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Regional Variation in Cardiovascular Risk Factor Screening by Dermatologists for Psoriasis Patients in the United States

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Title Page

Title: Regional Variation in Cardiovascular Risk Factor Screening by Dermatologists for Psoriasis Patients in the United States

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Short Title (45 chars): CVD Risk Screening in Psoriasis by U.S. Region

Abbreviations: National Ambulatory Medical Care Survey (NAMCS), American Academy of Dermatology (AAD), National Psoriasis Foundation (NPF), American Heart Association (AHA), American College of Cardiology (ACC)

To the Editor,

Psoriasis is associated with an increased risk of cardiovascular disease (CVD) and mortality, independent of co-morbid medical conditions, demographics, and individual health behaviors (Elmets et al., 2019, Gelfand et al., 2006). Recent guidelines specifically recommend that patients with psoriasis receive CV risk factor screening (Elmets et al., 2019, Grundy et al., 2019), a practice supported by dermatologists and people with psoriasis (Barbieri et al., 2022). However, screening rates for CV risk factors in psoriasis patients are low, representing a gap in clinical practice (Singh and Silverberg, 2021). One critical barrier to improved care for people with psoriasis is lack of understanding of regional variation in CV risk factor screening, which may represent unmet screening needs and insufficient CV health management for people with psoriasis. Therefore, we investigated regional variation in screening rates for CV risk factors in psoriasis patients in the United States.

Using cross-sectional data on ambulatory visits from the National Ambulatory Medical Care Survey (NAMCS), we identified screening rates in four regions of the United States (Northeast, Midwest, South, and West) for four CV risk factors (blood pressure, body mass index (BMI), serum cholesterol, and serum glucose) for patients with psoriasis visiting a dermatology provider from 2007 to 2016, the latest year with complete data. Visits for psoriasis were identified by diagnosis codes or if psoriasis was listed as a reason for the visit. Logistic regression analysis was used to identify the association between U.S. region and completion of CV risk factor screening, and results were adjusted by patient sex, age, race/ethnicity, and psoriasis severity based on the use of systemic psoriasis medications or phototherapy. Visits were weighted to provide nationally representative estimates using a multistage estimation procedure involving

inflation by reciprocals of the probability of selection, adjustment for nonresponse, ratio adjustment to fixed totals, and weight smoothing, as previously described (Centers for Disease Control and Prevention, 2015). A p-value less than 0.05 was considered statistically significant. This study was deemed exempt by the University of Pennsylvania Institutional Review Board.

A total of 14.8 million weighted (632 unweighted) psoriasis-related visits occurred over the 10-year study period. Of these visits, 19.2% occurred in the Northeast, 26.1% in the Midwest, 34% in the South, and 20.7% in the West. Patients were 50.8% female, 83.8% Non-Hispanic White, 5.5% Non-Hispanic Black, 8% Hispanic, 2.7% other race/ethnicity, 79.6% age 40 and older, and 25.3% with moderate to severe psoriasis. Screening rates were generally low and lowest in the South, particularly for blood pressure (Table 1). Compared to the rate of blood pressure screening in the South, the adjusted odds of blood pressure screening were 5.86 (95% CI, 1.25-27.61) in the Northeast, 5.08 (95% CI, 1.61-16.04) in the Midwest, and 3.40 (95% CI, 1.07-10.80) in the West (Table 2). BMI screening did not vary significantly by region, and regression analysis for cholesterol and glucose screening was not performed due to sample size limitations. Blood pressure screening increased by 2% each year and BMI screening increased by 1% each year, while glucose and cholesterol screening decreased by less than 1% each year.

CV risk factor screening by dermatology providers for patients with psoriasis is low across all regions of the United States and lowest in the South, the region which also experiences the highest CVD burden in the United States (Global Burden of Cardiovascular Diseases Collaboration et al., 2018). Overall screening rates did not change in a clinically meaningful way over the decade analyzed in this study. Additionally, CV risk factor screening for people with

psoriasis, especially blood pressure screening, varies by region, and that variation is not explained by patient demographics or disease severity. If providers in the South screened patients with psoriasis for high blood pressure at the same rate as providers in the Northeast, the South would have provided blood pressure screening to psoriasis patients at approximately 280,000 additional visits each year, or 2.8 million visits over the study period. Variation in screening suggests that some regions experience barriers to appropriate screening or challenges in adhering to guidelines for managing psoriasis and CV risk. Without appropriate screening, CVD in people with psoriasis remains underdiagnosed and undermanaged, resulting in preventable major cardiovascular events and mortality. This evidence-to-practice gap is particularly problematic because psoriasis is defined as a cardiovascular risk enhancer warranting aggressive management of cardiovascular risk factors (Grundy et al., 2019).

