Analysis of Factors Affecting Oral Cavity Cancer in Florida

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Introduction

- There will be an estimated 34,470 diagnoses of oral cavity cancer (OCC) in the US in 2023, over 90% of which are squamous cell carcinomas.[1]
- Known risk factors include cigarette, alcohol, and betel nut consumption.[2,3]
- Increasing attention has been directed at the impact of socioeconomic status (SES) on OCC outcomes.
- OCC has seen increases in late-stage diagnosis, which is associated with increased mortality.[4-6]
- Screening guidelines are an established tool for reducing morbidity and mortality in other types of cancer,[7,8] but there are no such guidelines for OCC in the US.
- International screening trials have shown promise, with multiple programs showing improvements in survival for high-risk individuals.[9,10]
- Knowledge of Florida's highest-risk populations is critical for developing screening trials and interventions with the highest potential benefits.

Methods/Materials

Sources

- The Florida Cancer Data System provided partially de-identified SES and cancer information on Floridians diagnosed with OCC from 2010-2017.
- The American Community Survey provided median income for each census tract.

Inclusion/Exclusion

- Anatomic site included tongue, gum, floor of mouth and other and unspecified parts of mouth.
- Cases were excluded (N=4,285) due to age under 18, post-mortem diagnosis, unspecified histology, non-squamous cell histology, missing or unstaged SEER stage, missing or unknown SES information, duplicate records, and missing treatment information.

Outcomes

- SEER stages were utilized to define disease stage:
  - "in situ" (SEER stage 0) or "local" (SEER stage I) were defined as local
  - "regional" (SEER stage II) were defined as regional
  - "distant" (SEER stage III) or "systemic spread" (SEER stage IV) were defined as distant[11]

Analysis

- Chi-square analysis compared SES factors and smoking behavior between racial and ethnic populations and between patients with different stages of disease.
- Univariable and multivariable multinomial logistic regressions analyzed associations between SES factors, smoking behavior, and stage at diagnosis.
- R software was used to geographically map cumulative incidence and percent distant stage diagnosis vs. residential census tract median income.

Contact Info

Results

- Black patients were significantly more likely to be under 60, uninsured, have regional or advanced disease, and single/unmarried than White Non-Hispanics (Table 1). White Hispanics were more likely to be never smokers and urban residents.
- Univariable analysis (Table 2) revealed greater odds of regional vs. early disease in patients who were: under 60, Black, not married, uninsured, publicly insured, and current smokers.
- Most associations remained significant across logistic regressions performed.

	All n	All %	White Non-Hispanic n	White Non-Hispanic %	White Hispanic n	White Hispanic %	Black n	Black %	P
All	5584		4612	82.6	661	11.8	311	5.6	
Age at diagnosis									0.009
<60	1828	32.7	1476	32.0	228	34.5	124	39.9	
≥60	3756	67.3	3136	68.0	433	65.5	187	60.1	
Sex									0.717
Male	3440	61.6	2845	61.7	399	60.4	196	63.0	
Female	2144	38.4	1767	38.3	262	39.6	115	37.0	
Marital status									<.001
Married	2919	52.3	2470	53.6	337	51.0	112	36.0	
Single/unmarried	1208	21.6	934	20.3	153	23.1	121	38.9	
Separated/Divorced/Widowed	1457	26.1	1208	26.2	171	25.9	78	25.1	
Insurance Status									<.001
Private Insurance	1675	30.0	1384	30.0	209	31.6	82	26.4	
Public Insurance	3545	63.5	2958	64.1	398	60.2	189	60.8	
Uninsured	364	6.5	270	5.9	54	8.2	40	12.9	
Cigarette smoking status									<.001
Never smoker	1434	25.7	1125	24.4	234	35.4	75	24.1	
Current Smoker	1374	24.6	1181	25.6	105	15.9	88	28.3	
Former Smoker	1917	34.3	1610	34.9	218	33.0	89	28.6	
Unknown	859	15.4	696	15.1	104	15.7	59	19.0	
Geographic Region									<.001
Urban	4053	72.6	3277	71.1	558	84.4	218	70.1	
Rural	1531	27.4	1335	28.9	103	15.6	93	29.9	
SEER stage									<.001
Early (in-situ/local)	2953	52.9	2515	54.5	334	50.5	104	33.4	
Regional	1896	34.0	1526	33.1	236	35.7	134	43.1	
Distant	735	13.2	571	12.4	91	13.8	73	23.5	

Table 1. Demographics and other characteristics of Oral Cavity Cancer Patients by race and ethnicity (N=5,584). Bolded p values are statistically significant at p<0.05.

