The Cancer Burden in Appalachia 2009
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Dear Partner in Cancer Prevention and Control:

The Appalachian Community Cancer Network (ACCN) is pleased to present this publication of cancer data within the Appalachian region represented by ACCN.

The goals of this publication are to:
- Provide accurate information about cancer in the region;
- Promote education and cancer awareness; and
- Promote community-based participatory research projects.

The collaboration of many cancer-related entities is necessary in the fight against cancer. To this purpose, the Appalachia Community Cancer Network came into existence. ACCN is a National Cancer Institute (NCI)-funded research initiative to reduce cancer health disparities in the Appalachian region through community participation in education, research, and training. The ACCN is one of 25 NCI Community Network Programs across the country under the Center to Reduce Cancer Health Disparities at the NCI.

Based at the University of Kentucky, the ACCN serves the Appalachian regions of Kentucky, Maryland, New York, Ohio, Pennsylvania, Virginia, and West Virginia. The ACCN collaborates with Appalachian communities and other partners to conduct evidence-based cancer education and awareness activities, community-based participatory research, and to provide training throughout the region.

The ACCN focuses its efforts on prevention and early detection of cervical, lung, and colorectal cancers, all of which have high incidence and mortality rates in the seven-state region. The cancer data in this publication focus on cancer sites that are highly preventable or detectable.

This publication will also be available on the Web at http://www.accnweb.com/.

We hope that you find this information useful in the fight against cancer.

Sincerely,

Mark Dignan, PhD, MPH  Electra Paskett, PhD  Eugene Lengerich, VMD, MS
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ACCN  ACCN Research Committee  ACCN Surveillance Committee
University of Kentucky  The Ohio State University  The Pennsylvania State University
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The Appalachian Region of the United States

The Appalachian region of the United States is a 205,000 square mile region that contains 420 counties in 13 states ranging along the spine of the Appalachian Mountains from New York to Mississippi. The cover of this report displays the Appalachian region of the United States. Approximately 23.6 million people reside in Appalachia. 1 Approximately 42% of the region is rural. 1 Appalachia is less racially heterogeneous than the United States. Only about 12% of the Appalachian population is non-White or Hispanic. 1 Most members of racial and ethnic minority groups residing in Appalachia live in Southern Appalachia (19%), compared to 7% in Northern Appalachia and 4% in Central Appalachia. 1 The economy of Appalachia has diversified over the past two decades from greater reliance on a few major industries involving manufacturing into areas of government, retail, service and tourism. 1

The counties within Appalachia have been divided by the Appalachian Regional Commission (ARC) into five economic categories: distressed, at-risk, transitional, competitive, and attainment. Based on the most recent (2009) determinations, the ARC considered 162 of the 420 (38.6%) Appalachia Counties to be at-risk or economically distressed.

Many additional characteristics of Appalachia affect the health of residents and, specifically, their health as related to cancer risk, screening, treatment and survival. Among these factors are:

- a greater proportion reporting no health insurance or being under-insured,
- greater geographic isolation,
- less public transportation, and
- fewer physicians, clinics, hospitals and cancer centers per capita.

Several reports and investigations have described cancer-related disparities among residents of Appalachia. 2-15 Findings from these reports/investigations of greater cancer incidence and cancer mortality rates, along with findings resulting from the Appalachian Community Cancer Network, have informed the specific content of this report.

**Socioeconomic characteristics of Appalachia include:**

- lower income (2002 per capita income of $25,470, compared to $30,906 for the United States overall) 1
- higher poverty rate (13.6% in 2000, compared to the overall rate for the United States of 12.4%) 1
- lower level of educational attainment (76.8% completing high school in 2000, compared to 80.4 for the United States overall; 17.7% completing college, compared to 24.4% for the United States overall) 1
- slightly higher unemployment rate (5.6% average unemployment rate for 2001-2003, compared to the overall rate of 5.5% for the United States) 1

The Appalachian Community Cancer Network

The Appalachian Community Cancer Network (ACCN) is a five-year, NIH-funded project (2005-2010) that includes a multidisciplinary team of collaborators from academic institutions and communities in Appalachian regions of Kentucky, Maryland, New York, Ohio, Pennsylvania, Virginia and West Virginia. ACCN Regional Offices are based at the University of Kentucky, The Ohio State University, The Pennsylvania State University, Virginia Tech University, and West Virginia University. The ACCN is working to expand previous cancer control projects in Appalachia and address cancer health disparities in seven areas of Appalachia - areas that include some of the most medically underserved, economically distressed and disadvantaged populations in the U.S. Cancer mortality rates are elevated in each of these areas, as are the incidence rates for lung, cervical, and colorectal cancers, suggesting that factors such as late stage diagnosis and barriers to cancer care must be addressed if disparities are to be reduced. The long-term goal of the ACCN is to contribute to the reduction of cancer health disparities in Appalachia by developing, implementing and evaluating community-based participatory research and providing education and training.
The objectives of ACCN:

1) Build on a foundation established by previous projects and develop and maintain community partnerships to facilitate research and action to reduce cancer health disparities.

