

Letters

RESEARCH LETTER

Incidence of In Situ and Invasive Cutaneous Melanomas During the COVID-19 Pandemic in the US

Multiple studies reported an increased relative proportion of advanced melanomas in the US during the COVID-19 pandemic but did not examine melanoma incidence.^{1,2} To address this gap, we used data from the Surveillance, Epidemiology, and End Results (SEER) program to examine melanoma incidence changes during the pandemic.

Methods | From 17 SEER registries, we identified 76 846 new cases of histologically confirmed first primary in situ or invasive cutaneous melanoma diagnosed between January 2018 and December 2020 (eMethods in Supplement 1). We calculated annual incidence rates per 100 000 person-years, age-adjusted to the 2000 standard population and stratified by in situ or invasive disease and demographic and pathological variables. Race and ethnicity data were analyzed to determine which groups were most affected during the pandemic. Percentage changes (PC) of incidence rates between 2018 and 2019 as well as 2019 and 2020 were calculated. Brigham and Women's Hospital deemed this study exempt from review and waived the informed consent requirement due to use of deidentified data. We followed the STROBE reporting guideline.



Supplemental content

All statistical tests were 2-sided, and multiple hypothesis correction was performed using the Bonferroni method, with $\alpha = .0008$. Analyses were conducted in April 2023 using SEER*Stat 8.4.1 (National Cancer Institute) and R 4.2.3 (R Core Team).

Results | In situ melanoma incidence rates between 2018 and 2019 were stable (PC, -0.36% ; 95% CI, -2.88% to 2.23%). Significant decreases were observed in 2020 vs 2019 (PC, -24.52% ; 95% CI, -26.56% to -22.42%), primarily among older (PC, -27.51% ; 95% CI, -30.17% to -24.76%), male (PC, -26.40% ; 95% CI, -29.08% to -23.61%), and non-Hispanic White patients (PC, -23.35% ; 95% CI, -25.53% to -21.10%) (Table 1).

Invasive melanoma incidence rates in 2019 did not significantly differ from 2018 rates (PC, -0.12% ; 95% CI, -2.40% to 2.21%). Significant decreases occurred in 2020 vs 2019 (PC, -19.51% ; 95% CI, -21.44% to -17.52%), predominantly among non-Hispanic White patients (PC, -18.72% ; 95% CI, -20.80% to -16.58%) (Table 2). Incidence of superficial spreading melanomas (PC, -19.56% ; 95% CI, -22.69% to -16.30%), T1 melanomas (PC, -25.52% ; 95% CI, -27.89% to -23.06%), nonulcerated melanomas (PC, -21.22% ; 95% CI, -23.42% to -18.96%), and nonmitogenic melanomas (PC, -24.40% ; 95% CI, -27.11% to -21.60%) significantly decreased in 2020. Incidence of stage I melanomas significantly decreased in 2020,

but not other stages (PC, -22.26% ; 95% CI, -24.62% to -19.83%) (Table 2).

Discussion | We identified decreases of in situ and invasive melanoma diagnoses during 2020, primarily among older, male, and non-Hispanic White patients. Incidence rates of superficial spreading melanomas, which are associated with screening, significantly decreased during the pandemic, but acral lentiginous melanoma incidence rates were stable. Similarly, the largest incidence decreases were seen in early-stage and less aggressive melanomas. These findings may reflect decreased skin cancer screening examinations or access to dermatologic care during the pandemic, both of which may lead to reduced melanoma diagnoses.^{3,4}

Study limitations included reliance on melanoma reporting to SEER, which may be underreported, especially at smaller dermatology practices.^{5,6} Additionally, analysis was limited to 2020 data, and subsequent changes in melanoma incidence remain unknown. If the pandemic primarily influenced diagnosis of indolent early melanomas, the incidence of thick melanoma should increase slightly in 2021 due to missed cases from 2020 subsequently being diagnosed, assuming a stable annual incidence of thick melanomas. However, if the pandemic played a role in missed diagnoses of thin melanomas that progressed to thick melanomas, a substantial future increase in thick melanoma incidence would be expected.

This study adds to the current literature by highlighting that the relative increase in thick melanomas in 2020 was primarily associated with a marked decrease in thin melanomas, rather than an absolute increase in thicker melanomas. Longer-term studies are needed to examine the implications of the pandemic for melanoma incidence and may help inform screening and overdiagnosis efforts.