According to the American Academy of Dermatology and National Psoriasis Foundation guidelines, dermatology providers play an important role in evidence-based screening of CV risk factors in patients with psoriasis (Elmets et al., 2019). This screening is especially crucial for the significant proportion of Americans with chronic skin diseases who do not have an established primary care provider, representing as many as 31% of men and 26% of women with chronic skin conditions (Barbieri et al., 2021). Integrating appropriate CVD screening and management into usual care for patients with psoriasis is desired by both dermatologists and patients with psoriasis (Barbieri et al., 2022), and care coordination with an interdisciplinary team is supported by physicians and people with psoriasis as a potential path forward (Gustafson et al., 2022). In alignment with this desire for improved care coordination, the ongoing Prevention of Cardiovascular Disease and Mortality in Patients with Psoriasis or Psoriatic Arthritis (CP3) study

aims to improve the health and lifespan of people with psoriasis by reducing barriers to appropriate CVD prevention. Using a novel centralized care coordination model, trained care coordinators in the National Psoriasis Foundation's Patient Navigation Center guide patients with psoriasis through CV risk calculations; develop guideline-based plans for their diet, exercise, and medication management; and connect them with appropriate providers (National Psoriasis Foundation, 2022).

Limitations of this study include lack of available data after 2016 and sample size limitations for cholesterol and glucose screening. Continued efforts to develop effective interventions to improve CV screening and care for people with psoriasis in all regions of the US are needed to more effectively address the burden of CV disease experienced by people with psoriasis.

Data Availability Statement

All data used in this article can be found at the Center for Disease Control and Prevention's website for the National Ambulatory Medical Care Survey at https://www.cdc.gov/nchs/ahcd/index.htm

Conflict of Interest Statement

Dr. Alan B. Fleischer is a consultant for Almirall, Incyte and SCM Lifescience (fees). He is an investigator for Galderma and Trevi (research support).

Dr. Steven R. Feldman has received research, speaking and/or consulting support from Eli Lilly and Company, GlaxoSmithKline/Stiefel, AbbVie, Janssen, Alovtech, vTv Therapeutics, Bristol-Myers Squibb, Samsung, Pfizer, Boehringer Ingelheim, Amgen, Dermavant, Arcutis, Novartis, Novan, UCB, Helsinn, Sun Pharma, Almirall, Galderma, Leo Pharma, Mylan, Celgene, Ortho Dermatology, Menlo, Merck & Co, Qurient, Forte, Arena, Biocon, Accordant, Argenx, Sanofi, Regeneron, the National Biological Corporation, Caremark, Teladoc, BMS, Ono, Micreos, Eurofins, Informa, UpToDate and the National Psoriasis Foundation. He is founder and part owner of Causa Research and holds stock in Sensal Health.

Dr. Joel M. Gelfand served as a consultant for Abbvie, BMS, Boehringer Ingelheim, Celldex (DSMB), FIDE (which is sponsored by multiple pharmaceutical companies) GSK, Happify, Lilly (DMC), Leo, Janssen Biologics, Novartis Corp, Pfizer, UCB (DSMB), Neuroderm (DSMB), and Mindera Dx., receiving honoraria; and receives research grants (to the Trustees of the University of Pennsylvania) from Amgen, Boehringer Ingelheim, and Pfizer Inc.; and received payment for continuing medical education work related to psoriasis that was supported indirectly pharmaceutical sponsors. Dr. Gelfand is a co-patent holder of resiquimod for treatment

of cutaneous T cell lymphoma. Dr. Gelfand is a Deputy Editor for the Journal of Investigative Dermatology receiving honoraria from the Society for Investigative Dermatology, is Chief Medical Editor for Healio Psoriatic Disease (receiving honoraria) and is a member of the Board of Directors for the International Psoriasis Council, receiving no honoraria.