2) Perform community-based participatory research ranging from focused needs assessments to intervention research and policy assessments.

3) Develop pilot research projects that focus on primary and secondary prevention of lung, cervical and colorectal cancers in Appalachia.

4) Train researchers in community-based participatory research.

5) Disseminate research findings to community and scientific partners.

6) Evaluate ACCN work, including processes, short term impact, and achievement of outcomes.

To reach its objectives, ACCN has formed strong relationships with clinical and non-clinical partners. The ACCN has worked to maintain relationships with programs/facilities that provide cancer screening services and with other organizations that provide cancer-related services to those most in need in the ACCN service area, namely the uninsured/underinsured population. ACCN relationships with non-clinical partners have resulted in successful collaboration on community-based education and research activities across central and northern Appalachia. In partnership with the ACCN, these community organizations are working to improve community utilization of cancer screening services by conducting outreach programs to educate the local community of the benefits of screening and early detection of cancer, tobacco cessation, and other cancer-related issues.

Purpose of this Report

This report was commissioned by the ACCN to characterize the burden of cancer in Appalachia, using data from ACCN-participating states (Kentucky, Ohio, New York, Pennsylvania, Virginia and West Virginia). In the body of this report, six participating states will be referenced as a region. State level data will not be specifically referenced unless there is information to highlight for that state. Due to the small number of Appalachian Counties in Maryland (3), this report does not contain information for Maryland, even though it is part of ACCN.

This report includes the following information:

- Cancer Incidence
- Cancer Mortality
- Trends in Cancer Mortality from 1996 to 2006
- Percent of Late Stage Diagnoses of Cancer
- Cancer-related Health Behaviors
- Cancer Screening Behaviors

Incidence, mortality, trends in mortality, and percent late stage diagnoses are shown for the following cancers (which are either a leading cancer site and/or a screenable cancer site):

- Female Breast Cancer
- Cervical Cancer
- Colon and Rectum Cancer
- Lung and Bronchus Cancer
- Melanoma of the Skin
- Oral and Pharyngeal Cancer
- Prostate Cancer
- Testicular Cancer

To obtain information about average annual age-adjusted cancer incidence rates, and percent late stage diagnoses for sites and types of cancer shown above, in addition to all sites and types of cancer combined, six state-based cancer registries submitted cancer incidence information about incident invasive cancers diagnosed from 2002 to 2006, or a similar time period shown in Appendix A. Similarly, average annual age-adjusted cancer mortality rates were provided by state-based health departments (or the ACCN partner agency) in each of the six states for deaths occurring from 2002 to 2006, or a similar time period, also shown in Appendix A.
Information from each of the state’s Behavioral Risk Factor Surveillance Systems (BRFSS) was submitted (with the exception of New York) about the prevalence of the following cancer-related health behaviors and cancer screening behaviors:

- Current Cigarette Use
- Current Smokeless Tobacco Use
- Inadequate Fruit and Vegetable Consumption
- Absence of Physical Activity in the Past Month
- Obesity
- Mammography Screening
- Colonoscopy or Sigmoidoscopy Screening
- Prostate-specific Antigen Screening
- Digital Rectal Exam Screening
- Pap Smear Screening

The years used by each state to estimate the prevalence of the above cancer-related and cancer screening behaviors are shown in Appendix A.

It should be noted that some rates and proportions included in tables and figures in this report were based on relatively small numbers. In general, population sizes are smaller in most Appalachian regions, compared to non-Appalachian regions; therefore, some figures displaying Appalachian regions may contain more variability, as compared to those displaying non-Appalachian regions. This may be more apparent for figures showing trends in cancer mortality.

As shown in Table 1, average annual age-adjusted incidence rates for all sites and types of cancer combined, in the Appalachian regions, ranged from 488.2 (Virginia) to 617.3 per 100,000 males (New York); and from 382.7 (Virginia) to 457.5 per 100,000 females (New York). For both genders combined, the incidence rate in the Appalachian region was greater than that for the non-Appalachian region for Kentucky, New York and Ohio. The greatest percent difference (7.4 %) between Appalachia and non-Appalachia was observed for New York.

