Updated Cancer Incidence: Appalachia 2004-2011

November 2014
Background
Appalachian Region

- Appalachian mountains
  - 13 states
  - 420 counties

- Homogeneous characteristics
  - Topography
  - Demographics
  - Economics
Background
Previous Studies

- Breast cancer in 3 states
- Cancer survivors in a single university hospital
- Cancer risk perceptions
- Mortality disparities
- Wingo, et al
  - 11/13 states
  - 88% population coverage
  - 2001-2003 with variation by state
Purpose

- **Expand time period**
  - 2004-2011

- **Expand population coverage**
  - 100% coverage

- **Examine incidence and trends**
  - *State, region, sex, race*

- **Compare to non-Appalachia**
  - *Within states*
  - *Rest of U.S.*
Methods

- Counties identified
  - Appalachia vs non-Appalachia

- Appalachian regions identified
  - Southern, Central, Northern

- NPCR-CSS 2013 November
  - States meeting high quality criteria
  - Diagnosis years 2004-2011
All Cancer Sites, All Races, Male and Female, Appalachia, 2004-2011

Incidence Rates, Appalachia vs Non-Appalachia

Statistical Significance, Regions vs US Non-Appalachia
All Cancer Sites, All Races, Male and Female, by West Virginia County, 2004-2011

Incidence Rates, West Virginia Counties

Statistical Significance, Counties vs US Non-Appalachia
Colon and Rectum, All Races, Male and Female, Appalachia, 2004-2011

Incidence Rates, Appalachia vs Non-Appalachia

Statistical Significance, Regions vs US Non-Appalachia

[Maps showing incidence rates and statistical significance]
Colon and Rectum, All Races, Male and Female, by West Virginia County, 2004-2011

Incidence Rates, West Virginia Counties

Statistical Significance, Counties vs US Non-Appalachia
Lung and Bronchus, All Races, Male and Female, Appalachia, 2004-2011

Incidence Rates, Appalachia vs Non-Appalachia

Statistical Significance, Regions vs US Non-Appalachia

NPCR NATIONAL PROGRAM OF CANCER REGISTRIES
Lung and Bronchus, All Races, Male and Female, by West Virginia County, 2004-2011

Incidence Rates, West Virginia Counties

Statistical Significance, Counties vs US Non-Appalachia
Female Breast, All Races, Appalachia, 2004-2011

Incidence Rates, Appalachia vs Non-Appalachia

Statistical Significance, Regions vs US Non-Appalachia

Incident Rate
- 106.9 - 112.3
- 112.4 - 116.3
- 116.4 - 119.6
- 119.9 - 124.1
- 124.2 - 128.7

Statistical Significance
- U.S. Non-Appalachia
- Lower
- Comparable
- Elevated

NPCR National Program of Cancer Registries
Female Breast, All Races, by West Virginia County, 2004-2011

Incidence Rates, West Virginia Counties

Statistical Significance, Counties vs US Non-Appalachia
Prostate, All Races, Appalachia, 2004-2011

Incidence Rates, Appalachia vs Non-Appalachia

Statistical Significance, Regions vs US Non-Appalachia
Incidence Rates, West Virginia Counties

Prostate, All Races, by West Virginia County, 2004-2011

Statistical Significance, Counties vs US Non-Appalachia
Appalachian Regions
Invasive Cancer Incidence Rates by Primary Site and Appalachian Region and US, Males, All Races, 2004-2011

