

Impact of demographic and behavioral risk factors on oral cancer in Florida

Dr. Denice Curtis¹, Dr. Scott Eckhart¹ and Capt. Jodine Anderson²

¹Department of Public Health
Usha Kundu, MD College of Health
University of West Florida

²United States Public Health Services/United States Coast Guard

INTRODUCTION

- Cancer is a significant cause of mortality across the world, with over 6 million deaths annually (Petersen, 2008).
- In 2000 over 615,000 new head and neck cancer diagnoses were made across the globe (Kademani, 2007). Unfortunately, oral cancer is often sidelined in comparison to other cancers of prominence, but it remains a problem of public health significance throughout the world.
- The United States' share of that figure was nearly 29,000 cases with almost 7,500 deaths being directly attributable to oral cancer (Kademani, 2007).
- In the United States the age-adjusted rate of oral cancer is 11.2 per 100,000 in 2017 and it is expected that over 10,000 people will die from the disease this year. (NIH, 2018; ACS, 2018).
- Oral cancers can be quite broad and represent lesions ranging from benign odontogenic tumors to particularly deadly oral malignant melanomas.
- Oral pathologists divide the group into three categories:
 - ✓ Carcinomas of the oral cavity proper
 - ✓ Carcinomas of the lip vermillion
 - ✓ Carcinomas arising in the oropharynx
- Of all the forms of oral cancer, squamous cell carcinoma is the most commonly seen with over 90% of diagnoses being this type (Bagan, Sarrion, & Jimenez, 2010).
- What makes matters worse is the poor survival rate. In fact, the five-year survival rate is only 50%, which has not improved by any noticeable amount over the last few decades (Park et al., 2009).

AIM

The purpose of this study was to determine if selected factors would be predictive of the incidence of oral cancer in Florida's population. These factors included sex, age, marital status, ethnicity, race, primary insurance payor, birthplace, cigarette use, smokeless tobacco use, and other tobacco use.

METHODOLOGY

We used data from the Florida Cancer Data System (FCDS). The presence of any form of cancers of the oral cavity (site code 0110) was used as the independent variable. Data from a sample of 73,916 participants with oral cancer were used in this study. SPSS Software (V.24) (IBM) was used for all statistical analyses. We investigated the association of marital status at the time of diagnosis, sex, race, ethnicity, birth country, age, cigarette use, smokeless tobacco use, primary insurance method at the time of diagnosis, cancer behavior, and any other form of tobacco smoking and oral cancer. Data were analyzed using Chi-Square tests of independence and a multiple logistic regression analysis to assess the effects of the predictor variables on oral cancer ($\alpha = .05$). This study received approval from the UWF Institutional Review Board IRB 2018-076.

RESULTS

2.60% (n = 73,916) of the total cancer cases had oral cancer. Cases were more likely to be: male, single, White non-Hispanic, 60 years and older, and tobacco users. Most of the cases had invasive cancer at the time of diagnosis (see table 1).

Table 1. Descriptive characteristics of individuals with oral cancer

	Frequency (n = 73,916)	Percent
Sex (n = 73,883)		
Male	50,789	68.7
Female	23,094	31.3
Race (n = 73,287)		
White	66,488	90.7
Black	5,969	8.1
Other	830	1.1
Ethnicity (n = 73,078)		
Hispanic	6,297	8.6
Not Hispanic	66,781	91.4
Marital Status (n = 70,964)		
Single	40,135	56.6
Married	30,829	43.4
Primary Insurance (n = 50,717)		
None	3,212	6.3
Medicaid	3,754	7.4
Medicare	22,938	45.2
Government	1,815	3.6
Private	18,998	37.5
Age (n = 73,912)		
0-24	487	0.7
25-39	2,099	2.8
40-59	24,439	33.1
60-100	46,887	63.4
Birthplace (n = 27,582)		
United States	23,139	83.9
Other Countries	4,443	16.1
Cigarette Use (n = 58,652)		
Never Used	14,293	24.4
Former Use	21,010	35.8
Current Use	23,349	39.8
Smokeless Tobacco Use (n = 11,760)		
Never Used	10,899	92.7
Former Use	288	2.4
Current Use	573	4.9
Other Tobacco Smoke Use (n = 12,625)		
Never Used	10,713	84.9
Former Use	388	3.1
Current Use	1,524	12.1
Cancer Stage (n = 73,916)		
In Situ	1,532	2.1
Invasive	72,384	97.9

Results from Chi-square testing showed a statically association between cigarette smoking, gender, age and primary type of insurance ($p < 0.001$). Multiple logistic regression analysis showed that females were 62% less likely to develop oral cancer compared to males.

RESULTS

Individuals of a race other than white or black were almost 80% more likely to have oral cancer than whites. For the tobacco-based behavioral categories cigarette use had the strongest statistical evidence ($p < 0.001$). The OR of current cigarette smokers was 1.525 making them 52% more likely to have oral cancer than never-smokers, while not surprisingly there was a protective effect for former smokers (OR=0.81; CI: 0.75-0.89; $p < 0.001$) (see table 2).

