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Visualizing Geographic Variation and Systemic Inequities of Disease Burden and CAR T-Cell Therapy Access in Multiple Myeloma in the US

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INTRODUCTION

- Chimeric antigen receptor (CAR) T-cell therapies have emerged as a transformative treatment for relapsed/refractory multiple myeloma (RRMM) with the first FDA approval in 2021.
- Real-world access to CAR T remains limited across many regions of the United States (US). Geographic barriers such as long travel distances to authorized treatment centers offering CAR Ts for RRMM (ATCs) and systemic inequities limit access to CAR Ts.[1]
- Currently, there is no comprehensive estimate on the extent of these barriers or their impact on CAR T access in RRMM.
- **Objectives: Characterize geographic variation in multiple myeloma (MM) burden and identify key drivers of disparities in CAR T access to inform targeted strategies in closing access gaps.**

METHODS

- Using the Komodo Patient-Level Analytics and Insights Derivative (PLAID) administrative claims database, MM burden was estimated for the period from January 2021-August 2024.
- Adult patients with MM and CAR T recipients were identified in the database using International Classification of Diseases (ICD)-10 and billing codes.
- MM prevalence rates at ZIP-3 level (using the first 3 digits of a ZIP) were estimated using input from the US Cancer Statistics (USCS) database.
- Distance and drive-time (considering distance, historical traffic, and terrain types) to the nearest ATC for patients with MM and drive-time to ATCs for CAR T recipients where they received treatment were estimated.[2]
- Logistic regression for multivariate analysis was used to study factors associated with CAR T utilization, adjusting for confounders.

RESULTS

Population Characteristics

- There were 106,593 unique prevalent MM cases over the study period.
- CAR T recipients were somewhat younger but otherwise similar to the overall MM population across sex, region, and insurance type (**Table 1**).

Table 1. Characteristics of the Study Population: Patients with Multiple Myeloma (MM) and Chimeric Antigen Receptor (CAR) T Recipients

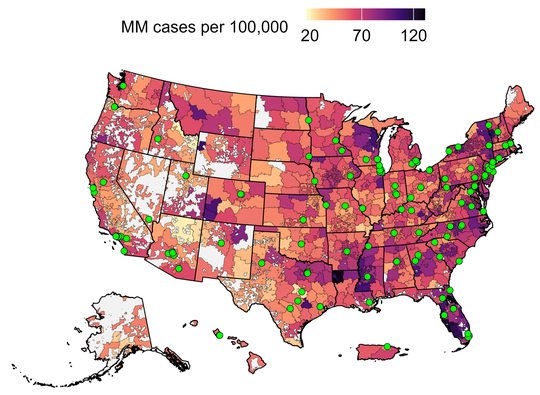
	Patients with MM (% Total)	CAR T Recipients (% Total)
Age Group (in years)		
<65	33.4	48.1
65-69	16.7	21.0
70-74	17.7	17.7
75+	32.2	13.1
Sex		
Female	44.9	43.2
Male	55.1	56.8
Region		
Northeast	21.1	20.9
Midwest	21.5	21.7
South	38.8	35.7
West	18.6	21.6
Insurance Type		
Commercial/MA	59.0	58.4
Medicare FFS	34.6	36.6
Medicaid	6.5	5.0

CAR T: Chimeric Antigen Receptor T; FFS: fee-for-service; MA: Medicare Advantage; MM: Multiple Myeloma

RESULTS *(CONTINUED)*

Disease Burden and Drive-times to Nearest ATCs

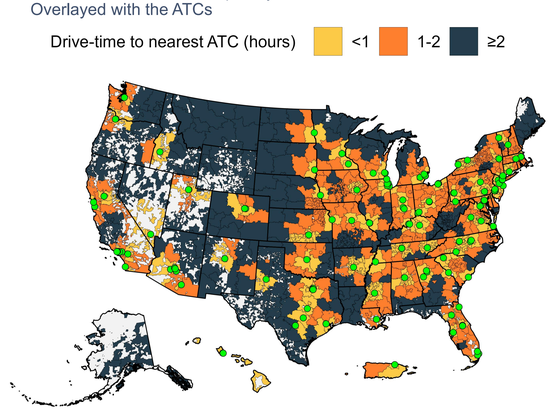
Figure 1. Geospatial Visualization of the Multiple Myeloma Prevalence Rates in the United States Overlayed with the ATCs



● *: Authorized Treatment Centers (ATCs)[3,4]*

- The highest density of MM was found in Florida, Mississippi, and New Jersey (**Figure 1**).
- Overall MM burden was 61/100,000 persons in the US, with the South and Northeast having the highest burden (**Table 2**).

