# Disparities in Utilization of Immune Checkpoint Inhibitor Therapy Among Older Patients With Advanced Non–Small Cell Lung Cancer: A SEER-Medicare Analysis

Danting Yang, MPH[1]; Shama D. Karanth, PhD[2,3]; Hyung-Suk Yoon, PhD[2,3]; Jae Jeong Yang, PhD[2,3]; Xiwei Lou, MS[4]; Jiang Bian, PhD[2,4]; Dongyu Zhang, PhD[5]; Yi Guo, PhD[2,4]; Lusine Yaghjyan, PhD[1]; Tomi Akinyemiju, PhD[6,7]; Estelamari Rodriguez, MD[8]; Hiren J. Mehta, MD[9]; and Dejana Braithwaite, PhD[1,2,3]

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## ABSTRACT

**PURPOSE** In the United States, there are disparities in access to care for patients with non–small cell lung cancer (NSCLC) on the basis of socioeconomic and racial/ethnic factors. This study investigates the association between race/ethnicity and the utilization of immune checkpoint inhibitor (ICI) therapy among older patients with advanced NSCLC (aNSCLC).

**METHODS** This retrospective study used data from the SEER-Medicare–linked database. The cohort included patients (age 66 years or older) diagnosed with aNSCLC (stage III/IV) between March 2015 and December 2017, and they were followed through December 2019. Race/ethnicity was categorized as non-Hispanic (NH)-White, NH-Black, Hispanic, and Other. ICI therapy utilization was determined by identifying any usage of ICI agents (nivolumab, pembrolizumab, atezolizumab, durvalumab, ipilimumab, and cemiplimab-rwlc) from the Medicare database. Multivariable logistic regression models assessed the association between race/ethnicity and ICI therapy utilization (yes, no). Effect measure modification analyses were conducted by sex, socioeconomic status, and comorbidity.

**RESULTS** The final sample included 26,836 patients; 76.2% were NH-White, 10.1% NH-Black, 5.7% Hispanic, and 8.0% Other. The overall ICI therapy utilization proportion was 17.8%, varying across ethnicities: NH-Black 14.1%, Hispanic 16.3%, NH-White 18.4%, and Other 18.5%. In comparison with NH-White patients, NH-Black patients were 15% less likely to receive ICI therapy (adjusted odds ratio, 0.85 [95% CI, 0.75 to 0.96]). Furthermore, the association between race/ethnicity and utilization of ICI therapy was modified by comorbidity status, sex, and socioeconomic status.

**CONCLUSION** NH-Black patients with aNSCLC were less likely to receive ICI therapy than their NH-White counterparts. Our findings indicate the racial/ethnic disparities in ICI therapy utilization and call for further interventions to optimize access to care.

ACCOMPANYING CONTENT

Appendix

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## INTRODUCTION

Lung cancer ranks as the third most common cancer and stands as the leading cause of cancer-related death in the United States.[1,2] Advanced non–small cell lung cancer (aNSCLC) often eludes detection until advanced stages, with a 5-year survival rate of roughly 9% for stage IV patients—significantly lower than early-stage NSCLC (approximately 65%).[3] Standard treatments such as surgery, chemotherapy, and radiation therapy are less effective at advanced stages.[4-6] However, immune checkpoint inhibitor (ICI) therapy has emerged as a groundbreaking approach, demonstrating a significant improvement in survival for patients with aNSCLC over traditional chemotherapy.[7-11] In 2015, the US Food and Drug Administration (FDA) approved the first ICI for aNSCLC following promising results from clinical trials.[12-14] The ICIs enhance the immune system's response to cancer cells, thereby minimizing damage to healthy cells.[15-20] This therapy is particularly beneficial for patients with high expression of PD-1 and PD-L1 or health conditions that preclude standard treatment options.[21-23]

Despite the potential of ICIs, limited evidence exists regarding their utilization across diverse populations.[24-28] Previous studies, including analyses of data sets such as the National Cancer Database (NCDB) and SEER-Medicare–

## CONTEXT

**Key Objective**
This study sought to understand how race/ethnicity affects the utilization of immune checkpoint inhibitor (ICI) therapy among older patients with advanced non–small cell lung cancer.

**Knowledge Generated**
Analysis revealed that non-Hispanic (NH)-Black patients were 15% less likely to receive ICI therapy compared with their NH-White counterparts. Variations in ICI therapy usage were also influenced by factors such as comorbidity status, sex, and socioeconomic status.

**Relevance *(P. Kunz)***
The findings underscore the need for targeted strategies to equalize access to advanced cancer treatments among racially diverse elderly populations. These insights can inform both policy and clinical practice to improve equity in oncology care.*

**Plain Language Summary *(M. Lewis)***
An analysis of a national database of Medicare patients showed that NH black patients with the most common form of lung cancer (non–small cell) were 15% less likely to receive immunotherapy treatments than NH white patients, a serious equity issue.†

*Relevance section written by *JCO Oncology Advances* Editor-in-Chief Pamela Kunz, MD.
†Plain Language Summary written by *JCO Oncology Advances* Associate Editor Mark Lewis, MD.

linked databases, have highlighted disparities in ICI usage across age and racial groups.[29-31] However, these studies primarily focus on patients with stage IV NSCLC and lack detailed information on specific ICI usage. The recent expansion of ICI therapy to include patients with stage III NSCLC highlights the need for updated assessments to understand evolving access patterns. Furthermore, analyses covering a limited time frame do not provide sufficient time to fully evaluate their utilization across all stages and populations, particularly among minority populations who often face barriers to health care access. Therefore, there is an urgent need for a reassessment of ICI usage among patients with advanced NSCLC to reflect on recent advancements and to gain insight into evolving access patterns.

