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ORIGINAL RESEARCH

The Inverse Association of Psoriasis and Life's Crucial 9 in US Adults: An Analysis from NHANES

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Background: Life's Crucial 9 (LC9) is a new tool used to evaluate cardiovascular health. At present, no studies have reported the association between LC9 and psoriasis.

Methods: This cross-sectional study utilized data from the National Health and Nutrition Examination Survey (NHANES) conducted between 2009 and 2014. The LC9 score was calculated based on the American Heart Association's recommendations and the Patient Health Questionnaire-9 assessment. Psoriasis status was identified using self-reported questionnaires. Weighted multivariable logistic regression and restricted cubic splines were applied to assess the association between LC9 and psoriasis. Subgroup analyses were conducted for each covariate, and the interaction between LC9 and potential confounders was examined. Additionally, sensitivity analyses were performed to assess the robustness of the results.

Results: A total of 11,762 participants aged 20 years and older were included in this study. After comprehensive adjustments, a negative linear association was observed between psoriasis and LC9: Each 10-point increment in LC9 corresponded to an odds ratio (OR) of 0.87 (95% CI: 0.78–0.96) for psoriasis. Relative to participants in the lowest LC9 quartile (Q1), the ORs for psoriasis were 0.73 (95% CI: 0.55–0.96) for Q3 and 0.55 (95% CI: 0.36–0.85) for Q4. Among participants aged 45 to 64 years, those in the highest LC9 quartile (Q4) had an adjusted OR of 0.42 (95% CI: 0.23–0.78). Heavy drinkers in Q4 exhibited an adjusted OR of 0.37 (95% CI: 0.15–0.92). Sensitivity analyses confirmed these results.

Conclusion: A linear negative relationship between psoriasis and LC9 was identified in this study. This observational result suggesting that enhancing LC9-related cardiovascular health factors may serve as an effective approach for psoriasis prevention and management.

Keywords: national health and nutrition examination survey, NHANES, life's crucial 9, LC9, psoriasis, cardiovascular health, predictive effect

Introduction

Psoriasis is a chronic inflammatory skin condition that affects over 60 million individuals worldwide, primarily impacting white and affluent populations.[1–3] It has been increasingly associated with other medical conditions, including psychological, metabolic, arthritic, and cardiovascular diseases (CVD), which are considered comorbidities of psoriasis.[4,5] The World Health Organization (WHO) recognizes psoriasis as a disturbing, disfiguring, disabling, and incurable disease, highlighting the need for research on its global burden.[1,2] Since psoriasis often involves multiple systems and causes both physical and psychological distress, comprehensive management is essential to improving patients' quality of life.

In 2010, the American Heart Association (AHA) introduced Life's Simple 7 (LS7) as a measurement of cardiovascular health (CVH) to prioritize the promotion and maintenance of health over disease treatment.[6] LS7 comprised seven components: diet quality, physical activity, cigarette smoke exposure, and assessments of body mass index (BMI), fasting blood glucose, total cholesterol, and blood pressure. To address the limitation of LS7, for example, The evaluation of components in LS7 is not comprehensive enough, and the sensitivity of individual difference evaluation is low, the AHA

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revised the CVH assessment methodology based on the previous practical application in 2022, introducing Life's Essential 8 (LE8) by updating seven metrics based on the latest guidelines and incorporating sleep health.[7] LE8 provides a more comprehensive and rational framework for CVH assessment than LS7.[7] The application range of LE8 measurement has been broadened that multiple studies have demonstrated that LE8 is associated with various chronic illnesses, including psoriasis and its comorbidities.[7–14] Although there is no proper way to assess psychological health, the AHA recommends including psychological factors for a complete assessment for CVH.[7,15] Recently, psychological health has been integrated into the LE8 framework, namely Life's Crucial 9 (LC9),[16,17] which is an emerging assessment for CVH and overall health.

Since depression has also been indicated in the development of psoriasis,[18] LC9, the combination of LE8 and psychological factors, may be correlated with psoriasis. However, the relationship of LC9 and psoriasis has not been fully elucidated. To address this, the association between psoriasis and LC9 was investigated in this study in a representative sample of US adults using data from the National Health and Nutrition Examination Survey (NHANES).

Methods

Data Sources

Data from NHANES were utilized in this study, which employed a stratified, multi-stage probability sampling design to collect information from a nationally representative sample of US adults. Participants initially provided demographic details through home interviews before undergoing comprehensive evaluations at a Mobile Examination Center (MEC), where physical assessments, specialized measurements, and laboratory tests were conducted (see http://www.cdc.gov/nchs/nhanes). Non-institutionalized US adults from three biennial cycles (2009–2014) were included in this study. The National Center for Health Statistics (NCHS) Ethics Review Board approved the survey protocol, and all participants provided written informed consent (see https://www.cdc.gov/nchs/nhanes/irba98.htm for details). In this study, de-identified, publicly available data was used and that no direct patient interaction occurred. Participants below 20 years old, pregnant females, and those with missing key variables were excluded, yielding a final sample of 11,762 participants aged 20 and older with complete data. Figure 1 presents a visual representation.

