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Minority Patients Receiving CAR T-Cell Therapy in the United States Between 2020-2025: A SEER-Based Projection on Racial Composition and Impact of Proximity to Authorized Treatment Centers

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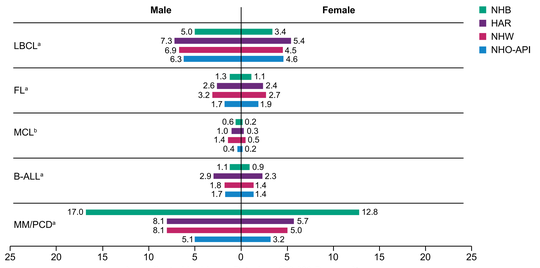
BACKGROUND

- Population projections for the United States (US) estimated increases in proportions of Non-Hispanic Black (NHB), Hispanic, all races (HAR), and Non-Hispanic Other (NHO) persons from 13%, 19%, and 7% in 2020 to 13%, 20%, and 8% in 2025, respectively[1]
- Compared with white patients, survival rates are generally lower among Black or African American patients for most cancer types and lower among Hispanic patients for certain cancers[2,3]
- Race/ethnicity disparities in access to oncology therapies have been linked to a number of factors like differences in incidence of certain cancers and mortality[4–9]
  - The incidence of B-cell malignancies, for which chimeric antigen receptor (CAR) T-cell therapies are indicated, varies across races/ethnicities (**Figure 1**)[5–12]
- Due to these disparities, patients of minority race/ethnicity are often underrepresented in oncology clinical trials[13]

Figure 1. Age-Adjusted Incidence Rate (per 100,000 persons) of B-cell Malignancies by Race/Ethnicity[6–10]



*SEER 2016–2020 age-adjusted incidence. †SEER 2001–2012 age-adjusted incidence. ‡An age-adjusted rate is a weighted average of the age-specific (crude) rates, where the weights are the proportions of persons in the corresponding age groups of a standard population.
API, Asian and Pacific Islander; B-ALL, B-cell acute lymphoblastic leukemia; FL, follicular lymphoma; HAR, Hispanic, all races; LBCL, large B-cell lymphoma; MCL, mantle cell lymphoma; MM, multiple myeloma; NHB, Non-Hispanic Black; NHO, Non-Hispanic Other; NHW, Non-Hispanic white; PCD, plasma cell disorder; SEER, Surveillance, Epidemiology, and End Results.

OBJECTIVE

- We evaluated the projected proportions of patients with B-cell malignancies that may receive CAR T-cell therapy in the US between 2020 and 2025 by race/ethnicity, including patients in proximity to CAR T-cell therapy authorized treatments centers (ATCs)[14]

METHODS

Figure 2. Study Design

Data sources
- SEER Research Plus Data including patients aged ≥20 years diagnosed between 2000–2019 (17 registries, November 2021 submission [latest as of February 2023])
- US population projections by race/ethnicity[1]

Racial/ethnicity categories
- Hispanic, all races (HAR)
- Non-Hispanic Black (NHB)
- Non-Hispanic Other (NHO), which includes Non-Hispanic unknown race, Asian and Pacific Islander, and American Indian and Alaska Native
- Non-Hispanic white (NHW)

Disease indications
- LBCL
- FL
- MCL
- B-ALL
- MM

B-ALL, B-cell precursor acute lymphoblastic leukemia; FL, follicular lymphoma; LBCL, large B-cell lymphoma; MCL, mantle cell lymphoma; MM, multiple myeloma.

