2008

Effect of Metro Living on Oral Cancers in Virginia: 2001-2005

Preeti Sastry
Virginia Commonwealth University

EFFECT OF METRO LIVING ON ORAL CANCERS IN VIRGINIA: 2001-2005

Preeti K Sastry

EPID 691: MPH PROGRAM RESEARCH PROJECT

Department of Epidemiology and Community Health

Virginia Commonwealth University

RICHMOND, VA

Master of Public Health Program

Adviser: Dr. Christopher (Kim) Buttery

Preceptor: Carolyn Halbert

12/05/2008

Submission Statement
Master of Public Health Research Project

This MPH Research Project report is submitted in partial fulfillment of the requirements for a Master of Public Health degree from Virginia Commonwealth University's School of Medicine. I agree that this research project report be made available for circulation in accordance with the program's policies and regulations pertaining to documents of this type. I also understand that I must receive approval from my Faculty Advisor in order to copy from or publish this document, or submit to a funding agency. I understand that any copying from or publication of this document for potential financial gain is not allowed unless permission is granted by my Faculty Advisor or (in the absence of my Faculty Advisor) the Director of the MPH Program.

CS Neeli

Student Signature

12/5/2008

Date

Master of Public Health
Research Project Agreement Form

Department of Epidemiology and Community Health

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Number of semester hours (3-6): 3 Semester: Fall Year: 2008

Please complete the following outline. **Do not exceed 2 pages (A-H)**

A.PROJECT TITLE: Effect of Metro living on Oral Cancers in Virginia: 2001-2005

B. PURPOSE (state hypothesis/research question):

Observing the effect of metro living as a predictor of Oral cancer after adjusting for gender and stage at diagnosis

C.SPECIFIC OBJECTIVES (list major aims of the study):

1. Present descriptive findings on the prevalence of Oral Cancers in Virginia
2. To look for association between metro living and Oral Cancers in Virginia
3. To determine if Metro living is a predictor of Oral Cancer after adjusting for gender and stage at diagnosis

D. DESCRIPTION OF METHODS

D.1. Identify source(s) of data (eg, existing data set, data collection plans, etc):

Secondary data tables from the Virginia Cancer Registry

D.2. State the type of study design (eg, cross-sectional, cohort, case-control, intervention, etc):

Cross-sectional Study

D.3. describe the study population and sample size:

Virginia Cancer registry is a population based cancer registry that collects incidence data on cancers. According to International Classification of Diseases for Oncology (ICD-O) Oral Cancers would include all the reported cases of lip, oral cavity and pharynx cancers over a 5 year time period (2001-2005).

The estimated numbers of reported cases of Oral cancer are 600/year. Total number of cases over the course of 5 years would be approximately 3000 cases.

D.4. List variables to be included (If a qualitative study, describe types of information to be Collected)

Gender-Male/female

Beale codes- (Code 3-counties in metro areas of fewer than 250,000 population)
Stage at diagnosis –Localized/regional/distant

D.5. Describe methods to be used for data analysis (If a qualitative study, describe general Approach to compiling the information collected)
Quantitative study-Cancer registry data tables
Population based Cross-sectional study
Analysis: SAS software Version 9.1-Descriptive Statistics, Bivariate analysis
Regression models –observe a relationship between metro living and oral cancer after adjusting for gender and stage at diagnosis.

E. ANTICIPATED RESULTS: Observe a relationship between metro living and Oral cancer after adjusting for gender and stage at diagnosis.

F.SIGNIFICANCE OF PROJECT TO PUBLIC HEALTH:

Forty percent of all head and neck cancers occur in the oral cavity. 60% of the oral cancers are diagnosed at an advanced stage which results in high morbidity and mortality. This is a huge public health concern and there is a need to understand risk factors, signs and symptoms for effectively recognizing and controlling the disease. According to CDC there are reports of more than 30,000 new cases/year of oral cancer and pharynx and over 8,000 deaths.

It is also the 8th leading type of cancer to be diagnosed among men in Virginia. Treatment modalities generally involve surgery, radiation, or a combination of the two. Oral cancer has also been frequently associated with disfigurement, diminished speech fluency, and inability to eat and swallow, often resulting in a substantial decrease in quality of life. With such outcomes prevention with early detection is a major criterion. Understanding the epidemiological trends would help describe the distribution, evaluate etiology, pathogenesis and provide preventive measures of Oral cancers.

