

GEOGRAPHIC DISPARITIES IN HEAD AND NECK CANCER SURVIVAL IN UPSTATE NEW YORK, 2021

Saiganesh Ravikumar, MPH^{1,2}, Nicolas J. Casellas, MD¹, Shalini Shah, BA², Katherine Rieth, MD, MA, MPH¹

¹Department of Otolaryngology – Head and Neck Surgery, University of Rochester Medical Center, Rochester, NY, USA, ²University of Rochester School of Medicine and Dentistry, Rochester, NY, USA.

Contact:

Saiganesh Ravikumar, MPH
Medical Student

Saiganesh_ravikumar@urmc.rochester.edu

BACKGROUND

- Disparities in survival for patients with HNC have been well documented in literature, and include race, socioeconomic status of patient, as well as the overall socioeconomic status of the neighborhood in which the patient resides. However, the impact of rural residence on HNC outcomes are mixed in the literature.
- The aim of our study is to identify whether geographic characteristics, as measured by urban-rural residence and distance to care center, influence 5-year head and neck cancer survival in Upstate New York.

METHODS

Sample

- We examined patients who had a diagnosis of cancer of the head and neck and received treatment at our tertiary academic medical center between 3/11/11 – 10/31/2019.
 - Patients were excluded if they had another primary cancer simultaneously as the HNC diagnosis or pursued palliative treatment.
 - Data beyond 5 years after initial date of diagnosis was censored.
 - The primary outcome examined was 5-year all-cause mortality, with duration of survival calculated as number of days since initial date of diagnosis.
 - ZIP codes of patient residence were assigned rural-urban commuting area (RUCA) scores from US Department of Agriculture 2010 dataset, which classifies ZIP codes based on population size and commuting flow²⁴, and subsequently stratified into one of four degrees of urban-rural defined by the University of Washington.
- Statistical analysis
- Chi-squared, fisher's exact, and ANOVA tests were utilized to identify characteristics unique to patient populations based on urban-rural residence.
 - Spearman correlations were utilized to identify characteristics associated with greater stage at initial presentation.
 - Multiple Cox proportional hazards models were utilized to identify characteristics associated with greater 5-year survival after adjusting for confounders.
 - Kaplan-Meier curves and log-rank tests were utilized to depict survival curves and calculate differences in OS.

RESULTS

- A total of 670 patients with a total of 2,096 person years of follow-up were included for analysis.
- A total of 128 deaths (19%) in this population over our study period.
- Of the 670 patients, 485 (73%) were classified as residing in urban-focused ZIP codes, 96 (14%) were classified as living in large rural city/town (micropolitan) focused ZIP codes, 52 (8%) were classified as residing in small rural town-focused ZIP codes, and 37 (6%) were classified as residing in isolated small rural town focused ZIP codes.
- Greater distance between patient ZIP code of residence and ZIP code of our academic medical center was correlated with more advanced stage of presentation for all cancers combined ($p = 0.11$, $p < 0.01$), as well as for cancers of oral cavity ($p = 0.15$, $p = 0.01$), and cancers of the larynx ($p = 0.21$, $p < 0.01$) when assessed separately.
- There was no significant association with distance from care center and 5-year survival in this model (HR = 0.996, $p = 0.11$).
- Patients have significantly lower 5-year survival when living in isolated small rural town focused ZIP codes (HR = 2.13, $p = 0.020$) or in small rural town focused zip codes (HR 2.02, $p = 0.019$) compared to urban focused zip codes (HR = 1, reference group).