This study aims to assess the patterns and factors of ICI therapy utilization among older patients with aNSCLC by race and ethnicity. Additionally, we investigated whether the association between race/ethnicity and ICI utilization is modified by comorbidity status, sex, and socioeconomic status, as previous studies have suggested that these factors may affect utilization.[32-34]

## METHODS

### Data Source

The data were obtained from the SEER registry database with Medicare linkage for patients diagnosed with NSCLC between March 2015 and December 2017 and were followed through December 2019. The linked Medicare data include information on health services utilization, providing detailed claims data for each individual.[35-37] The date of inclusion (March 1, 2015) was selected on the basis of the FDA's approval of ICI therapy for NSCLC treatment.

### Study Cohort

A total of 79,843 patients were identified. We included patients on the basis of the following criteria: (1) primary NSCLC with stage III-IV; (2) age 66 years or older at cancer diagnosis; and (3) complete information on race/ethnicity. The lung cancer diagnoses were ascertained using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), and International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) coding systems. To ensure a minimum of 1 year of medical status data before the NSCLC diagnosis, we excluded patients younger than 66 years.

### Exposure and Outcome of Interest

The primary exposure of interest in our study was race/ethnicity, categorized as non-Hispanic (NH)-White, NH-Black, Hispanic, and Other (American Indian, Asians, Pacific Islanders, and Other). The outcome of interest was utilization of ICI agents for NSCLC, which was identified from the Medicare database using the Healthcare Common Procedure Coding System codes. Treatment with ICI therapy was defined as the receipt of any of the following agents: nivolumab, pembrolizumab, atezolizumab, durvalumab, ipilimumab, and cemiplimab-rwlc. Nivolumab,

pembrolizumab, atezolizumab, and durvalumab were approved for NSCLC treatment before 2020, whereas ipilimumab and cemiplimab-rwlc were approved after.[38-43] To ensure the comprehensiveness of our analysis, we included patients who had likely received the latter two agents through their participation in clinical trials before 2020.

### Covariates

Covariates were chosen on the basis of prior published research and encompass essential sociodemographic and prognostic factors.[29,30,32,44] These covariates include age at diagnosis (66-74 and ≥75 years), sex (male *v* female), marital status (married, not married, and unknown), socioeconomic status (SES; low, middle, high, and unknown). In our analysis, the Yost Index was used to determine SES; this index comprises seven factors at the neighborhood level: educational attainment, median household income, unemployment rate, poverty rate, proportion of working-class residents, median house value, and median rent and available as a calculated field within the SEER data.[45] Participants with comprehensive SES details were classified into three distinct SES groups—low, middle, and high—on the basis of the distribution of their Yost Index scores. In addition, other covariates included histopathological subtypes (adenocarcinoma, squamous cell carcinoma, large cell carcinoma, and others); stage of cancer (III and IV); presence of multiple cancer diagnoses (yes or no); presence of comorbidities (yes, no, and unknown); and receipt of other treatments such as surgery, chemotherapy, or radiotherapy. Treatment histories, specifically surgery, chemotherapy, and radiotherapy, were extracted from the SEER database. Furthermore, the Charlson Comorbidity Index (CCI), which assesses the presence of comorbidities in the year preceding the cancer diagnosis, was used, with a nonmissing CCI score categorized as either 0 or ≥1.[46] To accommodate potential changes in clinical and/or coding practices, the year of diagnosis was categorized into 2015, 2016, and 2017.

### Statistical Analysis

The participant characteristics were summarized overall and by race/ethnicity. The utilization proportions and their respective 95% CIs for ICI therapy were computed by dividing the number of patients who underwent ICI therapy by the population within each race/ethnicity group. Additionally, the utilization proportions of surgical procedures, radiotherapy, and chemotherapy across race/ethnicity were also calculated using the same method. These results were further visualized using a bar plot.

To assess the association between race/ethnicity (reference group: NH-White) and ICI therapy, adjusted odds ratios (aORs) and 95% CIs were estimated using multivariable logistic regression models controlling for covariates mentioned above. Covariates were added to the model sequentially: The first model was adjusted for age and the second model further adjusted for sex, marital status, SES, stage, histopathological subtype, history of multiple cancers, treatment history (surgery, chemotherapy, and radiotherapy), comorbidity, and year of diagnosis.

Moreover, effect modification analyses were conducted by comorbidity, sex, and SES levels, to investigate whether the association of race/ethnicity and ICI utilization varies by the levels of these potential modifiers. Wald tests were used to assess the potential interactions between race/ethnicity and ICI therapy utilization. All the analyses were conducted using R 4.1.2, and the results were deemed statistically significant if the two-sided *P* value was < .05.

## RESULTS

In the SEER-Medicare database, 79,843 patients with NSCLC were identified between 2015 and 2017. After application of the study exclusion criteria, the final sample comprised 26,836 patients (Appendix Fig A1).

The participant characteristics are presented in Table 1. The average age of the patients was 75.2 years (standard deviation, 6.6). Over half were aged between 66 and 74 years (52.4%); 51.0% were male; 76.2% were NH-White patients, 10.1% NH-Black, 5.7% Hispanic, and 8.0% belonged to the Other group. Over two thirds of the patients had stage IV NSCLC (69.1%), and over half of the patients had at least one comorbidity (59.3%). After stratification by race/ethnicity, more NH-Black patients belonged to the younger age group (59.9%), were not married (64.4%), and were from the low-SES tertile (62.1%). Figure 1 shows the distribution of treatment variables. Chemotherapy was the predominant treatment, with nearly half of all patients across each race/ethnicity group receiving it. Notably, NH-Black patients exhibited the lowest proportions of both surgery and ICI therapy utilization.

A total of 4,785 patients (17.8%) received ICI therapy. NH-Black patients had the lowest utilization proportion of ICI therapy at 14.1% (381/2,700), followed by Hispanic patients at 16.3% (251/1,541), NH-White at 18.4% (3,754/20,439), and Other patients at 18.5% (399/2,156; Fig 1 and Table 2). During the follow-up period, 921 patients received multiple agents, with nivolumab and pembrolizumab being the most prevalent, administered to 53.3% and 41.0% of patients, respectively (Appendix Table A1). By contrast, atezolizumab, durvalumab, and ipilimumab were less commonly used, accounting for <10% of the patient cohort (Appendix Table A1). Significantly, younger patients (age 66-74 years) exhibited a higher utilization of ICI therapy compared with their older (≥75) counterparts (Appendix Table A1).