G. IRB Status:

1) Do you plan to collect data through direct intervention or interaction with human Subjects?
___yes __X__ no

2) Will you have access to any existing identifiable private information? ___yes _X_ no

If you answered "no" to both of the questions above, IRB review is not required.
If you answered "yes" to either one of these questions, your proposed study must be reviewed by the VCU Institutional Review Board (IRB). Please contact Dr. Vance or Dr. Sridhar for assistance with this procedure
Please indicate your IRB status:
___ to be submitted (targeted date_____)
___ submitted (date of submission _____; VCU IRB # _____)
___ IRB exempt review approved (date_____)
___ IRB expedited review approved (date_____)
__X__ IRB approval not required

H. PROPOSED SCHEDULE: Start Date: __08/08__ Anticipated End Date: _11/08___

I. INDICATE WHICH OF THE FOLLOWING AREAS OF PUBLIC HEALTH KNOWLEDGE WILL BE DEMONSTRATED:

1. Biostatistics – collection, storage, retrieval, analysis and interpretation of health data; design and analysis of health-related surveys and experiments; and concepts and practice of statistical data analysis. __X__yes ___no (if yes, briefly describe):
   Collection/Storage of data-Virginia Cancer Registry
   Retrieval of data- Secondary data set after de-identification for personal information
   Analysis- Analysis using SAS software version 9.1
   Models – Descriptive analysis, Bivariable analysis, Regression models

2. Epidemiology – distributions and determinants of disease, disabilities and death in human populations; the characteristics and dynamics of human populations; and the natural history of disease and the biologic basis of health. __X__ yes ___no (if yes, briefly describe):
   According to the American Cancer society almost 60% of oral cancers detected are at advanced stage which reduces the 5 year survival rates to only 59%. In 2007 almost 35,000 cases of oral Cancer was diagnosed in the United States. It is also the 8th leading type of cancer to be diagnosed amongst men in Virginia. Oral cancer is a debilitating cancer, with high morbidity resulting from the disease and its treatment. Treatment modalities generally involve surgery, radiation, or a combination of the two followed by disfigurement, diminished speech fluency, and inability to eat and swallow resulting in decreased quality of life. With such outcomes prevention with early detection is a major criterion.

3. Environmental Health Sciences – environmental factors including biological, physical and chemical factors which affect the health of a community. ___yes __X__ no (if yes, briefly describe):

4. Health Services Administration – planning, organization, administration, management, evaluation and policy analysis of health programs. __X__yes __ no (if yes, briefly describe):
   Increase awareness among dental professionals is a key component to early diagnosis and screening of oral cancer which had shown to decrease morbidity rates. As members of the health care profession, primary care physicians, dental hygienists, pharmacists, nurses are in a prime position to greatly impact the early detection of oral cancer. Further recommendations such as a need for mandatory oral cancer screening can be proposed for future policy changes.

5. Social/Behavioral Sciences – concepts and methods of social and behavioral sciences relevant to the identification and the solution of public health problems. __yes __X__no (if yes, briefly describe):

SIGNATURE PAGE
Master of Public Health Research Project

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Student: Preeti K Sastry Date: 07/21/2008

Preceptor: Date: 08-14-08

Faculty Advisor: Date: 08-15-08

MPH Program Director: Date: 9/10/08

MPH Program Coordinator: Date: 12-5-08

MPH Research Project Approval Form

Effect of Metro Living on Oral Cancers in Virginia: 2001-2005

Submitted to the Graduate Faculty of the
Department of Epidemiology and Community Health
Virginia Commonwealth University

In partial fulfillment of the requirements for the degree of
Master of Public Health

(by: Preeti K Sastry)

Comments:

Approval signatures:

MPH Student	Date 12/5/2008
MPH Research Project Faculty Advisor	Date 12/5/2008
MPH Program Director	Date 12/5/2008
MPH Program Coordinator	Date 12/5/08

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Acknowledgements

I would first like to thank my adviser Dr Kim Buttery for his constant support and encouragement throughout the Masters' program. Also, as an international student with a clinical background he played a critical role in helping me understand the difference between clinical medicine and preventive health.

I am grateful to Dr Jim Burns, Director of Virginia Cancer Registry for providing me with the data for my research project.

I would also like to thank Diane Bishop for all her help with the editing of my research project.

Finally, I would like to thank my husband and my family for their support and patience during my masters program.

