.4, 2.8)
Hispanic/Other	1.6 (1.1, 2.3)
Marital status	
Never married	2.3 (1.6, 3.3)
Married/living with partner	3.2 (2.7, 3.8)
Divorced/widowed/separated	2.9 (1.8, 4.7)
Education	
Less than high school	2.3 (1.7, 3.1)
High school	3.0 (2.3, 3.9)
More than high school	3.3 (2.7, 4.0)
Total household income	
Median income or less	2.7 (2.2, 3.4)
Greater than median income	3.4 (2.8, 4.1)
Arthritis	
Yes	6.4 (4.3, 9.4)**
No	2.6 (2.2, 3.1)
Any cardiovascular disease^b	
Yes	3.1 (1.7, 5.6)
No	3.1 (2.6, 3.6)
Current BMI	
Underweight–healthy weight	2.4 (1.9, 3.1)
Overweight	3.1 (2.4, 4.0)
Obese	3.7 (2.9, 4.7)
Current smoking status	
Nonsmoker	2.4 (1.9, 2.9)***
Former smoker	4.1 (3.2, 5.4)
Current smoker	3.5 (2.7, 4.5)
Current alcohol use	
Non-drinker	2.7 (1.9, 3.8)

(continued)

Table 2. (continued)

Characteristic	% (95% CI)
Non-excessive drinker	3.3 (2.6, 4.1)
Excessive drinker	3.2 (2.5, 4.1)

Note: Boldface indicates statistical significance.

^aPrevalence of psoriasis was directly standardized against the projected 2000 U.S. Census Population for ages 20–59 by the age categories defined for this study.^bResults may be statistically unreliable, as estimate is based on a cell size <30 and the sample comes from <12 variance strata with observations in both primary sampling units.

*Estimate is significantly greater for non-Hispanic whites compared with non-Hispanic blacks and Hispanics/others.

**Estimate is significantly greater for individuals with arthritis compared with individuals without arthritis.

***Estimate is significantly less for nonsmokers compared with former smokers.

NHANES, National Health and Nutrition Examination Survey

and gender (data not shown), and was significantly higher for those with moderate/severe psoriasis (Table 3). The mean number of mentally unhealthy days and overall unhealthy days (mental and physical combined) was higher for those with moderate/severe psoriasis compared with those with no/little psoriasis and mild psoriasis, but this was not statistically significant (Table 3). These results need to be interpreted carefully; although, the relative SEs were <30%, most estimates were based on sample sizes of <30.

In selected subanalyses, women with psoriasis (unweighted $n=80$, weighted $n=2,424,815$) reported nearly twice the mean number of mentally unhealthy days compared with men with psoriasis (unweighted $n=61$, weighted $n=2,064,853$; 6.6 days, 95% CI=4.4, 8.8 vs 3.5 days, 95% CI=2.0, 4.9), but this difference was not statistically significant.

For both unadjusted and adjusted (for age, gender, race/ethnicity, and arthritis) logistic regression models, psoriasis was significantly associated with current obesity, and marginally associated with current overweight (lower 95% bound=1.0). In both models, psoriasis was significantly associated with being a former or current smoker (Table 4).

Discussion

We estimate the prevalence of psoriasis among adults aged 20–59 years to be 3.1% (95% CI=2.6, 3.6%), which translates into 5.0 million adults (95% CI=4.2, 5.8 million) based on the 2003–2006 and 2009–2010 U.S. Census Bureau's Current Population Survey (CPS).^{47–49}

These estimates are comparable to other published findings in the U.S.,^{4–6,17} some of which used subsets of our NHANES data. A previous study suggests that the

Table 3. Weighted distribution of selected characteristics among adults aged 20–59 years by psoriasis severity,^{a,b} NHANES 2003–2006, ^c % (95% CI) unless otherwise noted