Also shown in Table 1, average annual age-adjusted mortality rates for all sites and types of cancer combined, in the Appalachian regions, ranged from 230.3 (New York) to 300.5 per 100,000 males (Kentucky); and from 159.0 (Virginia) to 189.3 per 100,000 females (Kentucky). For both genders combined, the mortality rate in the Appalachian region was greater than that for the non-Appalachian region for Kentucky, New York and Ohio. The greatest percent difference (10.0 %) between Appalachian and non-Appalachian mortality occurred for New York.

Trends in age-adjusted mortality rates for all sites and types of cancer combined for Appalachian and non-Appalachian regions are shown in Figures 1-4. Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006), for males, the mortality rate decreased in both regions of all states. Among males, the mortality rate decreased between the first and last years in the non-Appalachian regions. Among females, the mortality rate decreased in both regions, with the exception of Appalachia Kentucky, in which the rate slightly increased over the period.

### Table 1: Average Annual Age-adjusted All Sites/Types Combined Cancer Incidence and Mortality by Gender, Appalachia Compared to Non-Appalachia

<table>
<thead>
<tr>
<th>Region</th>
<th>Incidence</th>
<th></th>
<th></th>
<th></th>
<th>Mortality</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appetchia</td>
<td>Non-Appalachia</td>
<td>% Difference</td>
<td>Appetchia</td>
<td>Non-Appalachia</td>
<td>% Difference</td>
<td>Appetchia</td>
<td>Non-Appalachia</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Kentucky</td>
<td>613.8</td>
<td>451.5</td>
<td>517.5</td>
<td>606.3</td>
<td>444.2</td>
<td>508.6</td>
<td>1.7%</td>
<td>300.5</td>
</tr>
<tr>
<td>New York</td>
<td>617.3</td>
<td>457.5</td>
<td>524.0</td>
<td>573.6</td>
<td>431.8</td>
<td>487.7</td>
<td>7.4%</td>
<td>230.3</td>
</tr>
<tr>
<td>Ohio</td>
<td>557.5</td>
<td>416.8</td>
<td>473.6</td>
<td>535.5</td>
<td>411.6</td>
<td>460.0</td>
<td>3.0%</td>
<td>261.4</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>594.8</td>
<td>433.5</td>
<td>490.5</td>
<td>581.1</td>
<td>442.4</td>
<td>502.1</td>
<td>2.3%</td>
<td>247.8</td>
</tr>
<tr>
<td>Virginia</td>
<td>488.2</td>
<td>382.7</td>
<td>423.9</td>
<td>519.8</td>
<td>384.1</td>
<td>439.6</td>
<td>3.6%</td>
<td>247.9</td>
</tr>
<tr>
<td>West Virginia</td>
<td>547.0</td>
<td>422.0</td>
<td>471.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>276.7</td>
</tr>
</tbody>
</table>

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 See Appendix A for data by state as there are variations in what data was provided.
Trends in Age-adjusted Mortality Rates for Males All Cancer Sites/Types Combined, Appalachia, 1996-2006\(^1,2,3\)

Kentucky: 329.4, 304.3, 313.2, 312.6, 304.1, 298.6, 306.1, 308.0, 298.4, 291.6 **

Kentucky: 303.8, 309.0, 295.0, 285.1, 293.9, 298.0, 290.1, 279.0, 257.8, 270.3 **

New York: 259.1, 259.9, 250.3, 256.5, 253.2, 244.8, 255.5, 227.1, 228.9, 221.4, 218.7

New York: 255.5, 247.9, 237.3, 238.0, 233.5, 227.8, 221.2, 213.2, 210.1, 203.0, 197.7

Ohio: 281.2, 277.0, 286.2, 291.4, 274.2, 258.1, 256.3, 259.9, 257.6, 272.4, 260.7

Ohio: 283.7, 277.3, 273.8, 269.6, 263.9, 262.7, 257.5, 251.6, 249.5, 242.7, 240.7

Pennsylvania: 263.2, 260.2, 255.5, 256.8, 250.6, 251.1, 249.3, 251.4, 243.2, 248.5, 247.9

Pennsylvania: 282.1, 265.5, 264.5, 257.6, 264.8, 250.4, 254.9, 255.4, 239.1, 242.2, 244.6

Virginia: 262.8, 273.0, 270.8, 256.6, 268.2, 261.0, 267.8, 248.7, 228.4, 254.7, 241.5

Virginia: 277.3, 275.8, 263.7, 273.9, 262.5, 245.5, 250.5, 244.6, 227.6, 229.4, 222.9