	UVA Regional vs. Early OR	UVA Regional vs. Early 95% CI		UVA Regional vs. Early P	MVA Regional vs. Early OR	MVA Regional vs. Early 95% CI		MVA Regional vs. Early P	UVA Distant vs. Early OR	UVA Distant vs. Early 95% CI		UVA Distant vs. Early P	MVA Distant vs. Early OR	MVA Distant vs. Early 95% CI		MVA Distant vs. Early P
Age, in years																
<60	1 (Ref.)				1 (Ref.)				1 (Ref.)				1 (Ref.)			
≥60	0.766	0.678	0.866	<.001	0.757	0.653	0.877	<.001	0.824	0.694	0.977	0.026	0.867	0.705	1.065	0.18
Race/Ethnicity																
White Non-Hispanic	1 (Ref.)				1 (Ref.)				1 (Ref.)				1 (Ref.)			
White Hispanic	1.165	0.974	1.392	0.094	1.186	0.988	1.423	0.067	1.2	0.936	1.539	0.151	1.252	0.97	1.616	0.084
Black	2.144	1.646	2.794	<.001	1.949	1.491	2.548	<.001	3.122	2.282	4.27	<.001	2.792	2.002	3.803	<.001
Sex																
Male	1 (Ref.)				1 (Ref.)				1 (Ref.)				1 (Ref.)			
Female	0.8	0.711	0.901	<.001	0.796	0.703	0.902	<.001	0.622	0.524	0.74	<.001	0.621	0.518	0.745	<.001
Marital status																
Married	1 (Ref.)				1 (Ref.)				1 (Ref.)				1 (Ref.)			
Single/Unmarried	1.642	1.507	1.312	<.001	1.496	1.295	1.728	<.001	1.507	1.239	1.832	<.001	1.465	1.195	1.797	<.001
Separated/Divorced/Widowed	1.44	1.731	1.492	<.001	1.447	1.237	1.692	<.001	1.993	1.631	2.435	<.001	1.547	1.247	1.918	<.001
Insurance Status																
Private Insurance	1 (Ref.)				1 (Ref.)				1 (Ref.)				1 (Ref.)			
Public Insurance	1.231	1.083	1.399	0.004	1.326	1.146	1.536	<.001	1.62	1.336	1.966	<.001	1.684	1.357	2.09	<.001
Uninsured	1.913	1.483	2.469	<.001	1.528	1.175	1.986	0.002	3.396	2.462	4.685	<.001	2.627	1.881	3.667	<.001
Cigarette smoking status																
Never smoker	1 (Ref.)				1 (Ref.)				1 (Ref.)				1 (Ref.)			
Current Smoker	1.484	1.259	1.749	<.001	1.241	1.045	1.475	0.014	1.715	1.373	2.141	<.001	1.293	1.022	1.637	0.032
Former Smoker	1.093	0.939	1.272	0.25	1.068	0.915	1.248	0.404	1.028	0.828	1.277	0.8	0.939	0.752	1.172	0.577
Unknown	1.17	0.973	1.409	0.096	1.079	0.893	1.304	0.432	0.949	0.721	1.249	0.708	0.812	0.613	1.076	0.147
Geographic Region																
Urban	1 (Ref.)				1 (Ref.)				1 (Ref.)				1 (Ref.)			
Rural	1.027	0.902	1.169	0.688	1.031	0.903	1.177	0.653	1.182	0.99	1.412	0.064	1.189	0.991	1.426	0.063

Table 2. Univariable and Multivariable Multinomial Logistic Regression Analysis for Likelihood of Stage at Time of Diagnosis (Regional and Distant stages vs. Early stage) (N=5,584). Early stage= local/in-situ. **Bolded** p values indicate statistical significance at p<0.05.