<table>
<thead>
<tr>
<th>Primary Site</th>
<th>Southern Rate</th>
<th>Central Rate</th>
<th>Northern Rate</th>
<th>US Non-Appalachia Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sites</td>
<td>568.7</td>
<td>561.6</td>
<td>567.1</td>
<td>542.5</td>
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<td>Oral Cavity and Pharynx</td>
<td>18.9</td>
<td>18.0</td>
<td>16.7</td>
<td>16.5</td>
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<td>Esophagus</td>
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<td>8.6</td>
<td>10.0</td>
<td>8.5</td>
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<td>Stomach</td>
<td>8.7</td>
<td>8.1</td>
<td>10.0</td>
<td>9.5</td>
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<tr>
<td>Colon and Rectum</td>
<td>55.0</td>
<td>55.5</td>
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<td>Liver and Intrahepatic Bile Duct</td>
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<td>8.0</td>
<td>8.2</td>
<td>10.7</td>
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<td>Pancreas</td>
<td>13.7</td>
<td>12.8</td>
<td>14.2</td>
<td>13.7</td>
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<tr>
<td>Larynx</td>
<td>8.5</td>
<td>8.8</td>
<td>7.4</td>
<td>6.6</td>
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<td>Lung and Bronchus</td>
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<td>Melanoma of the Skin (whites)</td>
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<td>21.3</td>
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<td>Prostate</td>
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<td>5.3</td>
<td>6.7</td>
<td>5.5</td>
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<td>Urinary Bladder</td>
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<td>37.7</td>
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<tr>
<td>Kidney and Renal Pelvis</td>
<td>21.2</td>
<td>21.8</td>
<td>20.8</td>
<td>21.1</td>
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<tr>
<td>Brain and Other Nervous System</td>
<td>8.0</td>
<td>8.3</td>
<td>8.4</td>
<td>7.9</td>
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<tr>
<td>Thyroid</td>
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<td>5.9</td>
<td>7.7</td>
<td>6.0</td>
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<tr>
<td>Hodgkin Lymphoma</td>
<td>3.0</td>
<td>2.9</td>
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<td>Non-Hodgkin Lymphoma</td>
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<td>23.1</td>
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<td>Myeloma</td>
<td>7.6</td>
<td>7.2</td>
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<td>Leukemia</td>
<td>16.0</td>
<td>16.9</td>
<td>17.6</td>
<td>16.7</td>
</tr>
</tbody>
</table>
Results
Males, States

- **Appalachia counties vs. non-Appalachia counties**
  - **All sites combined**
    - Lower in AL, GA, NC, PA, VA
    - Higher in MS, NY, OH, SC, TN
    - WV higher than US non-Appalachia
  - **No consistent site-specific pattern**
    - Prostate cancer lower or comparable, except one state
    - Lung cancer higher in 10 states

- **Appalachia states vs. US non-Appalachia**
  - All sites higher in all but MD and VA
  - Lung cancer higher in all states
## Invasive Cancer Incidence Rates by Primary Site and Appalachian Region and US, Females, All Races, 2004-2011

<table>
<thead>
<tr>
<th>Primary Site</th>
<th>Southern Rate</th>
<th>Central Rate</th>
<th>Northern Rate</th>
<th>US Non-Appalachia Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sites</td>
<td>402.3</td>
<td>427.2</td>
<td>449.3</td>
<td>418.2</td>
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<tr>
<td>Oral Cavity and Pharynx</td>
<td>6.6</td>
<td>6.4</td>
<td>6.3</td>
<td>6.2</td>
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<tr>
<td>Esophagus</td>
<td>1.6</td>
<td>1.6</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Stomach</td>
<td>4.4</td>
<td>3.9</td>
<td>4.2</td>
<td>4.7</td>
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<tr>
<td>Colon and Rectum</td>
<td>39.1</td>
<td>41.0</td>
<td>43.8</td>
<td>39.5</td>
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<tr>
<td>Liver and Intrahepatic Bile Duct</td>
<td>2.9</td>
<td>2.7</td>
<td>2.6</td>
<td>3.6</td>
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<td>Pancreas</td>
<td>10.2</td>
<td>9.5</td>
<td>11.0</td>
<td>10.7</td>
</tr>
<tr>
<td>Larynx</td>
<td>1.9</td>
<td>2.3</td>
<td>1.7</td>
<td>1.4</td>
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<tr>
<td>Lung and Bronchus</td>
<td>56.5</td>
<td>67.0</td>
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<td>54.7</td>
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<td>Melanoma of the Skin (whites)</td>
<td>22.6</td>
<td>19.8</td>
<td>15.9</td>
<td>17.8</td>
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<td>Breast</td>
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<td>122.4</td>
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<td>Cervix Uteri</td>
<td>8.2</td>
<td>8.8</td>
<td>7.9</td>
<td>7.9</td>
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<tr>
<td>Corpus and Uterus, NOS</td>
<td>18.8</td>
<td>24.5</td>
<td>31.1</td>
<td>24.5</td>
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<tr>
<td>Ovary</td>
<td>12.4</td>
<td>12.4</td>
<td>13.4</td>
<td>12.3</td>
</tr>
<tr>
<td>Urinary Bladder</td>
<td>7.8</td>
<td>9.4</td>
<td>11.3</td>
<td>9.3</td>
</tr>
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</tr>
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<td>6.1</td>
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<tr>
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<td>4.5</td>
<td>4.6</td>
<td>4.9</td>
</tr>
<tr>
<td>Leukemia</td>
<td>9.8</td>
<td>10.3</td>
<td>10.9</td>
<td>10.2</td>
</tr>
<tr>
<td>Breast, in situ</td>
<td>28.2</td>
<td>23.4</td>
<td>29.7</td>
<td>30.5</td>
</tr>
</tbody>
</table>
Results
Females, States

