# Trends in Neoadjuvant Pembrolizumab Use in Triple-Negative Breast Cancer

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## Background

- Pembrolizumab, a PD-1 inhibitor, has demonstrated strong antitumor activity with low-grade toxicity in TNBC, especially as first-line treatment.[1, 2]
- The KEYNOTE-522 trial showed that combining pembrolizumab with NAC and surgery significantly improves pCR and OS outcomes.[3, 4]
- The FDA approved pembrolizumab in July 2021 for neoadjuvant use in high-risk, early-stage, PD-L1-positive TNBC.[5]
- Despite proven efficacy, real-world patterns of pembrolizumab use and disparities in its receipt remain poorly understood.
- Disparities in TNBC care (surgery, chemotherapy) have been consistently documented. Early access to pembrolizumab may vary across racial and socioeconomic groups.[6]
- High treatment costs and unequal healthcare distribution may further limit access to immunotherapy for socioeconomically disadvantaged populations.[6]

## Aim

Examine national patterns of pembrolizumab use with NAC, focusing on how race, ethnicity, and socioeconomic status influence access.

## Methods

- **Data Source**: Epic Cosmos national database. Patients were identified using breast cancer ICD-10 codes.
- **Study Inclusion Criteria**:
  1. New diagnosis of ER-negative disease and/or triple negative disease between January 1, 2021 and December 31, 2024.
  2. Not diagnosed with Stage 0, I, or IV breast cancer.
  3. Had an encounter with an oncologist and received paclitaxel without trastuzumab as part of their neoadjuvant regimen prior to undergoing breast surgery.

  **Identified 6,689 unique patients with TNBC**
- **Study Measures and Covariates**: We evaluated pembrolizumab use as a function of year of treatment and patient and sociodemographic characteristics:
  1. Race/ethnicity
  2. Area of Deprivation Index (ADI)
  3. Geographic region

## Results

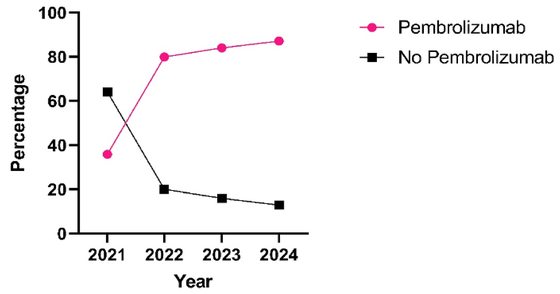



**Figure 1. Pembrolizumab Use Over Time**
Overall use rate was 74.2% across the study period. Usage increased annually from 35.9% in 2021 to 79.9% in 2022, 84.1% in 2023, and 87.1% in 2024.

**Table 1. Pembrolizumab Receipt Across Patient Covariates**

| | % Given Pembrolizumab | p-value |
|---|---|---|
| **Age *a.*** | | <0.01 |
| 40-50 | 82% | |
| 50-60 | 77.5% | |
| 60-70 | 73.5% | |
| 70-80 | 68% | |
| 80+ | 62.8% | |
| **Race** | | 0.95 |
| White | 76.2% | |
| Black/African American | 76.5% | |
| Asian | 75.8% | |
| AIAN | 72.4% | |
| NHPI | 68.8% | |
| Other/None of above | 79% | |
| **Ethnicity** | | 0.33 |
| Not Hispanic/Latino | 76.3% | |
| Hispanic/Latino | 76.7% | |
| Other/Unknown | 72.2% | |
| **ADI** | | 0.04 |
| <75 | 77.4% | |
| >75 | 74% | |
| **Region** | | 0.11 |
| South | 75.3% | |
| Midwest | 78.2% | |
| Northeast | 75.5% | |
| West | 75.6% | |
| **Stage** | | 0.01 |
| II | 80.5% | |
| III | 83.8% | |
| Unknown | 67.5% | |

a., p-value as a result of Chi-Square test for trend

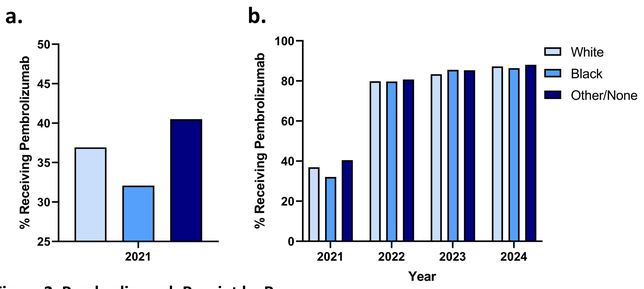



**Figure 2. Pembrolizumab Receipt by Race**
**a.** Black Patients had slightly lower uptake than White patients in 2021 (32.1% vs, 36.9%, p=0.08).
**b.** Difference narrowed in subsequent years.

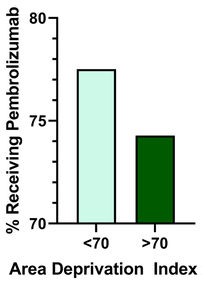



**Figure 3.** Patients in the highest ADI quartile had lower rates of pembrolizumab use compared to the rest of the population (77.4% vs. 74.0%, p=0.04).

## Discussion

**Key Findings:**
- Overall increase in pembrolizumab use.
- No statistically significant difference in receipt across racial or ethnic groups overall.
- Black patients had slightly lower uptake than White patients in 2021 (not statistically significant); gap narrowed over time.
- Patients in higher ADI quartiles had significantly lower rates of pembrolizumab use, especially early post-approval.
- No statistically significant differences in pembrolizumab receipt by US census region.
- Older patients had a lower rate of receiving pembrolizumab.
- Stage III patients had higher rates of pembrolizumab use than those with Stage II disease.

## Limitations

- Retrospective observational design limits causal inference
- Included individuals with missing or unknown data for some sociodemographic variables.
- Only ~50% of the study population had Area Deprivation Index (ADI) data available.
- Cosmos only includes EPIC-participating health systems – may exclude those without regular access to primary care or in underserved areas.
- Likely underestimated the true extent of disparities, particularly among socioeconomically marginalized populations.

**References**

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