Abstract:

Background: Forty percent of all head and neck cancers occur in the oral cavity. According to ICD-O (International classification of diseases for oncology) C00-C14 includes cancers of the lip, oral cavity and pharynx. Studies have indicated that increased population density or Metro living have increased oral cancer incidence. The objectives of this study are to look at the distribution of Oral and Oro pharyngeal Cancers in Virginia from 2001-2005 The study aims to determine if there is an association between metro living (beale code 3) and advanced Oral Cancers. This study is also being done to determine if Metro living is a predictor of Oral Cancer after adjusting for gender.

Methods: The data for this study was obtained from the Virginia Cancer Registry. Cancer counts were obtained based on gender, beale code distribution and stage at diagnosis. The counts were collected for the years 2001-2005 based on the ICD-O codes C00-C14. Analysis of this secondary data was done using SAS 9.1. Descriptive statistics presents the distribution of oral cancer according to the stage, gender and urbanity level of the patient. A log-linear model was done to look for association between metro living and Oral Cancers in Virginia after adjusting for gender and stage. This model was fit using a Poisson's regression to observe if the cancer counts are influenced by the urban beale code 3.

Results: During the five year period of 2001- 2005 the Virginia Cancer registry received a total of 3,390 reported cases of oral and pharyngeal cancers. Out of the 3,390 cases 67.35% (2283) of the cases were diagnosed in males and the rest 32.65% were females (1107). Based on the stage at diagnosis, 34.45% (1168) of Oro-pharyngeal cancers were diagnosed to have localized staging as compared to 50.18% (1701) regional and 11.03% (374) distant. 4.34% of the cancers were unstaged (N=147). 82% of all Oro-pharyngeal cancers were seen amongst whites. Majority of oral cancers were seen amongst age groups 35-74 years (78.41%).

While looking at the distribution of oral cancers reported from the urban populations; 82.3% (2790) were reported from beale code1. Only 9.73% (330) cases were reported from beale code 2 and 7.96% (270) cases were reported from beale code 3 (population fewer than 250,000 people). More than 50% of cancers were diagnosed at an advanced stage in the urban populations; we did not see a significant relation between advanced oral cancers and metro living. ($p = 0.2878$). After performing a scaled deviance Poisson regression model indicated that there was a stable trend in counts of advanced oral cancer after adjusting for race, age and gender.($\theta = -0.04$ p-value $= 0.617$).

Conclusions: With a linear trend between increased population density and advanced oral cancers, our study observed a stable trend within the metro populations. Due to lack of a clear understanding of all the possible contributing factors further research is recommended to observe the various etiological differences within the urban populations and advanced oral cancers.

Introduction:

Oral and pharyngeal cancers are a part of head and neck cancers. According to the ICD-O (International Classification of Diseases for Oncology) C00-C14 includes cancers of the lip, oral cavity and pharynx. [1] It includes the lips, the inside lining of the lips and cheeks (buccal mucosa), parotid and other salivary glands along with tonsil, gums, front two-thirds of the tongue, the floor of the mouth(below the tongue), the bony roof of the mouth (hard palate), and the area behind the wisdom teeth. It also includes the oropharynx, nasopharynx, hypopharynx, pyriform sinus and all the other ill-defined sites in the lip oral cavity and the pharynx. [2]

Forty percent of all head and neck cancers occur in the oral cavity. [3] Due to the proximity of oral cancer to the neck vasculature dissemination of the cancer cells to the surrounding structures occurs at a faster rate. When diagnosed early the survival for cancer patients is almost 90% as compared to an advanced stage where the survival reduces to almost 50%. According to CDC more than 30,000 cases of Oral cancers are being diagnosed every year and 8000 deaths occur due to oral cancers.[3] Most of the Oral cancers diagnosed are in the advanced stages which drastically affects the survival rates.

Various factors have been linked to Oral and Oro-pharyngeal cancers. Environmental risk factors, pollution, occupational hazards and personal habits such as smoking have been attributed for increased oral cancer incidence amongst urban populations. Studies on site specific risks for oral cancers are few. Studies have indicated that in addition to the use of Tobacco and cigarette smoking as primary risk factors for several intra-oral cancers poor oral health, nutritional factors and infection with Human papilloma virus type 16 has also been related. In general, tobacco posed high risk for

buccal mucosa and alveolus in comparison to other subsites. Smoking affected tonsil and floor of mouth more than other sites. Alcohol posed more risk for buccal mucosa and floor of mouth than tongue. Other factors that have a predisposition to increased incidence of cancer are age, race, ethnicity and gender. [4]

Demographic characteristics such as gender have for long been a major factor associated with various cancers. Propensity for oral cancer increases if an individual is male. Various genetic factors, patters and risks associated with excessive alcohol consumption, particularly among current smokers may be contributing to this high risk amongst males [4]. A study which obtained trends on incidence, mortality and survival rates from the SEER (Surveillance, Epidemiology and End Results) web site indicated highest rates for males. Although over the course of time smoking rates increased for females resulting in closing the gender gap.

