

The Effects of Rurality on Adjuvant Radiation Therapy Compliance and Survival Outcomes in HNSCC Patients



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Introduction

- Advanced-stage HNSCC is treated with primary surgical resection and adjuvant radiation therapy (adj RT) +/- chemotherapy.¹
- Incomplete course of adj RT confers worse survival outcomes.²⁻³
- "Rural" is defined as >400 square miles with population density of ≤35 people per square mile with census codes 2-3 in metropolitan counties by Department of Health Resources and Service Administration, which accounts for 19.3% of the population.⁴
- No consistent "rural" definition in the literature.
- Rurality has been shown to confer worse outcomes in many types of cancer.⁵⁻⁸
- Rurality is associated with delayed presentation in HNSCC.⁹⁻¹¹
- There is mixed literature on rurality's effects on HNSCC survival.¹²⁻¹⁴
- There is a paucity of data investigating how rurality and distance from treatment centers affects treatment compliance and survival outcomes in HNSCC.¹⁵
- The southeastern US has a significant proportion of patients living in rural areas.¹⁶

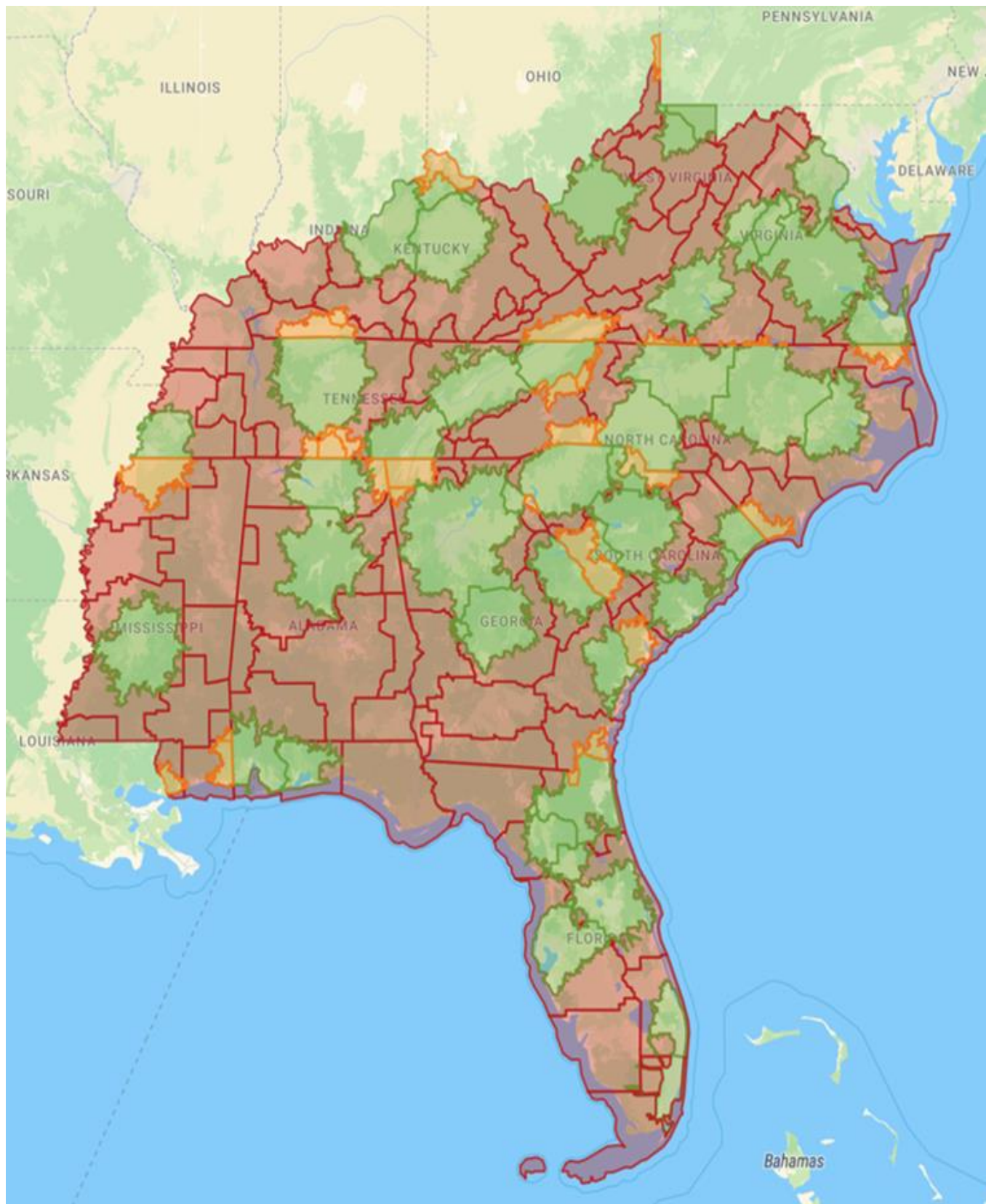


Figure 1. Designated Market Areas outline in bold, color-coded to represent drive times to the closest Level 1 trauma center (L1TC). Green = within 1-hour drive of in-state L1TC. Yellow = within a 1-hour drive time of out-of-state L1TC. Red = >1 hour away from any L1TC. (16)