ICI therapy seemed to be used differently across race/ethnicity (Table 2). NH-Black patients showed a 15% decreased likelihood of receiving ICI therapy compared with their NH-White counterparts (aOR, 0.85 [95% CI, 0.75 to 0.96]), adjusting for all covariates. No significant differences were observed in Hispanic (aOR, 0.99 [95% CI, 0.85 to 1.15])

**TABLE 1.** Characteristics of Patients Diagnosed With Advanced Non–Small Cell Lung Cancer From 2015 to 2017 SEER-Medicare

| Characteristic | Overall (26,836) | NH-White (20,439 [76.2]), No. (%) | NH-Black (2,700 [10.1]), No. (%) | Hispanic (1,541 [5.7]), No. (%) | Other (2,156 [8.0]), No. (%) |
|---|---|---|---|---|---|
| Age groups, year | | | | | |
| 66-74 | 14,065 (52.4) | 10,684 (52.3) | 1,616 (59.9) | 774 (50.2) | 991 (46.0) |
| ≥75 | 12,771 (47.6) | 9,755 (47.7) | 1,084 (40.1) | 767 (49.8) | 1,165 (54.0) |
| Sex | | | | | |
| Male | 13,685 (51.0) | 10,255 (50.2) | 1,385 (51.3) | 822 (53.3) | 1,223 (56.7) |
| Female | 13,151 (49.0) | 10,184 (49.8) | 1,315 (48.7) | 719 (46.7) | 933 (43.3) |
| Married | | | | | |
| Yes | 13,262 (49.4) | 10,363 (50.7) | 851 (31.5) | 715 (46.4) | 1,333 (61.8) |
| No | 12,519 (46.7) | 9,292 (45.5) | 1,740 (64.4) | 744 (48.3) | 743 (34.5) |
| Unknown | 1,055 (3.9) | 784 (3.8) | 109 (4.0) | 82 (5.3) | 80 (3.7) |
| SES index (tertiles) | | | | | |
| Low | 8,848 (33.0) | 5,758 (28.2) | 1,676 (62.1) | 783 (50.8) | 631 (29.3) |
| Medium | 8,844 (33.0) | 7,056 (34.5) | 637 (23.6) | 444 (28.8) | 707 (32.8) |
| High | 8,845 (33.0) | 7,403 (36.2) | 363 (13.4) | 298 (19.3) | 781 (36.2) |
| Unknown | 299 (1.0) | 222 (1.1) | 24 (0.9) | 16 (1.0) | 37 (1.7) |
| Stage | | | | | |
| III | 8,290 (30.9) | 6,451 (31.6) | 862 (31.9) | 447 (29.0) | 530 (24.6) |
| IV | 18,546 (69.1) | 13,988 (68.4) | 1,838 (68.1) | 1,094 (71.0) | 1,626 (75.4) |
| Histology | | | | | |
| Adenocarcinoma | 11,725 (43.7) | 8,546 (41.8) | >1,150 (>42.6) | >742 (>48.2) | >1,272 (>59.0) |
| Squamous cell | 5,398 (20.1) | 4,152 (20.3) | 651 (24.1) | 279 (18.1) | 316 (14.7) |
| Large cell | 107 (0.4) | 89 (0.4) | <11 (<0.4) | <11 (<0.7) | <11 (<0.5) |
| Other | 9,606 (35.8) | 7,652 (37.4) | 888 (32.9) | 509 (33.0) | 557 (25.8) |
| Having more than one cancers | | | | | |
| Yes | 2,025 (7.5) | 1,575 (7.7) | 208 (7.7) | 93 (6.0) | 149 (6.9) |
| No | 24,811 (92.5) | 18,864 (92.3) | 2,492 (92.3) | 1,448 (94.0) | 2,007 (93.1) |
| Surgery receipt | | | | | |
| Yes | 2,351 (8.8) | 1,838 (9.0) | 204 (7.6) | >128 (>8.3) | >175 (>8.1) |
| No | 24,368 (90.8) | 18,511 (90.6) | 2,485 (92.0) | 1,402 (91.0) | 1,970 (91.4) |
| Unknown | 117 (0.4) | 90 (0.4) | 11 (0.4) | <11 (<0.7) | <11 (<0.5) |
| Radiation receipt | | | | | |
| Yes | 11,045 (41.2) | 8,622 (42.2) | 1,146 (42.4) | 544 (35.3) | 733 (34.0) |
| No | 15,311 (57.1) | 11,451 (56.0) | 1,499 (55.5) | 969 (62.9) | 1,392 (64.6) |
| Unknown | 480 (1.8) | 366 (1.8) | 55 (2.0) | 28 (1.8) | 31 (1.4) |
| Chemotherapy receipt | | | | | |
| Yes | 14,146 (52.7) | 10,924 (53.4) | 1,331 (49.3) | 750 (48.7) | 1,141 (52.9) |
| No | 12,690 (47.3) | 9,515 (46.6) | 1,369 (50.7) | 791 (51.3) | 1,015 (47.1) |
| Charlson/Deyo comorbidity score | | | | | |
| 0 | 6,129 (22.8) | 4,782 (23.4) | 496 (18.4) | 321 (20.8) | 530 (24.6) |
| ≥1 | 15,906 (59.3) | 12,449 (60.9) | 1,566 (58.0) | 835 (54.2) | 1,056 (49.0) |
| Unknown | 4,801 (17.9) | 3,208 (15.7) | 638 (23.6) | 385 (25.0) | 570 (26.4) |
| Year of diagnosis | | | | | |
| 2015 | 8,076 (30.1) | 6,185 (30.3) | 821 (30.4) | 432 (28.0) | 638 (29.6) |
| 2016 | 9,511 (35.4) | 7,258 (35.5) | 958 (35.5) | 571 (37.1) | 724 (33.6) |
| 2017 | 9,249 (34.5) | 6,996 (34.2) | 921 (34.1) | 538 (34.9) | 794 (36.8) |

Abbreviations: ICI, immune checkpoint inhibitor; NH, non-Hispanic; SES, socioeconomic status, on the basis of Yost criteria.