Some studies have also indicated that increased population density have increased cancer incidence[5, 6-9]. The study done in Illinois examined the relation between population density and cancer incidence; results indicated that there were no urban rural differences. However, the methodological weakness of the study prevents making generalizable assumptions. [7]

A case control study was conducted in a hospital (1981-1990) where cases were between 21-80 yrs. The results of this study indicated the proportions of the population with oral cancer (Squamous cell Carcinoma) were higher amongst males as compared to females. [10]

Beale Codes:

Due to urbanization and increased stress there is increase in smoking rates among females which is proportionate to the increase in oral cancer.[11] Rural-Urban Continuum codes form a classification scheme that distinguishes metropolitan (metro) counties by the population's size of their metro area and non- metropolitan (non-metro) counties by the degree of urbanization and adjacency to a metro areas or areas. This has resulted in a nine part county classification scheme with three divisions for the metro areas (Urban) and six for the non-metro areas (suburban and rural).The office of Management and budget (OMB) in June of 2003 applied the metro-non metro status to the counties, where the metro counties were described based on the population size of the Metropolitan Statistical area.

2003 Rural-Urban Continuum Codes Code Description

Metro counties: 1 Counties in metro areas of 1 million populations or more

2 Counties in metro areas of 250,000 to 999,999 million populations

3 Counties in metro areas of fewer than 250,000 populations

Independent cities of Virginia have been combined with the counties of their origin. [12]

Distribution of the Urban-Rural Beale codes are seen in Figure: 1. Analyzing relationship between cancer and urbanization in the United States has been discussed since the early 1950's. [13] Cancer rates appear to be more evident amongst the urban populations. This has been believed to be due to air and water pollution, occupational exposures and personal habits such as smoking [13]. On comparing the Urban-Rural cancer aspects various studies have used population density as a tool to define urbanization. Factors such

as access to care or utilization of early screening methods may be contributing to the urban-rural differences in the extent of the disease at diagnosis[14].

A study in New York during 1978-82 indicated a significant linear relationship between increasing population density and cancer of buccal cavity, pharynx and esophagus. The trends were significantly higher in the two most urban population quintiles. [8]

Netherlands has an excellent access to health care in both urban and rural areas. Differences were observed in the overall oral cancer rates. With respect to oral cavity and pharynx the relative risk showed an excess in urban population (RR= 1.6-1.4). It showed a significant linear trend in incidence rates of cancer. [15]

Cross sectional studies done in developing countries such as India (1986-1998) showed an overall reduction in oral cancer rates but the rates were higher amongst the urban population with a 2:1 ratio as compared to a 5:1 (male :female) in rural areas. [16]

Other international studies such as the one conducted in Taiwan indicated that there is a relation between incidence of Oral Cancers and local residence of the individual. The high incidence of oral cancers in Northern Taiwan was related to increase population density. Long term poor prognosis was confirmed by the Kaplan Meier survival curves and the log rank test. [17]Another study done in Taiwan between 1982-1991 reported site specific patters of cancer rates within four population density quartiles (rural, suburban, urban, metropolitan), there was an linear increase in cancer trend over the course of 10 years amongst males.

Reports and results based on previous studies indicate a relation between urban populations with a linear trend and oral cancer. Prior to 2003 various papers had different

methods to classify Urban-Rural populations. Our study hopes to eliminate the differences in the classification that may have lead to varying results.

The objectives of this study are 1) To look at the prevalence of Oral and Oro pharyngeal Cancers in Virginia from 2001-2005 2) Is there an association between metro living and Oral Cancers in VA. 3) This study is also being done to determine if Metro living is a predictor of Oral Cancer after adjusting for gender, race and age.

