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## Skin Cancer Diagnosis among People with Disabilities

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### Abstract

**Introduction:** People with disabilities (PWD) face unique challenges that may affect skin cancer prevention, diagnosis, and access to treatment. These challenges could be exacerbated by the COVID-19 pandemic. In 2022, the prevalence of self-reported skin cancer diagnoses, delayed medical care due to the COVID-19 pandemic, and skin cancer risk factors among PWD were estimated.

**Methods:** Data from the 2020 National Health Interview Survey (NHIS, N=31,568 US adults) was analyzed. Skin cancer diagnosis, age at the time of skin cancer diagnosis, skin cancer risk factors (e.g., sun protection), and delayed medical care due to the COVID-19 pandemic were included. Disability status was measured using the Washington Group Short Set on Functioning (WG-SS) which includes vision, hearing, mobility, communication, self-care, and cognitive disabilities.

**Results:** While 8.8% of US adults reported having a disability, PWD accounted for 14.7% of all self-reported skin cancer diagnoses, including 17.5% of melanoma diagnoses. Notably, PWD were on average older ( $M_{age}=59.8$ ) compared to people without disabilities ( $M_{age}=46.8$ ). Models that adjusted for age and other demographics revealed that PWD had higher odds of delaying medical care because of the COVID-19 pandemic (OR=1.65, 95% CI=1.42, 1.94); PWD reported being diagnosed with skin cancer later in life (age 61.5 vs. 54.0;  $p<.001$ ) but had similar odds of reporting any skin cancer (OR=1.11, 95% CI=0.93, 1.32) or melanoma diagnosis (OR=1.34, 95% CI=1.20, 1.51), compared to people without disabilities.

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**Conclusions:** Because of disability-related challenges, older age, and delaying medical care during the pandemic, people with disabilities may be at increased risk for inequitable skin cancer outcomes.

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## Introduction

People with disabilities (PWD) are a diverse group facing unique challenges that may negatively affect skin cancer prevention, access to treatment, and outcomes. For instance, people who are blind or have low vision may have difficulty noticing early signs of skin cancer like new or changing moles.<sup>1</sup> Individuals with mobility-related disabilities could encounter barriers to accessing total body skin examination (TBSE),<sup>2</sup> and dialogue with medical providers can be challenging for people with communication-related impairments.<sup>3</sup> Moreover, PWD experience ableism in healthcare,<sup>4</sup> socioeconomic disadvantages,<sup>5,6</sup> report insufficient social support,<sup>7,8</sup> and all of these challenges could be further exacerbated by the COVID-19 pandemic.

Researchers have recently highlighted PWD as an unrecognized population facing health disparities,<sup>8–10</sup> such as reduced access to recommended dental examinations, cervical cancer screening, and mammography.<sup>8,9,11,12</sup> While tens of millions of US adults live with a disability,<sup>13,14</sup> limited data have been reported on the dermatologic outcomes and skin cancer risk factors among PWD. Of these few studies, researchers have identified increased skin cancer incidence among people with visual impairment,<sup>15</sup> and lower odds of lifetime TBSE among adults with mobility-related disabilities.<sup>16</sup> Several recent commentaries have called for more dermatology-focused research about PWD.<sup>1,10,17,18</sup> The aim of this study was to estimate the prevalence of skin cancer, delayed medical care due to the COVID-19 pandemic, and skin cancer risk factors among PWD using a nationally representative sample of US adults.

## Methods

Data from the 2020 National Health Information Survey (NHIS), a national multistage probability sample of civilian noninstitutionalized US adults, were used. Data were collected primarily via telephone from 31,568 adults with a response rate of 48.9%.<sup>19</sup> As NHIS data used in this study are publicly available and deidentified, IRB approval was not required.

Study variables are described in Appendix Table 1. The Washington Group Short Set on Functioning (WG-SS), a composite indicator, was used to measure disability status. The WG-SS assesses functioning with respect to vision, hearing, mobility, communication, self-care, and cognition; individuals responding that they “have a lot of difficulty” or “cannot do at all” to any domain were coded as PWD. Data for lifetime diagnosis of skin cancer were collected using four categories: skin melanoma, other melanoma, non-melanoma, and unknown skin cancer; data are presented on skin melanoma, and all types combined.

