

Population-based analysis of social health determinants associated with advanced stage presentation in oral squamous cell carcinoma

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INTRODUCTION

Staging of head and neck cancer is used to provide prognostic information and guide treatment recommendations for patients.¹ Survival outcomes are strongly correlated to overall stage in head and neck cancer.² Treatment plans become more aggressive at higher stages with increased reliance on multimodality therapy and resultant increase in morbidity.³ Patients present with advanced tumors for a variety of reasons, many of which may be influenced by social determinants of health, of which patients have limited control. These factors include economic and housing stability, education, social support systems, access to health care, and other aspects of a patient's physical environment that contribute to health outcomes. Data from the National Cancer Database (NCDB) has been used to explore effects of these social determinants of health on survival and other treatment outcomes.^{4,5} However, little is known about the relationship between these factors and the delays in diagnosis that result in advanced stage presentation. We hypothesize that these factors contribute significantly to delays in diagnosis and thus increase the likelihood of advanced stage presentation. The purpose of this study was to evaluate this relationship in patients with oral cavity squamous cell carcinoma (OCSCC).

METHODS

- The NCDB is a collaboration of the American College of Surgeons' Commission on Cancer (CoC) and the American Cancer Society⁴. The NCDB the largest clinical registry in the world with data from 21 million cancer patients is included over 30 years.
 - Methods of case reporting, data collection, and confidentiality have previously been described.⁶
- This is a retrospective analysis of patients with OCSCC included from 2004-2012.
- Variables collected included:
 - Demographics - age, sex, race, ethnicity, insurance status, education level, geographic location, housing area, and median income.
 - Clinical Data - primary anatomic tumor site, year of diagnosis, histology, Charleson/Deyo score, tumor grade and tumor stage.
 - Treatment Data - facility type, treatment modality and sequence of treatments.
- Advanced stage was defined as overall stage three or four, and patients were grouped according to this definition.
- Multivariable logistic regression was used to examine the effects on stage of presentation of community income and education levels, as well as individual insurance status, while controlling for potential confounders
 - Statistical analyses were performed with Microsoft Open R version 3.3.2 (Microsoft Corp., Redmond, WA)
- Income levels were based on median household income for the patient's zip code.
- Education levels were established based on community averages of high school graduation rates.

RESULTS

- 50,845 were included in the analysis.
 - 21,303 41.9% of patients presented with advanced stage tumors.
 - 29,542 58.1% presented with early stage tumors.
- Several factors increased the likelihood of advanced stage presentation.
 - Patients with Medicaid, Medicare, or no insurance were more likely to present at advanced stages compared to those with private insurance.
 - Patients living in communities with low median household incomes were more likely to have advanced tumors than those in more affluent communities, with the greatest effect observed in the lowest income communities.
 - Patients in communities with low high school graduation rates presented at higher stages than those with the highest graduation rates.

	Odds Ratio	Lower CI	Upper CI	p Value
Insurance Status				
Private*	1.00			
Medicaid	2.69	2.50	2.90	<0.001
Medicare	1.25	1.18	1.32	<0.001
None	1.99	1.83	2.17	<0.001
Median Annual Income				
Greater than \$63,000*	1.00			
\$48,000 - \$62,999	1.09	1.03	1.15	<0.01
\$38,000 - \$47,999	1.14	1.07	1.21	<0.001
Less than \$38,000	1.19	1.10	1.28	<0.001
High School Graduation Rate				
Greater than 93%*	1.00			
87.1-93%	1.15	1.08	1.21	<0.001
79.1-87.0%	1.23	1.15	1.32	<0.001
Less than 79%	1.41	1.30	1.53	<0.001

Table 1: Insurance status, income, and education groups are compared. Risk of advanced stage presentation is displayed as an odds ratio relative to the comparator groups, which are noted with asterisks. Annual income and education levels are based on median levels of a patient's zip code

DISCUSSION

- Advanced stage presentation of head and neck cancers may be influenced by numerous factors, including aggressive tumor behavior, vague or absent symptoms, or delayed referral by primary care providers.^{7,8} Patient-related factors, including unfamiliarity with head and neck cancer and poor coping skills, may also delay evaluation.⁹
- This study highlights the effects of social determinants of health on advanced stage presentation in oral cancer. Patients have limited influence over these factors, which are predominately related to where a person lives.
 - Median income levels reflect the general wealth of a patient's community, which may impact other factors that affect access to medical care, such as access to housing, reliable transportation and ability to pay medical bills.
 - High school graduation rates may reflect other important factors that contribute to delays, including health literacy and language skills.
 - Insurance status likely relates to other health care system factors, such as access to a medical provider and quality of care

CONCLUSION

Social determinants of health have significant effects on stage of presentation in OCSCC. These effects have implications not only for providers, but on a broader level in an evolving landscape of health care policy. Further understanding of these factors can help guide targeted population-level interventions to diagnose high-risk patients at an earlier stage.

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