Table 2. Logistic Regression Analysis of Behavioral and Demographic Factors of people with oral cancer

Parameter	B	S.E.	Wald	OR	Lower	Upper	Sig.
Sex							
Male	Reference			1			
Female	-9.69	0.034	816.9	0.379	0.355	0.405	0.000
Race							
White	Reference			1			
Black	0.25	0.103	0.057	1.025	0.838	1.254	0.812
Other	0.587	0.113	26.87	1.798	1.44	2.244	0.000
Ethnicity							
Not Hispanic	Reference			1			
Hispanic	-0.278	0.061	20.94	0.757	0.672	0.853	0.000
Marital Status							
Single	Reference			1			
Married	0.225	0.032	50.25	1.253	1.177	1.333	0.000
Primary Insurance							
None	Reference			1			
Private	0.192	0.09	4.548	1.212	1.016	1.446	0.033
Medicaid	0.308	0.074	17.53	1.361	1.178	1.571	0.000
Medicare	0.242	0.086	7.834	1.273	1.075	1.508	0.005
Government	0.447	0.073	37.3	1.563	1.354	1.804	0.000
Age							
0-24	Reference			1			
25-39	0.6	0.17	12.5	1.822	1.307	2.541	0.000
40-59	0.215	0.109	3.928	1.24	1.002	1.535	0.047
60-100	-0.501	0.04	160.3	0.606	0.561	0.655	0.000
Birthplace							
United States	Reference			1			
Other Country	-0.066	0.054	1.518	0.936	0.842	1.04	0.218
Cigarette Use							
Never	Reference			1			
Current	0.422	0.037	132.4	1.525	1.419	1.638	0.000
Former	-0.211	0.04	27.04	0.81	0.748	0.877	0.000
Smokeless Tobacco Use							
Never	Reference			1			
Current	0.606	0.126	23.15	1.834	1.432	2.347	0.000
Former	0.268	0.185	2.101	1.307	0.91	1.878	0.147
Other Tobacco Use							
Never	Reference			1			
Current	0.047	0.112	0.176	1.048	0.841	1.307	0.675
Former	-0.273	0.148	3.409	0.761	0.57	1.017	0.065
Cancer Stage							
In Situ	Reference			1			
Invasive	1.148	0.104	122.7	3.152	2.572	3.862	0.000

DISCUSSION

- This investigation represented a large-scale analysis of oral cancer in Florida with regards to individually-associated demographic and behavioral risk factors.
- Other select research has been done in this area, but primarily to differentiate between oral and pharyngeal cancers in respect to their associations with race and age (McGorray, Guo, & Logam 2011).
- The hypothesis of this investigation was that behavioral and demographic characteristics such as sex and smokeless tobacco usage were prognostic of the incidence of oral cancer in Florida's population. Indeed, certain factors are predictively associated with oral cancer.

- The logistic regression analysis illustrated the level of impact that each individual factor had on oral cancer incidence overall. Sex was shown to be a significant factor, but that is likely due to the differential behavioral characteristics displayed regarding alcohol consumption and tobacco usage by men. Married persons were at increased risk, but this is probable due to singles frequently being younger or quite a bit older and not at the age when oral cancer is typically diagnosed. Additionally, an interesting point was that those on government insurance like Tricare were at the highest risk of having oral cancer.
- This study does endure several limitations. The controls that were used in the analysis are other individuals in the FCDS. As such all these individuals are in the database because they have also been diagnosed with cancer. Due to this fact, their demographic and behavioral factors may not match up with the Floridian population at large.
- Additionally, a weakness was that some of the investigated factors did not have sufficiently high reported response rates. Ideal response rates are above 90% but several categories like birth country, primary type of insurance, and smokeless tobacco use did not meet this desired goal.

CONCLUSION

- Future research in this area is warranted and needed.
- Oral cancer has shown itself to present differently in diverse populations.
- Specifically, with many individuals continuing to participate in negative behaviors and actions that increase their risk for this deadly disease, a better understanding of the hazard is needed.
- Additional reported elements like HPV history, sunlight exposure, and alcohol consumption (by amount) would be greatly beneficial.
- This study seeks to encourage public health professionals and health care providers of all categories to further understand risk factors so that they can target oral cancer screenings and information distribution.

REFERENCES

- Kademani, D. (2007). Oral cancer. *Mayo Clinic Proceedings*, 82(7), 878-887. doi:10.4065/82.7.878
- Messadi, D. V., Wilder-Smith, P., & Wolinsky. (2009). Improving oral cancer survival: The role of dental providers. *Journal of the California Dental Association*, 37(11), 789-798. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2866626/>
- McGann, G. (2017). *Oral cancer detection*. Retrieved from <http://mcgannfacialdesign.com/oral-cancer-detection/>
- Park, N. J., Zhou, H., Elashoff, D., Henson, B. S., Kastratovic, D. A., Abemayor, E., & Wong, D. T. (2009). Salivary microRNA: Discovery, characterization, and clinical utility for oral cancer detection. *Clinical Cancer Research*, 15(17), 5473-5477. doi:10.1158/1078-0432.CCR-09-0736
- Neville, B. W., & Day, T. A. (2002). Oral cancer and precancerous lesions. *CA: A Cancer Journal for Clinicians*, 52(4), 195-215. doi:10.3322/canjclin.52.4.195