Measurement of CVH

CVH was assessed in this study using the LC9 score, which was calculated as the average of nine metrics.[16,17] Detailed computation methods for each metric have been previously described.[7] Dietary evaluation was conducted using the Healthy Eating Index (HEI-2015), based on two 24-hour dietary recalls and food pattern scores from the USDA.[19] Data on physical activity, smoking, sleep, diabetes, and medication use were obtained through self-reported questionnaires. Blood pressure (BP), height, and weight were measured during physical examinations, with BP recorded as the average of three readings. BMI was calculated as weight divided by height squared. A central laboratory analyzed blood samples for lipid profiles, blood glucose levels, and glycated hemoglobin. Depression severity was assessed using the Patient Health Questionnaire-9 (PHQ-9), where higher scores indicated more severe depressive symptoms. Depression scores were classified as 100, 75, 50, 25, or 0, corresponding to ranges of 0 to 4, 5 to 9, 10 to 14, 15 to 19, and 20 to 27, respectively. The reasons for using PHQ-9 as a mental health assessment exercise are as follows: firstly, in the literature about LC9, the psychological assessment is based on the PHQ-9 scale.[16,17] This is because depression is a commonly used indicator in psychological assessment, and PHQ-9 is the currently recognized scale for assessing depression. Secondly, the literature shows that depression is closely related to psoriasis.[8]

Diagnosis of Psoriasis

Psoriasis diagnosis was determined by asking participants whether a healthcare provider or doctor had ever informed them of having the condition. Based on their responses, participants were classified into two groups: those who answered affirmatively and those who answered negatively. Although self-reported diagnostic methods may lead to bias, this is the only way to confirm psoriasis in the NHANES database.

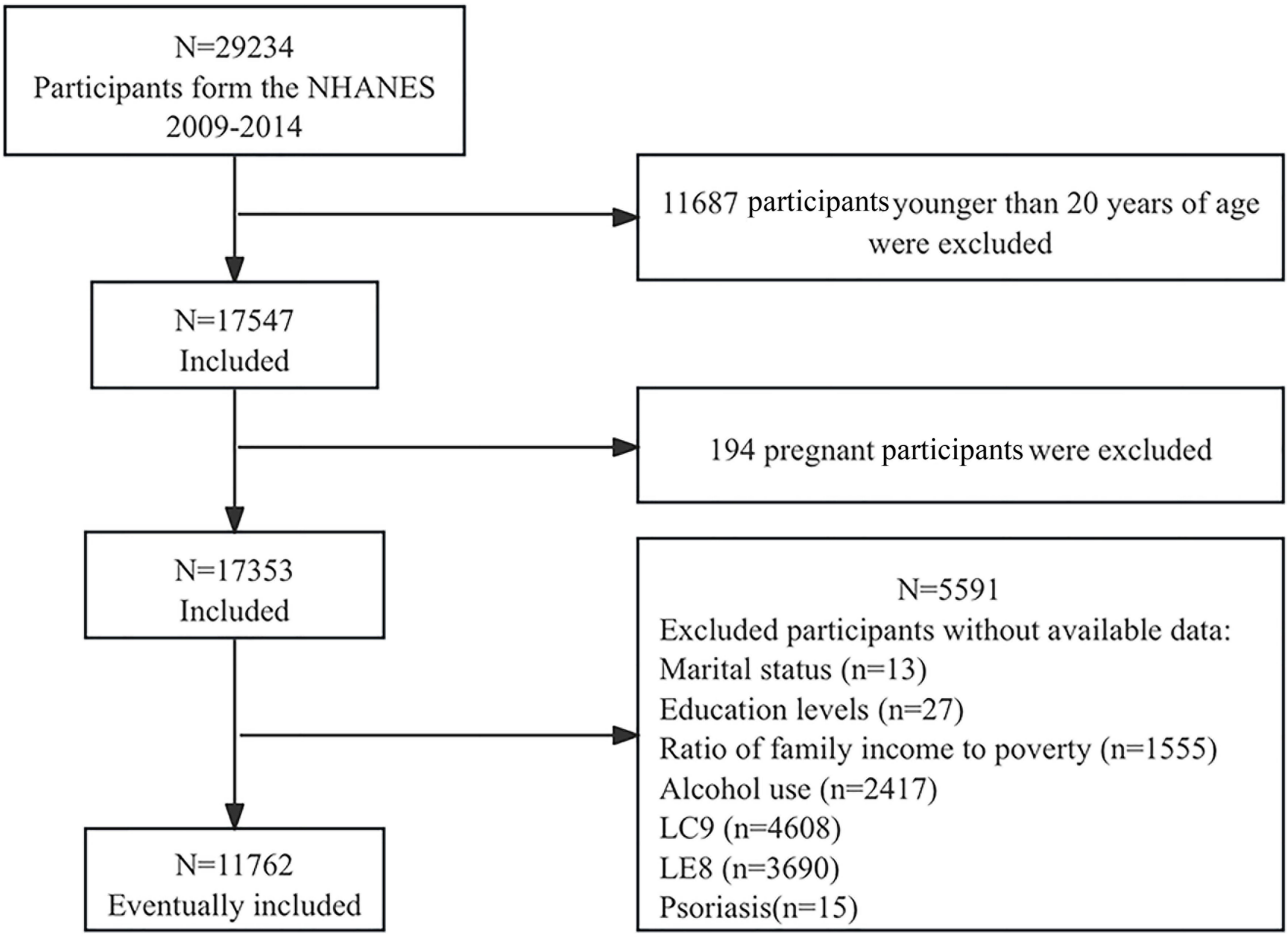

Figure 1 Flowchart depicting the screening and enrollment process of study participants.
Abbreviations: LE8, Life's Essential 8; LC9, Life's Crucial 9.