METHODS (CONTINUED)

Table 1. Simulation Method for Projected LDP Estimates

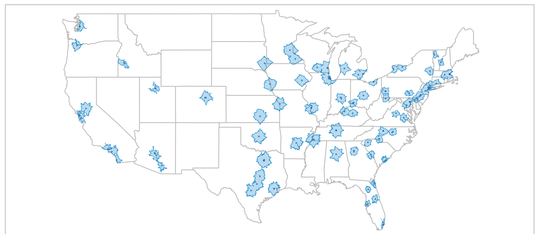
	Entire US	Regions Within a 1-hour Drive of ATCs
Step 1	Historical 5-year LDP data (2005–2019) for the 5 indications (LBCL, FL, MCL, B-ALL, MM) were extracted from the SEER Research Plus Data, stratified by age, sex, and race/ethnicity (NHW, NHB, NHO, HAR)	
Step 2	5-year LDP for 2020–2025 per indication and stratum were projected using segmented logistic regression	
Step 3	Projected LDP was combined with US population projections[1] to estimate racial prevalence counts per indication and separately by year	Projected LDP was combined with US population projections[1] and weighted by 1-hour drive proximity from commercial CAR T-cell therapy ATCs to estimate racial prevalence counts per indication and separately by year
Step 4	A bootstrapping method (10,000 sets of 1000 draws without replacement) was used to estimate the uncertainty. Random samples for a given sample size (1000) were drawn based on prevalence counts to estimate proportions of patients by race/ethnicity and 95% CIs	

ATC, authorized treatment centers; B-ALL, B-cell precursor acute lymphoblastic leukemia; FL, follicular lymphoma; HAR, Hispanic, all races; LBCL, large B-cell lymphoma; LDP, limited-duration prevalence; MCL, mantle cell lymphoma; MM, multiple myeloma; NHB, Non-Hispanic Black; NHO, Non-Hispanic Other; NHW, Non-Hispanic white; SEER, Surveillance, Epidemiology, and End Results.

- The whole process was repeated for the entire US, as well as within a 1-hour drive isochrone from ATCs for which proximity to CAR T-cell therapy ATCs was considered by weighting US county populations according to landmass within a 1-hour drive isochrone

RESULTS

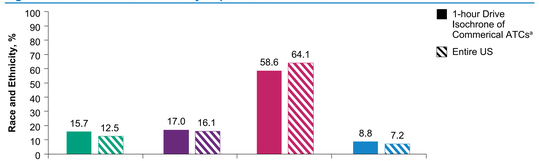
Figure 3. Map of a 1-Hour Drive Isochrone of ATCs[a]



[a]Commercial ATCs for axicabtagene ciloleucel or brexucabtagene autoleucel as of February 15, 2023.
ATC, authorized treatment center.

- As of July 1, 2019, 102 of 247 million people aged ≥20 years (41.3%) lived within a 1-hour drive isochrone of commercial ATCs (**Figure 3**)

Figure 4. Overall Race and Ethnicity Populations in the US

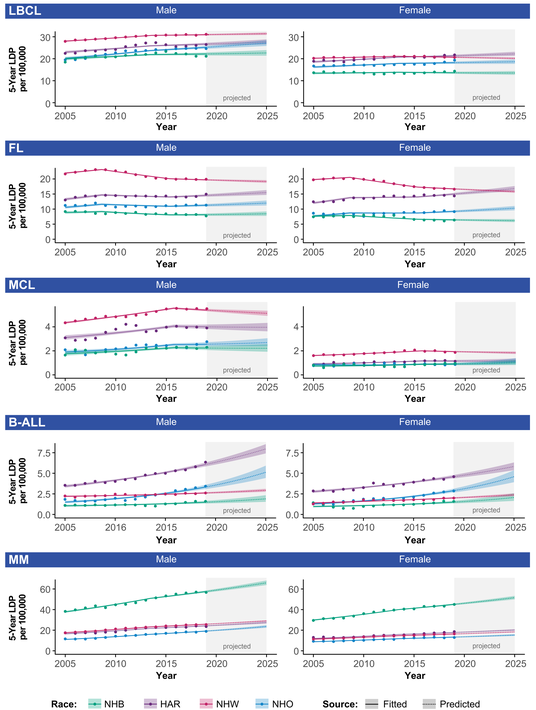


[a]Commercial ATCs for axicabtagene ciloleucel or brexucabtagene autoleucel as of February 15, 2023.
ATC, authorized treatment center; HAR, Hispanic, all races; NHB, Non-Hispanic Black; NHO, Non-Hispanic Other; NHW, Non-Hispanic white; US, United States.