RESULTS

Table 1. Main Effects of Demographic & Clinical Characteristics on HNC 5-Year Survival

	Multivariate ¹ HR (95%CI)	P-Value / P-Trend
Age at Diagnosis		
<40	1 (Reference)	
41-60	2.2 (0.50 - 9.6)	
61-80	3.0 (0.7 - 13.0)	
>81	6.3 (1.4 - 28.7)*	<0.01*
Race		
Black	0.63 (0.21 - 1.9)	0.4
Other	0.95 (0.12 - 7.6)	0.4
White	1 (Reference)	---
Ethnicity		
Hispanic or Latino	1.1 (0.28-3.9)	0.9
Not Hispanic or Latino	1 (Reference)	---
Unknown	1.0 [0.45 - 2.3]	0.9
Sex		
Male	0.9 (0.61 - 1.3)	0.6
Female	1 (Reference)	---
Stage at Diagnosis		
I	1 (Reference)	---
II	3.06 (1.4 - 6.9)	< 0.01*
III	4.9 (1.9 - 13)	< 0.01*
IV	6.9 (2.8 - 17)	< 0.01*
Unknown	2.9 (0.99-8.2)	0.2
Cancer Site		
Hypopharynx	1.1 (0.44 - 2.8)	0.8
Larynx	0.70 (0.42 - 1.1)	0.2
Major salivary glands	0.70 (0.28 - 1.8)	0.5
Nasopharynx	0.75 (0.16 - 3.4)	0.7
Oral cavity	1 (Reference)	---
Oropharynx	0.44 (0.24 - 0.80)	< 0.01*
Other	1.7 (0.47 - 6.1)	0.4
Unknown	1.4 (0.34 - 5.6)	0.7
Treatment		
CT ² and RT ³	1.0 (0.58 - 1.8)	0.9
Only RT	1.6 (0.94 - 2.9)	0.08
Only surgery	1 (Reference)	---
Surgery and RT	1.0 (0.54 -1.9)	0.9
Surgery, CT, and RT	2.0 (1.05 - 3.7)	0.04*
Unknown	1.8 (0.72 - 4.6)	0.2
HPV Status		
Positive	1 (Reference)	---
Negative	3.5 (1.5 - 8.0)	< 0.01*
Unknown/Not Tested	1.5 (0.69 - 3.3)	0.3
Type 2 Diabetes		
	0.87 (0.56 - 1.4)	0.5
Smoking Pack Years		
Never Smoker	1 (Reference)	---
< 20	2.5 (1.3 - 4.6)	< 0.01*
21-40	1.9 (0.93 - 4.0)	0.08
41-60	1.6 (0.73 - 3.7)	0.2
>60	2.5 (1.1 - 5.4)	0.03*
Unknown	2.5 (1.4 - 4.4)	< 0.01*
Hypertension		
	1.3 (0.87 - 1.9)	0.2

¹Adjusted for all other covariates in model, ²CT = Chemotherapy, ³RT = Radiation Therapy