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Author Contributions Statement

Conceptualization: WS, GP, AN, DS, AF, SF, JM; Methodology: WS, DS, JG; Formal Analysis: WS, GP, DS; Investigation: WS, GP; Data Curation: WS; Writing – original draft: WS, JG; Writing – review & editing: WS, GP, AN, DS, AF, SF, JG; Visualization: WS; Supervision: JG

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Tables

Table 1. Cardiovascular Risk Factor Screening Rates for People with Psoriasis In Each US Region and Age Group.							
US Region	**Visits, Unweighted**	**Visits, Weighted**	**Any CV Screening**	**Blood Pressure Screening**	**BMI Screening**	**Cholesterol Screening**	**Glucose Screening**
			% of Total Visits in the Region				
Psoriasis Visits with All Adults Seen by Dermatology Provider							
Northeast	87	2,838,786	15%	12%	11%	2.4%	3.0%
Midwest	206	3,867,454	22%	10%	13%	5.5%	2.0%
South	194	5,029,905	14%	2.3%	11%	3.0%	0.9%
West	145	3,063,279	14%	7.5%	8.7%	10%	1.3%
All Regions	632	14,799,423	16%	7.4%	11%	2.9%	1.7%
Psoriasis Visits with Adults Age 40 and Older Seen by Dermatology Provider							
Northeast	62	2,250,092	16%	13%	13%	1.7%	1.3%
Midwest	171	3,203,821	24%	11%	14%	6.2%	2.4%
South	149	3,847,633	12%	1.2%	10%	2.9%	1.1%
West	115	2,474,763	14%	5.9%	9.3%	10%	0.8%
All Regions	497	11,776,309	17%	7.2%	12%	3.0%	1.4%

Table 2. Regression Analysis for Regional Differences in Cardiovascular Risk Factor Screening for People with Psoriasis Visiting Dermatology Providers.			
	Any CV Screening	**Blood Pressure Screening**	**BMI Screening**
	Odds Ratio (95% CI)		
Unadjusted Logistic Regression			
Region (Reference: South)			
Northeast	1.11 (0.41, 3.04)	5.9 (1.34, 25.92)*	0.97 (0.27, 3.54)
Midwest	1.73 (0.94, 3.18)	4.87 (1.59, 14.97)*	1.27 (0.65, 2.48)
West	1.03 (0.53, 1.99)	3.42 (1.01, 11.57)*	0.79 (0.37, 1.66)
Adjusted Logistic Regression			
Region (Reference: South)			
Northeast	1.25 (0.43, 3.64)	5.86 (1.25, 27.61)*	1.08 (0.28, 4.2)
Midwest	1.92 (0.99, 3.72)	5.08 (1.61, 16.04)*	1.39 (0.69, 2.79)
West	0.98 (0.51, 1.87)	3.4 (1.07, 10.8)*	0.74 (0.36, 1.53)
Male (Reference: Female)	1.06 (0.61, 1.83)	0.87 (0.39, 1.97)	0.92 (0.48, 1.75)
Age (Reference: Age 18-29)			
Age 30-39	2.07 (0.65, 6.54)	3.28 (0.8, 13.51)	2.48 (0.55, 11.15)
Age 40-49	1.62 (0.47, 5.55)	2 (0.34, 11.71)	2.58 (0.53, 12.56)
Age 50-59	1.89 (0.65, 5.53)	1.69 (0.44, 6.49)	2.29 (0.57, 9.16)
Age 60-69	2.15 (0.7, 6.59)	2.32 (0.53, 10.12)	2.5 (0.54, 11.5)
Age 70-79	1.25 (0.35, 4.46)	1.17 (0.25, 5.42)	2.53 (0.51, 12.6)
Age 80+	1.51 (0.43, 5.36)	1.44 (0.27, 7.58)	3.24 (0.68, 15.36)
Race/Ethnicity (Reference: White, Non-Hispanic)			

Black, Non-Hispanic	1.88 (0.65, 5.44)	0.96 (0.15, 6.29)	1.42 (0.4, 5.03)
Hispanic	1.94 (0.86, 4.41)	0.9 (0.28, 2.85)	2.33 (0.94, 5.79)
Other, Non-Hispanic	1.29 (0.33, 5.08)	1.61 (0.3, 8.82)	0.59 (0.15, 2.31)
Moderate/Severe Disease (Reference: Mild Disease)	1.61 (0.88, 2.93)	1.19 (0.56, 2.53)	1.46 (0.75, 2.85)

*$p<0.05$