- The proportion of NHB, HAR, Non-hispanic white (NHW), and NHO race/ethnicities within a 1-hour drive of commercial ATCs was comparable to the proportion of the race/ethnicities in the overall US population (**Figure 4**)

RESULTS (CONTINUED)

Figure 5. Projected 2020–2025 LDP For Males and Females by Indication

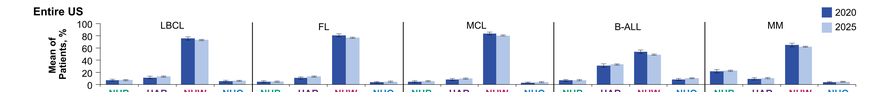


Standardized using WHO standard population; points represent observed data based on SEER Research Plus Data (17 registries, November 2021 submission).
B-ALL, B-cell acute lymphoblastic leukemia; CAR, chimeric antigen receptor; FL, follicular lymphoma; HAR, Hispanic, all races; LBCL, large B-cell lymphoma; LDP, limited-duration prevalence; MM, multiple myeloma; NHB, Non-Hispanic Black; NHO, Non-Hispanic Other; NHW, Non-Hispanic white; SEER, Surveillance, Epidemiology, and End Results; WHO, World Health Organization.

- Trends of 5-year limited-duration prevalence (LDP) from 2020–2025 were heterogenous (**Figure 5**)
  - LDP for LBCL, FL, and MCL indicated a slightly increasing or decreasing trend from 2020–2025 depending on the disease indication, sex, or race/ethnicity
  - LDP for B-ALL and MM showed an increasing trend from 2020–2025 regardless of sex across all race/ethnicity groups
- In a sensitivity analysis, the models were used to project 5-year LDP for 2019 after the actual 2019 data were removed and found to be consistent with the actual 5-year LDP for 2019 as extracted from the SEER, suggesting that the models had good predictive characteristics, and providing support for the extrapolation of 2020–2025

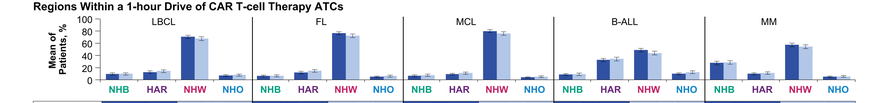
Figure 6. Projected Proportions by Race/Ethnicity and Indication Within a 1-hour Drive of ATCs in the US (2020, 2025)

Entire US



	LBCL		FL		MCL		B-ALL		MM	
Mean (95% CI)	2020	2025	2020	2025	2020	2025	2020	2025	2020	2025
NHB	7.4 (6.8–9.0)	7.5 (6.9–9.2)	4.8 (3.5–6.2)	5.1 (3.8–6.6)	4.9 (3.6–6.3)	5.7 (4.2–7.3)	7.0 (5.4–8.6)	7.4 (6.6–9.4)	21.8 (19.3–24.4)	22.7 (20.0–25.3)
HAR	11.5 (9.6–13.6)	13.2 (11.2–15.4)	10.8 (8.9–12.7)	13.3 (11.2–15.5)	8.3 (6.7–10.0)	9.9 (8.1–11.9)	31.0 (28.1–33.8)	33.0 (29.8–36.2)	9.4 (7.6–11.2)	10.6 (8.8–12.6)
NHW	75.5 (72.8–78.1)	72.9 (70.0–75.6)	80.4 (77.9–82.8)	76.7 (74.0–79.3)	83.6 (81.3–85.8)	80.3 (77.7–82.9)	53.8 (50.7–56.8)	49.0 (45.6–52.5)	64.7 (61.7–67.7)	62.0 (58.9–65.0)
NHO	5.6 (4.3–7.0)	6.4 (4.9–8.0)	4.0 (2.8–5.2)	4.9 (3.6–6.2)	3.2 (2.2–4.3)	4.1 (2.8–5.4)	8.3 (6.6–10.0)	10.5 (8.5–12.7)	4.1 (2.9–5.3)	4.7 (3.4–6.1)