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Table 1. Age-Adjusted Incidence Rates and Percentage Change of In Situ Cutaneous Melanoma Before and During the COVID-19 Pandemic

Characteristic	Age-adjusted incidence per 100,000 person-years (95% CI)			Percentage change (95% CI)			P value
	2018	2019	2020	2018-2019	2019-2020	P value	
All	12.25 (12.03 to 12.47)	12.21 (11.99 to 12.43)	9.21 (9.02 to 9.40)	-0.36 (-2.88 to 2.23)	-24.52 (-26.56 to -22.42)	.79	<.001
Age, y							
<65	6.76 (6.58 to 6.94)	6.65 (6.47 to 6.83)	5.24 (5.08 to 5.40)	-1.63 (-5.29 to 2.16)	-21.22 (-24.35 to -17.96)	.40	<.001
≥65	50.19 (48.95 to 51.45)	50.61 (49.39 to 51.85)	36.68 (35.66 to 37.73)	0.83 (-2.63 to 4.41)	-27.51 (-30.17 to -24.76)	.65	<.001
Sex							
Female	10.44 (10.16 to 10.74)	10.54 (10.26 to 10.83)	8.20 (7.95 to 8.46)	0.96 (-2.89 to 4.95)	-22.23 (-25.38 to -18.96)	.64	<.001
Male	14.68 (14.32 to 15.04)	14.48 (14.13 to 14.83)	10.66 (10.36 to 10.96)	-1.36 (-4.70 to 2.10)	-26.40 (-29.08 to -23.61)	.44	<.001
Race and ethnicity ^a							
Hispanic (all races)	2.50 (2.25 to 2.77)	2.39 (2.14 to 2.64)	1.65 (1.46 to 1.86)	-4.73 (-17.88 to 10.54)	-30.63 (-40.93 to -18.60)	.54	<.001
Non-Hispanic American Indian or Alaska Native	4.48 (2.95 to 6.53)	3.52 (2.23 to 5.32)	3.60 (2.27 to 5.44)	-21.31 (-57.09 to 43.47)	2.18 (-45.76 to 92.11)	.49	>.99
Non-Hispanic Asian or Pacific Islander	0.58 (0.44 to 0.74)	0.50 (0.38 to 0.66)	0.34 (0.24 to 0.47)	-13.29 (-40.94 to 26.97)	-32.34 (-56.57 to 4.59)	.50	.08
Non-Hispanic Black	0.25 (0.16 to 0.38)	0.20 (0.12 to 0.31)	0.12 (0.06 to 0.21)	-20.24 (-58.99 to 54.56)	-39.55 (-73.59 to 32.02)	.57	.24
Non-Hispanic White	19.26 (18.89 to 19.63)	19.39 (19.03 to 19.76)	14.86 (14.54 to 15.19)	0.71 (-1.97 to 3.46)	-23.35 (-25.53 to -21.10)	.61	<.001
Site							
Head and neck	4.07 (3.95 to 4.20)	4.12 (4.00 to 4.25)	2.94 (2.83 to 3.05)	1.14 (-3.22 to 5.70)	-28.67 (-31.99 to -25.20)	.62	<.001
Upper extremities	3.24 (3.13 to 3.36)	3.16 (3.05 to 3.28)	2.41 (2.32 to 2.51)	-2.41 (-7.18 to 2.61)	-23.75 (-27.75 to -19.54)	.34	<.001
Trunk	3.32 (3.21 to 3.44)	3.37 (3.25 to 3.48)	2.53 (2.44 to 2.64)	1.37 (-3.52 to 6.51)	-24.70 (-28.58 to -20.62)	.60	<.001
Lower extremities	1.54 (1.46 to 1.62)	1.48 (1.40 to 1.56)	1.21 (1.14 to 1.28)	-3.53 (-10.49 to 3.98)	-18.55 (-24.79 to -11.81)	.35	<.001
Skin, not otherwise specified	0.08 (0.06 to 0.10)	0.08 (0.06 to 0.09)	0.12 (0.10 to 0.15)	-4.47 (-31.63 to 33.48)	61.69 (19.52 to 119.59)	.85	.002 ^b
Region							
West	11.92 (11.64 to 12.22)	11.55 (11.27 to 11.83)	8.99 (8.75 to 9.24)	-3.14 (-6.42 to 0.25)	-22.12 (-24.93 to -19.20)	.07	<.001
Midwest	16.94 (15.62 to 18.34)	18.43 (17.05 to 19.90)	14.42 (13.19 to 15.74)	8.84 (-2.68 to 21.73)	-21.77 (-30.48 to -12.02)	.14	<.001
Northeast	9.73 (9.23 to 10.24)	10.43 (9.92 to 10.96)	7.84 (7.41 to 8.30)	7.24 (-0.21 to 15.26)	-24.80 (-30.31 to -18.87)	.06	<.001
South	13.94 (13.45 to 14.45)	14.08 (13.59 to 14.58)	9.84 (9.43 to 10.26)	0.98 (-4.01 to 6.22)	-30.12 (-33.88 to -26.17)	.71	<.001
Rurality							
Metropolitan	11.99 (11.76 to 12.23)	11.89 (11.66 to 12.12)	8.91 (8.72 to 9.11)	-0.83 (-3.51 to 1.94)	-25.04 (-27.22 to -22.80)	.56	<.001
Nonmetropolitan	14.39 (13.66 to 15.15)	14.79 (14.05 to 15.56)	11.62 (10.97 to 12.30)	2.74 (-4.50 to 10.53)	-21.41 (-27.26 to -15.11)	.48	<.001

