

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

Joann Bluj, MD<sup>1</sup>; Daiven Sharma, BS<sup>2</sup>; Madison Hinson, BS<sup>2</sup>; Malini Suresh Nair, BS<sup>2</sup>; Ryan Hughes, MD<sup>3</sup>; Ralph D'Agostino Jr, PhD<sup>4</sup>; Joshua Waltonen, MD<sup>1</sup>

<sup>1</sup> Department of Otolaryngology – Head & Neck Surgery, Atrium Health Wake Forest Baptist

<sup>2</sup> Wake Forest School of Medicine

<sup>3</sup> Department of Radiation Oncology, Atrium Health Wake Forest Baptist

<sup>4</sup> Department of Biostatistics and Data Science, Wake Forest School of Medicine

## Introduction

- Advanced-stage HNSCC is treated with primary surgical resection and adjuvant radiation therapy (adj RT) +/- chemotherapy.<sup>1</sup>
- Incomplete course of adj RT confers worse survival outcomes.<sup>2-3</sup>
- "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.<sup>4</sup>
- No consistent "rural" definition in the literature.
- Rurality has been shown to confer worse outcomes in many types of cancer.<sup>5-8</sup>
- Rurality is associated with delayed presentation in HNSCC.<sup>9-11</sup>
- There is mixed literature on rurality's effects on HNSCC survival.<sup>12-14</sup>
- There is a paucity of data investigating how rurality and distance from treatment centers affects treatment compliance and survival outcomes in HNSCC.<sup>15</sup>
- The southeastern US has a significant proportion of patients living in rural areas.<sup>16</sup>

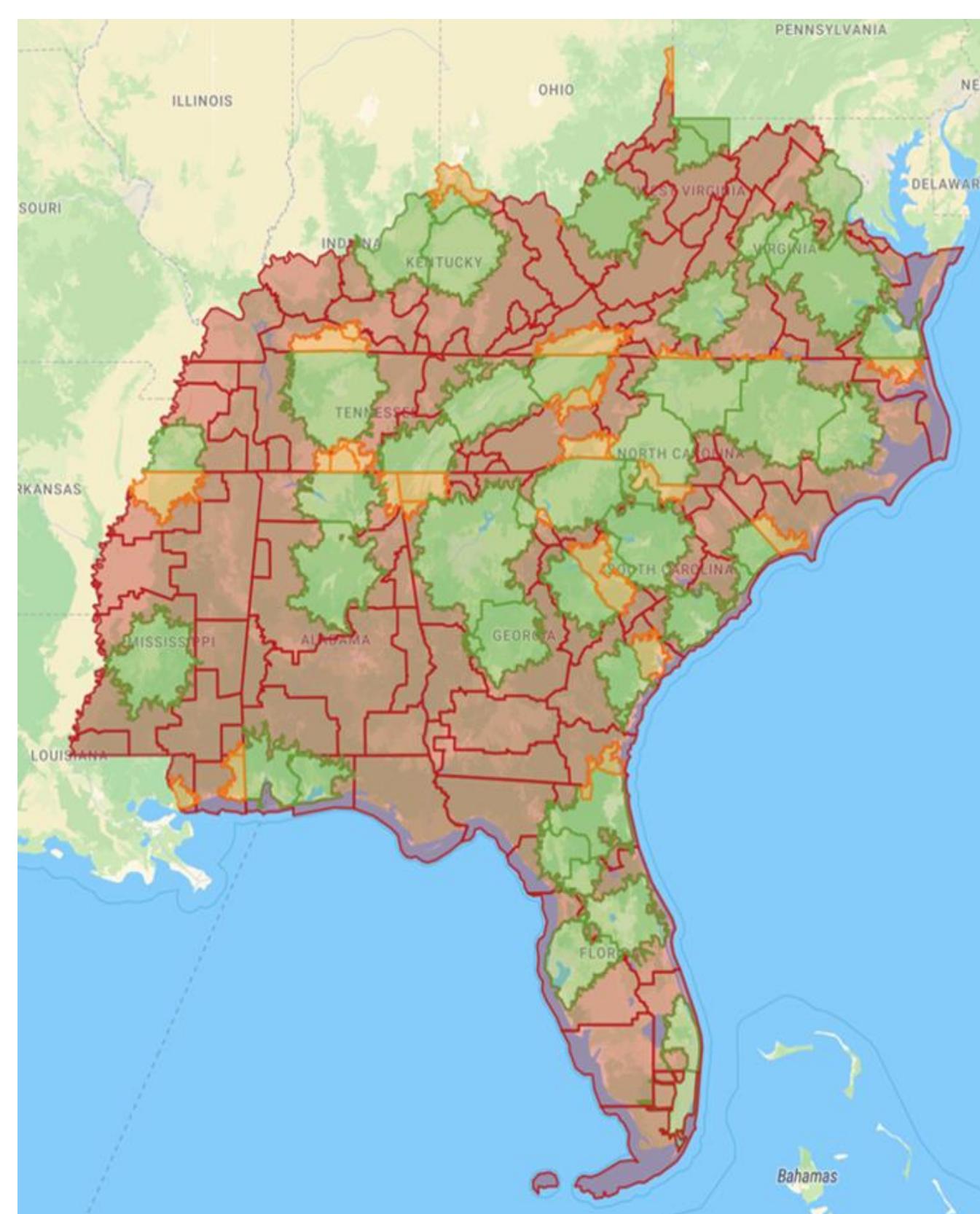


Figure 1. Designated Market Areas outline in bold, color-coded to represent drive times to the closest Level 1 trauma center (L1TC). Green = within 1-hour drive of in-state L1TC. Yellow = within a 1-hour drive time of out-of-state L1TC. Red = >1 hour away from any L1TC.<sup>(16)</sup>

## 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.<sup>17</sup>
- 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
<b>Primary Site</b>			<b>Adj RT dose</b>		
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			
<b>Pathologic T stage</b>			<b>Alive at 1 year</b>		
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			
<b>Pathologic N stage</b>			<b>Alive at 5 years</b>		
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			
<b>Travel distance</b>			<b>Geography</b>		
<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)

Predictor	Odds Ratio	95% Confidence Interval	P-value
Travel distance >20 miles*	0.341	0.116 - 1.00	0.051
<b>Geography*</b>			
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
<b>Geography**</b>			
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
<b>Geography***</b>			
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.