Regions Within a 1-hour Drive of CAR T-cell Therapy ATCs



	LBCL		FL		MCL		B-ALL		MM	
Mean (95% CI)	2020	2025	2020	2025	2020	2025	2020	2025	2020	2025
NHB	9.8 (8.0–11.7)	9.9 (8.1–11.8)	6.4 (5.0–8.0)	6.9 (5.3–8.5)	6.7 (5.3–8.2)	7.6 (6.0–9.5)	8.7 (7.2–10.4)	9.3 (7.3–11.4)	27.8 (25.0–30.5)	28.6 (25.8–31.5)
HAR	12.7 (10.7–14.8)	14.5 (12.3–16.7)	12.1 (10.1–14.1)	14.8 (12.7–17.1)	9.4 (7.8–11.0)	11.1 (9.2–13.1)	32.6 (30.0–35.1)	34.2 (31.2–37.1)	9.9 (8.1–11.8)	11.2 (9.2–13.2)
NHW	70.4 (67.6–73.2)	67.6 (64.6–70.5)	76.3 (73.7–78.9)	72.1 (69.2–75.0)	79.8 (77.4–82.0)	76.0 (73.2–78.7)	48.7 (46.0–51.5)	44.0 (40.8–47.2)	57.3 (54.3–60.4)	54.6 (51.4–57.6)
NHO	7.0 (5.5–8.7)	8.0 (6.4–9.8)	5.1 (3.8–6.5)	6.2 (4.8–7.8)	4.2 (3.1–5.3)	5.3 (3.9–6.7)	10.0 (8.4–11.6)	12.6 (10.5–14.8)	4.9 (3.7–6.3)	5.7 (4.3–7.2)

ATC, authorized treatment center; B-ALL, B-cell acute lymphoblastic leukemia; CAR, chimeric antigen receptor; FL, follicular lymphoma; HAR, Hispanic, all races; LBCL, large B-cell lymphoma; NHB, Non-Hispanic Black; NHO, Non-Hispanic Other; NHW, Non-Hispanic white; MCL, mantle cell lymphoma; MM, multiple myeloma.

- Corresponding to the projected increases in the general US population's proportions of HAR and NHB, proportions of NHB and HAR patients aged ≥20 years were projected to increase from 2020-2025 across all indications (**Figure 6**)
  - The opposite trend was observed in NHW patients with proportions projected to decline from 2020-2025 across all indications
- High proportions of NHB patients compared with the general population were observed in MM
  - These proportions are expected to increase from 27.8% in 2020 to 28.6% in 2025 for regions within a 1-hour drive of ATCs and 21.8% to 22.7% for the entire US
- High proportions of HAR patients compared with the general population were also seen in B-ALL
  - These proportions are expected to increase from 32.6% in 2020 to 34.2% in 2025 for regions within a 1-hour drive of ATCs and from 31.0% to 33.0% for the entire US, respectively
- The proportions of NHB, HAR, and NHO patients were higher in regions within a 1-hour drive of ATCs compared with the entire US
  - Conversely, the proportions of NHW patients were lower within a 1-hour drive of ATCs compared with the entire US

CONCLUSIONS

- This is the first study to project trends in patients with B-cell malignancies by race and ethnicity that may receive CAR T-cell therapy using a geographical information systems approach while considering proximity to CAR T-cell therapy ATCs
- The results suggest a consistent trend toward increasing proportions of minority patients in forthcoming years and higher proportions of minority patients in regions close to CAR T-cell therapy ATCs, consistent with the projected increases of NHB and HAR population in the US
- A limitation of this study is the lack of investigation into other factors that may impact access to CAR T-cell therapies for patients of minority race/ethnicity
  - Further evaluation of these factors are needed, which may include differential insurance coverage, commuting accessibility to ATCs, impact of COVID-19, burden of comorbidities, systemic racism, medical distrust, patient-physician relationship, and other potential systemic healthcare inequities