^a Race and ethnicity data were obtained from the Surveillance, Epidemiology, and End Results (SEER) registries.

^b P value did not reach significance ($\alpha = .0008$) after Bonferroni correction.

Table 2. Age-Adjusted Incidence Rates and Percentage Change of Invasive Cutaneous Melanoma Before and During the COVID-19 Pandemic

Characteristic	Age-adjusted incidence per 100 000 person-years (95% CI)			Percentage change (95% CI)		P value
	2018	2019	2020	2018-2019	2019-2020	
All	15.47 (15.22 to 15.73)	15.46 (15.21 to 15.71)	12.44 (12.22 to 12.67)	-0.12 (-2.40 to 2.21)	-19.51 (-21.44 to -17.52)	<.001
Age, y						
<65	9.98 (9.76 to 10.20)	9.96 (9.74 to 10.19)	8.02 (7.83 to 8.23)	-0.12 (-3.23 to 3.08)	-19.47 (-22.12 to -16.72)	<.001
≥65	53.47 (52.20 to 54.77)	53.41 (52.16 to 54.69)	42.96 (41.85 to 44.10)	-0.11 (-3.44 to 3.32)	-19.56 (-22.35 to -16.67)	<.001
Sex						
Male	18.43 (18.03 to 18.83)	18.21 (17.82 to 18.61)	14.52 (14.17 to 14.87)	-1.19 (-4.19 to 1.91)	-20.26 (-22.82 to -17.62)	<.001
Female	13.23 (12.91 to 13.57)	13.42 (13.09 to 13.75)	10.90 (10.61 to 11.21)	1.37 (-2.12 to 4.99)	-18.72 (-21.67 to -15.67)	<.001
Race and ethnicity ^a						
Hispanic (all races)	3.56 (3.27 to 3.87)	3.65 (3.36 to 3.95)	3.03 (2.77 to 3.32)	2.47 (-8.96 to 15.36)	-16.81 (-26.39 to -6.02)	.003 ^a
Non-Hispanic American Indian or Alaska Native	6.35 (4.47 to 8.77)	7.96 (5.85 to 10.59)	4.89 (3.24 to 7.06)	25.36 (-20.30 to 98.60)	-38.66 (-63.04 to -0.06)	.05 ^a
Non-Hispanic Asian or Pacific Islander	1.03 (0.85 to 1.25)	0.86 (0.69 to 1.06)	0.79 (0.64 to 0.98)	-16.80 (-37.70 to 10.92)	-7.78 (-32.03 to 25.09)	.65
Non-Hispanic Black	0.56 (0.42 to 0.74)	0.54 (0.40 to 0.72)	0.55 (0.40 to 0.73)	-2.86 (-36.04 to 47.33)	0.75 (-33.76 to 53.27)	>.99
Non-Hispanic White	24.83 (24.41 to 25.27)	24.96 (24.53 to 25.39)	20.29 (19.90 to 20.68)	0.51 (-1.93 to 3.00)	-18.72 (-20.80 to -16.58)	<.001
Site						
Head and neck	3.00 (2.89 to 3.12)	3.04 (2.93 to 3.16)	2.38 (2.28 to 2.48)	1.31 (-3.83 to 6.73)	-21.91 (-26.09 to -17.48)	<.001