Figure 2. Geospatial Visualization of Drive-times to the Nearest ATC for Patients with Multiple Myeloma in the United States Overlayed with the ATCs



● *: Authorized Treatment Centers (ATCs)[3,4]*

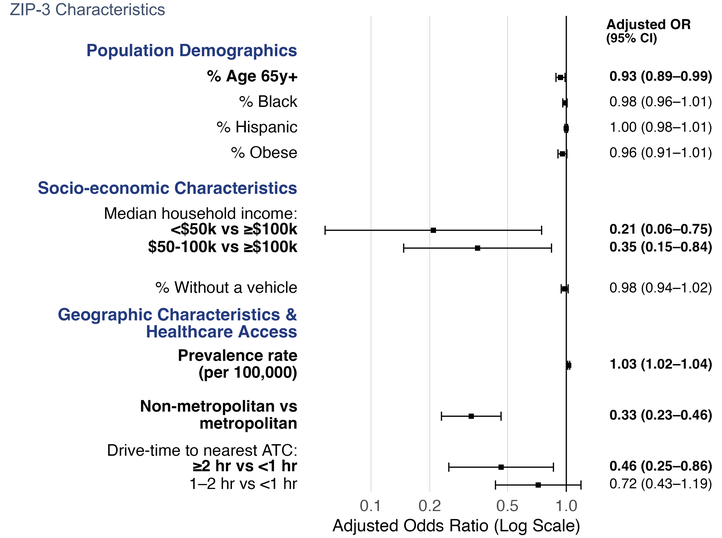
- Over 40% of patients with MM in the South and West drove more than an hour to reach the nearest ATC (**Figure 2**, **Table 2**).
- While 72.9% of patients with MM lived within 50 miles of an ATC, this proportion was lower in the South (67.0%) and Midwest (66.7%), compared to 88.3% in the Northeast.

Table 2. Multiple Myeloma (MM) Burden and Drive-times to ATC by Region

	Northeast	Midwest	South	West	All
MM Cases per 100,000	67.4	58.8	66.1	50.0	61.0
MM Cases per ATC	1,243	1,095	1,654	1,356	1,373
MM Cases With <1 Hour Drive of Nearest ATC	72%	60%	56%	58%	60%
Median Drive-time to Nearest ATC (Hours)	0.65	0.72	0.80	0.80	0.72

Multivariate Analysis of Factors Associated with CAR T Utilization

Figure 3. Forest Plot of Adjusted Odds Ratios of a ZIP-3 Having at Least One CAR T Recipient by ZIP-3 Characteristics



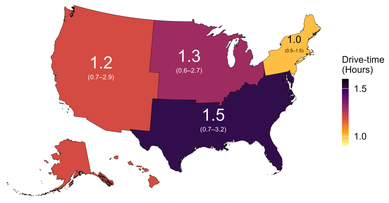
ATC: Authorized Treatment Centers; OR: Odds Ratio. Note: Bold represents factors significantly associated with CAR T utilization

- Multivariate analysis identified the most impactful factors associated with decreased odds of CAR T utilization at a ZIP-3 level **(Figure 3)**:
  - lower median household income (79% lower for <$50k vs. ≥$100k)
  - residence in non-metropolitan areas (67% lower than metropolitan areas)
  - longer drive-time to the nearest ATC (54% lower for ≥2hour vs. <1hour)

- Descriptive analysis suggested that improving CAR T access from “poor access” ZIP-3s (drive-time to nearest ATC ≥2 hours) to “good access” ZIP-3s (drive-time to nearest ATC <1 hour), could lead to a 36% relative increase in CAR T utilization in these areas, consistent with insight from the multivariate analysis.

Drive-times to CAR T Recipient ATCs

Figure 4. Median (Interquartile Range) Empirical Drive-times (Hours) to the CAR T Recipient ATCs



Overall US: 1.3 (0.6-2.8) Hours

- CAR T recipients traveled a median of 1.3 hours to ATCs where they received treatment, with the longest times in the South (1.5 hours; **Figure 4**). In contrast, patients with MM overall lived a median of 0.72 hours from the nearest ATC (**Table 2**), suggesting CAR T recipients often traveled far for receiving their treatment.
- 15% of CAR T recipients traveled out-of-state, over 2 hours, and bypassed top three nearest ATCs. They were more often from the South, non-metro areas, and insured under Medicare fee-for-service.

Limitations

- The analysis relies on a single claims database, which may lead to underestimation of MM prevalence and CAR T utilization.
- Since all patients had insurance and a valid address, findings may not apply to uninsured or housing-insecure populations.

CONCLUSIONS

- **This study suggests a need for ATC expansion**
  - **Decreasing drive-times to the nearest ATC from ≥2 hours to within <1 hour could lead to an increase in the likelihood of patients receiving CAR T by 36%.**
  - **In the South and Midwest, CAR T access was poor despite high MM prevalence, highlighting geographical inequities.**
- **Besides drive-time, lower household income (<$50k vs. ≥$100k) had 79% lower odds and non-metro residence (vs. metro) had 67% lower odds of receiving CAR T.**

References

1. Gajra A, et al. Pharm Med. doi:10.1007/s40290-022-00428-w., 2. www.mapbox.com/, 3. www.abecma.com/find-a-treatment-center, 4. www.carvykti.com/treatment-centers/

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