Methodology

The data for this study was from the Virginia Cancer Registry. Virginia Cancer registry is a population based statewide cancer registry that collects incidence data on cancers. State wide collections of data on cancer by the Virginia Department of Health is mandated in the Code of Virginia (§ 32.1-70 et seq.) of Title 32.1, and the Virginia Department of Health disease reporting regulations. According to these statues, each hospital, clinic and independent pathology laboratory in the Common wealth is required to report all cases of cancer.

According to International Classification of Diseases for Oncology (ICD-O) Oral Cancers would include all the reported cases of lip, oral cavity and pharynx cancers.

For the purposes of the study eligibility was limited to the patients with the primary oral cancers diagnosed between 2001 and 2005. The data was de-identified to create a secondary data set which consisted of Oral cancer counts over the five year time period.

For the purposes of the study cases were classified according to the area of residence which was defined using urban beale codes 1, 2 and 3. Other factors that were observed for the purposes of the study were stage at diagnosis which included localized, regional, distant, un-staged, gender (male and female), age of patient (5 year interval

from 0-85 years) and race (white and black). For the purposes of this study, Regional and distant stage of oral cancer were combined as “advanced stage” and unstaged oral cancers were eliminated as they were not clearly defined. Analysis of this secondary data was done using SAS 9.1. Descriptive statistics presents the distribution of oral cancer according to the stage, gender and urbanity level of the patient. A log-linear model was done to look for association between metro living and Oral Cancers in Virginia after adjusting for gender and stage. This model was fit using a Poisson’s regression to observe if the cancer counts are influenced by the urban beale code 3 populations. In case of not a good fit a scaled deviance was used to account for the over dispersion in the oral cancers counts. As the individual cases could not be identified the study did not require IRB approval.

Results:

During the five year period of 2001- 2005 the Virginia Cancer registry received a total of 3,390 reported cases of oral and pharyngeal cancers. Table 1 describes the basic demographic characteristics of the reported cases. Out of the 3,390 cases 67.35% (2283) of the cases were diagnosed in males and the rest 32.65% were females (1107).

Based on the stage at diagnosis, 34.45% (1168) of Oro-pharyngeal cancers were diagnosed to have localized staging as compared to 50.18% (1701) regional and 11.03% (374) distant. 4.34% of the cancers were unstaged (N=147).

We observed that 63.98% (2075) of the cancers were diagnosed at an advanced stage as compared to only 36.02% (1168) being diagnosed as localized. This is of critical interest as prognosis of oral and pharyngeal cancers when diagnosed at an advanced stage is poor due to the propensity for metastasis.

Looking at the distribution of oral cancers amongst different race ethnicity groups 82% of all Oro-pharyngeal cancers were seen amongst whites. Majority of oral cancers were seen amongst age groups 35-74 years (78.41%).

While looking at the distribution of oral cancers reported from the Urban populations; 82.3% (2790) were reported from beale code1 (population of 1 million or more individuals). Only 9.73% (330) cases were reported from beale code 2 (Populations of 250,000- 999,999 individuals) and 7.96% (270) cases were reported from beale code 3(population fewer than 250,000 people).

Distribution of oral cancers due to the various risk factors is seen in Table 2. We observed that within beale code 3 there were only 97 (37.45%) cases of localized cancers as compared to 162 (62.55%) regional or distant cases. A similar distribution was seen when the urban population increased to one million or more; 970 (36.34%) localized cases of Oro pharyngeal cancer as compared to 1699 (64%) regional or advanced cancers. There was almost an equal distribution of unstaged oral cancers amongst the metro populations. Within the beale codes there was almost a similar distribution of unstaged oral cancers. 9.9% of 3069 cancers were unstaged in urban beale code1. 12.12% of 363 cancers were unstaged in beale code 2 and 11.56% of 294 cancers were unstaged in beale code 3. More than 50% of cancers were diagnosed at an advanced stage in the urban populations; we did not see a significant relation between advanced oral cancers and metro living. ($p = 0.2878$).

Among males 712 (31.19%) cases of localized cancers were observed as compared to 1571 (68.81%) of advanced cancers. Among females 456 (47.5%) cases of localized cancers were observed as compared to 504 (24.3%) advanced cancers. When

gender was observed to be a risk factor for oral cancer a significant association was seen between gender and advanced oral cancers ($\chi 2$=78.04, p-value <.0001).

A significant association was seen between race and advanced oral cancers. ($\chi 2$=35.019, p-value <.0001). Almost75% of oral cancers was diagnosed at regional/advanced stage amongst blacks as compared to 61.62% in whites.