Upper extremities	4.05 (3.92 to 4.18)	3.92 (3.80 to 4.05)	3.16 (3.05 to 3.27)	-3.07 (-7.37 to 1.43)	-19.39 (-23.18 to -15.43)	<.001
Trunk	5.07 (4.93 to 5.22)	5.07 (4.93 to 5.22)	3.98 (3.86 to 4.11)	0.06 (-3.91 to 4.20)	-21.47 (-24.78 to -18.02)	<.001
Lower extremities	2.75 (2.64 to 2.86)	2.80 (2.69 to 2.91)	2.35 (2.25 to 2.45)	1.99 (-3.51 to 7.81)	-16.21 (-20.90 to -11.24)	<.001
Skin, not otherwise specified	0.61 (0.56 to 0.66)	0.62 (0.57 to 0.67)	0.57 (0.52 to 0.62)	1.39 (-9.73 to 13.88)	-7.18 (-17.49 to 4.41)	.22
Region						
West	14.52 (14.21 to 14.85)	14.62 (14.30 to 14.94)	11.61 (11.33 to 11.89)	0.64 (-2.45 to 3.82)	-20.58 (-23.15 to -17.93)	<.001
Midwest	21.88 (20.31 to 23.54)	23.49 (21.87 to 25.21)	18.82 (17.40 to 20.34)	7.39 (-3.09 to 19.03)	-19.88 (-27.94 to -10.93)	<.001
Northeast	13.33 (12.74 to 13.94)	13.20 (12.62 to 13.80)	10.44 (9.93 to 10.97)	-1.01 (-7.12 to 5.50)	-20.90 (-26.07 to -15.38)	<.001
South	18.36 (17.78 to 18.95)	17.83 (17.27 to 18.41)	14.83 (14.32 to 15.36)	-2.88 (-7.18 to 1.63)	-16.84 (-20.71 to -12.78)	<.001
Rurality						
Metropolitan	15.14 (14.87 to 15.40)	15.08 (14.82 to 15.34)	12.01 (11.78 to 12.24)	-0.37 (-2.80 to 2.12)	-20.38 (-22.44 to -18.28)	<.001
Nonmetropolitan	18.69 (17.81 to 19.59)	18.97 (18.09 to 19.89)	16.32 (15.51 to 17.17)	1.53 (-5.08 to 8.60)	-13.95 (-19.73 to -7.76)	<.001
Histological feature						
Superficial spreading melanoma	5.86 (5.71 to 6.02)	5.95 (5.79 to 6.11)	4.79 (4.65 to 4.93)	1.47 (-2.29 to 5.37)	-19.56 (-22.69 to -16.30)	<.001
Acral lentiginous melanoma	0.20 (0.17 to 0.23)	0.19 (0.16 to 0.22)	0.19 (0.16 to 0.22)	-3.09 (-21.61 to 19.79)	-1.78 (-20.60 to 21.51)	.91
Nodular melanoma	1.24 (1.17 to 1.32)	1.28 (1.21 to 1.35)	1.13 (1.07 to 1.20)	2.76 (-5.19 to 11.38)	-11.35 (-18.32 to -3.78)	.004 ^b

(continued)

Table 2. Age-Adjusted Incidence Rates and Percentage Change of Invasive Cutaneous Melanoma Before and During the COVID-19 Pandemic (continued)

