Geographic Disparities in Sinonasal Masses: A Single Institution Experience

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Background

- Sinonasal masses (SNM) are rare tumors, accounting for 3-5% of all head and neck malignancies.[1]

- SNMs represent vast heterogeneity in their histologic composition and present insidiously with an aggregate 5-year survival of about 50%.[2,3]

- Patients with SNMs from resource-limited backgrounds experience worse outcomes due to a complex interplay of factors at both the individual and health system levels.[4-6]

- Despite these known associations, there are few studies in the current literature that investigate the impact of geographic disparities (GD) on SNMs.

Objectives

- To identify, describe, and understand geographic disparities in the presentation, treatment, and outcomes of patients with SNMs in southern Arizona (SA).

Methods

- Retrospective cohort study of 86 patients with SNMs treated at the University of Arizona (UA) from Jan 2010 to Dec 2024.

- 2023 National Center for Health Sciences Urban-Rural Classification Scheme was adapted for SA to stratify patients into three groups by residential location population size:[7,8]
  - Urban (UL): ≥ 250,000 population
  - Suburban (SL): 50,000 – 249,999 population
  - Rural (RL): ≤ 49,999 population

- Descriptive statistics included mean ± standard deviation for normally distributed continuous variables, median with interquartile range for non-normally distributed data, and frequencies with percentages for categorical variables.

- Multivariable linear regression (MLR) models were used to evaluate the impact of geographic location (GL) on tumor size, diagnostic delay (DD), and 5-year survival, adjusted for age, sex, and histology. Sensitivity analyses included stratification by tumor histology and exclusion of potential outliers in DD and 5-year survival.

- All statistical analyses were conducted using Stata BE 17.0 (StataCorp LLC, College Station, TX). A p-value of <0.05 was considered statistically significant.

Results

Table 1: Study Population and Demographics

Characteristic	Urban (n=41)	Suburban (n=12)	Rural (n=33)	p-value
Age, years				
Mean ± SD	63.5±15.1	55.7±20.7	64.6±14.4	0.28
Gender, n (%)				
Male	25 (60.9%)	8 (75.0%)	22 (66.7%)	0.14
Race, n (%)				
White	29 (70.7%)	10 (83.3%)	25 (75.8%)	0.89
Black	2 (4.88%)	0 (0.00%)	1 (3.03%)	
Asian American and Pacific Islander	1 (2.44%)	0 (0.00%)	0 (0.00%)	
More than one/other	1 (2.44%)	0 (0.00%)	1 (3.03%)	
Ethnicity, n (%)				
Hispanic/Latino	8 (19.5%)	2 (16.7%)	6 (18.2%)	0.97
Marital Status, n (%)				
Married/Civil Partner	17 (41.5%)	6 (50.0%)	24 (72.7%)	0.17
Insurance Type, n (%)				
Medicare	21 (51.2%)	4 (33.3%)	23 (69.7%)	0.07
Private	17 (41.5%)	5 (41.7%)	10 (30.3%)	0.58
Medicaid	5 (12.2%)	3 (25.0%)	1 (3.03%)	0.09
VA/Tricare	6 (14.6%)	2 (16.7%)	5 (15.2%)	0.99
Uninsured/Unknown	1 (2.44%)	0 (0.00%)	1 (3.03%)	0.84

Table 2: Select Data from Comorbidity Profiles and Lifestyle Factors

Characteristic	Urban (n=41)	Suburban (n=12)	Rural (n=33)	p-value
Comorbidities, n (%)				
Diabetes Mellitus	5 (12.2%)	0 (0.00%)	12 (36.4%)	**0.006**
Smoking Status, n (%)				
Never	25 (61.0%)	7 (58.3%)	15 (45.5%)	**0.044**
Former	16 (39.0%)	3 (25.0%)	11 (33.3%)	
Current	0 (0.00%)	2 (16.7%)	7 (21.2%)	

Table 3: Radiation Therapy (RT) Utilization

RT Treatment	Urban	Suburban	Rural	Total
Y	34	9	19	62
N	7	3	14	24
Total	41	12	33	86

p=0.047

Supplemental Information

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Figure 1: TNM Staging by Location

(A) T-staging, with all geographic groups showing predominantly advanced local disease (T3-T4).
(B) M and N staging, with all groups demonstrating predominantly M0 disease. N0 staging varied by location.