West Virginia: 282.0, 295.0, 285.2, 289.6, 278.0, 268.3, 270.5, 263.8, 267.0, 258.5

Trends in Age-adjusted Mortality Rates for Males All Cancer Sites/Types Combined, Non-Appalachia, 1996-2006\(^1,2,3\)

Kentucky: 303.8, 309.0, 295.0, 285.1, 293.9, 298.0, 290.1, 279.0, 257.8, 270.3 **

New York: 255.5, 247.9, 237.3, 238.0, 233.5, 227.8, 221.2, 213.2, 210.1, 203.0, 197.7

Ohio: 283.7, 277.3, 273.8, 269.6, 263.9, 262.7, 257.5, 251.6, 249.5, 242.7, 240.7

Pennsylvania: 282.1, 265.5, 264.5, 257.6, 264.8, 250.4, 254.9, 255.4, 239.1, 242.2, 244.6

Virginia: 277.3, 275.8, 263.7, 273.9, 262.5, 245.5, 250.5, 244.6, 227.6, 229.4, 222.9

Trends in Age-adjusted Mortality Rates for Females All Cancer Sites/Types Combined, Appalachia, 1996-2006\(^1,2,3\)

Kentucky: 190.2, 182.8, 177.8, 177.4, 175.9, 178.0, 179.9, 176.1, 177.0, 168.7

New York: 177.1, 170.7, 168.6, 167.7, 164.6, 161.4, 157.9, 155.8, 152.1, 147.7, 145.4

Ohio: 187.1, 179.3, 179.8, 181.1, 176.1, 171.9, 173.7, 169.5, 169.8, 165.5, 167.1

Pennsylvania: 182.1, 182.7, 176.6, 177.1, 175.9, 174.2, 171.5, 168.4, 169.3, 162.3, 166.0

Virginia: 176.7, 174.0, 173.1, 176.6, 175.2, 168.2, 165.2, 163.8, 154.3, 156.4, 154.1

West Virginia: 189.0, 185.8, 185.9, 185.0, 188.3, 185.5, 177.0, 176.2, 176.8, 175.5

Trends in Age-adjusted Mortality Rates for Females All Cancer Sites/Types Combined, Non-Appalachia, 1996-2006\(^1,2,3\)

Kentucky: 190.2, 182.8, 177.8, 177.4, 175.9, 178.0, 179.9, 176.1, 177.0, 168.7

New York: 177.1, 170.7, 168.6, 167.7, 164.6, 161.4, 157.9, 155.8, 152.1, 147.7, 145.4

Ohio: 187.1, 179.3, 179.8, 181.1, 176.1, 171.9, 173.7, 169.5, 169.8, 165.5, 167.1

Pennsylvania: 182.1, 182.7, 176.6, 177.1, 175.9, 174.2, 171.5, 168.4, 169.3, 162.3, 166.0

Virginia: 176.7, 174.0, 173.1, 176.6, 175.2, 168.2, 165.2, 163.8, 154.3, 156.4, 154.1

West Virginia: 189.0, 185.8, 185.9, 185.0, 188.3, 185.5, 177.0, 176.2, 176.8, 175.5

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 Note: Y axis has been broken to better display variation between states.
**Tobacco Use**

**Figure 5** shows the prevalence of current cigarette smoking among adults 18 years and older. In the Appalachian regions, the proportion of males reporting current cigarette smoking ranged from 25.9% (Virginia) to 33.6% (Kentucky), and the proportion of females reporting current cigarette smoking ranged from 25.9% (Virginia) to 29.4% (Kentucky). Among both males and females, the percent reporting current cigarette smoking was greater in the Appalachian regions.

**Prevalence of Current Cigarette Smoking Among Adults 18 and Older, Appalachia compared to Non-Appalachia**¹²

![Bar chart showing prevalence of current cigarette smoking among adults 18 and older in Appalachian and non-Appalachian regions.]

¹ West Virginia is the only state in ACCN that is entirely Appalachian.
² See Appendix A for data year by state as there are variations in what data was provided.

**Figure 6** shows the prevalence of current use of smokeless tobacco among adults 18 years and older. In the Appalachian regions, the proportion of males reporting current use of smokeless tobacco ranged from 4.5% (Kentucky) to 14.3% (Ohio), and the proportion of females reporting current use of smokeless tobacco ranged from 0.1% (Virginia) to 0.9% (Ohio). The current use of smokeless tobacco could not be estimated in West Virginia females and males, and females in Pennsylvania. Among males, the percent reporting current use of smokeless tobacco was greater in the Appalachian regions of Ohio, Pennsylvania and Virginia, and was lesser in Kentucky. Among females, greater proportions of smokeless tobacco users were reported for the Appalachian regions of Kentucky and Ohio, while the proportions were equal in Appalachia and non-Appalachia Virginia.