GEOGRAPHICAL DISTRIBUTION OF HEAD AND NECK CANCER, UPSTATE NEW YORK

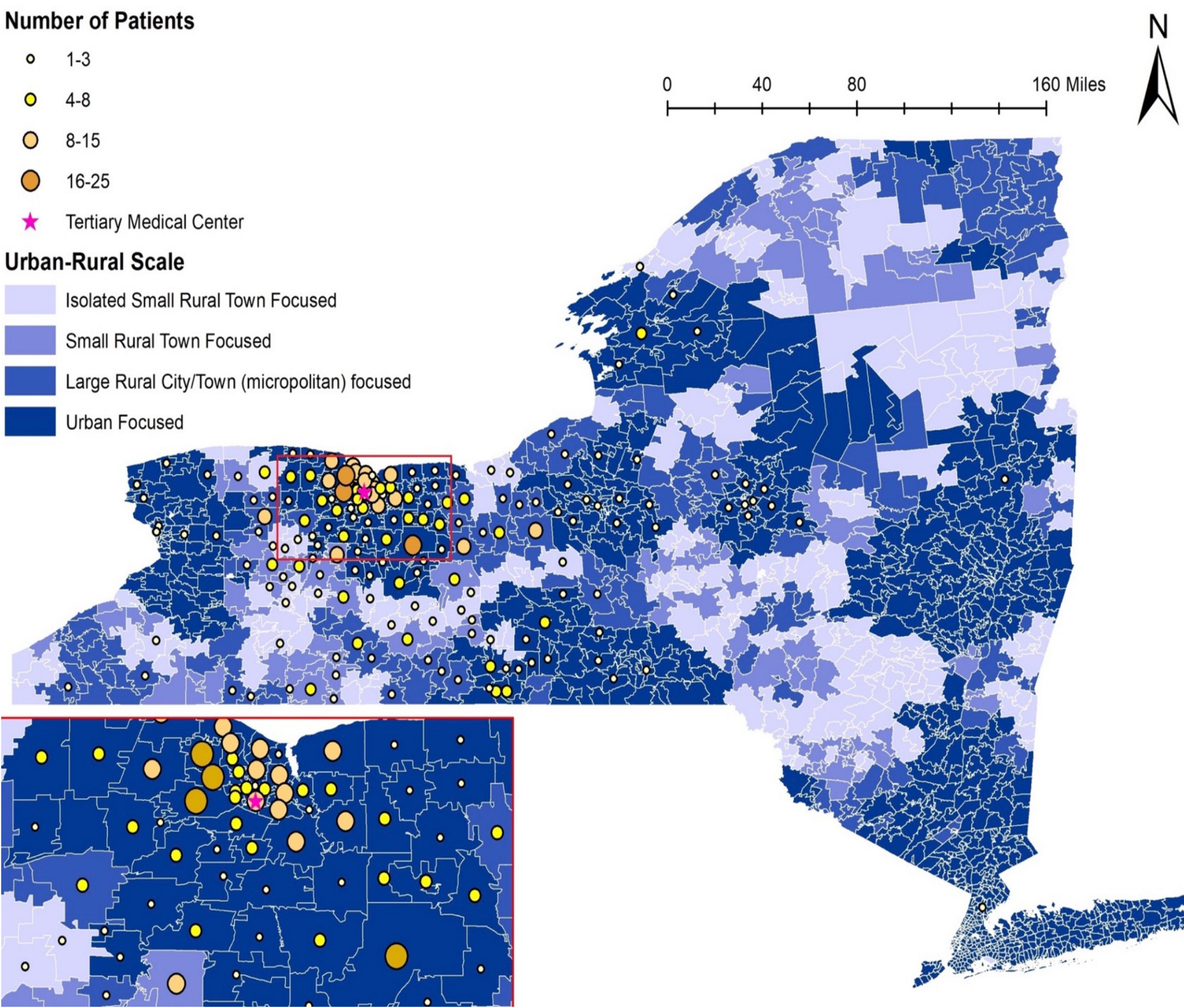


Table 2. Main Effects of Geographical Residence on HNC Five-year Survival

	HR	P-Value
Distance to Care (Miles)¹		
	0.996 (0.991 - 1.0006)	0.11
Urban-Rural²		
Isolated Small Rural Town focused	2.13 (1.13 - 4.03)	0.020*
Small Rural Town focused	2.02 (1.13 - 3.62)	0.019*
Large Rural City/Town (micropolitan) focused	1.03 (0.56 - 1.12)	0.92
Urban focused	1 (Reference)	---

¹Distance to care adjusted for all demographic, clinical, and comorbidity covariates.

