Cancer Incidence and Trends in Rural and Urban Populations in the United States

Whitney Zahnd, MS
Doctoral Candidate, University of Illinois Urbana-Champaign, Department of Kinesiology and Community Health
Senior Research Development Coordinator, Southern Illinois University School of Medicine, Office of Population Science and Policy
CO-AUTHORS

• Southern Illinois University School of Medicine (Funding: 1P20CA192987-01A1)
  • Wiley D. Jenkins, PhD, MPH
  • David E. Steward, MD, MPH
  • Laurent Brard, MD, PhD

• Washington University School of Medicine in St. Louis (Funding: 1P20CA192966-01A1)
  • Aimee S. James, PhD, MPH
  • Graham Colditz, MD, DrPH
WHO IS RURAL?

• By most measures, rural populations comprise between ~15-20% of the U.S. Population:
  • 2010 Census Bureau Rural Urban Classification-19.3% (~59+ million people) ¹
  • United States Department of Agriculture Rural Urban Continuum Codes-14.8% (~46+ million people) ²
• 20% of rural Americans are people of color. ³
• Higher rates of poverty and uninsured status are often found in rural areas. ⁴,⁵
RURAL HEALTH/CANCER DISPARITIES

- Limited access to care
- Lower rates of cancer screening
- Higher rates of poor health behaviors (smoking, obesity, and physical inactivity)
- Higher rates of cancer mortality

Figure Sources: HRSA Data Warehouse, CDC
OUR OBJECTIVE

- To describe rural-urban differences in cancer incidence and trends in the United States.
• North American Association of Central Cancer Registries (NAACCR) public use dataset
  • Data from population-based cancer registries from 46 states (~93% of the U.S. population)
    • 4 states did not consent for their data to be used
    • Some registries’ data were not included for a given year if they did not achieve silver or gold NAACCR certification during that year
  • Years available-1995-2013

• Rural-urban status determined by United States Department of Agriculture’s Rural-Urban Continuum Codes
  • 1-3= metro (urban)
  • 4-9=nonmetro (rural)
METHODS- CANCER TYPES AND POPULATIONS

• Cancers of Interest
  • All cancers combined and individual cancer types as used in previous studies/reports 13,14
    • Focus on cancers with screening mechanisms and/or modifiable risk factors for this presentation
  • Cancers groupings associated with carcinogenic exposure:
    • Tobacco associated cancers as defined by the 2014 Surgeon General’s report (ICD-O-3 primary site) 15
    • Human Papillomavirus (HPV) associated cancers as defined by ICD-O-3 primary site and relevant histology 16

• Populations
  • Sex
  • Race/Ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic)
  • U.S. Census Division (Northeast, South, Midwest, and West)
  • County Level Poverty
METHODS-STATISTICAL ANALYSIS

• Age-adjusted incidence rates and rate ratios were calculated for rural-urban comparisons across population groups; 2009-2013
  • Rates were calculated using the 2000 U.S. Standard Population and expressed per 100,000 population