 

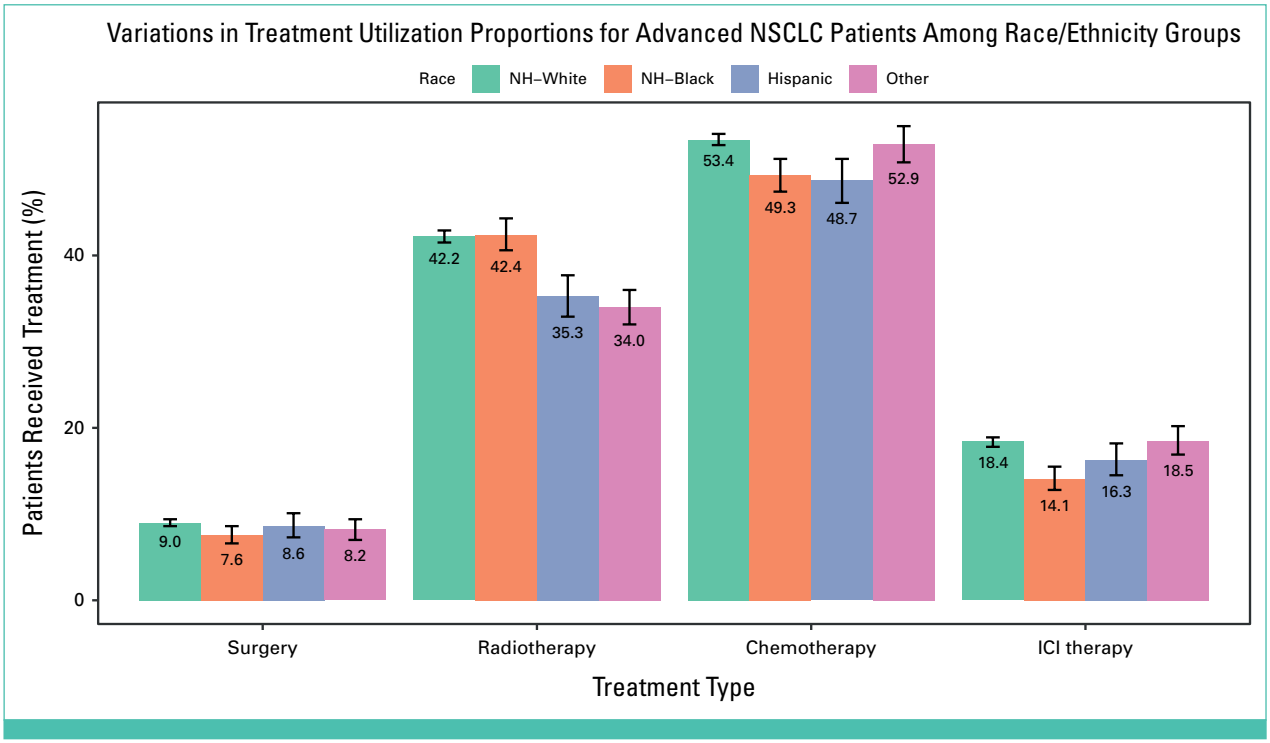


**FIG 1.** Variations in treatment utilization proportions for patients with advanced NSCLC among race/ethnicity groups. ICI, immune checkpoint inhibitor; NH, non-Hispanic; NSCLC, non–small cell lung cancer.

and Other (0.99 [95% CI, 0.88 to 1.12]) race/ethnicity groups compared with NH-White patients.

In the subgroup analysis (Table 3), we found significant interaction between race/ethnicity and comorbidity, sex, and SES, even in the fully adjusted models (*P* interaction = .043, .019, and .022, respectively). Upon examining each subgroup, patients lacking comorbid conditions demonstrated a higher likelihood of using ICI therapy than those with comorbidities (23.0% *v* 18.9%, respectively). By contrast, the disparities in ICI therapy utilization between female and male patients were minimal, standing at 18.4% and 17.2%, respectively. When stratified by SES, patients in the high SES group demonstrated the highest utilization proportion of ICI therapy (20.5%), followed by those in the middle SES group (17.7%), whereas the low-SES group revealed the lowest utilization of ICI therapy (15.2%). In comparison with their respective NH-White patient categories, (1) NH-Black patients without any comorbid conditions were 29% less likely to receive ICI therapy (OR, 0.71 [95% CI, 0.55 to 0.92]); (2) female patients in the Other racial/ethnic group had an 18% decreased likelihood of receiving ICI therapy (OR, 0.82 [95% CI, 0.68 to 0.99]); and (3) NH-Black patients in the high-SES group exhibited a 26% lower likelihood of undergoing ICI therapy (OR, 0.74 [95% CI, 0.54 to 0.99]).

## DISCUSSION

The findings from the study indicate there are significant differences in the utilization of ICI therapy across

**TABLE 2.** Association Between Race and ICI Therapy Utilization Among Patients With Advanced Non–Small Cell Lung Cancer

| Race/Ethnicity | User/No. | Utilization Proportion, % and (95% CI) | aOR and (95% CI)[a] | aOR and (95% CI)[b] |
|---|---|---|---|---|
| NH-White | 3,754/20,439 | 18.4 (17.8 to 18.9) | REF | REF |
| NH-Black | 381/2,700 | 14.1 (12.8 to 15.5) | 0.71 (0.63 to 0.79) | 0.85 (0.75 to 0.96) |
| Hispanic | 251/1,541 | 16.3 (14.5 to 18.2) | 0.87 (0.76 to 1.00) | 0.99 (0.85 to 1.15) |
| Other | 399/2,156 | 18.5 (16.9 to 20.2) | 1.03 (0.92 to 1.16) | 0.99 (0.88 to 1.12) |

NOTE. The patients' overall utilization proportion and 95% CI was 17.8 (17.4 to 18.3).
Abbreviations: aOR, adjusted odds ratio; ICI, immune checkpoint inhibitor; NH, non-Hispanic; REF, reference.
[a]The model adjusted for age.
[b]The model adjusted for age, sex, marital status, histopathologic subtype, stage, having more than one cancers, surgery, chemotherapy, radiotherapy, comorbidity, year of diagnosis, and SES level, on the basis of Yost criteria.