Figure 2: Delays in Presentation and Diagnosis of Sinonasal Masses

Kaplan-Meier curves illustrating DDs (p=0.021). (A) ULs exhibited delays of 500-1000 days vs. RLs (>3,000 days). (B-C) Racial/ethnic patterns in ULs and RLs.

Figure 3: 5-Year Survival for All Sinonasal Masses

Kaplan-Meier survival curves for SNMs (p<0.001). (A) Overall survival with 50-60% 5-year survival for SLs and RLs vs. 30-40% for ULs. (B-D) Racial/ethnic survival patterns by location.

Discussion

Study Population and Demographics
- No differences in GLs by age, sex, race, or ethnicity, strengthening the inference that differences in outcomes are more likely due to GL than demographic confounders.

Comorbidity Profiles and Risk Factors
- Patients from RLs had a higher prevalence of DM **(p=0.006)** and tobacco exposure **(p=0.044)**, reflecting geographic inequities and influencing DDs by masking symptoms.

Tumor Characteristics and Histologic Diversity
- Advanced tumor stage at diagnosis was high across all GLs, illustrating the diagnostic challenge posed by the histologic diversity and nonspecific presentation of SNMs.

Delays in Presentation and Diagnosis
- MLR analysis demonstrated that ULs were independently associated with a 205-day shorter diagnostic interval compared to RLs (p=0.021).

- The Three Delays Framework concisely illustrates the complex barriers to surgery as delays in seeking, reaching, and receiving care. Any of these factors may prevent timely treatment.

Treatment Access and Utilization Patterns
- RT use varied significantly across GLs (82.9% ULs vs 57.6% RLs; **p=0.047**), possibly due to limited access to RT facilities, transportation difficulties, financial constraints, and challenges in coordinating multidisciplinary care.

- No difference in the use of surgical resection, chemotherapy, or immunotherapy across GLs.
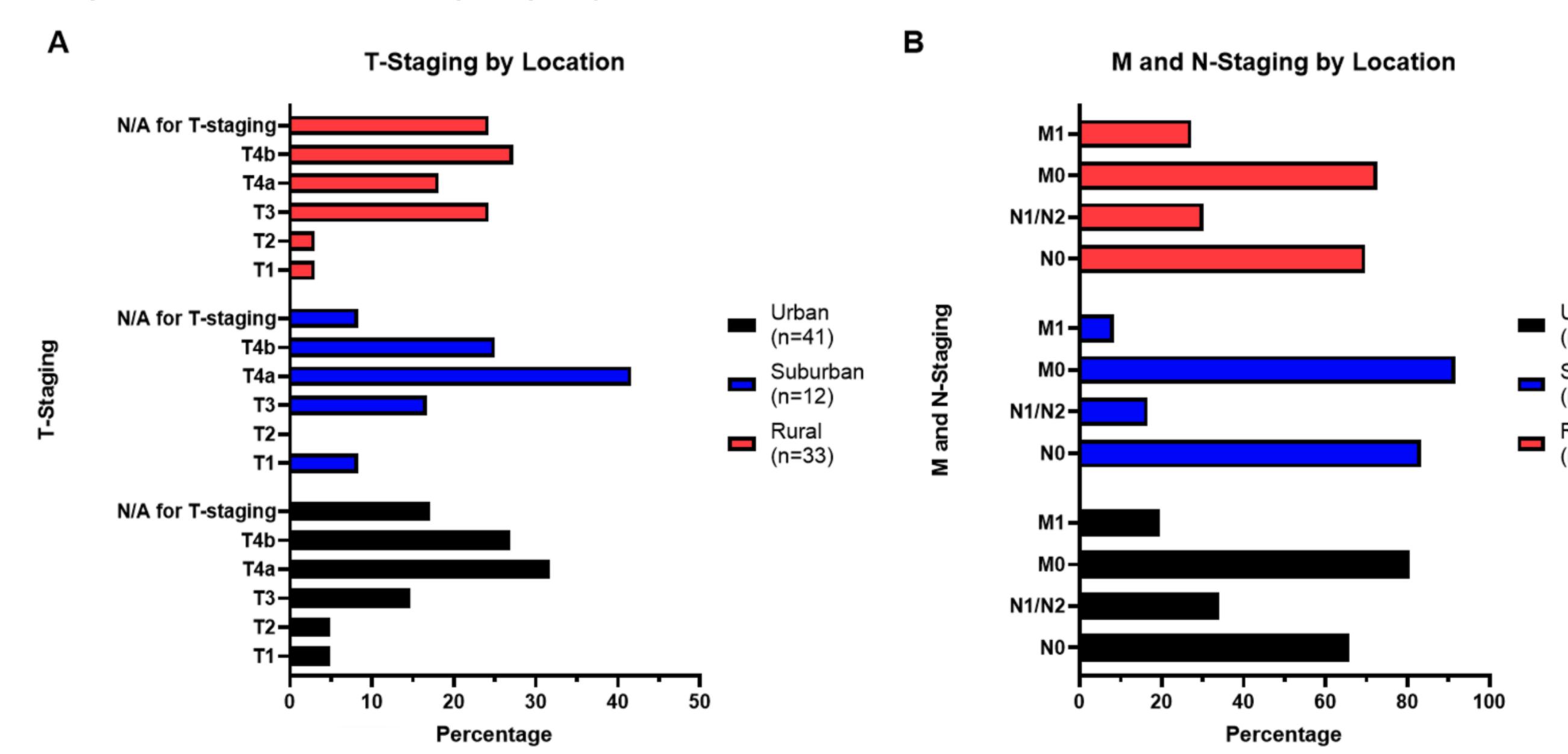
Survival Outcomes and Prognosis
- No difference in overall mortality by GL.

