Fast Food Density and The Risk of Colorectal Cancer in Oklahoma between 2003 and 2012

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BACKGROUND

❖ Oklahoma had a higher incidence and mortality rate of colorectal cancer (CRC) than the U.S. overall rates between 2007 and 2012.

❖ In 2000, Oklahoma had a higher number of fast food restaurants (FFRs) per square mile (ranked 15th) and per population (ranked 18th) as compared to the other states in the U.S.

RESEARCH AIMS

❖ To explore the association between fast food density and CRC risk in Oklahoma between 2003 and 2012 while controlling for other related-risk factors including age, gender, race/ethnicity, and poverty.

❖ To develop a model that predicts CRC risk at the census tract level.

❖ To identify high risk areas for CRC.

MATERIALS AND METHODS

❖ An estimate for 2000 and 2008-2012 census tract population data were obtained from the U.S. Census Bureau source.

❖ An Oklahoma licensed facility data from 1991-2015 (n=80,027) was obtained from the Oklahoma State Department of Health (OSDH), Department of Protective Health Services.

❖ CRC cases from 1997-2012 were acquired from the OSDH, Oklahoma Central Cancer Registry (OCCR).

❖ Two statistical approaches were applied to find the best model fit for study data, which included a Geographically Weighted Poisson Regression (GWPR) and a non-spatial Log-linear Poisson Regression model.
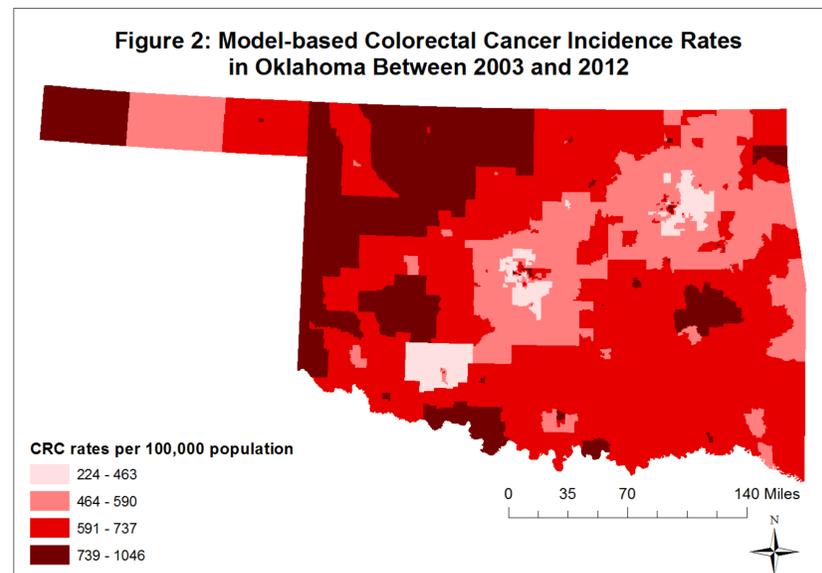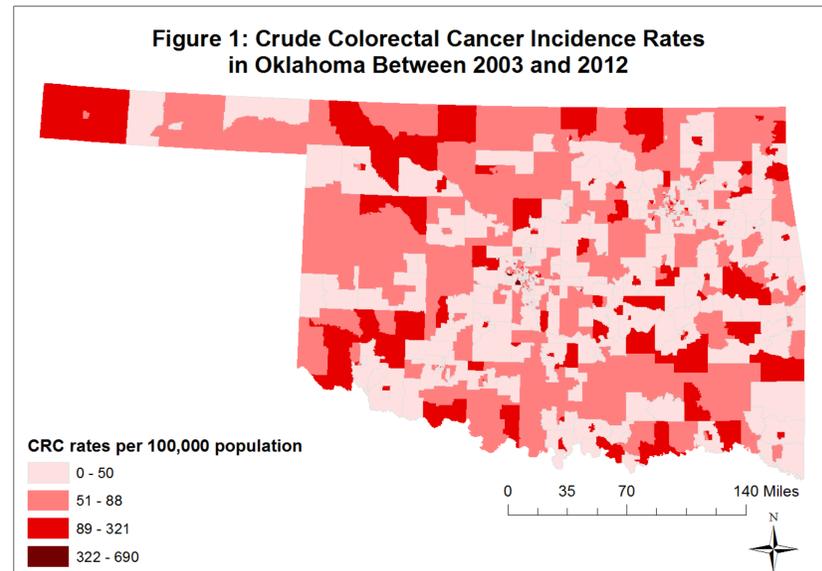
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RESULTS

Figure 1: Crude Colorectal Cancer Incidence Rates in Oklahoma Between 2003 and 2012

CRC rates per 100,000 population
- 0 - 50
- 51 - 88
- 89 - 321
- 322 - 690

0 35 70 140 Miles

Figure 2: Model-based Colorectal Cancer Incidence Rates in Oklahoma Between 2003 and 2012

CRC rates per 100,000 population
- 224 - 463
- 464 - 590
- 591 - 737
- 739 - 1046

0 35 70 140 Miles

❖ The distribution of the crude CRC incidence rates in Oklahoma between 2003 and 2013 was randomly scattered (Figure 1). Moreover, the spatial relationship between the outcome and explanatory variables was also not significant found based on the result of the Global Moran's Z scores and p-values (Table 1), thus a non-spatial Log-linear Poisson Regression model was used.