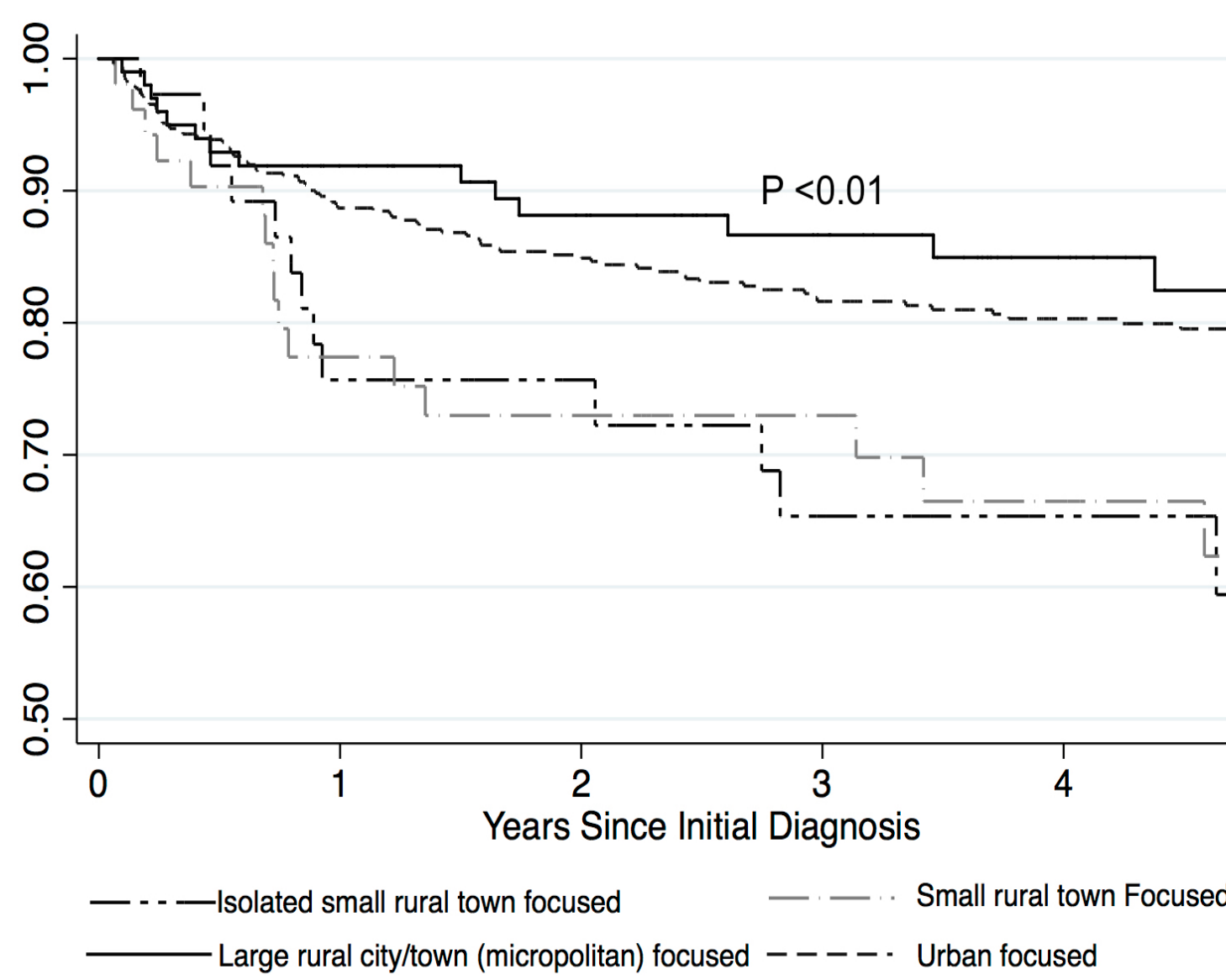
²Urban-rural adjusted for all demographic, clinical, and comorbidity covariates as well as distance to care.