Defining Covariates

The demographic data was collected in this study through a questionnaire, encompassing age groups (20–44, 45–64, 65+), gender, race (non-Hispanic white, non-Hispanic black, Mexican American, others), marital status (married, separated, never married), and the family income-to-poverty ratio (< 1.30, 1.30–< 3.00, 3.00–< 5.00, 5.00+), which accounts for household size relative to the federal poverty threshold. A higher ratio indicates greater income levels. Education levels were categorized as less than 11th grade, high school graduate, or college graduate and above. Alcohol consumption was classified into heavy drinkers (women ≥ 3 drinks/day, men ≥ 4 drinks/day, or binge drinking ≥ 5 days/month), moderate drinkers (women ≥ 2 drinks/day, men ≥ 3 drinks/day, or binge drinking ≥ 2 days/month), mild drinkers (not meeting prior criteria), former drinkers (previously consumed alcohol but abstain now), and individuals who have never consumed alcohol.

Statistical Analysis

The data in this study were weighted according to NCHS guidelines. Participants were categorized into two groups based on psoriasis status. Statistical tests for weight adjustments were thoroughly applied. Participant characteristics were analyzed using chi-square tests and t-tests.

Multivariable logistic regression analysis was conducted to assess the association between psoriasis and CVH scores. LE8 and LC9 scores were categorized into quartiles, with the lowest quartile (Q1) serving as the reference group. CVH scores were analyzed as continuous variables per 1-score and 10-score increments. The relationship between LE8, LC9, and psoriasis was evaluated using p-values, odds ratios (ORs), and 95% confidence intervals (CIs). Three models were constructed: (1) Crude model (unadjusted), (2) Model 1 (adjusted for age, sex, and race/ethnicity), and (3) Model 2 (fully adjusted).

Restricted cubic spline (RCS) analysis is frequently used to examine nonlinear associations between continuous variables and dichotomous or survival time outcomes. Compared to categorization methods, RCS minimizes information loss and reduces bias. In this study, RCS analysis was conducted to assess linear trends between LC9, LE8, and psoriasis, with the model fully adjusted.

Additionally, weighted multivariate logistic regression was used to perform subgroup analyses for each covariate. The interaction between LC9 and potential confounders was also examined.

Statistical analyses were conducted using R software version 4.2.2 (https://cran.r-project.org/bin/windows/base/old/4.2.2). Bilateral tests were used to determine statistical significance, with a *p*-value threshold of less than 0.05.

Results

Baseline Characteristics

A total of 11,762 participants aged 20 or older, of whom 6,008 (51.4%) were female were included in this study. Among all participants, 360 (3.06%) had psoriasis, while 11,402 (96.94%) did not. The weighted mean scores (SE) for LC9 and LE8 were 70.30 (0.29) and 68.30 (0.31), respectively. Table 1 summarizes the baseline characteristics of participants based on psoriasis status. Significant differences were observed between participants with and without psoriasis concerning age, race/ethnicity, LC9, and LE8 ($p < 0.001$). Participants with psoriasis had lower LC9 and LE8 scores than those without psoriasis, with a SE of 67.58 (1.01) and 66.00 (1.08), respectively. Among age groups, the number and weighted percentage of psoriasis cases were 114 (31.83%) for ages 20 to 44, 155 (48.29%) for ages 45 to 64, and 91 (19.88%) for ages 65 and older. Regarding race/ethnicity, white individuals were more likely to have psoriasis, with 216

Table 1 Baseline Characteristics of Participants According to Non-Psoriasis/ Psoriasis From the US National Health and Nutrition Examination Survey (US NHANES)

Characteristics	Total (N = 11762)	Without Psoriasis (N = 11402)	With Psoriasis (N = 360)	P-value
Age				**0.002**
20-44	4878(43.24)	4764(43.61)	114(31.83)	
45-64	4136(38.03)	3981(37.71)	155(48.29)	
≥65	2748(18.72)	2657(18.69)	91(19.88)	
Sex				0.59
Female	6008(51.40)	5825(51.45)	183(49.94)	
Male	5754(48.60)	5577(48.55)	177(50.06)	
Race/ethnicity				**< 0.001**
Non-Hispanic white	5547(70.71)	5331(70.41)	216(79.90)	
Non-Hispanic black	2427(10.34)	2385(10.49)	42(5.61)	
Mexican American	1520(7.53)	1488(7.62)	32(4.69)	
Other	2268(11.43)	2198(11.48)	70(9.80)	
Marital status				0.29
Married	6978(63.81)	6772(63.88)	206(61.82)	
Separated	2204(17.94)	2152(17.98)	52(16.61)	
Never married	2580(18.25)	2478(18.14)	102(21.57)	
Ratio of family income to poverty levels				0.05
<1.3	3797(21.73)	3672(21.75)	125(20.85)	
1.3-3	3417(27.58)	3320(27.55)	97(28.62)	
3-5	2365(24.13)	2302(24.31)	63(18.50)	
≥5	2183(26.56)	2108(26.38)	75(32.03)	
Education levels				0.71
Less than 11th grade	2488(14.47)	2422(14.52)	66(13.00)	
High school graduate	5628(53.23)	5445(53.16)	183(55.44)	
College graduate or above	3646(32.30)	3535(32.32)	111(31.56)	

(*Continued*)

Table 1 (Continued).