- Cox proportional hazards analysis revealed profound racial disparities in survival with White patients across all GLs exhibiting 98-99% risk of death reduction vs Black patients from RLs (Likelihood ratio $\chi^2(6)$ = 24.21, **p<0.001**).

- Three (3.49%) patients identified as Black. Black people represent 4.24% of the population of SA.[9] Our cohort accurately represents location-specific demographics. However, the small number of Black patients limits conclusions from comparing racial groups.
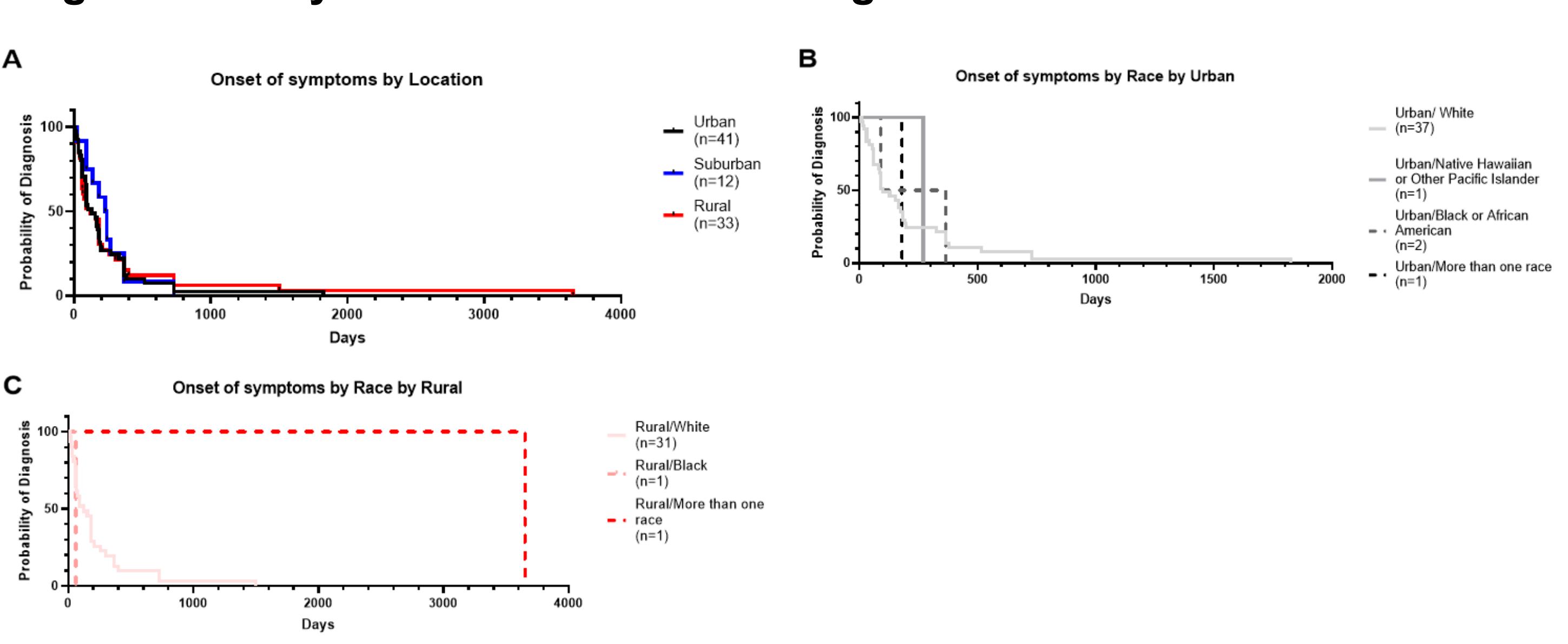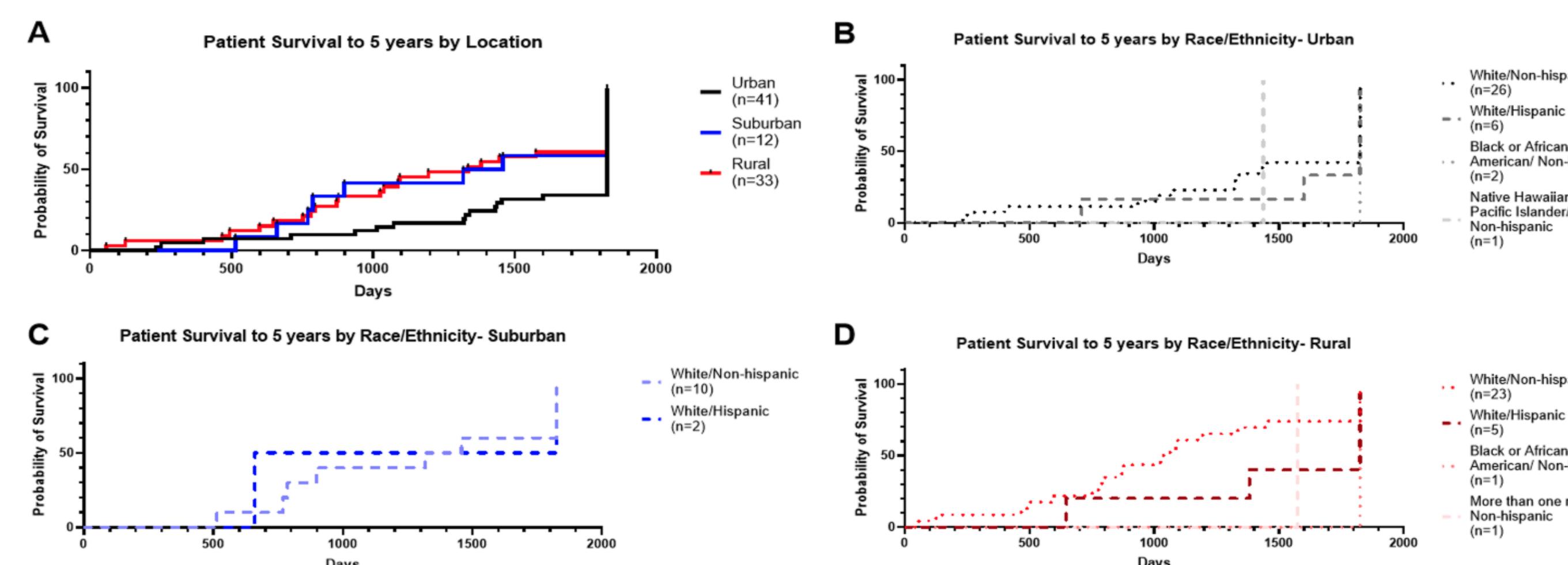
Conclusions

- This study identifies significant GDs in DM, tobacco exposure, DDs, and RT use among patients with SNMs.

- Patients from RLs experience substantially greater DDs and less RT utilization.

- Overall survival was similar across GLs while racial and ethnic disparities in hazard of death were evident.

- These findings illustrate the importance of addressing GDs through enhanced PCP education, novel models for care delivery, and reducing systemic barriers to care.

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