REFERENCES

1. Hauer MC. *Sci Data*. 2019;6:190005.
2. DeSantis CE, *et al. CA Cancer J Clin*. 2019;69:211–233.
3. Miller KD, *et al. CA Cancer J Clin*. 2021;71:466–487.
4. Zavala VA, *et al. Br J Cancer*. 2021;124:315-332.
5. Alpazcay R, *et al. JAMA Netw Open*. 2022;5:e2228877.
6. NCI SEER Cancer Stat Facts: NHL-DLBCL. Accessed January 2, 2024. https://seer.cancer.gov/statfacts/html/dlbcl.html
7. NCI SEER Cancer Stat Facts: NHL-FL. Accessed January 2, 2024. https://seer.cancer.gov/statfacts/html/follicular.html
8. Teras LR, *et al. CA Cancer J Clin*. 2016;66:443–459.
9. NCI SEER Cancer Stat Facts: ALL. Accessed January 2, 2024. https://seer.cancer.gov/statfacts/html/all.html
10. NCI SEER Cancer Stat Facts: Myeloma. Accessed January 2, 2024. https://seer.cancer.gov/statfacts/html/mulmy.html
11. YESCARTA® (axicabtagene ciloleucel) prescribing information. Kite, a Gilead Company; 2023.
12. TECARTUS® (brexucabtagene autoleucel) prescribing information. Kite, a Gilead Company; 2023.
13. Awidi M, *et al. JCO Oncol Pract*. 2021;17:265-271.
14. Goldfinger M, *et al. Blood*. 2022;140(Suppl 1):9520–9522.

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DISCLOSURES

MG has nothing to disclose; **ZHH** is an employee of Kite and owns stock in Gilead Sciences, Inc; **APR** has nothing to disclose; **TS** has received consulting fees from AstraZeneca, Pharmacyclics, Celgene, Kite, and BeiGene; has been paid to participate in speakers' bureaus by Pharmacyclics, Janssen, AstraZeneca, and Seagen; and has received research funding from Kite, Genentech, and Gilead Sciences; **LL** has received consulting fees from Bristol Myers Squibb, Kite, and Incyte; has received research funding from Kite, Genentech, Bristol Myers Squibb, Calibr, Janssen, and Gilead Sciences; **DB** is an employee of Delta Hat Limited; **MP** has received consulting fees from Kite, Gilead Sciences, Inc, Bristol Myers Squibb, Janssen, and GlaxoSmithKline; **EB** is an employee of Kite and owns stock in Gilead Sciences, Inc; **MES-J** has received consulting fees from Kite, Gilead Sciences, Inc, Bristol Myers Squibb, Janssen, and GlaxoSmithKline; has received royalties from Gilead; **SS** is an employee of Kite, owns stock in Gilead Sciences, Inc, and has been paid to participate in speakers' bureaus by Amgen; **LS** is an employee of Kite and owns stock in Gilead Sciences, Inc; **FS** is an employee of Kite and owns stock in Gilead Sciences, Inc; **HX** is an employee of Kite and owns stock in Gilead Sciences, Inc; **FLL** has received consulting fees from ecoRI, Emerging Therapy Solutions, Gerson Lehman Group, Allogene, Amgen, bluebird bio, Bristol Myers Squibb/Celgene, Calibr, Iovance, Kite, Janssen, Legend Biotech, Novartis, Umoja, Cowen, Cellular Biomedicine Group, GammaDelta Therapeutics, Wugen; has received research funding from Kite, Allogene, and Novartis; and has institutional patents.