• Annual percentage change (APC) and overall percentage change in age-adjusted cancer incidence rates were calculated; 1995-2013
  • P< 0.05 indicated statistically significant rate ratios and APCs
  • All analysis was performed using SEER*Stat
<table>
<thead>
<tr>
<th></th>
<th>Rural N (%)</th>
<th>Urban N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cases</td>
<td>1,215,260 (16.7%)</td>
<td>6,073,283 (83.3%)</td>
</tr>
<tr>
<td>U.S. Census Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>134,197 (11.0%)</td>
<td>1,411,055 (23.2%)</td>
</tr>
<tr>
<td>Midwest</td>
<td>373,953 (30.8%)</td>
<td>1,157,272 (19.1%)</td>
</tr>
<tr>
<td>South</td>
<td>546,632 (45.0%)</td>
<td>2,130,224 (35.1%)</td>
</tr>
<tr>
<td>West</td>
<td>160,478 (13.2%)</td>
<td>1,374,732 (22.6%)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>646,302 (53.1%)</td>
<td>3,069,294 (50.5%)</td>
</tr>
<tr>
<td>Female</td>
<td>568,866 (46.9%)</td>
<td>3,003,288 (49.5%)</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Hispanic White</td>
<td>1,066,639 (87.8%)</td>
<td>4,571,767 (75.3%)</td>
</tr>
<tr>
<td>Non Hispanic Black</td>
<td>84,207 (6.9%)</td>
<td>688,268 (11.3%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>31,675 (2.6%)</td>
<td>507,150 (8.4%)</td>
</tr>
<tr>
<td>Other</td>
<td>22,784 (1.9%)</td>
<td>223,674 (3.7%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>9,955 (0.8%)</td>
<td>82,424 (1.4%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-19</td>
<td>9,384 (0.8%)</td>
<td>59,312 (1.0%)</td>
</tr>
<tr>
<td>20-44</td>
<td>70,405 (5.8%)</td>
<td>464,105 (7.6%)</td>
</tr>
<tr>
<td>45-64</td>
<td>441,423 (36.3%)</td>
<td>2,316,831 (38.1%)</td>
</tr>
<tr>
<td>65+</td>
<td>694,048 (57.1%)</td>
<td>3,233,035 (53.2%)</td>
</tr>
<tr>
<td>County Poverty Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-9.99%</td>
<td>69,566 (5.7%)</td>
<td>1,019,614 (16.8%)</td>
</tr>
<tr>
<td>10-19.99%</td>
<td>744,946 (61.3%)</td>
<td>4,403,852 (72.5%)</td>
</tr>
<tr>
<td>20+%</td>
<td>400,748 (33.0%)</td>
<td>649,817 (10.7%)</td>
</tr>
</tbody>
</table>
# RESULTS - RURAL-URBAN DIFFERENCE BY SEX

<table>
<thead>
<tr>
<th>Rural</th>
<th></th>
<th></th>
<th></th>
<th>Rural</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All Rates</td>
<td>Male Rates</td>
<td>Female Rates</td>
<td>All Rates</td>
<td>Male Rates</td>
<td>Female Rates</td>
<td>All Rates</td>
<td>Male Rates</td>
</tr>
<tr>
<td>All sites</td>
<td>446.4</td>
<td>502.1</td>
<td>405.4</td>
<td>448.7</td>
<td>501.1</td>
<td>412.5</td>
<td></td>
</tr>
<tr>
<td>Tobacco-associated</td>
<td>205.8</td>
<td>266.0</td>
<td>155.8</td>
<td>192.0</td>
<td>248.3</td>
<td>147.9</td>
<td></td>
</tr>
<tr>
<td>HPV-associated</td>
<td>12.6</td>
<td>9.9</td>
<td>15.2</td>
<td>11.7</td>
<td>10.0</td>
<td>13.4</td>
<td></td>
</tr>
<tr>
<td>Breast (Female)</td>
<td>N/A</td>
<td>N/A</td>
<td>113.4</td>
<td>N/A</td>
<td>N/A</td>
<td>124.8</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>N/A</td>
<td>114.1</td>
<td>N/A</td>
<td>N/A</td>
<td>124.5</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>70.2</td>
<td>86.7</td>
<td>57.1</td>
<td>61.2</td>
<td>72.5</td>
<td>52.8</td>
<td></td>
</tr>
<tr>
<td>Colorectal</td>
<td>43.9</td>
<td>50.5</td>
<td>38.2</td>
<td>40.1</td>
<td>46.2</td>
<td>35.1</td>
<td></td>
</tr>
<tr>
<td>Cervical</td>
<td>N/A</td>
<td>N/A</td>
<td>8.4</td>
<td>N/A</td>
<td>N/A</td>
<td>7.5</td>
<td></td>
</tr>
</tbody>
</table>

Purple shading indicates a statistically significantly higher rate in a geographic group (P-value of rate ratio <0.05)
RESULTS - RURAL-URBAN DIFFERENCE BY RACE/ETHNICITY

