Socioeconomic Disparities in Treatment Access and Survival in Sinonasal Adenoid Cystic Carcinoma: A Population-Based Analysis

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Introduction

- Sinonasal adenoid cystic carcinoma (ACC) is a rare malignancy with complex management often requiring specialized care.
- Sociodemographic factors, including socioeconomic status (SES) and rurality, may influence access to timely treatment and survival outcomes.
- Data examining the impact of SES and residence type on treatment and survival in sinonasal ACC are limited.

Objective

- To evaluate the association of income level and rural versus urban residence with treatment access and survival in patients with ACC using the Surveillance, Epidemiology, and End Results (SEER) database (2000-2022).

Methods

- SEER study of 872 sinonasal ACC patients (2000-2022)
- Identified by ICD-O site codes (sinonasal subsites) and histology 8200/3
- SES was measured using county-level median household income, analyzed by quartiles, with a secondary binary cutoff of <$50,000 versus ≥$50,000
- Rurality categorized as urban (metro) vs rural (non-metro) using Rural-Urban Continuum Codes (RUCC)
- Time to treatment initiation (TTI) defined as the earliest treatment date (surgery, radiation, or chemotherapy) minus date of clinical or pathological diagnosis
- Outcomes:
  - Delayed treatment initiation (>30 days)
  - Receipt of surgery
  - Survival
- Statistical Analyses:
  - Multivariable logistic regression (delay, surgery)
  - Cox regression (survival) adjusted for age, sex, race, subsite, stage
  - Records with unknown values were excluded from analyses

Results

| Demographics	N	%
Male	388	44.5
Female	484	55.5
White	635	72.8
Black	114	13.1
Asian or Pacific Islander	106	12.2
Unknown/Other	17	1.9
Tumor Subsite	**N**	**%**
Nasal cavity	242	27.8
Maxillary sinus	340	39.0
Ethmoid sinus	60	6.9
Nasopharynx (all subsites)	157	18.0
Accessory sinus, NOS	30	3.4
Overlapping accessory sinuses	13	1.5
Sphenoid sinus	29	3.3
Frontal sinus	1	0.1
Age	**N**	**%**
Age <50	246	28.2
Age 50–64	286	32.8
Age ≥65	340	39.0
Income Quartile	**N**	**%**
Income quartile 1	84	9.6
Income quartile 2	199	22.8
Income quartile 3	342	39.2
Income quartile 4	247	28.3
Rurality	**N**	**%**
Rural	77	8.8
Urban	795	91.2
Tumor Stage	**N**	**%**
Localized stage	63	7.2
Regional stage	348	39.9
Distant stage	66	7.6
Stage unknown	395	45.3
Time to Treatment Initiation (TTI)	**N**	**%**
≤30 days (valid n=741)	372	42.7
≥30 days (valid n=741)	369	42.3
Unknown	131	15.0
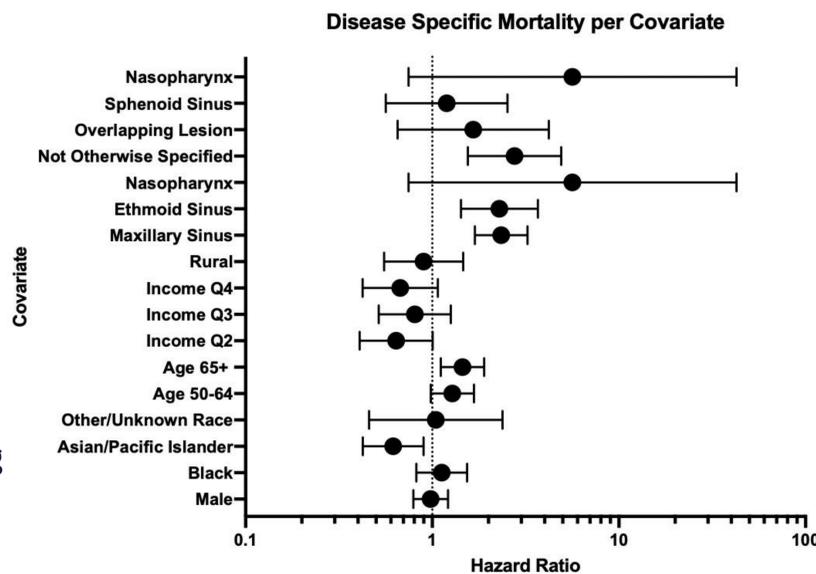
Figure 1. Forest plot of adjusted hazard ratios (95% CI) from a Cox Hazard's model of disease specific mortality. Points show HRs; horizontal bars show 95% CIs; vertical line marks OR=1. Reference categories were nasal cavity for tumor subsite, urban for rurality, income quartile 1 (Q1) for income, age <50 years for age, White for race, and female for sex.
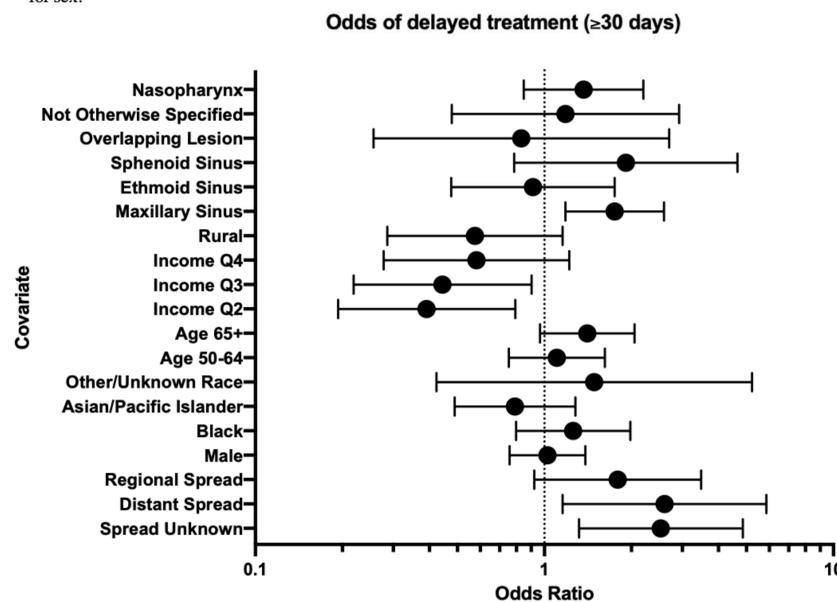