Characteristics	Total (N = 11762)	Without Psoriasis (N = 11402)	With Psoriasis (N = 360)	P-value
Alcohol consumption status				0.23
Former	2102(14.87)	2029(14.83)	73(16.39)	
Heavy	2335(20.58)	2270(20.72)	65(16.19)	
Moderate	1784(17.33)	1722(17.20)	62(21.64)	
Mild	4011(36.77)	3893(36.79)	118(36.20)	
Never	1530(10.43)	1488(10.46)	42(9.58)	
Life's Essential 8 (LE8) score	68.30(0.31)	68.37(0.31)	66.00(1.08)	**0.03**
Life's Crucial 9 (LC9) score	70.30(0.29)	70.38(0.29)	67.58(1.01)	**0.01**
Per 10-score increase of LE8	6.83(0.03)	6.84(0.03)	6.60(0.11)	**0.03**
Per 10-score increase of LC9	7.03(0.03)	7.04(0.03)	6.76(0.10)	**0.01**
LE8 Quartile				**0.03**
Q1, [10,56.25]	2994(21.21)	2876(20.97)	118(28.76)	
Q2, (56.25,66.88]	2902(23.66)	2818(23.75)	84(20.83)	
Q3, (66.88,77.5]	3090(27.59)	2994(27.59)	96(27.52)	
Q4, (77.5,100]	2776(27.54)	2714(27.69)	62(22.88)	
LC9 Quartile				**0.03**
Q1, [13.89,58.89]	3039(21.46)	2918(21.22)	121(28.87)	
Q2, (58.89,69.44]	2816(22.51)	2731(22.54)	85(21.50)	
Q3, (69.44,78.89]	3038(27.20)	2942(27.21)	96(27.13)	
Q4, (78.89,100]	2869(28.83)	2811(29.03)	58(22.49)	

Notes: Categorical data were presented as unweighted frequencies (weighted percentage) and continuous data were presented as weighted mean (weighted standard error (SE)). The P-value was calculated using a chi-square test and Students *T* test after considering the sampling weights. Bold type of P-value indicated statistical significance (P < 0.05).

(79.90%) affected. No significant differences were found between participants with and without psoriasis concerning sex, marital status, education level, family income-to-poverty ratio, or alcohol consumption status ($p > 0.05$).

Association of LC9 Score with Psoriasis

The multivariable regression analysis of LC9 scores in relation to psoriasis is presented in Table 2. After full adjustment for potential confounders, LC9 scores remained significantly associated with psoriasis risk in all models. For each 1-score increase in LC9, the adjusted ORs for psoriasis were consistently 0.99 across the crude model, model 1, and model 2, with 95% confidence intervals of 0.98–1.00 and *p*-values of 0.005, 0.01, and 0.01, respectively. For each 10-point increase in LC9, the adjusted ORs for psoriasis were 0.87 (95% CI: 0.80–0.96; $p = 0.005$) in the crude model, 0.88 (95% CI: 0.80–0.97;

Table 2 Multiple Logistic Regression Models of Life's Crucial 9 with Psoriasis for Participants

Parameter	Crude Model		Model 1		Model 2	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Life's Crucial 9 score						
Q1, [13.89,58.89]	Ref		Ref		Ref	
Q2, (58.89,69.44]	0.70(0.47,1.04)	**0.07**	0.70(0.47,1.04)	0.08	0.69(0.46,1.02)	0.06
Q3, (69.44,78.89]	0.73(0.56,0.95)	**0.02**	0.74(0.56,0.98)	**0.04**	0.73(0.55,0.96)	**0.03**
Q4, (78.89,100]	0.57(0.39,0.83)	**0.004**	0.59(0.39,0.88)	**0.01**	0.55(0.36,0.85)	**0.01**
Continuous variable	0.99(0.98,1.00)	**0.005**	0.99(0.98,1.00)	**0.01**	0.99(0.98,1.00)	**0.01**
Per 10-score increase	0.87(0.80,0.96)	**0.005**	0.88(0.80,0.97)	**0.01**	0.87(0.78,0.96)	**0.01**

Notes: Crude model: unadjusted model Model 2: adjusted for age (continuous), sex, race/ethnicity.Model 3: adjusted for age (continuous), sex, race/ethnicity, marital status, family income to poverty ratio, education levels and alcohol consumption status.Bold type indicated statistical significance (P < 0.05).

Abbreviations: OR, odds ratio; CI, confidence interval.

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$p = 0.01$) in model 1, and 0.87 (95% CI: 0.78–0.96; $p = 0.01$) in model 2. Compared to Q1 of the LC9 quartiles, the adjusted ORs for psoriasis in Q3 and Q4 were as follows: Crude model: 0.73 (95% CI: 0.56–0.95; $p = 0.02$) and 0.57 (95% CI: 0.39–0.83; $p = 0.004$). Model 1: 0.74 (95% CI: 0.56–0.98; $p = 0.04$) and 0.59 (95% CI: 0.39–0.88; $p = 0.01$). Model 2: 0.73 (95% CI: 0.55–0.96; $p = 0.03$) and 0.55 (95% CI: 0.36–0.85; $p = 0.01$).

The RCS analysis indicated that the LC9 score did not exhibit a nonlinear relationship with psoriasis among participants of NHANES (p-nonlinear > 0.05; Figure 2).

Subgroup Analysis

The results of the subgroup analysis are presented in Figure 3. Compared to Q1 of the LC9 quartile, the adjusted ORs for psoriasis in Q4 were 0.42 (95% CI, 0.23–0.78; $p = 0.01$) among participants aged 45 to 64 years and 0.37 (95% CI, 0.15–0.92; $p = 0.03$) among heavy drinkers. Additionally, the linear trend test for the association in the 45 to 64-year age group was statistically significant. Stratified analyses showed no significant interactions between LC9 and the covariates.