CONCLUSIONS

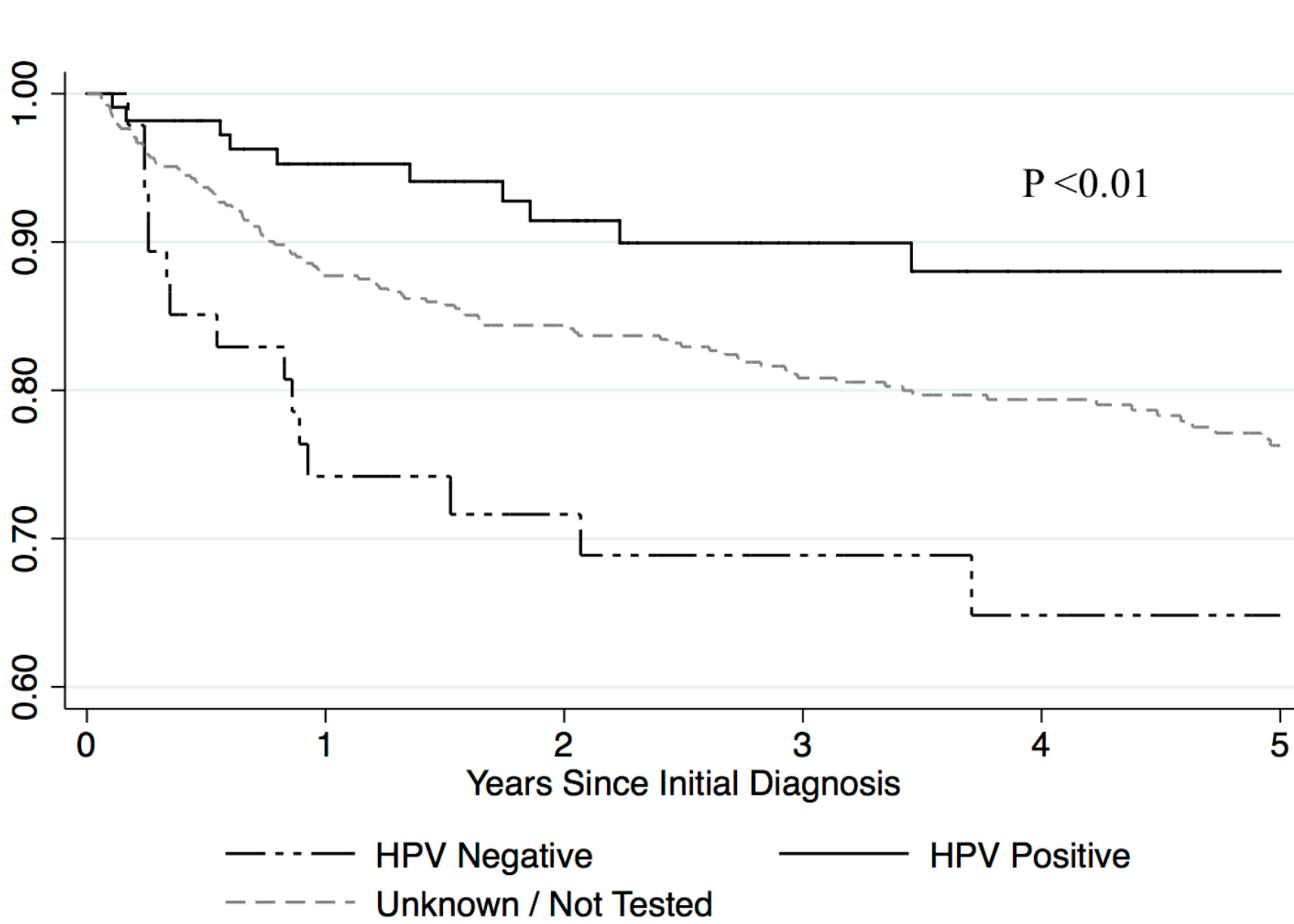
- Our study shows that residing in areas with greater degrees of rurality is associated with lower 5-year OS among HNC patients.
- Our data support that greater distance to care is likely a barrier to initial clinical presentation, given the significant correlation with stage at presentation for all cancers combined.
- However, our analysis shows that even after adjusting for distance to our care center, residence in ZIP codes classified as either small rural town focused or isolated small rural town focused was associated with lower 5-year OS. Therefore, it is unlikely that distance to care alone is sufficient to explain this disparity in outcomes by urban-rural residence for our patient population.
- Additionally, we did not find a significant association between greater distance to care and worse 5-year OS after adjusting for confounding variables, suggesting that greater distance to care may not be a prognostic factor once patients enter care.