**TABLE 3.** Subgroup Analysis for the Association Between Race and ICI Therapy Utilization

| Race/Ethnicity | User/No. | Utilization Proportion, % and (95% CI) | aOR and (95% CI)[a] | aOR and (95% CI)[b] |
|---|---|---|---|---|
| Charlson/Deyo comorbidity score | | | | |
| 0 CCI | 1,412/6,129 | 23.0 (22.0 to 24.1) | | |
| NH-White | 1,148/4,782 | 24.0 (22.8 to 25.2) | REF | REF |
| NH-Black | 83/496 | 16.7 (13.6 to 20.3) | 0.62 (0.48 to 0.78) | 0.71 (0.55 to 0.92) |
| Hispanic | 66/321 | 20.6 (16.3 to 25.4) | 0.82 (0.61 to 1.08) | 0.87 (0.65 to 1.16) |
| Other | 115/530 | 21.7 (18.3 to 25.5) | 0.89 (0.71 to 1.10) | 0.82 (0.65 to 1.02) |
| ≥1 CCI | 3,006/15,906 | 18.9 (18.3 to 19.5) | | |
| NH-White | 2,364/12,449 | 19.0 (18.3 to 19.7) | REF | REF |
| NH-Black | 263/1,566 | 16.8 (15.0 to 18.7) | 0.83 (0.72 to 0.96) | 0.92 (0.79 to 1.07) |
| Hispanic | 151/835 | 18.1 (15.5 to 20.9) | 0.95 (0.79 to 1.14) | 0.97 (0.80 to 1.18) |
| Other | 228/1,056 | 21.6 (19.1 to 24.2) | 1.23 (1.05 to 1.43) | 1.05 (0.89 to 1.24) |
| *P* interaction | | | .036 | .043 |
| Sex | | | | |
| Male | 2,523/13,685 | 18.4 (17.8 to 19.1) | | |
| NH-White | 1,938/10,255 | 18.9 (18.1 to 19.7) | REF | REF |
| NH-Black | 200/1,385 | 14.4 (12.6 to 16.4) | 0.70 (0.59 to 0.81) | 0.85 (0.72 to 1.01) |
| Hispanic | 142/822 | 17.3 (14.8 to 20.0) | 0.90 (0.75 to 1.09) | 1.07 (0.87 to 1.31) |
| Other | 243/1,223 | 19.9 (17.7 to 22.2) | 1.08 (0.93 to 1.26) | 1.13 (0.96 to 1.32) |
| Female | 2,262/13,151 | 17.2 (16.6 to 17.9) | | |
| NH-White | 1,816/10,184 | 17.8 (17.1 to 18.6) | REF | REF |
| NH-Black | 181/1,315 | 13.8 (11.9 to 15.7) | 0.72 (0.61 to 0.85) | 0.85 (0.71 to 1.02) |
| Hispanic | 109/719 | 15.2 (12.6 to 18.0) | 0.83 (0.67 to 1.02) | 0.90 (0.72 to 1.12) |
| Other | 156/933 | 16.7 (14.4 to 19.3) | 0.96 (0.80 to 1.14) | 0.82 (0.68 to 0.99) |
| *P* interaction | | | .269 | .019 |
| SES index (tertiles) | | | | |
| Low SES level | 1,347/8,848 | 15.2 (14.5 to 16.0) | | |
| NH-White | 887/5,758 | 15.4 (14.5 to 16.4) | REF | REF |
| NH-Black | 226/1,676 | 13.5 (11.9 to 15.2) | 0.84 (0.72 to 0.98) | 0.92 (0.77 to 1.08) |
| Hispanic | 117/783 | 14.9 (12.5 to 17.6) | 0.98 (0.79 to 1.21) | 1.04 (0.83 to 1.30) |
| Other | 117/631 | 18.5 (15.6 to 21.8) | 1.31 (1.05 to 1.62) | 1.19 (0.94 to 1.49) |
| Medium SES level | 1,564/8,844 | 17.7 (16.9 to 18.5) | | |
| NH-White | 1,269/7,056 | 18.0 (17.1 to 18.9) | REF | REF |
| NH-Black | 93/637 | 14.6 (11.9 to 17.6) | 0.77 (0.61 to 0.96) | 0.82 (0.64 to 1.04) |
| Hispanic | 79/444 | 17.8 (14.3 to 21.7) | 0.99 (0.77 to 1.27) | 1.10 (0.84 to 1.43) |
| Other | 123/707 | 17.4 (14.7 to 20.4) | 0.97 (0.79 to 1.19) | 0.97 (0.78 to 1.21) |
| High SES level | 1,817/8,845 | 20.5 (19.7 to 21.4) | | |
| NH-White | 1,554/7,403 | 21.0 (20.1 to 21.9) | REF | REF |
| NH-Black | 59/363 | 16.3 (12.6 to 20.5) | 0.70 (0.52 to 0.92) | 0.74 (0.54 to 0.98) |
| Hispanic | 52/298 | 17.4 (13.3 to 22.2) | 0.80 (0.58 to 1.07) | 0.80 (0.57 to 1.09) |
| Other | 152/781 | 19.5 (16.7 to 22.4) | 0.91 (0.75 to 1.10) | 0.89 (0.73 to 1.08) |
| *P* interaction | | | .008 | .022 |

Abbreviations: aNSCLC, advanced NSCLC; aOR, adjusted odds ratio; CCI, Charlson Comorbidity Index; ICI, immune checkpoint inhibitor; NH, non-Hispanic; REF, reference; SES, socioeconomic status, on the basis of Yost criteria.

