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Rural Health Disparities in Skin Cancer Amplified Among Skin of Color

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ABSTRACT

Limited studies explore the role social determinants of health have on urban-rural health disparities, particularly for Skin of Color. To further evaluate this relationship, a cross-sectional study was conducted on data from five states using the 2018 to 2021 Behavior Risk Factor Surveillance Survey, a national state-run health survey. Prevalence of skin cancer history and urban/rural status were evaluated across these social determinants of health: sex, age, race, insurance status, number of personal healthcare providers, and household income. Overall, rural counterparts were significantly more likely to have a positive skin cancer history across most social determinants of health. Rural populations had a higher prevalence of skin cancer history across all races ($P<.001$). Rural non-Hispanic Whites had greater odds than their urban counterparts (OR=1.40; 95% CI 1.34 - 1.46). The odds were approximately twice as high for rural Black (OR=1.74; 95% CI 1.14 - 2.65), Hispanic (OR=2.31; 95% CI 1.56 - 3.41), and Other Race, non-Hispanic (OR=1.99; 95% CI 1.51 - 2.61), and twenty times higher for Asians (OR=20.46; 95% CI 8.63 - 48.54), although no significant difference was seen for American Indian/Alaskan Native (OR=1.5; 95% CI 0.99 - 2.28). However, when household income exceeded $100,000 no significant difference in prevalence or odds was seen between urban and rural settings. Despite increasing awareness of metropolitan-based health inequity, urban-rural disparities in skin cancer prevalence continue to persist and may be magnified by social determinants such as income and race.

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INTRODUCTION

While urban-rural health disparities in skin cancer prognosis have been well-described, few studies evaluate the role of social determinants of health (SDOH) on urban-rural health disparities.[1] Even fewer studies examine the impact of urban-rural differences on skin cancer prevalence among skin of color (SOC) patients. Among skin cancer research, more recent studies have shown that rural populations are more likely to present with later-stage melanoma in the vulnerable head and neck region.[2] In addition to this, patients of color have an increased risk of mortality for both melanoma and non-melanoma skin cancers.[3,4] The intersection of rural health disparities and SOC is an important but understudied frontier. Increasing awareness of skin cancer prevention and screening has significant health implications because the delay in skin cancer diagnosis, particularly for SOC patients, can lead to increased morbidity and mortality from a condition that has an excellent prognosis with early diagnosis and treatment. Therefore, we sought to examine the association between urban-rural status and skin cancer prevalence across the following SDOHs: sex, age, race, insurance status, number of personal health care providers (PHCP), and income.

MATERIALS AND METHODS

We conducted a cross-sectional study on the 2018 to 2021 data from the Behavioral Risk Factor Surveillance Survey (BRFSS). The BRFSS is an annual, telephone-based health survey in which adult participants are randomly selected to voluntarily participate through random digit dialing either through landline or mobile phone. Questions included in the BRFSS have been validated as moderately or highly reliable, and the survey provides an accurate and timely sample of individual health behaviors by state.[5] Due to the participant selection process, the BRFSS does not distinguish by citizenship and includes answers from undocumented residents, legal residents, and U.S citizens. We selected data from California, Florida, Georgia, Michigan, and Tennessee as states with high numbers of agricultural workers per the United States Bureau of Labor Statistics.[6] These states were chosen to ensure a fair distribution of urban and rural workers that may compromise the sample, and reflect a generalizable sample selected from different regions of the country.

The outcome of positive skin cancer history was determined by the answer "Yes" to the survey question "(Ever told) you had

skin cancer?" Individuals who responded, "Don't know/Not sure," refused to answer, or had a null response to this question were excluded. Urban-rural status was determined through the National Center for Health Statistics's definition of urban (living in a metropolitan or micropolitan county) or rural (living in a non-core county). Metropolitan counties are defined as populations of 50,000 or higher, whereas micropolitan counties are those with urban clusters of 10,000-49,999.[7] Non-core counties are defined if the county does not meet the definition of metropolitan or micropolitan. Participants who did not provide information about their metropolitan status were also excluded.

Skin cancer prevalence was evaluated across urban-rural status and the chosen SDOH: sex, age, race, insurance status, number of personal healthcare providers (PHCP), and income. Statistical analyses were conducted using z-test and odds ratios (OR) with 95% confidence intervals (CI), with corresponding p-values reported. All analyses were conducted using R version 4.3.1.

RESULTS

A total of 170,871 out of 171,385 participants were analyzed, of which 11% reported a positive history of skin cancer (Table 1). The proportion of positive skin cancer diagnoses

TABLE 1.