- **Appalachia counties vs. non-Appalachia counties**
  - All sites combined
    - Lower in VA
    - Higher in GA, KY, MD, NY, SC, TN
  - No consistent site-specific pattern
    - Lung cancer higher in 7 states
    - Cervical cancer higher in 4 states, lower in 1 state
    - Thyroid cancer higher in 6 states

- **Appalachia states vs. US non-Appalachia**
  - All sites higher in 7 states
  - Lung cancer higher in 10 states
  - Cervical cancer higher in 5 states, lower in 1 state
Invasive Cancer Incidence Rates by Appalachian Region and US, By Race, 2004-2011

- No consistent pattern by race vs. US non-Appalachia
  - White higher in Central and Northern regions
  - Black higher in Northern region only

- Black:White within each region
  - Black higher in Southern and Northern regions

<table>
<thead>
<tr>
<th></th>
<th>Southern</th>
<th>Central</th>
<th>Northern</th>
<th>US Non-Appalachia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>White</strong></td>
<td>470.4</td>
<td>482.0</td>
<td>493.5</td>
<td>470.4</td>
</tr>
<tr>
<td><strong>Black</strong></td>
<td>483.3</td>
<td>476.9</td>
<td>513.5</td>
<td>480.0</td>
</tr>
<tr>
<td>% Black Population</td>
<td>14%</td>
<td>4%</td>
<td>4%</td>
<td>11%</td>
</tr>
</tbody>
</table>
Invasive Cancer Incidence Rates, By Race, West Virginia, 2004-2011

- No evaluation by race and county
- Black:White within state
  - All sites lower
  - Colorectal comparable
  - Lung and bronchus
    - Lower males/females combined and females
    - Comparable males
  - Stomach and liver/intrahepatic bile duct higher
  - Females, breast and cervix comparable
  - Males, prostate higher
Invasive Cancer Incidence Rates by Appalachian Region and US, By Economic Status, 2004-2011

- **Southern**
  - Transitional and Distressed status counties higher rate

- **Central**
  - Distressed status counties higher rate

- **Northern**
  - Transitional status counties lower rate

<table>
<thead>
<tr>
<th></th>
<th>Southern Rate</th>
<th>Central Rate</th>
<th>Northern Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive/Attainment</td>
<td>454.1</td>
<td>481.7</td>
<td>505.9</td>
</tr>
<tr>
<td>Distressed</td>
<td><strong>467.9</strong></td>
<td><strong>503.2</strong></td>
<td>~</td>
</tr>
<tr>
<td>At Risk</td>
<td>452.9</td>
<td>475.8</td>
<td>497.8</td>
</tr>
<tr>
<td>Transitional</td>
<td><strong>478.8</strong></td>
<td>480.4</td>
<td><strong>493.1</strong></td>
</tr>
</tbody>
</table>
All Sites, All Races, Male and Female, by West Virginia County and Economic Status, 2004-2011
Conclusions

- **Overall Appalachia rate higher**
  - 2001-2003 IR 568.7 vs. 539.4
  - 2004-2011 IR 484.9 vs. 469.6

- **No consistent patterns**
  - *Except larynx and lung consistently higher*
  - *Except white population*

- **Further analysis by race/sex/site**
- **Further analysis by race/sex/site/economic status**
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the

Centers for Disease Control and Prevention.