Analyses were performed using SAS 9.4 and were weighted by applying the NHIS sample weight (wtfa\_a); design-adjusted standard errors were calculated by applying the survey’s primary sampling unit (ppsu) and strata (pstrat) variables using Taylor Series Linearization. Weighted proportions were calculated for self-reported skin cancer diagnosis and mean age

of diagnosis among PWD and PwOD. Adjusted weighted multivariable logistic and linear regression models were used to examine the relationship between disability status with study outcomes, controlling for sociodemographic characteristics.

## Results

An estimated 8.8% (95% CI=8.4, 9.2) of US adults were categorized as having a disability. The most common disability type was mobility (5.1%; 95% CI=4.8, 5.4), followed by cognition (2.4%; 95% CI=2.1, 2.6), hearing (1.5%; 95% CI=1.4, 1.7), vision (1.5%; 95% CI=1.3, 1.7), self-care (1.0%; 95% CI=0.8, 1.1), and communication (0.8%; 95% CI=0.6, 0.9). An estimated 3.9% (95% CI=3.6, 4.1) of US adults reported ever having any skin cancer diagnosis, and 0.9% (95% CI=0.8, 1.0) reported ever having melanoma. Among those reporting any type of skin cancer diagnosis and melanoma diagnosis, respectively, 14.7% (95% CI=12.8, 16.7) and 17.5% (95% CI=12.8, 22.2) were PWD.

Table 1 summarizes sample characteristics and weighted unadjusted study outcomes. A greater percentage of PWD reported any skin cancer (6.5%, 95% CI=5.6, 7.4) and melanoma diagnosis (1.7%, 95% CI=1.2, 2.2), compared to PwOD (any type: 3.6%, 95% CI=3.4, 3.9; melanoma: 0.8%, 95% CI=0.7, 0.9;  $p<0.001$ ). The mean age of skin cancer diagnosis among PWD was 61.5, compared to 54.0 among PwOD ( $p<0.001$ ). Notably, PWD were on average older than PwOD (59.8 vs. 46.8, respectively). Further, a greater percentage of PWD reported delaying medical care because of the COVID-19 pandemic (33.4%, 95% CI=30.4, 36.3) compared to PwOD (22.7%, 95% CI=21.8, 23.7;  $p<0.001$ ).

Table 2 reports results from the weighted multivariable models. While disability status was not associated with any skin cancer diagnosis (OR=1.110, 95% CI=0.930, 1.324) or melanoma diagnosis (OR=1.332, 95% CI=0.950, 1.869), PWD had significantly greater odds of delaying medical care because of the COVID-19 pandemic (OR=1.653, 95% CI=1.409, 1.940). PWD reported a significantly higher mean age of diagnosis in a fully-adjusted model (61.5 vs. 54.0;  $p<.001$ ). Estimates for skin cancer risk factors are reported in Table S2 and adjusted odds for skin cancer risk factors are in Table S3.

## Discussion

PWD in the US are on average older, diagnosed with skin cancer later in life, and have greater odds of delaying medical care due to the COVID-19 pandemic, compared to people without disabilities. Previous research documented drastic declines in skin biopsies during the COVID-19 pandemic.<sup>20,21</sup> Moreover, delays in surgical excisions could result in more aggressive disease and worse outcomes, which has also been reported.<sup>22–24</sup> Combined with disability-related challenges to accessing preventive care, treatment, and communication with medical providers, PWD are at risk for poorer skin cancer prognosis long-term, particularly in the setting of the COVID-19 pandemic.