[a]The model adjusted for age.

[b]The model adjusted for the same set of covariates as the primary multivariable model except the factor used for stratification.

diverse racial/ethnic groups. Notably, NH-Black patients exhibited the lowest proportion of ICI therapy receipt and were less likely to receive it when compared with NH-White patients. Importantly, the utilization proportions of ICI therapy were influenced by comorbidity status, sex, and SES levels.

In line with prior research conducted using NCDB data and SEER-Medicare data, our findings reinforce that NH-Black patients were less inclined to receive ICI therapy in comparison with NH-White patients.[29-31,47] A recent study using SEER-Medicare data, focusing on racial/ethnic differences in immunotherapy utilization for stage IV NSCLC, reported that Black patients were 40% less likely to receive immunotherapy, contrasting with our 15% disparity.[29] Notably, our study demonstrates a significant surge in overall ICI therapy utilization to 17.8%, up from the 1.5% reported previously, suggesting increased adoption after FDA approval.[29] This is supported by an NCDB analysis by Ermer et al,[30] which included 402,689 patients and assessed ICI therapy utilization before and after FDA approval. The analysis suggests a consistently lower likelihood of receiving ICI therapy in Black patients compared with White patients; however, the differences decreased after FDA approval.[30] Several factors have been proposed to account for diminished utilization of ICI therapy among NH-Black patients, including their engagement with medical innovations and adherence to health care professional recommendations.[30] This phenomenon may be elucidated by the prevalent mistrust toward the health care system within NH-Black communities, evident by their lower participation proportions in clinical trials, despite facing a disproportionate impact from certain cancer types, including lung cancer.[26,27,48-50] This mistrust is potentially exacerbated by unconscious racial biases by the health care professionals, affecting the quality of doctor-patient communication and subsequently influencing treatment decisions.[48,51,52] The underrepresentation of Black patients in clinical trials compounds this issue, leading to insufficient evidence to address concerns regarding the treatment's efficacy for this population.[49]

Our study revealed a significant nuance when examining how comorbidities affect racial disparities in the utilization of ICI therapy. NH-Black patients without comorbidities were less likely to receive ICI therapy compared with NH-White patients, a difference that was not observed among those with comorbid conditions. This may be attributed to health care providers allocating more time and health care resources to patients with multiple comorbidities.[53] In addition, such patients have been observed to engage more with health services because of the continual management of their chronic conditions, a factor that could contribute to the observed results.[54]

Typically, individuals with a higher SES are expected to have greater access to health care resources. Surprisingly, our findings indicate that among those with a high SES, NH-Black patients were less likely to receive ICI therapy compared with their NH-White counterparts. However, it is crucial to interpret this result with caution, as the sample size of NH-Black patients within the high-SES category was relatively small, comprising only 13.4% of all NH-Black patients in the study.

We also observed distinct patterns of ICI therapy utilization among female patients from the Other race/ethnicity group, a majority of whom identified as Asian and Pacific Islanders. The 18% less likely to receive ICI therapy in these individuals, as compared with NH-White female patients, may be attributed to the higher prevalence of epidermal growth factor receptor mutations in Asian patients, particularly at 31%, in contrast to just 7% among White patients.[55] Interestingly, Asian female patients demonstrated an even greater likelihood of harboring this mutation than Asian male patients, making them more suitable candidates for targeted therapies tailored for their specific genetic profiles, consequently diminishing the necessity for ICI therapy.[56-58] Aside from genetic factors, cultural and linguistic barriers also may contribute to these disparities. For instance, Chen et al[59] underscores the existence of cancer-related stigma and linguistic challenges within the Asian community, potentially discouraging these patients from opting for ICI therapy.

Our study uses the SEER-Medicare data, which has several strengths in both design and analysis. First, the data set provides a representative sample of patients with cancer in the United States, and its substantial sample size ensures robust statistical power. Second, the data set contains a thorough measurement of cancer-related characteristics, facilitating more detailed analyses controlled for or stratified by key prognostic and risk factors. Finally, the data set furnishes comprehensive information on cancer treatment and outcomes, enabling us to explore the overall utilization patterns of lung cancer treatments and ICI agents among older patients diagnosed with aNSCLC.

Several limitations should be considered when interpreting our findings. Most of the patients in our data set were White, which restricts the generalizability of our results to all older patients with aNSCLC. Additionally, the relatively small number of American Indian and Alaska Native patients (n = 119) required us to group them with Asian and Pacific Islander patients under the category "Other," potentially compromising our ability to detect distinct disparities in ICI therapy utilization for these specific populations. Many covariates were only collected at baseline, preventing us from capturing changes over time that may have affected the outcomes. There is also a risk of patients being incorrectly coded using ICD-9 and ICD-10 codes, potentially resulting in a mismatch with their true health status and affecting result accuracy. Furthermore, using SEER data for treatment variables presents challenges, including incomplete data and biases from unrecorded treatment decisions, which could affect the robustness of our analyses. It is also important to note that our data set spans from 2015 to 2017, a period when immunotherapy was only approved for second-line treatment. This timing may influence the utilization numbers and conclusions, as the use of immunotherapy has since increased across the board. The higher utilization of pembrolizumab and nivolumab observed in our study can

be attributed to their approval status during this period, which should be considered when interpreting the results. Additionally, our analysis did not distinguish between initial and subsequent treatments, which may affect the interpretation of utilization patterns.