❖ There was not a significant relationship between fast food density and CRC risk in Oklahoma between 2003 and 2010 after accounting for other related-risk factors in the model (Table 2, p-value = 0.0645). This association was also observed for male and below poverty populations (Table 2, p-value = 0.7196 and 0.1816, respectively).

❖ There was a significant inverse relationship between CRC risk and the age population of persons < 50 and 50-64 years (Table 2, p-value < 0.0001 and p-value = 0.0016, respectively).

❖ Race/ethnicity was significantly related to the risk of CRC as well (Table 2, p-value < 0.0001)

Table 1: Descriptive statistics of outcome measure and predictor variables

Variable	Min	Max	Mean (Standard Deviation)	Global Moran's (Clustering) Z score	P-value
Outcome measure (Based on 2008-2012 population census tract estimate)					
CRC incidence rates per census tract from 2003-2012	0	689.66	57.68 (44.32)	- 0.40	0.70
Predictor variables (Based on 2000 population census tract estimate)					
Fast food density per census tract from 1996-2000	0	9704.14	430.09 (706.95)	33.67*	0.00
Proportion of White	0	0.98	0.77 (0.15)	43.01*	0.00
Proportion of African American	0	0.98	0.09 (0.15)	45.36*	0.00
Proportion of AI/AN§	0	0.50	0.07 (0.06)	48.82*	0.00
Proportion of Male	0	0.78	0.50 (0.04)	25.96*	0.00
Proportion of Female	0	0.58	0.50 (0.04)	26.11*	0.00
Proportion of below poverty	0	0.54	0.15 (0.08)	42.73*	0.00
Proportion of above poverty	0	0.98	0.85 (0.09)	37.16*	0.00
Proportion of age less than 50	0	0.97	0.72 (0.07)	34.24*	0.00
Proportion of age 50-64	0	0.25	0.15 (0.03)	36.69*	0.00
Proportion of age 65 and over	0	0.27	0.13 (0.05)	39.64*	0.00

§American Indian/Alaska Native
*Significant at 1% confidence interval

Table 2: Overview of regression model results

Variable	Coefficients	Std. Error	95 % Confidence Interval	Z	P-value
Intercept	- 4.7601	0.2034	(- 5.1589, - 4.3614)	- 23.40	<.0001
Fast food density per census tract from 1996-2000	- 0.0000	0.0000	(- 0.0001, 0.0000)	- 1.85	0.0645
Proportion of White	3.0408*	0.3785	(2.2990, 3.7826)	8.03	<.0001
Proportion of African American	3.1880*	0.3647	(2.4733, 3.9027)	8.74	<.0001
Proportion of AI/AN§	3.5519*	0.5073	(2.5576, 4.5461)	7.00	<.0001
Proportion of Male	- 0.1601	0.4460	(- 1.0341, 0.7140)	- 0.36	0.7196
Proportion of below poverty	0.2670	0.1998	(- 0.1247, 0.6586)	1.34	0.1816
Proportion of age less than 50	- 3.9587*	0.2944	(- 4.5357, - 3.3817)	- 13.45	<.0001
Proportion of age 50-64	- 3.0673*	0.9731	(- 4.9745, - 1.1601)	- 3.15	0.0016

§American Indian/Alaska Native
*Significant at 5% confidence interval

DISCUSSION / CONCLUSION

❖ Although the relationship between fast food density and CRC risk was not significant found and the distribution of the crude CRC incidence rates was randomly dispersed in Oklahoma between 2003 and 2012 (Table 2), the non-spatial log-linear regression model-based map for the Oklahoma CRC incidence rates indicated that rural areas have a higher incidence rate of CRC than urban regions (Figure 2).

❖ This suggested that CRC might correlate with other important risk factors that were not able to be included in this model instead of the fast food density alone such as screening rates, percentage use of healthcare coverage, obesity rates, diabetes (particularly Type II) rates, percentage of alcohol intake, smoking rates, and percentage of educational attainments measuring at the census tract level.

❖ Future research in this area needs to replicate the study in fully concern with these foregoing limitations. Moreover, the high incidence rate of CRC among rural populations in Oklahoma calls for research into effective rural interventions.

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