PWD are disproportionately impacted by skin cancer, with 8.8% of US adults identifying as having a disability, but accounting for nearly 15% of all skin cancers. However, in fully-adjusted models, the present study found no relationship between disability status and skin cancer diagnosis. One important factor associated with both skin cancer diagnosis and

disability status is older age.<sup>25</sup> Therefore, higher unadjusted skin cancer incidence among PWD may be driven by this population's older age. Additionally, while PWD are also diagnosed with skin cancer at an older age, it remains unclear if this is due to disability-related challenges to accessing dermatologists, including delays due to COVID-19, or older age of disability onset. Regardless, the dermatologic community should be cognizant that PWD represent a large, aging population<sup>26</sup>, facing unique challenges that can delay skin cancer diagnosis and treatment.

Medical disparities for PWD, often stemming from lack of healthcare access and insurance, are widespread; experts recommend improving the accessibility of equipment (e.g., exam tables), patient-provider communication, and inclusion of PWD in healthcare education.<sup>27</sup> Nassim *et al.* have proposed a series of best practices for disability-specific dermatologic care.<sup>1</sup> Among their recommendations include increasing frequency of visits for individuals at risk of skin cancer, utilizing teledermatology if appropriate, and inquiring if someone living with the patient can assist with skin monitoring and/or photographing lesions.<sup>1</sup> Training programs may also need to be updated to help implement these practices as well as anti-bias education<sup>10</sup> to improve care among PWD.

### Limitations

The present study analyzed data from the 2020 NHIS and data were collected during the COVID-19 pandemic. Thus responses, including non-response, may have been affected by the pandemic. In addition, PWD may be less likely to participate in NHIS. While a large number of NHIS respondents identified as having a disability (n=3,116), some disability types may have been underrepresented. Moreover, NHIS measures skin cancer diagnosis by self-report, which could have resulted in misclassification.

### Conclusions

Because of disability-related challenges, older age, later diagnosis, and delaying medical care during the pandemic, PWD are at increased risk for inequitable skin cancer outcomes. Challenges related to self-care, access to healthcare appointments, as well as factors like older age, are important considerations for developing personalized treatment and monitoring plans to improve dermatologic outcomes for PWD.

### Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**Table 1.**

Weighted sample characteristics and unadjusted outcomes among PWD and PwOD

Variable	PWD (n = 3,116)		PwOD (n = 28,451)		P-value <sup>df</sup>
	n	Weighted %/mean (95% CI)	n	Weighted %/mean (95% CI)	
<i>Skin Cancer Diagnosis</i>					
Melanoma of the skin	69	1.7 (1.2, 2.2)	322	0.8 (0.7, 0.9)	<0.001
Any skin cancer type	265	6.5 (5.6, 7.4)	1,503	3.6 (3.4, 3.9)	<0.001
Mean age of diagnosis <sup>b</sup>	257	61.5 (59.3, 63.7)	1,470	54.0 (53.1, 55.0)	<0.001
<i>Sample characteristics</i>					
Age, years					
18–29	135	9.4 (7.5, 11.3)	3,519	21.6 (20.8, 22.4)	<0.001
30–39	163	7.6 (6.2, 8.9)	4,722	18.0 (17.4, 18.6)	
40–49	215	8.9 (7.5, 10.4)	4,360	16.7 (16.1, 17.2)	
50–65	938	30.6 (28.4, 32.7)	8,010	25.8 (25.1, 26.5)	
66<	1,664	43.6 (41.3, 45.9)	7,771	17.9 (17.3, 18.5)	
Mean Age, years	3,115	59.8 (58.8, 60.8)	28,382	46.8 (46.4, 47.1)	<0.001
Sex					
Male	1,270	43.9 (41.6, 46.3)	13,251	48.7 (48.0, 49.5)	<0.001
Female	1,845	56.1 (53.7, 58.4)	15,199	51.3 (50.5, 52.0)	
Education					
HS diploma or less	1,528	58.9 (56.6, 61.2)	8,420	38.4 (37.4, 39.5)	<0.001
Some college/Assoc deg	915	27.4 (25.4, 29.4)	8,190	30.7 (29.8, 31.5)	
BA or higher	648	13.7 (12.4, 14.9)	11,717	30.9 (30.0, 31.9)	
Race					
White	2,458	77.5 (74.9, 80.2)	21,696	76.9 (75.5, 78.2)	<0.001
Black/African American	351	13.5 (11.6, 15.4)	2,958	12.9 (11.9, 14.0)	
Asian	73	3.6 (2.4, 4.9)	1,632	6.8 (6.1, 7.4)	
AIAN/other	111	5.4 (3.6, 7.1)	789	3.4 (2.9, 4.0)	
Ethnicity					
Hispanic	322	13.5 (11.3, 15.8)	3,511	17.1 (15.7, 18.4)	0.002
Non-Hispanic	2,794	86.5 (84.2, 88.7)	24,940	82.9 (81.6, 84.3)	
Region					
Northeast	499	15.9 (14.0, 17.8)	5,120	17.8 (16.6, 18.9)	<0.001
Midwest	736	21.9 (19.8, 24.1)	6,438	20.8 (19.6, 22.0)	
South	1,205	42.2 (39.4, 45.0)	9,703	37.4 (35.8, 39.1)	
West	676	20.0 (17.6, 22.5)	7,190	24.0 (22.4, 25.6)	
Health Insurance					
Private	1,153	35.0 (32.7, 37.3)	18,439	64.3 (63.2, 65.3)	<0.001
Medicaid	497	20.5 (18.3, 22.7)	2,057	9.7 (9.0, 10.3)	