Sensitivity Analysis

To evaluate the stability of the results, the accepted CVH assessment was incorporated into the model, specifically the LE8 score, which excludes depressive symptom assessments. After adjusting for underlying variables, the LE8 score remained significantly associated with psoriasis. For each 1-point increase in the LE8 score, the adjusted ORs for psoriasis were 0.99 (95% CI: 0.98–1.00; $p = 0.02$) in the crude model and 0.99 (95% CI: 0.98–1.00; $p = 0.03$) in model 2. For each 10-point increase in the LE8 score, the adjusted ORs for psoriasis were 0.90 (95% CI: 0.82–0.99; $p = 0.02$) in the crude model and 0.90 (95% CI: 0.81–0.99; $p = 0.03$) in model 2. Compared to Q1 of the LC9 quartile, the adjusted ORs for psoriasis in Q2 and Q4 were as follows: in the crude model, 0.64 (95% CI: 0.46–0.89; $p = 0.01$) and 0.60 (95% CI: 0.42–0.87; $p = 0.01$), respectively; in model 1, 0.64 (95% CI:

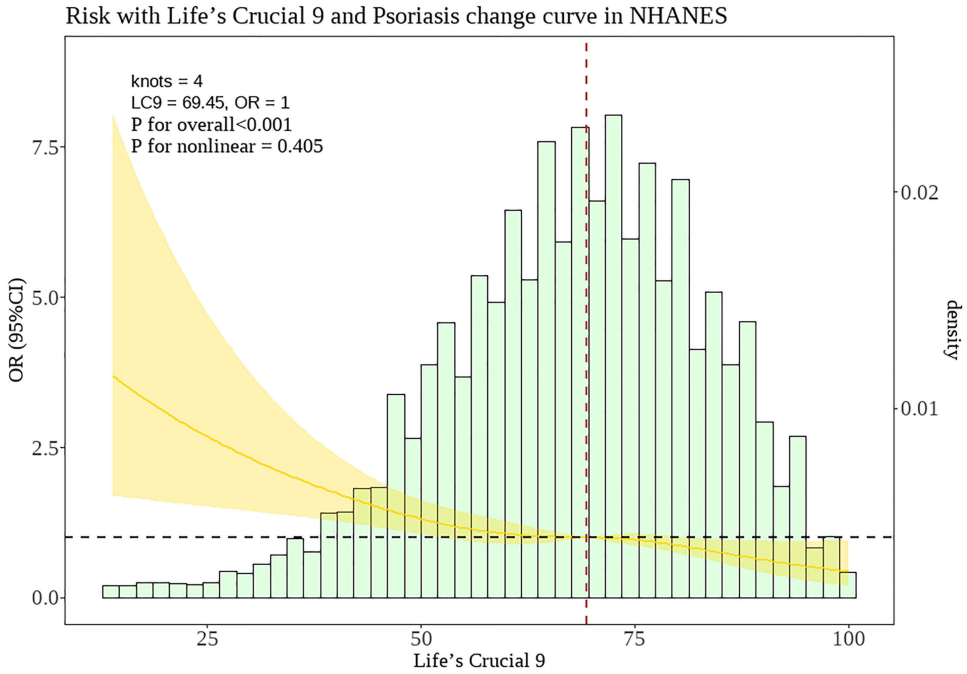

Figure 2 Relationship between Life's Crucial 9 score and psoriasis in a restricted cubic spline model.The ORs (solid lines) and 95% confidence intervals (shaded areas) were adjusted for age (continuous), gender, race (non-Hispanic White, non-Hispanic Black, Mexican American, others), marital status (married, separated, never married), and the family income-to-poverty ratio (< 1.30, 1.30 to < 3.00, 3.00 to < 5.00, ≥ 5.00), which accounts for household size relative to the federal poverty threshold. Adjustments also included education level (less than 11th grade, high school graduate, or college graduate and above) and alcohol consumption, categorized as heavy drinkers (women ≥ 3 drinks/day, men ≥ 4 drinks/day, or binge drinking ≥ 5 days/month), moderate drinkers (women ≥ 2 drinks/day, men ≥ 3 drinks/day, or binge drinking ≥ 2 days/month), mild drinkers (not meeting previous criteria), former drinkers (previously consumed alcohol but no longer do), and individuals who have never consumed alcohol. Vertical dotted lines indicate the minimum threshold for a beneficial association, with an estimated OR of 1.
Abbreviation: OR, odds ratio.