In conclusion, our study indicates a significant impact of race and ethnicity on the utilization of ICI therapy among individuals with aNSCLC. NH-Black patients were less likely to receive ICI therapy than NH-White patients. The association between race and ICI therapy utilization was influenced by comorbidity status, sex, and SES. These findings emphasize the need for further investigation to identify the underlying causes of these disparities and develop effective strategies to alleviate them. From a clinical perspective, our study also carries substantive implications. Prior research suggests that NH-Black patients receiving immunotherapy may achieve even better survival rates than NH-White patients.[28] This amplifies the urgency of targeted interventions aimed at reducing these health care disparities. Addressing these disparities is not merely an ethical obligation but also has the potential to enhance survival rates among minority populations. Therefore, the prompt development and implementation of strategies to overcome these barriers hold substantial potential for enhancing public health.

## AFFILIATIONS

[1]Department of Epidemiology, University of Florida College of Public Health and Health Professions, Gainesville, FL
[2]University of Florida Health Cancer Center, Gainesville, FL
[3]Department of Surgery, University of Florida College of Medicine, Gainesville, FL
[4]Department of Health Outcomes and Biomedical Informatics, University of Florida College of Medicine, Gainesville, FL
[5]Johnson & Johnson MedTech, New Brunswick, NJ
[6]Department of Population Health Sciences, School of Medicine, Duke University, Durham, NC
[7]Duke Cancer Institute, School of Medicine, Duke University, Durham, NC
[8]Sylvester Comprehensive Cancer Center, University of Miami, Coral Gables, FL
[9]Department of Medicine, Division of Pulmonary and Critical Care Medicine, University of Florida, Gainesville, FL

## CORRESPONDING AUTHOR

Dejana Braithwaite, PhD; e-mail: dbraithwaite@surgery.ufl.edu.

## DISCLAIMER

The ideas and opinions expressed herein are those of the author(s) and do not necessarily reflect the opinions of the State of California, Department of Public Health, the National Cancer Institute, and the Centers for Disease Control and Prevention or their Contractors and Subcontractors.

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## AUTHOR CONTRIBUTIONS

**Conception and design:** Shama D. Karanth, Jiang Bian, Dongyu Zhang, Lusine Yaghjyan, Estelamari Rodriguez, Dejana Braithwaite
**Administrative support:** Dejana Braithwaite,
**Collection and assembly of data:** Dejana Braithwaite
**Data analysis and interpretation:** Danting Yang, Shama D. Karanth, Hyung-Suk Yoon, Jae Jeong Yang, Xiwei Lou, Yi Guo, Tomi Akinyemiju, Hiren J. Mehta, Dejana Braithwaite
**Manuscript writing:** All authors
**Final approval of manuscript:** All authors
**Accountable for all aspects of the work:** All authors

## AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The following represents disclosure information provided by authors of this manuscript. All relationships are considered compensated unless otherwise noted. Relationships are self-held unless noted. I = Immediate Family Member, Inst = My Institution. Relationships may not relate to the subject matter of this manuscript. For more information about ASCO's conflict of interest policy, please refer to https://ascopubs.org/authors.
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**Dongyu Zhang**
**Employment:** Johnson & Johnson/Janssen
**Stock and Other Ownership Interests:** Johnson & Johnson/Janssen
**Travel, Accommodations, Expenses:** Johnson & Johnson/Janssen

**Estelamari Rodriguez**
**Consulting or Advisory Role:** AstraZeneca, Research to Practice, Novartis, Janssen Oncology, Bristol Myers Squibb Foundation, Oncocyte, Regeneron, Amgen, Pfizer, Daiichi Sankyo/AstraZeneca, novocure, Boehringer Ingelheim, g1 ther