Characteristic	No/little psoriasis (<1% BSA)	Mild psoriasis (1–2% BSA)	Moderate/severe psoriasis (≥3% BSA)
Total	54.5 (44.8, 63.9)	27.3 (21.1, 34.6)	18.2 (12.4, 25.9)
Demographics			
Age, mean	41.6 (39.4, 43.9)	41.9 (39.1, 44.7)	39.9 (36.1, 43.7)
Gender, male	41.9 (29.9, 54.9)	59.0 (41.1, 74.7)	42.4 (24.9, 62.1)
Non-Hispanic white	77.6 (66.3, 85.9)	92.1 (85.1, 95.9)	87.0 (75.5, 93.5)
Married/living with partner	72.8 (62.4, 81.1)	72.3 (55.5, 84.5)	67.4 (49.7, 81.3)
More than high school education	72.8 (65.3, 79.3)	64.4 (44.4, 80.3)	59.8 (40.7, 76.3)
Greater than median income	62.4 (51.7, 72.1)	77.8 (62.6, 88.0)	58.6 (41.0, 74.3)
HRQOL measures			
Mentally unhealthy days, mean	5.1 (2.9, 7.2)	4.1 (1.7, 6.4)	7.2 (3.7, 10.8)
Overall unhealthy days, mean	8.3 (5.4, 11.1)	6.5 (3.2, 9.8)	9.2 (5.0, 13.4)
Impact on daily life, mean	2.7 (2.2, 3.2)	4.2 (2.8, 5.5)	7.5 (6.3, 8.7)*
Other characteristics			
Ever smoker ^d	55.0 (43.8, 65.7)	51.1 (35.9, 66.2)	62.4 (48.9, 74.2)

^aSeverity is defined as the self-reported number of hand palms that can cover the psoriasis rash, with one palm considered 1% BSA.

^bUnweighted sample size: no/little psoriasis=89, mild psoriasis=43, moderate/severe psoriasis=30

^cResults may be statistically unreliable, as estimates are based on cell sizes <30 or the sampled individual comes from <12 variance strata with observations in both primary sampling units.

^dBoth current and former smokers.

*The mean impact of psoriasis on daily life was significantly greater among moderate/severe cases compared to mild and no/little cases. An age–gender-adjusted test for trend also showed that impact of psoriasis on daily life increased with disease severity ($p=0.0001$).

BSA, body surface area; HRQOL, health-related quality of life; NHANES, National Health and Nutrition Examination Survey

occurrence of psoriasis is similar for adults aged ≥50 years⁶; therefore, applying our age 50–59 year estimate (3.5%) to those aged ≥60 years in the CPS population suggests that an additional 1.7 million, or 6.7 million total adults, are affected.^{47–49}

These estimates are likely conservative, as they do not include undiagnosed persons,⁵ those who may have been diagnosed but do not know their diagnosis, and those younger than 20 years. Consistent with previous investigations, the prevalence of psoriasis among non-Hispanic whites was significantly higher than among other racial/ethnic groups, which may be due to differences in the disease occurrence itself or issues related to healthcare access or utilization.

The prevalence of psoriasis was significantly higher (about 2.0-fold) among those who reported having arthritis than those without arthritis, probably because of the occurrence of psoriatic arthritis in 10%–15% of psoriasis patients,^{50,51} and highlights a need for dermatologists and rheumatologists to work together to address the spectrum of psoriatic disease. The prevalence of psoriasis was higher among those with any cardiovascular

disease compared with those without cardiovascular disease, as has been seen in other studies,^{24,52–54} but this association was not significant in our study, in part because of the small sample size ($n < 30$).

The selected HRQOL measures have been previously validated^{33,36,55} and are included in the CDC's Healthy Days Core Module. Although frequent mental distress was the only measure that was significantly worse in the psoriasis group (about 1.5-fold), all of the HRQOL measures tended to be worse for adults with psoriasis than those without psoriasis. Subsequent analyses revealed that the impact of psoriasis on daily life increased significantly with disease severity, demonstrating the importance of managing and treating moderate to severe psoriasis.

Depression severity was assessed using the previously validated PHQ-9,⁴⁴ and results indicate that adults with psoriasis report mild to severe depression significantly more frequently (about 1.5-fold) than those without psoriasis. These results, combined with the HRQOL measures, provide a more comprehensive assessment of the burden of psoriasis within the U.S. population and

Table 4. OR of psoriasis prevalence among adults aged 20–59 years, NHANES 2003–2006, 2009–2010