Variable	PWD (n = 3,116)		PWoD (n = 28,451)		P-value <sup>a</sup>
	n	Weighted %/mean (95% CI)	n	Weighted %/mean (95% CI)	
Dual eligible	226	6.4 (5.1, 7.6)	380	1.0 (0.9, 1.1)	
Medicare	693	19.0 (17.2, 20.8)	3,630	8.6 (8.2, 9.0)	
Other	427	13.8 (12.2, 15.4)	1,561	4.9 (4.4, 5.3)	
Uninsured	110	5.4 (4.1, 6.8)	2,307	11.6 (10.9, 12.4)	
Delaying getting medical care because of the COVID-19 pandemic <sup>c</sup>					
Yes	437	33.4 (30.4, 36.3)	2,495	22.7 (21.8, 23.7)	<b>&lt;0.001</b>
No	1,235	72.9 (70.1, 75.7)	13,415	85.4 (84.6, 86.2)	

**Notes:** AIAN=American Indian or Alaska Native; PWD=Person with disability; PWoD=Person without disability.

The SAS “domain” command was used for all subpopulation estimates.

Boldface indicates statistical significance (p<0.05).

<sup>a</sup>Design-corrected Pearson Chi-square test with second order correction by Rao and Scott for categorical variables and Adjusted Wald test for continuous variables.

<sup>b</sup>In cases where participants reported multiple skin cancer diagnoses, the earliest age was used.

<sup>c</sup>Measured in quarters 3 and 4 of 2020 only.



**Table 2.**

Adjusted odds of weighted outcome variables among PWD compared to PwOD

Variable	Not adjusted for Age <sup>a</sup>		Adjusted for Age <sup>b</sup>	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Melanoma of the skin	1.792 (1.244, 2.580)	<b>0.002</b>	1.332 (0.950, 1.869)	0.097
Any skin cancer type	1.524 (1.262, 1.840)	<b>&lt;0.001</b>	1.110 (0.930, 1.324)	0.248
Delaying getting medical care because of the COVID-19 pandemic <sup>c</sup>	1.751 (1.493, 2.054)	<b>&lt;0.001</b>	1.653 (1.409, 1.940)	<b>&lt;0.001</b>

**Notes:** PWD=Person with disability; PwOD=Person without disability.

Boldface indicates statistical significance (p<0.05).

<sup>a</sup> Adjusted for sex, region, health insurance, sunburn propensity, race, ethnicity, and education.

<sup>b</sup> Adjusted for age, sex, region, health insurance, sunburn propensity, race, ethnicity, and education.

<sup>c</sup> Measured in quarters 3 and 4 of 2020 only.