**Yi Guo**
**Consulting or Advisory Role:** Merck

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## APPENDIX

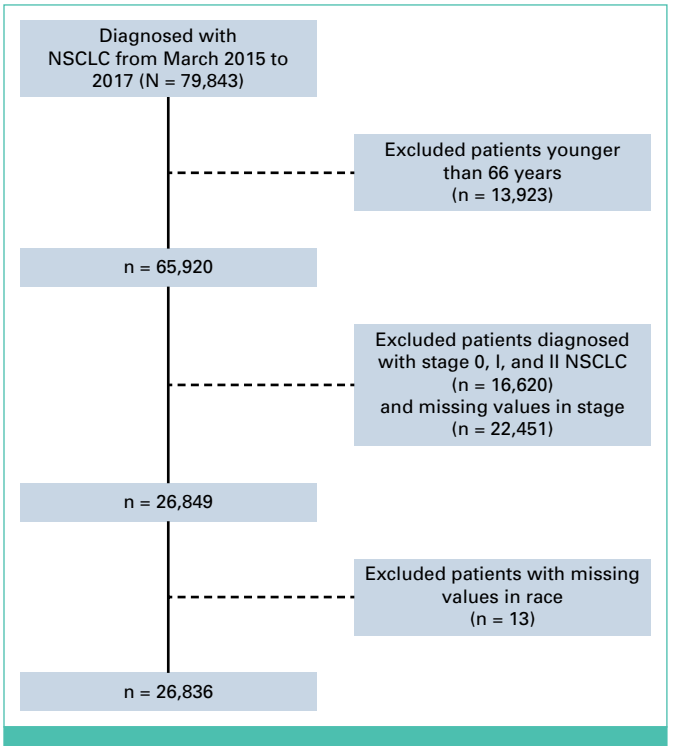


**FIG A1.** Flowchart of participant selection. NSCLC, non–small cell lung cancer.

**TABLE A1.** Characteristics of Patients Treated by ICI Therapy From 2015 to 2019 SEER-Medicare

| Characteristic | Nivolumab (2,552 [53.3]), No. (%)[a] | Pembrolizumab (1,962 [41.0]), No. (%)[a] | Atezolizumab (300 [6.3]), No. (%)[a] | Durvalumab (153 [3.2]), No. (%)[a] | Ipilimumab (125 [2.6]), No. (%)[a] |
|---|---|---|---|---|---|
| Race | | | | | |
| NH-White | 2,000 (78.4) | 1,559 (79.5) | 217 (72.3) | >112 (>73.2) | >91 (>72.8) |
| NH-Black | 212 (8.3) | 135 (6.9) | 28 (9.3) | 18 (11.8) | <11 (<8.8) |
| Hispanic | 137 (5.4) | 104 (5.3) | 13 (4.3) | <11 (<7.2) | <11 (<8.8) |
| Other | 203 (7.9) | 164 (8.4) | 42 (14.0) | 12 (7.9) | 12 (9.6) |
| Age groups, years | | | | | |
| 66-74 | 1,586 (62.1) | 1,107 (56.4) | 191 (63.7) | 103 (67.3) | 92 (73.6) |
| ≥75 | 966 (37.9) | 855 (43.6) | 109 (36.3) | 50 (32.7) | 33 (26.4) |
| Sex | | | | | |
| Male | 1,361 (53.3) | 1,006 (51.3) | 161 (53.7) | 87 (56.9) | 70 (56.0) |
| Female | 1,191 (46.7) | 956 (48.7) | 139 (46.3) | 66 (43.1) | 55 (44.0) |
| Married | | | | | |
| Yes | 1,518 (59.5) | 1,072 (54.6) | >180 (>60.0) | >84 (>54.9) | >74 (>59.2) |
| No | 951 (37.3) | 817 (41.6) | 109 (36.3) | 58 (37.9) | 40 (32.0) |
| Unknown | 83 (3.3) | 73 (3.7) | <11 (<3.7) | <11 (<7.2) | <11 (<8.8) |
| SES index (tertiles) | | | | | |
| Low | 748 (29.3) | 531 (27.1) | >69 (>23.0) | >45 (>29.4) | >20 (>16.0) |
| Medium | 844 (33.1) | 632 (32.2) | 90 (30.0) | 45 (29.4) | 38 (30.4) |
| High | 925 (36.2) | 783 (39.9) | 130 (43.3) | 52 (34.0) | 56 (44.8) |
| Unknown | 35 (1.4) | 16 (0.8) | <11 (<3.7) | <11 (<7.2) | <11 (<8.8) |
| Stage | | | | | |
| III | 752 (29.5) | 517 (26.4) | 91 (30.3) | 131 (85.6) | 35 (28.0) |
| IV | 1,800 (70.5) | 1,445 (73.6) | 209 (69.7) | 22 (14.4) | 90 (72.0) |
| Histology | | | | | |
| Adenocarcinoma | >1,183 (>46.4) | >1,243 (>63.3) | 163 (54.3) | 73 (47.7) | 13 (10.4) |
| Squamous cell | 633 (24.8) | 370 (18.9) | 76 (25.3) | 53 (34.6) | <11 (<8.8) |
| Large cell | <11 (<0.4) | <11 (<0.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Other | 725 (28.4) | 338 (17.2) | 61 (20.3) | 27 (17.6) | >101 (>80.8) |
| Having more than one cancers | | | | | |
| Yes | 241 (9.4) | 150 (7.6) | 34 (11.3) | 11 (7.2) | <11 (<8.8) |
| No | 2,311 (90.6) | 1,812 (92.4) | 266 (88.7) | 142 (92.8) | >114 (>91.2) |
| Surgery receipt | | | | | |
| Yes | >151 (>5.9) | 145 (7.4) | >17 (>5.6) | 13 (8.5) | <11 (<8.8) |
| No | 2,390 (93.7) | 1,805 (92.0) | 272 (90.7) | >129 (>84.3) | >103 (>82.4) |
| Unknown | <11 (<0.4) | 12 (0.6) | <11 (<3.7) | <11 (<7.2) | <11 (<8.8) |
| Radiation receipt | | | | | |
| Yes | 1,281 (50.2) | 891 (45.4) | >128 (>42.6) | >131 (>85.6) | >60 (>48.0) |
| No | 1,234 (48.4) | 1,038 (52.9) | 161 (53.7) | 11 (7.2) | 54 (43.2) |
| Unknown | 37 (1.4) | 33 (1.7) | <11 (<3.7) | <11 (<7.2) | <11 (<8.8) |
| Chemotherapy receipt | | | | | |
| Yes | 2,209 (86.6) | 1,157 (59.0) | 251 (83.7) | >142 (>92.8) | 110 (88.0) |
| No | 343 (13.4) | 805 (41.0) | 49 (16.3) | <11 (<7.2) | 15 (12.0) |
| Charlson/Deyo comorbidity score | | | | | |
| 0 | 735 (28.8) | 607 (30.9) | 93 (31.0) | 33 (21.6) | 33 (26.4) |
| ≥1 | 1,626 (63.7) | 1,216 (62.0) | 168 (56.0) | 109 (71.2) | 75 (60.0) |
| Unknown | 191 (7.5) | 139 (7.1) | 39 (13.0) | 11 (7.2) | 17 (13.6) |

(continued on following page)

**TABLE A1.** Characteristics of Patients Treated by ICI Therapy From 2015 to 2019 SEER-Medicare (continued)

| Characteristic | Nivolumab (2,552 [53.3]), No. (%)[a] | Pembrolizumab (1,962 [41.0]), No. (%)[a] | Atezolizumab (300 [6.3]), No. (%)[a] | Durvalumab (153 [3.2]), No. (%)[a] | Ipilimumab (125 [2.6]), No. (%)[a] |
|---|---|---|---|---|---|
| Year of diagnosis | | | | | |
| 2015 | 929 (36.4) | 184 (9.4) | 47 (15.7) | <11 (<7.2) | 21 (16.8) |
| 2016 | 966 (37.9) | 555 (28.3) | 123 (41.0) | <11 (<7.2) | 42 (33.6) |
| 2017 | 657 (25.7) | 1,223 (62.3) | 130 (43.3) | >131 (>85.6) | 62 (49.6) |

NOTE. During the period of 2015-2019, a total of 4,785 patients underwent ICI therapy, but none of them were found to have used cemiplimab-rwlc during the course of their treatment.

Abbreviations: ICI, immune checkpoint inhibitor; NH, non-Hispanic; SES, socioeconomic status, on the basis of Yost criteria.

[a]Percentage of patients treated with a specific ICI agent out of all patients who received ICI therapy.