Characteristic	Unadjusted OR (95% CI)	AOR ^a (95% CI)
Age (years)		
20–29	1.0	1.0
30–39	1.6 (1.0, 2.5)	1.4 (0.9, 2.4)
40–49	1.4 (0.9, 2.2)	1.1 (0.7, 1.7)
50–59	1.6 (1.2, 2.2)	1.0 (0.7, 1.6)
Gender		
Male	1.0	1.0
Female	1.0 (0.8, 1.3)	1.1 (0.8, 1.4)
Race/ethnicity		
Non-Hispanic white	1.0	1.0
Non-Hispanic black	0.5 (0.3, 0.7)	0.5 (0.4, 0.8)
Hispanic/other	0.4 (0.3, 0.6)	0.5 (0.3, 0.7)
Arthritis		
No	1.0	1.0
Yes	2.3 (1.6, 3.3)	2.0 (1.3, 3.0)
Current BMI		
Underweight–healthy weight	1.0	1.0
Overweight	1.4 (1.0, 2.0)	1.4 (1.0, 2.0)
Obese	1.7 (1.2, 2.3)	1.6 (1.2, 2.2)
Current smoking status		
Nonsmokers	1.0	1.0
Former smokers	2.0 (1.4, 2.7)	1.7 (1.2, 2.4)
Current smokers	1.5 (1.2, 1.9)	1.5 (1.1, 1.9)

Note: Boldface indicates OR significantly > 1.

^aAdjusted for age, gender, race/ethnicity, current smoking status, current BMI, and arthritis (potential confounders identified in preliminary analyses)
NHANES, National Health and Nutrition Examination Survey

demonstrate the need for targeted interventions to improve QOL and other mental health domains.

The analysis found no association with current alcohol use, as did another study,²⁵ but the 12-month recall period is subject to recall bias. A systematic literature review suggested a positive association but was not conclusive because of the heterogeneity of alcohol measurement in relevant studies.²⁶ Consistent with previous research, the analysis found a significant association with current obesity.^{19,53,56,57} A recent study using 2003–2006 NHANES data reported a high prevalence of metabolic syndrome (AOR=1.96) among psoriasis patients.¹⁷ As a component of metabolic syndrome,

obesity should continue to be recognized and managed among individuals with psoriasis.

Previous research has shown that former and current smokers have a significantly increased risk of developing incident psoriasis when compared with nonsmokers.^{25,58,59} As expected, our study found a significant association of prevalent psoriasis among former and current smokers. If smoking is associated with disease progression as well as incidence, then the high proportion of current smokers (30%) suggests another reason for public health professionals and clinicians to work together to promote smoking-cessation efforts among those with prevalent psoriasis.

There were at least nine limitations in this study. First, overall prevalence estimates exclude the pediatric population, and analyses of prevalence exclude those aged ≥60 years as well. Second, self-report of a previous diagnosis of psoriasis has not been validated. Third, the relatively small sample size (and high relative SE) required grouping some variable responses, which disallowed in-depth or stratified analysis of some variables and prevented analysis of other important disease management topics. Fourth, the cross-sectional design of NHANES did not allow us to address issues of natural history, age of onset, response to or lack of treatment, and risk factors.

Fifth, the use of BSA is limited by the lack of information on psoriasis location (e.g., scalp, hands, feet, and nails) and type (e.g., erythrodermic, pustular, guttate, or inverse), both of which can affect clinical severity. Sixth, it is difficult to attribute some significant findings to psoriasis because other medical conditions may have contributed to those outcomes. Seventh, limited numbers made it impossible to assess some ethnic populations (e.g., Asian subpopulations) that are known to have higher psoriasis prevalence. Eighth, excluding those with incomplete responses may have biased the analysis toward completers. Ninth, a general survey like NHANES precludes the use of psoriasis-specific questions that might be more informative.

Strengths of this study include its effort to examine the full spectrum of psoriasis, its generalizability to the target U.S. population, and its ability to address a variety of issues in the same survey. In addition, it extends the findings of an earlier analysis⁵ and provides nationally representative evidence on alcohol, cardiovascular disease, depression, smoking, and HRQOL not previously examined within the U.S. population using the NHANES surveys.

Psoriasis is a major public health problem, affecting an estimated 6.7 million adult Americans. The financial burden of this disease has been estimated to be as high as \$11.25 billion⁶⁰ annually. This work is part of a broader public health agenda⁶¹ to address psoriasis from a population-based perspective. The findings from this study suggest the need for additional public health activities to monitor and address the adverse HRQOL effects, comorbid conditions, and smoking behaviors of individuals with psoriasis.

The study also demonstrates the need to validate self-reported psoriasis; develop better survey questions for assessing psoriasis severity; support efforts to include psoriasis questions into existing national (e.g., National Health Interview Survey) and state (e.g., Behavioral Risk Factor Surveillance Survey) surveys; and consider the value that psoriasis-specific surveys might add.

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Appendix

Supplementary data

Supplementary data associated with this article can be found at <http://dx.doi.org/10.1016/j.amepre.2014.02.012>.