- Visual representations of cumulative OCC incidence per 1,000 vs. census tract median household income revealed clusters of cases around metropolitan areas along major interstate corridors. Cases were also observed in more rural areas of Florida. Areas with some of the highest incidence rates can be seen in the Fort Myers and Kissimmee areas. (Figures 2a and 2b).
- Mapping of late-stage diagnosis rates (Figures 3a and 3b) displayed a similar pattern.
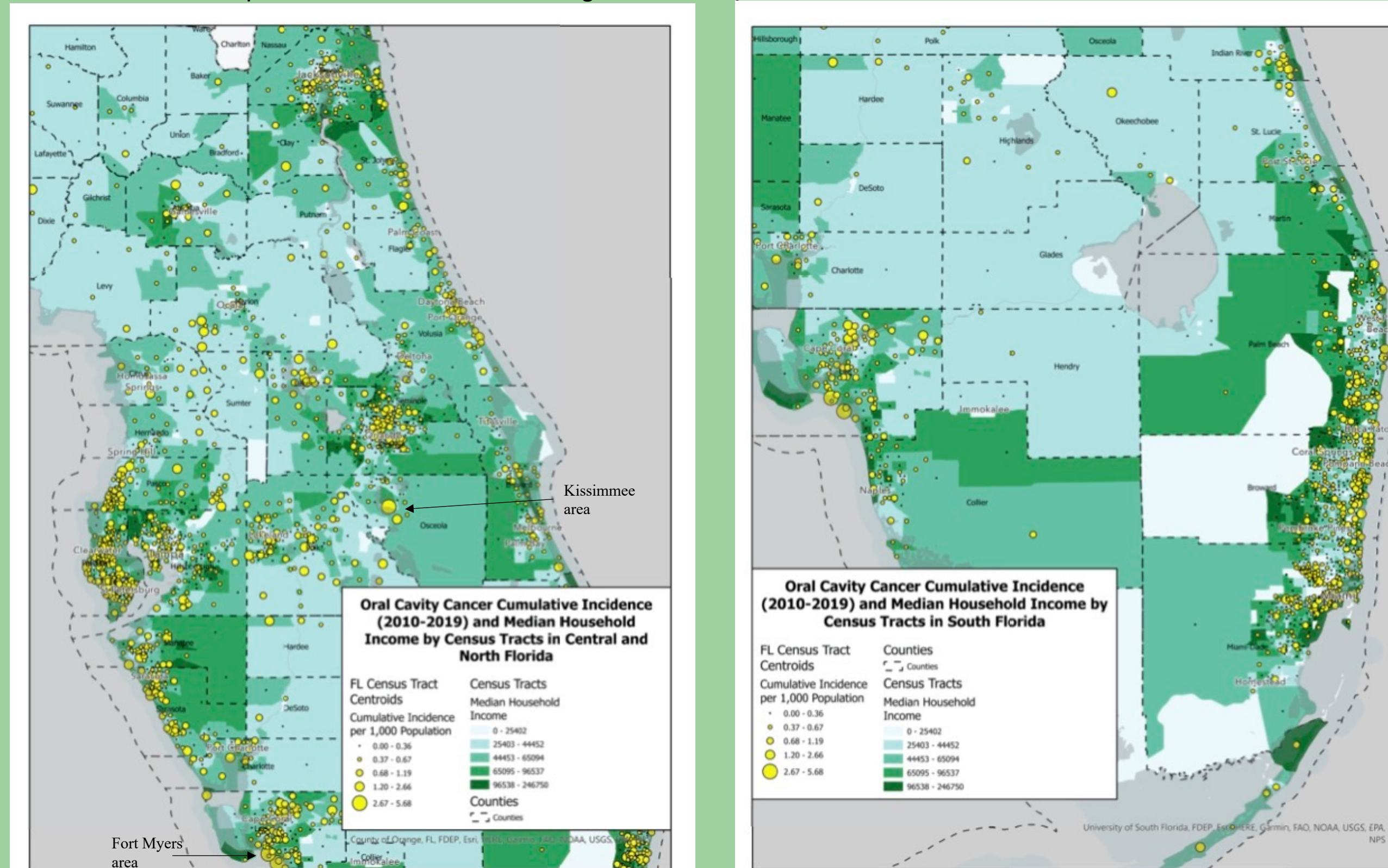