Age was another significant risk factor for advanced oral cancers ($\chi 2$=42.003, p-value <.0001). Majority of the advanced cancer cases were seen amongst 35-74 year age groups (N=1718).

Poisson regression:

In our analysis we want to determine if advanced oral cancers counts are influenced by the location of the individuals in beale code 3 areas (population of under 250,000). GENMOD procedure was used to perform the regression analysis. In this case the goodness of fit statistics indicated that the value/DF= 1.5239. As the model was over dispersed a scaled deviance was used to fit the model reasonably well. At this point type 3 analyses indicated that there is not a significant trend in advanced oral cancers in beale code 3. [F=0.11 (DF=2,323) p-value=0.8922]

After adjusting for age, race and gender we wanted to observe if advanced oral cancer counts are influenced by the location of individuals in beale code 3. Another Poisson regression model using GENMOD procedure with the LINK= LOG function. In this case the good ness of fit analysis indicated the value/DF = 1.4844. Similarly the dispersion parameter >1 and the model is over dispersed. After performing a scaled deviance Poisson regression model indicated that there was a stable trend in counts of advanced oral cancer after adjusting for race, age, and gender.(θ=-0.04 p-value =0.617).

Table 3 indicates the Analysis of Parameter estimates for the various risk factors for advanced oral cancer.

Discussion:

The data showed an association between race, gender, age and advanced oral cancers. Similar associations have been reported with other studies. [6, 18, 19]. Our study also indicated that males in Virginia have an increased propensity for advanced cancers as compared to females, although some of the newer studies have indicated an increased prevalence of smoking in women has resulted in closing the gender gap of oral cancers. This has been attributed to increase levels of stress in urban populations amongst women.

In our study we observed increased counts of advanced oral cancers as compared to localized cases (36.02% vs. 63.98%). This is of concern as prognosis of oral and pharyngeal cancers when diagnosed at an advanced stage is poor and the functional, cosmetic and psychological insults suffered by the oral cancer patients results in social isolation, significantly burdening patients, their families and society.[20] 4.34% of the cancers were unstaged due to inadequate clinical and diagnostic information about the cancer at the time it was being diagnosed.

In spite of growing numbers of advanced cancers in urban populations areas Population density (beale code 3) did not impact Oral cancer counts. The increase in numbers could be associated with the difference in etiological factors within the urban areas such as personal behaviors. Larger number of counts in beale code 1 could be associated with better and early screening in the highly populated areas[9].

Individuals in highly populated areas have a higher risk of cigarettes smoking, exposure to UV radiation, diet, pollutants and occupational hazards[19].

According to the chronic disease indicators put forth by the CDC in 2007 prevalence of Cigarette smoking among adults 18 years and older is almost 18.5% (95% CI's 16.8, 20.2). In spite of the decline in smoking rates over the course of years there are almost 1.1 million Virginians who smoke which increases the risk for oral cancers.

We used Poisson distribution which best characterizes the rare events of oral cancers. There are certain assumptions being considered while using a Poisson distribution; where the variance of the response variable approximates the mean of the response variable [20, 21].

i.e., V (E(Y)) = ø E(Y) where ø is the dispersion parameter [20]

Our results indicated that the model is over dispersed (where the variance is larger than the mean). This has been corrected using the scaled deviance criteria where the model is almost forced to have a reasonably good fit. Various factors are responsible for the Over dispersion in out cancer counts, our data was cumulative over a five year time period and reporting of the cancers occurred from various hospitals, nursing home, clinics and other health care facilities. There is a huge amount of variation of the type of reporting of these cases at the stage at diagnosis. Screening and detection methods have improved and changed over the course of this 5-year period which at this point could not be accounted for in our study.

Our analysis also did not account for personal habits history of smoking, tobacco chewing, and alcohol consumption. Even after adjusting for some of the potential covariates such as age, race and gender we were unable to see population density as a significant predictor for oral cancers.

Conclusions

There is an unequal burden of oral cancers in the urban populations is VA. In spite of decreased smoking incidence in VA the cancer counts are higher with increased population density. Due to the aggressive nature of these cancers there is a need to create a centralized reporting system across the commonwealth. In spite of NAACCR (North American Association of Central Cancer Registries) having certified Virginia Cancer Registry as a provider for a complete accurate and timely cancer incident data there are some discrepancies for data collection in some of the rural areas. We hope to bridge this gap and use our data to generate hypothesis for further studies discussing more specific factors such personal health behaviors, environmental factors and other agents that are related to increased oral cancer Incidence. Further research can help us to understand the exact nature and extent of these relationships.