Skin Cancer History by Urban/Rural Status and Sociodemographic. Characteristics of BRFSS 2018-2021 Survey Participants in California, Florida, Georgia, Michigan, and Tennessee

Socio-Demographic Category	Characteristics	Skin Cancer History (Urban)	Skin Cancer History (Rural)	Z-Score	*P*-value
Gender	Male	10.7%	15.7%	-13.71	<0.001
	Female	10.1%	12.6%	-7.94	<0.001
Race	White	14.5%	16.3%	-5.79	<0.001
	Black	0.8%	1.3%	-2.60	<0.001
	Asian	0.6%	11.1%	-9.67	<0.001
	American Indian/Alaskan Native	8.3%	12.0%	-1.91	<0.001
	Hispanic	1.7%	3.9%	-4.30	<0.001
	Other race	6.4%	12.0%	-4.97	<0.001
Health Plan	Have some form of insurance	11.3%	15.5%	-15.62	<0.001
	Do not have some form of health insurance	2.9%	4.1%	-3.16	0.002
Presence of Personal Healthcare Provider	Yes, only one	11.7%	15.2%	-11.64	<0.001
	More than one	14.0%	19.2%	-6.43	<0.001
	No	3.3%	5.3%	-5.60	<0.001
Age	18-24	0.4%	0.3%	0.69	0.492
	25-34	0.6%	1.0%	-1.87	0.061
	35-44	1.9%	2.4%	-1.27	0.202
	45-54	5.0%	5.9%	-2.19	0.028
	55-64	10.3%	11.9%	-3.10	0.002
	65+	22.1%	24.5%	-4.72	<0.001
Income	Less than $10,000	4.3%	7.9%	-5.1	<0.001
	Less than $15,000 ($10,000 to < $15,000)	8.0%	13.4%	-6.03	<0.001
	Less than $20,000 ($15,000 to < $20,000)	8.6%	12.6%	-5.00	<0.001
	Less than $25,000 ($20,000 to < $25,000)	9.3%	13.5%	-5.49	<0.001
	Less than $35,000 ($25,000 to < $35,000)	10.2%	14.4%	-5.67	<0.001
	Less than $50,000 ($35,000 to < $50,000)	10.7%	15.7%	-7.20	<0.001
	Less than $75,000 ($50,000 to < $75,000)	11.4%	15.4%	-5.50	<0.001
	Less than $100,000? ($75,000 to < $100,000)	11.4%	14.4%	-4.81	<0.001
	Less than $150,000? ($100,000 to < $150,000)	9.2%	13.7%	-1.86	0.062
	Less than $200,000? ($150,000 to < $200,000)	9.1%	9.5%	-0.09	0.925
	$200,000 or more	9.3%	9.7%	-0.08	0.936

in rural communities was significantly higher than in urban communities across all sexes, races, insurance statuses, and number of PHCPs. In addition, the odds of skin cancer (Table 1) were significantly higher for rural individuals across sexes, most races, and all insurance and PHCP statuses. Skin cancer prevalence was lowest among those who made less than $10,000 for both urban and rural cohorts. Among all SDOH except high-income (greater than $100,000), rural counterparts were significantly more likely to have positive skin cancer history (*P*<.001) (Table 1).

The odds of skin cancer (Table 2) were significantly higher for rural individuals across most races and all insurance and PHCP statuses. Rural non-Hispanic Whites had greater odds than their urban counterparts (OR 1.40; 95% CI 1.34 - 1.47). The odds were even higher for rural Black (OR=1.74; 95% CI 1.14 - 2.65), Hispanic (OR=2.31; 95% CI 1.56 - 3.41), Asians (OR=20.46; 95% CI 8.63 - 48.54), and Other Race, non-Hispanic (OR=1.99; 95% CI 1.51 - 2.61). When household income exceeded $100,000, no difference was seen between rural and urban rates of skin cancer diagnoses.

TABLE 2.

Odds Ratio (OR) for Skin Cancer History and Urban/Rural Status by Sociodemographic Characteristics

Socio-Demographic Category	Characteristics	OR		
		Urban	Rural	95% CI
Gender	Male	Ref	1.56	(1.46,1.66)
	Female	--	1.28	(1.21,1.37)
Race	White	--	1.4	(1.34,1.47)
	Black	--	1.74	(1.14,2.65)
	Asian	--	20.46	(8.63,48.54)
	American Indian/Alaskan Native	--	1.5	(0.99,2.28)
	Hispanic	--	2.31	(1.56,3.42)
	Other race	--	1.99	(1.51,2.61)
Health Plan	Have some form of insurance	--	1.44	(1.37,1.5)
	Do not have some form of health insurance	--	1.44	(1.15,1.81)
Presence of Personal Healthcare Provider	Yes, only one	--	1.35	(1.28,1.42)
	More than one	--	1.47	(1.3,1.65)
	No	--	1.63	(1.37,1.94)
Age	18-24	--	0.61	(0.15,2.52)
	25-34	--	1.64	(0.97,2.78)
	35-44	--	1.23	(0.9,1.68)
	45-54	--	1.21	(1.02,1.43)
	55-64	--	1.18	(1.06,1.31)
	65+	--	1.14	(1.08,1.21)
Income	Less than $10,000	--	1.93	(1.49,2.5)
	Less than $15,000 ($10,000 to < $15,000)	--	1.78	(1.47,2.15)
	Less than $20,000 ($15,000 to < $20,000)	--	1.53	(1.29,1.8)
	Less than $25,000 ($20,000 to < $25,000)	--	1.51	(1.3,1.76)
	Less than $35,000 ($25,000 to < $35,000)	--	1.49	(1.3,1.71)
	Less than $50,000 ($35,000 to < $50,000)	--	1.56	(1.38,1.76)
	Less than $75,000 ($50,000 to < $75,000)	--	1.42	(1.25,1.6)
	Less than $100,000? ($75,000 to < $100,000)	--	1.31	(1.17,1.46)
	Less than $150,000? ($100,000 to < $150,000)	--	1.55	(0.97,2.48)
	Less than $200,000? ($150,000 to < $200,000)	--	1.05	(0.37,3)
	$200,000 or more	--	1.05	(0.31,3.51)