Characteristic	Age-adjusted incidence per 100 000 person-years (95% CI)			Percentage change (95% CI)		P value
	2018	2019	2020	2018-2019	2019-2020	
Melanoma, not otherwise specified	6.70 (6.53 to 6.87)	6.58 (6.42 to 6.75)	5.15 (5.00 to 5.29)	-1.71 (-5.12 to 1.82)	-21.84 (-24.73 to -18.84)	<.001
Other	1.47 (1.39 to 1.55)	1.45 (1.38 to 1.53)	1.19 (1.12 to 1.26)	-1.23 (-8.28 to 6.35)	-18.27 (-24.38 to -11.67)	<.001
Breslow thickness						
T1: ≤1 mm	9.06 (8.87 to 9.26)	9.19 (9.00 to 9.39)	6.85 (6.68 to 7.02)	1.47 (-1.55 to 4.58)	-25.52 (-27.89 to -23.06)	<.001
T2: >1-2 mm	1.99 (1.90 to 2.09)	1.95 (1.86 to 2.04)	1.67 (1.59 to 1.75)	-2.24 (-8.41 to 4.35)	-14.38 (-19.99 to -8.37)	<.001
T3: >2-4 mm	1.18 (1.11 to 1.25)	1.25 (1.18 to 1.32)	1.09 (1.03 to 1.16)	5.32 (-3.02 to 14.38)	-12.24 (-19.30 to -4.56)	.002 ^b
T4: >4 mm	1.18 (1.11 to 1.25)	1.12 (1.05 to 1.19)	1.08 (1.01 to 1.14)	-5.21 (-12.88 to 3.13)	-3.86 (-11.77 to 4.76)	.38
Unknown	2.05 (1.96 to 2.15)	1.95 (1.86 to 2.04)	1.75 (1.67 to 1.84)	-5.28 (-11.16 to 0.99)	-9.91 (-15.70 to -3.72)	.002 ^b
Ulceration status						
Ulcerated	1.89 (1.80 to 1.98)	1.85 (1.77 to 1.94)	1.71 (1.63 to 1.79)	-1.85 (-8.13 to 4.86)	-7.57 (-13.58 to -1.14)	.02 ^b
Not ulcerated	11.74 (11.52 to 11.96)	11.66 (11.44 to 11.88)	9.19 (8.99 to 9.38)	-0.66 (-3.27 to 2.02)	-21.22 (-23.42 to -18.96)	<.001
Unknown	1.85 (1.77 to 1.94)	1.94 (1.86 to 2.04)	1.54 (1.47 to 1.63)	5.07 (-1.63 to 12.22)	-20.58 (-25.86 to -14.93)	<.001
Mitotic rate						
≥1: mitogenic	5.80 (5.65 to 5.96)	5.74 (5.59 to 5.89)	4.97 (4.83 to 5.11)	-1.11 (-4.78 to 2.71)	-13.37 (-16.70 to -9.90)	<.001
0: nonmitogenic	7.18 (7.01 to 7.36)	7.20 (7.03 to 7.38)	5.45 (5.30 to 5.60)	0.25 (-3.09 to 3.72)	-24.40 (-27.11 to -21.60)	<.001
Unknown	2.49 (2.39 to 2.59)	2.52 (2.42 to 2.62)	2.03 (1.94 to 2.12)	1.11 (-4.52 to 7.07)	-19.49 (-24.21 to -14.50)	<.001
AJCC 8th edition stage						
I	9.70 (9.50 to 9.91)	9.90 (9.70 to 10.11)	7.70 (7.52 to 7.88)	2.05 (-0.88 to 5.06)	-22.26 (-24.62 to -19.83)	<.001
II	1.79 (1.71 to 1.88)	1.81 (1.73 to 1.90)	1.70 (1.62 to 1.78)	1.22 (-5.36 to 8.26)	-6.34 (-12.48 to 0.23)	.06
III	1.24 (1.17 to 1.32)	1.23 (1.16 to 1.30)	1.14 (1.08 to 1.21)	-1.21 (-9.07 to 7.32)	-6.84 (-14.37 to 1.34)	.10
IV	0.60 (0.55 to 0.65)	0.64 (0.59 to 0.69)	0.57 (0.52 to 0.62)	6.96 (-4.71 to 20.08)	-11.00 (-20.80 to -0.02)	.05 ^b
Unknown	2.10 (2.01 to 2.19)	1.87 (1.78 to 1.96)	1.33 (1.26 to 1.40)	-10.96 (-16.54 to -5.02)	-28.78 (-33.77 to -23.42)	<.001

Abbreviation: AJCC, American Joint Committee on Cancer.

^a Race and ethnicity data were obtained from the Surveillance, Epidemiology, and End Results (SEER) registries.

^b P value did not reach significance ($\alpha = .0008$) after Bonferroni correction.

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Data Sharing Statement: See [Supplement 2](#).

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