Figure 2a and 2b. Map of OCC cumulative Incidence of cases (2010-2019) and Census Tract Median Household Income in Central and North Florida (A) and South Florida (B).
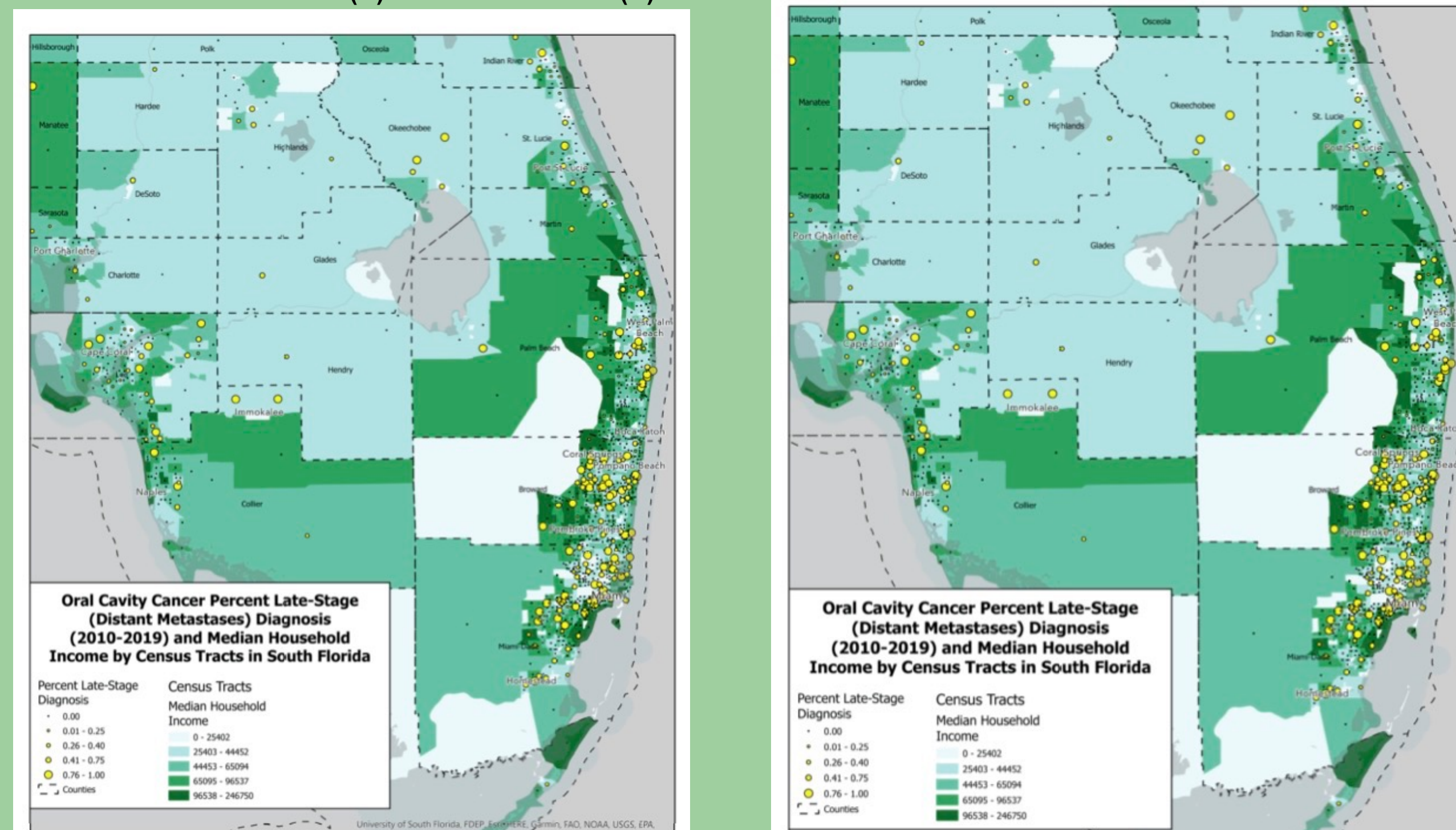

Figure 3a and 3b. Map of OCC percent late-stage (distant) diagnosis (2010-2019) and Census Tract Median Household Income in Central and North Florida (A) and South Florida (B).

Discussion

- Multiple SES-associated variables were independent risk factors.
- Across analyses, SES factors with the highest ORs of advanced stage OCC include Black race, non-married status, public insurance, and no insurance.
- Current smoking (but not former smoking) was consistently associated with regional and distant disease. Current smokers are less likely to report oral examination and have benefited from targeted screening intervention.[2,9,10]
- Unmarried status was a strong risk factor in this study and others. Marriage rates have declined in Florida.[12,13]
- No association between urban/rural residence and regional or distant disease.
- Specific geographic locations have been subject to change due to changing demographics and smoking behaviors.
- Late-stage diagnosis visually correlated more with median income than did cumulative incidence.
- Randomized controlled trials are needed for establishing OCC screening guidelines.[14]
- Future studies should further quantify risks (e.g., smoking pack-years).

Conclusions

- Risk factors (e.g., Black race, low SES, smoking, uninsured status) were similar to findings in other studies.
- Age <60 was also associated with increased likelihood of regional and distant disease.
- This study provides information on the unique profile of OCC patients, their associated risk factors in Florida, and geographic locations facing heightened OCC burden.
- It is important to recognize these risk factors associated with OCC progression and the unique profile of OCC patients in Florida.
- This information will be useful in constructing public health research, intervention, and targeted OCC screenings, which have shown promise in other countries.

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