Methods

- Retrospective chart review, 2010-2023 (N = 171)
- Inclusion criteria: 18+ years old, primary surgical resection for HNSCC at Atrium Health Wake Forest Baptist, adj RT at any facility
- Exclusion criteria: neoadjuvant treatment, adj RT not indicated
- Travel distance was calculated in miles using online mapping from patient's home address to patient's adj RT facility.
- Home geography determined by searching patient's home address in HRSA "Find Shortage Areas by Address" calculator.¹⁷
- Adj RT compliance determined by the percent of completed adj RT:
 - dose completed / dose prescribed
- "Complete adj RT" defined as completing 100% of the prescribed adj RT dose.
- "Incomplete adj RT" defined as completing <100% of the prescribed adj RT dose.

- Statistical analysis completed using SAS software.

Abbreviations

- HNSCC = head & neck squamous cell carcinoma
- Adj RT = adjuvant radiation therapy
- HPSA = Health Professional Shortage Area; areas with a shortage of primary, dental, or mental health care providers.
- MUA = Medically Underserved Area; areas and populations with lack of access to primary care services

Table 1. Patient characteristics.

Patient Characteristic	Frequency	Percent	Patient Characteristic	Frequency	Percent
Primary Site			Adj RT dose		
Larynx	29	17.5	Complete (100%)	140	81.9
Oral Cavity	73	44.2	Incomplete (<100%)	31	18.1
Base of Tongue	15	9.1			
Oropharynx	38	23.0			
Hypopharynx	5	3.0			
Salivary gland	5	3.0			
Pathologic T stage			Alive at 1 year		
0	1	0.6	Yes	143	83.6
1	25	14.8	No	24	14.0
2	52	30.8	Unknown	4	2.3
3	35	20.7			
4	56	33.1			
Pathologic N stage			Alive at 5 years		
0	29	17.0	Yes	80	46.8
1	26	15.2	No	148	86.5
2	79	46.2	Unknown / Not applicable	23	13.4
3	37	21.6			
Travel distance			Geography		
<20 miles	77	45.8	MUA	7	4.1
≥20 miles	91	54.1	HPSA	81	47.7
			Both	63	37.1
			Neither	19	11.1

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Results

Table 2. Multivariate analysis using forced variables (subsite, pT, pN, distance, home geography, smoking status, HTN, HLD, T2DM, COPD, mood disorder, gtube, age)

*Predictors of receiving 100% adj RT dose

**Predictors of being alive at 1 year post op

***Predictors of being alive at 5 years post op

Predictor	Odds Ratio	95% Confidence Interval	P-value
Travel distance >20 miles*	0.341	0.116 - 1.00	0.051
Geography*			
HPSA	0.560	0.087 - 3.59	0.601
MUA	0.891	0.039 - 20.1	0.839
Both	0.555	0.080 - 3.87	0.588
Increasing pN stage*	0.63	0.40 - 0.98	0.038
Travel distance >20 miles**	0.212	0.044 - 1.028	0.054
Geography**			
HPSA	0.045	0.002 - 0.906	0.028
MUA	0.556	0.004 - 69.0	0.651
Both	0.211	0.011 - 4.405	0.738
Complete adj RT course**	10.9	2.16 - 55.6	0.004
Increasing pT stage**	0.502	0.254 - 0.992	0.047
Increasing age**	0.898	0.827 - 0.974	0.010
Hypertension**	8.55	1.42 - 50.0	0.019
Travel distance >20 miles***	0.600	0.184 - 1.953	0.396
Geography***			
HPSA	0.485	0.068 - 3.43	0.461
MUA	0.703	0.026 - 19.2	0.990
Both	0.758	0.099 - 5.77	0.911
Complete adj RT course***	9.43	1.79 - 50.0	0.008
Increasing age***	0.939	0.894 - 0.987	0.013
Hyperlipidemia***	5.92	1.17 - 30.3	0.032
G-tube***	0.342	0.114 - 1.02	0.055

Discussion

- Complete adj RT conferred better 1-year and 5-year OS.
- Travel distance >20 miles increased risk of incomplete adj RT course.
- Travel distance >20 miles conferred worse 1-year OS but not 5-year OS.
- Rural home geography did not significantly affect adj RT compliance or 5-year OS.
- HPSA conferred worse 1-year OS.

Conclusions

- Patients traveling >20 miles to adj RT site may need additional support during the first year after surgery to optimize survival outcomes. The risks diminish by 5 years post-op.
- This may be due to the high volume of clinic visits during the first year of treatment.
- Results can help identify at-risk populations.