TABLE: 1 Characteristics of Oro pharyngeal cancers

Variables	N (%)
Stage	
Localized	1168 (34.45)
Regional	1701 (50.18)
Distant	374 (11.03)
Unstaged	147 (4.34)
Gender	
Male	2283 (67.35)
Female	1107 (32.65)
Stage	
Localized	1168 (36.02)
Regional/Distant	2075 (63.98)
Beale Codes	
Code:1:One million or greater pop	2790 (82.3)
Code:2:250,000-999,999 pop	330 (9.73)
Code:3:below 250,000 pop	270 (7.96)
Race	
Black	615 (18.14)
White	2775 (81.86)
Age	
0-34 years	69 (2.04)
35-74 years	2658 (78.41)
75+ years	663 (19.56)

TABLE: 2 Risk factors for advanced oral cancers:

	Stage		
Variables	**Localized**	**Advanced**	**Total**
	N (%)	**N (%)**	
Beale			
one million or greater pop	970(36.34)	1699(63.66)	2669
250,000-999,999 pop	101(32.06)	214(67.94)	315
below 250,000 pop	97(37.45)	162(62.55)	259
Gender			
Male	712(31.19)	1571(68.81)	2283
Female	456(47.50)	504(52.5)	960
Race			
Black	152(25.5)	444(74.5)	596
White	1016(38.38)	1631(61.62)	2647
Age			
0-34 years	33(51.56)	31(48.44)	64
35-74 years	856(33.26)	1718(66.74)	2574
75+ years	279(46.12)	326(53.88)	605

Table: 3 Analysis of Parameter estimates for advanced oral cancers

Parameter		DF	θ	SE	Wald 95% CI's		χ2	P-value
Intercept		1	0.39	0.07	0.26	0.53	34.3	<.0001
Bealef	one million or greater pop	1	-0.03	0.06	-0.14	0.08	0.23	0.6324
	below 250,000 pop	1	-0.04	0.08	-0.19	0.12	0.25	0.617
	250,000-999,999 pop	Ref						
Race	Black	1	0.07	0.04	-0.02	0.15	2.52	0.1124
	White	Ref						
Age	0-34 years	1	-0.05	0.13	-0.31	0.21	0.11	0.7442
	35-74 years	1	0.06	0.05	-0.03	0.15	1.71	0.1911
	75+ years	Ref						
Gender	Male	1	0.09	0.04	0.02	0.16	5.7	0.017
	Female	Ref						

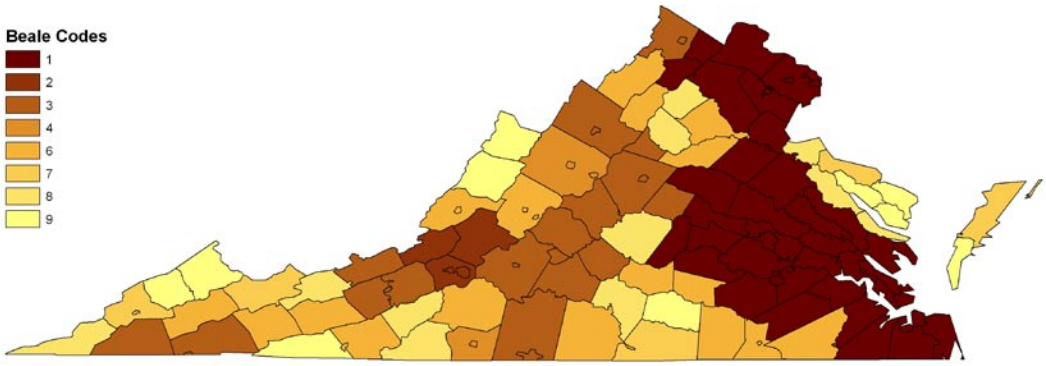

FIG: 1 Urban-Rural Beale codes

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(1) *International Classification of Diseases for Oncology ICD-O.* 3rd ed. Geneva: WHO; 2000.

(2) 2005; Available at: http://www.cancer.org/docroot/CRI/content/CRI 2 4 1X What is oral cavity and Oro pharyngeal cancer60.asp? Accessed 09/15, 2008

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