OVERALL SURVIVAL OF HEAD AND NECK CANCER BY

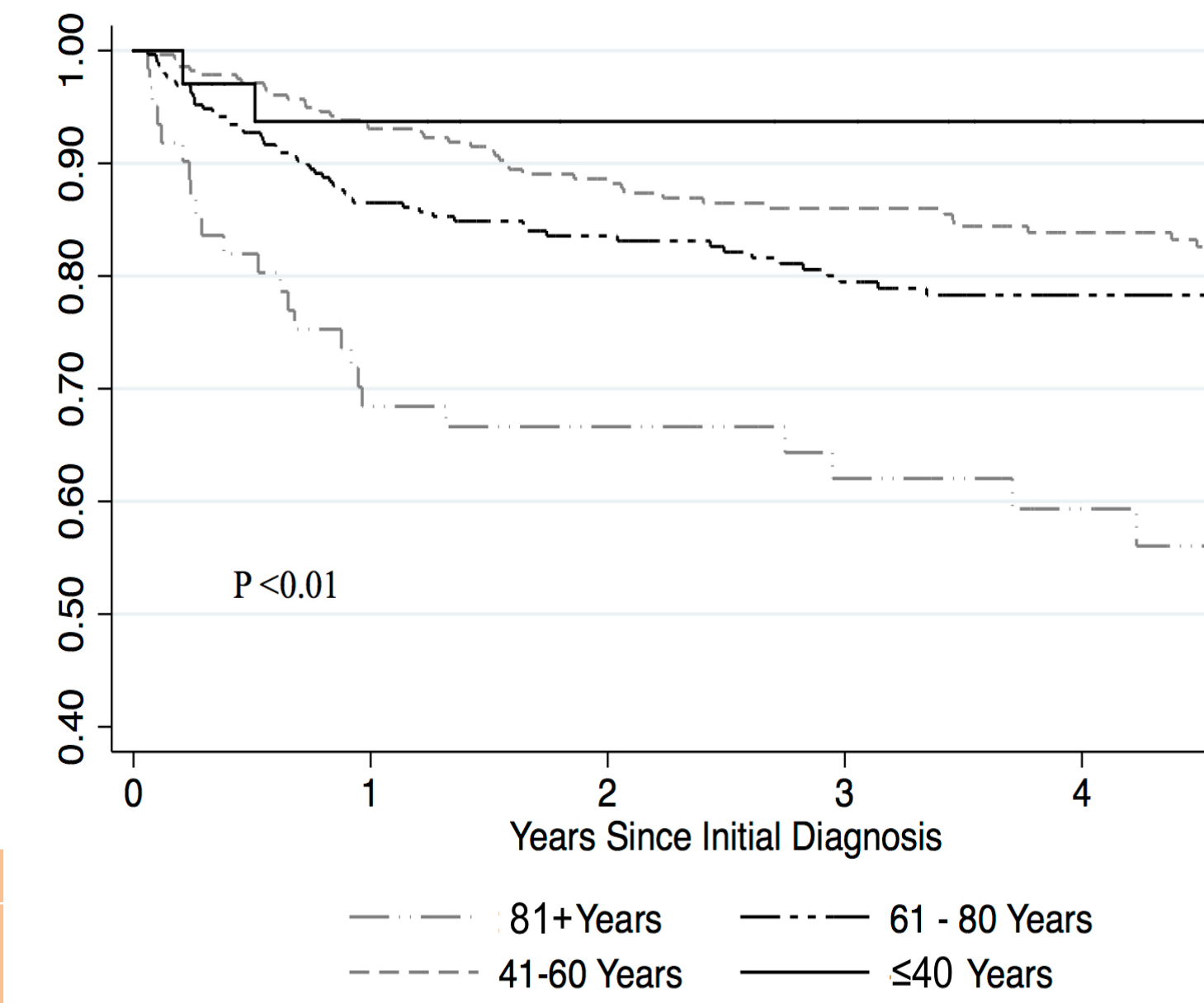
A. URBAN-RURAL CLASSIFICATION



B. HUMAN PAPILLOMA VIRUS STATUS



C. AGE AT DIAGNOSIS



D. DISTANCE TO CANCER CARE CENTER