DISCUSSION

Our study highlights not only the need for more research but also impactful intervention on location-based health disparities. Rural populations had higher odds of skin cancer diagnoses than urban populations among all races, however, even higher odds were seen among SOC. It is well-established that skin cancer mortality is greater in SOC, often because of late diagnosis.[1] Studies have also shown that rural populations diagnosed with melanoma have increased odds of metastatic disease and greater all-cause mortality.[1,8] In addition, SOC individuals may be less likely to participate in sun-protective behaviors or seek dermatological care due to misconceptions about skin cancer risk or economic barriers.[9,10] These intersecting factors may increase rural SOC risk for developing skin cancer.[1,8-11]

Interestingly, we noted the largest difference between urban and rural skin cancer risks was for Asian individuals, who had an odds ratio of 20.46. While this may reflect a smaller cohort size captured in this sample, it is important to note the Asian demographic category in the United States compromises multiple ethnicities aggregated into a monolith, which may mask health disparities. Echoing previous recommendations, studies that disaggregate this demographic may be beneficial.[12] Like other SOC, Asian and Pacific Islander (API) patients have poorer rates of melanoma survival and outcome due to late diagnosis, and understanding if any subgroup is more affected may aid in providing targeted public health efforts within the rural API demographic.[12,13] Beyond changes in demographic reporting, prevention is crucial in limiting the number of skin carcinomas appearing in rural regions. The role of providers who reflect their patients should not be understated, particularly in rural regions where there are fewer dermatologists of color.

Beyond race, rural populations had higher prevalence and odds of prior skin cancer diagnoses among nearly all SDOH, except for high-income. In our study, the seeming protective threshold was a household income that exceeded $100,000. Decreased odds of skin cancer in high-income households have been described and could be associated with increased financial access to sun-protective materials or spaces, decreased exposure to occupational hazards, or more sun-protective knowledge, although these associations would need to be further studied.[14]

Decreased skin cancer odds were seen in those without insurance, PHCP, or who made less than $10,000. This drop-off likely does not reflect decreased skin cancer prevalence but rather a diagnostic gap due to a lack of healthcare access. Despite this, we noted an increased proportion of rural individuals with skin cancer compared to urban, even among those who were not insured or with a PCHP, suggesting the disparity may be even larger than what was captured by our data.

In one study on socioeconomic and geographic barriers, researchers found that most counties with African-American, Hispanic, and Native-American majorities had zero dermatological providers.[15] In addition, 88% of rural counties had zero dermatologists, among other providers.[15] While correcting the healthcare shortage in these communities will take time, dermatological healthcare interventions can be conducted immediately and remotely. Promoting sun-protective behaviors in rural and SOC populations as well as structural changes that include building more shaded areas in recreational or occupational settings may be an actionable place to start. Studies have shown that multi-component interventions that incorporate educational, environmental, and policy-based changes are effective in promoting UV protection at a community level compared to educational interventions and health messaging alone.[16,17]

Limitations of this study include extrapolation of urban-rural disparities from five states. In addition, since BRFSS is a state-conducted survey, there may be methodology discrepancies in the execution of each survey, such as the number of individuals sampled per state. A limitation of state-based surveying seen in our sample is that data for Florida was only available up until 2020 as Florida did not conduct this survey in 2021. In addition, the BRFSS is a telephone-based survey, meaning those without access to a phone were excluded from the survey, leaving a data gap for some of the most vulnerable patient populations. This survey also did not measure specific skin cancer risk factors that may affect the outcome of skin cancer history. However, a strength of the BRFSS is its inclusion of all United States residents, regardless of citizenship status, meaning that our sample does not exclude undocumented or legal residents.

CONCLUSION

This study highlights that urban-rural health disparities regarding skin cancer continue to exist, particularly among low/middle-income communities and communities of color. Increasing awareness of vulnerable sociodemographic groups can help direct necessary attention to these communities regarding skin cancer prevention and screening. However, the onus of decreasing rural rates of skin cancer should not fall entirely on the dermatologists practicing in rural areas. Multi-component interventions that have been shown to increase sun-protective habits require a collaborative effort that includes healthcare providers, government agencies, and the affected community. Further studies can build on this to examine how the intersection of different social determinants of health may moderate the effect of urban-rural status and skin cancer. More research is needed to further disseminate risk and determine effective public health strategies for skin cancer among these rural communities.

DISCLOSURES

The authors have no conflicts of interest to declare.

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