Figure 2. Forest plot of adjusted odds ratios (95% CI) from a binary logistic regression of treatment initiation within 30 days of diagnosis. Points show ORs; horizontal bars show 95% CIs; vertical line marks OR=1. Reference categories were nasal cavity for tumor subsite, urban for rurality, income quartile 1 (Q1) for income, age <50 years for age, White for race, female for sex, and localized for spread.

- Treatment Delay:
  - Higher income quartiles were associated with lower odds of delayed treatment initiation (overall p = 0.009).
  - Rural vs urban residence was not significantly associated with treatment delay (p = 0.106).
- Receipt of Surgery:
  - Higher income quartiles had higher odds of receiving surgery (overall p = 0.039).
  - Rural versus urban residence was not significantly associated with receipt of surgery (p = 0.448).
- Survival:
  - Survival was not significantly associated with income (p = 0.254) or rural versus urban residence (p = 0.494).
  - Income <$50,000 was associated with decreased survival and a 2.53-fold increased hazard of death (95% CI 1.38–4.63; p = 0.003).

Discussion

- Lower income was associated with delayed treatment initiation and lower odds of surgery, suggesting SES-related barriers to timely definitive care.
- Rural vs urban residence was not independently associated with treatment access or survival in this cohort.
- Survival differences emerged primarily in the lowest income subgroup (<$50,000), rather than across income quartiles.
- Results may reflect disparities in referral pathways, insurance coverage, and access to specialized multidisciplinary sinonasal care.
- Limitations include registry-based design, county-level income proxy, and lack of detailed clinical variables (e.g., margins, recurrence).

Conclusions

- SES is associated with time to treatment, with the lowest income (<$50,000) associated with significantly worse survival. These findings highlight the need for further investigation into mitigating structural barriers for the most economically disadvantaged patients.

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