**Age-Adjusted Cancer Rates by Rural-Urban Status and Race/Ethnicity**

- **Non Hispanic White**
  - Rural: 449.5
  - Urban: 464.4

- **Non Hispanic Black**
  - Rural: 458.7
  - Urban: 471.4

- **Hispanic**
  - Rural: 322.7
  - Urban: 350.9

**Age-Adjusted Tobacco Associated Cancer Rates by Rural-Urban Status and Race/Ethnicity**

- **Non Hispanic White**
  - Rural: 206.6
  - Urban: 216.1

- **Non Hispanic Black**
  - Rural: 152.4
  - Urban: 197

- **Hispanic**
  - Rural: 150
  - Urban: 150

**Age-Adjusted Cervical Cancer Rates by Rural-Urban Status and Race/Ethnicity**

- **Non Hispanic White**
  - Rural: 8.0
  - Urban: 6.9

- **Non Hispanic Black**
  - Rural: 10.8
  - Urban: 10.0

- **Hispanic**
  - Rural: 9.4
  - Urban: 9.9

**Age-Adjusted Colorectal Cancer Rates by Rural-Urban Status and Race/Ethnicity**

- **Non Hispanic White**
  - Rural: 43.2
  - Urban: 39.5

- **Non Hispanic Black**
  - Rural: 53.8
  - Urban: 48.8

- **Hispanic**
  - Rural: 36.6
  - Urban: 35.6

*indicates a statistically significantly higher rate in a geographic group (P-value of rate ratio <0.05)*
RESULTS-RURAL-URBAN DIFFERENCES BY U.S. CENSUS REGION

All regions had statistically significantly different rates (rate ratios $p<0.05$)
RESULTS - RURAL-URBAN DIFFERENCE BY COUNTY LEVEL
POVERTY

All poverty levels had statistically significantly different rural-urban rates (rate ratios p<0.05)
RURAL-URBAN CANCER INCIDENCE TRENDS

All Cancer Incidence Rates, 1995-2013

- Rural: Total: -4.84%; APC: -0.27%^  
- Urban: Total: -10.22%; APC: -0.56%^  

Tobacco-associated Cancer Incidence Rates, 1995-2013

- Rural: Total: -3.37%; APC: -0.27%^  
- Urban: Total: -13.82%; APC: -0.86%^  

HPV-associated Cancer Incidence Rates, 1995-2013

- Rural: Total: 19.26%; APC: 0.79^  
- Urban: Total: 0.55%; APC: 0.16  

^ indicates a statistically significant APC change (p<0.05)
LIMITATIONS

- Rural-urban characterization was dichotomous and pre-defined
- Variable data availability due to lack of consent/annual certification
- Potential residual confounding with categorization of poverty into a few groups
DISCUSSION/CONCLUSIONS

• Urban populations had higher cancer incidence rates than rural populations, largely driven by higher breast and prostate cancer rates (i.e. likely higher screening rates in urban areas)

• Rural populations had higher rates of tobacco associated cancers
  • Opportunities for continued tobacco cessation efforts and policy changes that more effectively target rural areas

• Colorectal cancer incidence was higher across most rural populations, including both whites and blacks, all poverty levels
  • Opportunities to continue to promote screening interventions, including FOBT/FIT interventions that may reduce the travel burden for screening

• HPV associated cancers are higher in rural populations and are increasing
  • Opportunities to promote HPV vaccinations in rural areas

• Further research should aim to continue to elucidate rural-urban disparities in cancer by addressing additional areas on the cancer control continuum
REFERENCES


REFERENCES


11. SEER*Stat Database: NAACCR Incidence Data - CiNA Analytic File -, Public Use (which includes data from CDC’s National Program of Cancer Registries (NPCR), CCCR’s Provincial and Territorial Registries, and the NCI’s Surveillance, Epidemiology and End Results (SEER) Registries), certified by the North American Association of Central Cancer Registries (NAACCR) as meeting high-quality incidence data standards for the specified time periods, submitted December 2015.


Questions?

wzahnd@illinois.edu
(217) 545-2428