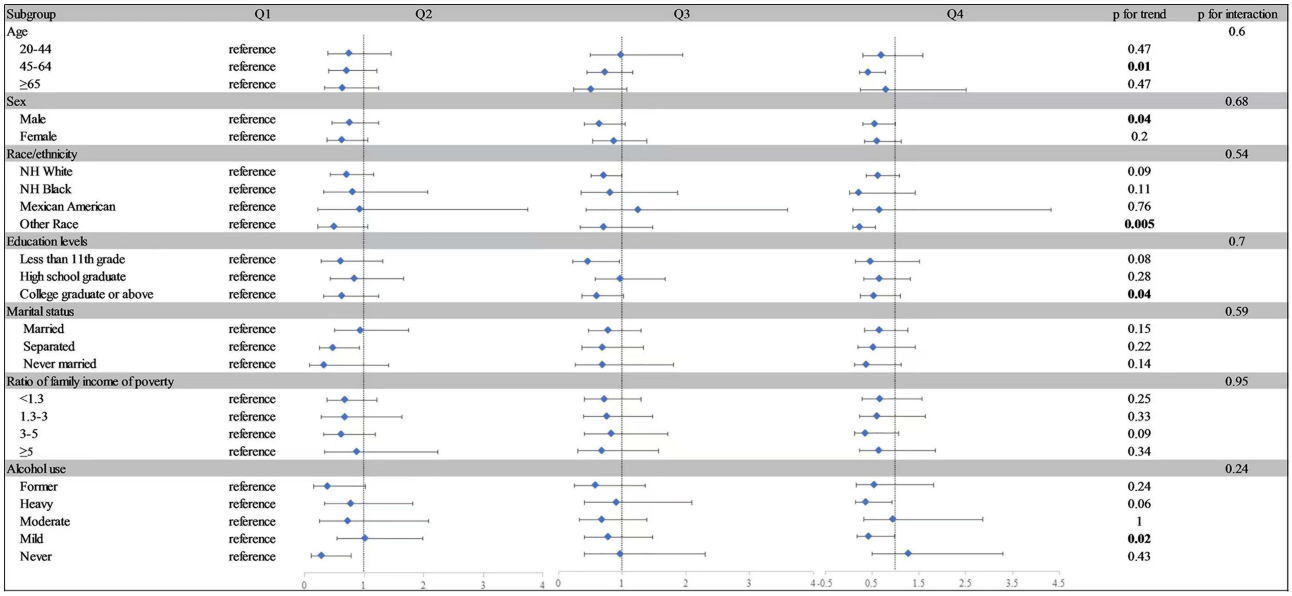

Figure 3 Subgroup analysis of the association between Life's Crucial 9 levels and psoriasis.Each stratification was adjusted for age, gender, race, marital status, family income-to-poverty ratio, and alcohol consumption, except for the stratification factor itself.
Note: Bold type indicated statistical significance ($p < 0.05$).
Abbreviations: LC9, Life's Crucial 9; NH, non-Hispanic.

0.46–0.90; $p = 0.01$) and 0.63 (95% CI: 0.42–0.95; $p = 0.03$), respectively; and in model 2, 0.64 (95% CI: 0.46–0.89; $p = 0.01$) and 0.60 (95% CI: 0.39–0.92; $p = 0.02$), respectively. Refer to Supplementary Table 1.

The RCS analysis indicated no nonlinear relationship between the LE8 score and psoriasis in participants of NHANES (p-nonlinear > 0.05), as shown in Supplementary Figure 1.

Discussion

Although there have been no studies that have reported an association between psoriasis and LC9, psoriasis is closely linked to CVD, and LC9 serves as an assessment tool for CVH.[4,5,12] Thus, a potential relationship between psoriasis and LC9 may exist. This cross-sectional analysis identified an inverse, linear relationship between LC9 and psoriasis prevalence. Subgroup analysis demonstrated a stronger negative association among participants aged 45 to 64 and heavy drinkers. As previous studies suggested, this study confirmed a negative linear relationship between LE8 and psoriasis after excluding depression assessment in the sensitivity analysis,[7,10–14] which illustrates the stability of our model.

There is no documented association between LC9 and psoriasis; however, all nine metrics in LC9 are linked to the comorbidities and lifestyle factors associated with psoriasis. Obesity, a well-established risk factor for psoriasis, contributes to disease onset and exacerbation through pro-inflammatory factors secreted by adipose tissue.[20,21] A meta-analysis reported that 25% of individuals with psoriasis also had obesity, with a higher prevalence observed in moderate cases.[22] Clinical studies and systematic reviews have consistently demonstrated that individuals with psoriasis exhibit significantly higher rates of hypertension, dyslipidemia, diabetes, and mental disorders.[13,23–26] Systemic inflammation is considered a key mechanism underlying both psoriasis and multisystem comorbidities, and anti-psoriasis therapies can concurrently alleviate these conditions.[18,23,24] Unacceptable skin lesions are a major contributor to depression and anxiety in individuals with psoriasis, negatively impacting their treatment adherence and quality of life.[24] Research also indicates that individuals with psoriasis are particularly prone to sleep disturbances and are less likely to engage in vigorous physical activity.[27–32] Additionally, studies suggest that their diets often lack anti-inflammatory and antioxidant components and do not align with high-quality dietary patterns.[32–36] Recent research has also identified smoking as a potential risk factor for psoriasis.[37,38] Taken together, these findings indicate that all nine metrics of LC9 are associated with psoriasis, supporting our results that LC9 is linked to psoriasis.

LC9 measurement is a unique evaluation system obtained by experts after multiple scientific rigorous argumentations, which is different from the evaluation standards adopted by previous studies.[7,17] Therefore, LC9 and psoriasis cannot be concluded to be associated for each metric in LC9 is associated with psoriasis. This study using weighted multivariable logistic regression and restricted cubic splines confirmed the lineally negative association between LC9 and psoriasis, particularly among individuals aged 45 to 64 and heavy drinkers indicated by subgroup analysis subsequently. Systemic inflammation may explain why a lower LC9 score correlate with an increased risk of psoriasis, as the low LE8 or LC9 score can induce inflammation-driven metabolic abnormalities and organ damage.[5,7,39]

With the decline in cardiovascular disease mortality, the AHA emphasizes management strategies aimed at sustaining and improving population health, leading to the definition of CVH management strategies and the emergence of LC9.[7,16,17] The LC9 scoring system assigns scores ranging from 0 to 100 to each metric, based on the latest clinical guidelines.[7,16,17] A higher score signifies better health. Each metric is categorized into 5 to 7 levels, capturing subtle health variations among individuals rather than a binary disease classification. Notably, the LC9 assessment incorporates medication history, prioritizing overall health evaluation over disease diagnosis.[7] For instance, patients having diabetes with well-controlled blood glucose receive a higher score in the blood glucose metric. The LC9 scoring method is straightforward and transparent, facilitating its clinical application. Since psoriasis independently elevates CVD risk, evaluating LC9 can serve as an effective approach to managing CVH in individuals with psoriasis.[5] Moreover, for specific LC9 metrics, such as obesity and smoking, are recognized risk factors for psoriasis, LC9 may function as a potential indicator of psoriasis risk, despite the absence of an established causal relationship. Since depression is associated with psoriasis,[18] LC9 is more closely associated than LE8 in its relationship with psoriasis. However, further research is needed to explore the difference between LC9 and LE8 in the association of psoriasis.

This study has several strengths and limitations. Notably, it is the first to examine the association between psoriasis and LC9. Additionally, it utilizes data from the NHANES database, recognized as a leading resource for monitoring cardiovascular health of the population.[7] Furthermore, the latest CVH measurement recommended by the AHA enhances sensitivity in detecting individual and group differences.

However, this study also has certain limitations. First, its cross-sectional design prevents the establishment of a temporal relationship between psoriasis and LC9, underscoring the need for well-structured prospective studies. Second, reliance on self-reported data for health behavior metrics and psoriasis diagnosis may introduce recall bias and lead to an underestimation of psoriasis prevalence. Lastly, the study may not have accounted for all potential confounders, which could influence the observed associations.

Conclusions

CVH has been linked to several chronic disease. LC9 is an emerging measurement of CHV, adding psychological assessment to LE8, and is by far the most comprehensive measure of health. A negative linear relationship between LC9 and psoriasis prevalence was identified in this study, especially among participants aged 45 to 64 and heavy drinkers. Our results hint at the possibility that LC9 may serve as a strategy for managing patients with psoriasis, or a predictor for the onset of psoriasis, particularly in older adults and heavy drinkers. Further research is required to explore the causal relationship and elucidate the specific mechanisms linking LC9 and psoriasis.

Ethics Approval and Consent to Participate

The National Center for Health Statistics (NCHS) Ethics Review Board (ERB) ensures protections of all human participants in NCHS studies and surveys, and approves each NHANES study protocol. The details of approved NHANES protocol in this study are showed in https://www.cdc.gov/nchs/nhanes/about/erb.html. Considering that the data in the public database has passed a compliant ethical review at the time of collection (such as indicating an IRB approval number), and our research has not involved secondary data collection or the addition of new human subjects, our institution's ethics committee has exempted the approval of this study.

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Disclosure

All authors have contributed significantly to the manuscript and declare that the work is original and has not been submitted or published elsewhere. None of the authors have any financial disclosure or conflict of interest.

References

1. Griffiths CEM, Armstrong AW, Gudjonsson JE, Barker J. Psoriasis. *Lancet*. 2021;397(10281):1301–1315. doi:10.1016/S0140-6736(20)32549-6
2. WHO. Global report on psoriasis. Geneva: World Health Organization, 2016.
3. Parisi R, Iskandar IYK, Kontopantelis E, et al. National, regional, and worldwide epidemiology of psoriasis: systematic analysis and modelling study. *BMJ*. 2020;369:m1590. doi:10.1136/bmj.m1590
4. Amin M, Lee EB, Tsai TF, Wu JJ. Psoriasis and Co-morbidity. *Acta Derm Venereol*. 2020;100(3):adv00033. doi:10.2340/00015555-3387
5. Takeshita J, Grewal S, Langan SM, et al. Psoriasis and comorbid diseases: epidemiology. *J Am Acad Dermatol*. 2017;76(3):377–390. doi:10.1016/j.jaad.2016.07.064
6. Lloyd-Jones DM, Hong Y, Labarthe D, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation*. 2010;121(4):586–613. doi:10.1161/CIRCULATIONAHA.109.192703
7. Lloyd-Jones DM, Allen NB, Anderson CAM, et al. Life's essential 8: updating and enhancing the american heart association's construct of cardiovascular health: a presidential advisory from the American heart association. *Circulation*. 2022;146(5):e18–e43. doi:10.1161/CIR.0000000000001078
8. Zhang R, Wu M, Zhang W, et al. Association between life's essential 8 and biological ageing among US adults. *J Transl Med*. 2023;21(1):622. doi:10.1186/s12967-023-04495-8
9. Wang L, Yi J, Guo X, Ren X. Associations between life's essential 8 and non-alcoholic fatty liver disease among US adults. *J Transl Med*. 2022;20(1):616. doi:10.1186/s12967-022-03839-0
10. Zhang Y, Sun M, Wang Y, et al. Association of cardiovascular health using life's essential 8 with noncommunicable disease multimorbidity. *Prev Med*. 2023;174:107607. doi:10.1016/j.ypmed.2023.107607
11. Chen H, Tang H, Huang J, et al. Life's essential 8 and mortality in US adults with chronic kidney disease. *Am J Nephrol*. 2023;54(11–12):516–527. doi:10.1159/000533257
12. Rasmussen-Torvik LJ, Shay CM, Abramson JG, et al. Ideal cardiovascular health is inversely associated with incident cancer: the atherosclerosis risk in com- munities study. *Circulation*. 2013;127:1270–1275. doi:10.1161/CIRCULATIONAHA.112.001183
13. Zhang J, Ren C, Qin Z, et al. Association between life's essential 8 and psoriasis in US adults: a cross-sectional study. *Front Med*. 2024;11:1445288. doi:10.3389/fmed.2024.1445288
14. Ouyang F, Yang, Honghao H, et al. Life's Essential 8, genetic susceptibility and the risk of psoriatic disease: a prospective cohort study. *Br. J. Dermatol*. 2024;191(6):897–905. doi:10.1093/bjd/ljae268
15. Levine GN, Cohen BE, Commodore–Mensah Y, et al. Psychological health, well--being, and the mind--heart–body connection: a scientific statement from the American Heart Association. *Circulation*. 2021;143:e763–e783. doi:10.1161/CIR.0000000000000947
16. Gaffey AE, Rollman BL, Burg MM. Strengthening the pillars of cardiovascular health: psychological health is a crucial component. *Circulation*. 2024;149:641–643. doi:10.1161/CIRCULATIONAHA.123.066132
17. Jinzhuo G, Peng W, Jiapeng L. Predictive value of life's crucial 9 for cardiovascular and all-cause mortality: a prospective cohort study from the NHANES 2007 to 2018. *J. Am. Heart Assoc*. 2024;13(20):e036669. doi:10.1161/JAHA.124.036669
18. Cohen BE, Martires KJ, Ho RS. Psoriasis and the risk of depression in the US population: national health and nutrition examination survey 2009-2012. *JAMA dermatol*. 2016;152(1):73–79. doi:10.1001/jamadermatol.2015.3605
19. Krebs-Smith SM, Pannucci TE, Subar AF, et al. Update of the Healthy Eating Index: HEI-2015. *J Acad Nutr Diet*. 2018;118(9):1591–1602. doi:10.1016/j.jand.2018.05.021
20. Yamazaki F. Psoriasis: comorbidities. *J Dermatol*. 2021;48(6):732–740. doi:10.1111/1346-8138.15840
21. Snekvik I, Smith CH, Nilsen TIL, et al. Obesity, waist circumference, weight change, and risk of incident psoriasis: prospective data from the HUNT study. *J Invest Dermatol*. 2017;137:2484–2490. doi:10.1016/j.jid.2017.07.822
22. Wang J, Yuanting Y, Liu L, et al. Global prevalence of obesity in patients with psoriasis: an analysis in the past two decades. *Autoimmunity Rev*. 2024;23(6):103577. doi:10.1016/j.autrev.2024.103577
23. Hu MY, Yang Q, Zheng J. The association of psoriasis and hypertension: focusing on anti-inflammatory therapies and immunological mechanisms. *Clin Exp Dermatol*. 2020;45(7):836–840. doi:10.1111/ced.14327
24. Elmets CA, Leonardi CL, Davis DMR, et al. Joint AAD-NPF guidelines of care for the management and treatment of psoriasis with awareness and attention to comorbidities. *J Am Acad Dermatol*. 2019;80(4):1073–1113. doi:10.1016/j.jaad.2018.11.058
25. Armstrong AW, Harskamp CT, Armstrong EJ. Psoriasis and the risk of diabetes mellitus: a systematic review and meta-analysis. *JAMA Dermatol*. 2013;149(1):84–91. doi:10.1001/2013.jamadermatol.406
26. Ma C, Harskamp CT, Armstrong EJ, et al. The association between psoriasis and dyslipidaemia: a systematic review. *Br J Dermatol*. 2013;168(3):486–495. doi:10.1111/bjd.12101
27. Henry AL, Kyle SD, Chisholm A, Griffiths CEM, Bundy C. A cross-sectional survey of the nature and correlates of sleep disturbance in people with psoriasis. *Br J Dermatol*. 2017;177:1052–1059. doi:10.1111/bjd.15469
28. Jensen P, Zachariae C, Skov L, Zachariae R. Sleep disturbance in psoriasis: a case-controlled study. *Br J Dermatol*. 2018;179:1376–1384. doi:10.1111/bjd.16702
29. Halioua B, Chelli C, Misery L, Taieb J, Taieb C. Sleep disorders and psoriasis: an update. *Acta Derm Venereol*. 2022;102:adv00699. doi:10.2340/actadv.v102.1991
30. Zheng Q, Sun XY, Miao X, et al. Association between physical activity and risk of prevalent psoriasis: a MOOSE-compliant meta-analysis. *Medicine*. 2018;97:e11394. doi:10.1097/MD.0000000000011394
31. Yeroushalmi S, Hakimi M, Chung M, Bartholomew E, Bhutani T, Liao W. Psoriasis and Exercise: a Review. *Psoriasis*. 2022;12:189–197. doi:10.2147/PTT.S349791

32. Duchnik E, Kruk J, Tuchowska A, Marchlewicz M. The impact of diet and physical activity on psoriasis: a narrative review of the current evidence. *Nutrients*. 2023;15(4):840. doi:10.3390/nu15040840
33. Afifi L, Danesh MJ, Lee KM, et al. Dietary behaviors in psoriasis: patient-reported outcomes from a U.S. national survey. *Dermatol Ther*. 2017;7:227–242. doi:10.1007/s13555-017-0183-4
34. Ford AR, Siegel M, Bagel J, et al. Dietary recommendations for adults with psoriasis or psoriatic arthritis from the medical board of the national psoriasis foundation: a systematic review. *JAMA Dermatol*. 2018;154:934–950. doi:10.1001/jamadermatol.2018.1412
35. Phan C, Touvier M, Kesse-Guyot E, et al. Association between mediterranean anti-inflammatory dietary profile and severity of psoriasis: results from the nutrinet-santé cohort. *JAMA Dermatol*. 2018;154(9):1017–1024. doi:10.1001/jamadermatol.2018.2127
36. Flores-Balderas X, Peña-Peña M, Rada KM, et al. beneficial effects of plant-based diets on skin health and inflammatory skin diseases. *Nutrients*. 2023;15(13):2842. doi:10.3390/nu15132842
37. Lee EJ, Han KD, Han JH, et al. Smoking and risk of psoriasis: a nationwide cohort study. *J Am Acad Dermatol*. 2017;77:573–575. doi:10.1016/j.jaad.2017.04.015
38. Wei J, Zhu J, Xu H, et al. Alcohol consumption and smoking in relation to psoriasis: a Mendelian randomization study. *Br J Dermatol*. 2022;187(5):684–691. doi:10.1111/bjd.21718
39. Tang K, Wang L, Jinming Y, et al. Association between life's crucial 9 and severe abdominal aortic calcification in U.S. Adults: the mediating role of the systemic inflammatory response index. *Front Endocrinol*. 2025;16:1526114. doi:10.3389/fendo.2025.1526114