**Prevalence of Current Use of Smokeless Tobacco Among Adults 18 and Older, Appalachia compared to Non-Appalachia**¹²

![Bar chart showing prevalence of current use of smokeless tobacco among adults 18 and older in Appalachian and non-Appalachian regions.]

¹ (*) Insufficient or missing data
² See Appendix A for data year by state as there are variations in what data was provided.
Nutrition and Physical Activity

Figure 7 shows the prevalence of inadequate fruit and vegetable consumption among adults 18 years and older. In the Appalachian regions, the proportion of males reporting inadequate fruit and vegetable consumption ranged from 52.0% (Pennsylvania) to 88.9% (Ohio), and the proportion of females reporting inadequate fruit and vegetable consumption ranged from 36.0% (Pennsylvania) to 80.2% (Kentucky). Among both males and females, the percent reporting inadequate fruit and vegetable consumption was greater in the Appalachian regions. In both regions, a greater proportion of males reported inadequate fruit and vegetable consumption.

![Prevalence of Inadequate Fruit & Vegetable Consumption Among Adults 18 and Older, Appalachia compared to Non-Appalachia](image)

Figure 8 shows the prevalence of no physical activity in the past month among adults 18 years and older. In the Appalachian regions, the proportion of males reporting no physical activity in the past month ranged from 24.0% (Pennsylvania) to 36.8% (Kentucky), and the proportion of females reporting no physical activity in the past month ranged from 29.0% (Pennsylvania) to 41.1% (Kentucky). Among both males and females, the percent reporting no physical activity in the past month was greater in the Appalachian regions. In both regions, a greater proportion of females reported no physical activity in the past month.

![Prevalence of No Physical Activity in the Past Month Among Adults 18 and Older, Appalachia compared to Non-Appalachia](image)

Figure 9 shows the prevalence of obesity among adults 18 years and older. In the Appalachian regions, the proportion of males reporting obesity ranged from 27.0% (Pennsylvania) to 34.7% (Kentucky), and the proportion of females reporting obesity ranged from 26.0% (Pennsylvania and Virginia) to 31.7% (Kentucky). A greater or equal proportion of males reported obesity in all regions except Appalachia Ohio and non-Appalachia Kentucky.

![Prevalence of Obesity in the Past Month Among Adults 18 and Older, Appalachia compared to Non-Appalachia](image)

1 See Appendix A for data year by state as there are variations in what data was provided.
**Early Detection**

Figure 10 shows the prevalence of having had a mammogram in the past two years among women 40 years and older. In the Appalachian regions, the proportion of females reporting having had a mammogram in the past two years ranged from 68.1% (Kentucky) to 75.0% (Pennsylvania). The percent reporting having had a mammogram in the past two years was greater in the non-Appalachian regions of each of the states.

![Prevalence of Reporting Having Had a Mammogram in the Past 2 Years in Women 40 and Older, Appalachia compared to Non-Appalachia](image)

Figure 11 shows the prevalence of having had a colonoscopy or sigmoidoscopy in the past five years among adults 50 years and older. In the Appalachian regions, the proportion reporting having had a colonoscopy or sigmoidoscopy in the past five years ranged from 40.0% (Ohio) to 66.6% (Kentucky). The percent reporting having had a colonoscopy or sigmoidoscopy in the past five years was greater in the non-Appalachian regions of each of the states, with the exception of Kentucky.

![Prevalence of Reporting Having Had a Colonoscopy/Sigmoidoscopy in the Past 5 Years in Adults 50 and Older, Appalachia compared to Non-Appalachia](image)
**Figure 12** shows the prevalence of having had a Prostate-specific Antigen (PSA) test in the past year among males 50 years and older. In the Appalachian regions, the proportion of males reporting having had a PSA test in the past year ranged from 51.9% (Kentucky) to 72.8% (Virginia). There is little variation between Appalachia and Non-Appalachia in percent reporting having had a PSA test.

**FIGURE 12**

**Prevalence of Reporting Having Had a Prostate-specific Antigen (PSA) Test in the Past Year in Men 50 and Older, Appalachia compared to Non-Appalachia**

<table>
<thead>
<tr>
<th>State</th>
<th>Appalachia</th>
<th>Non-Appalachia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky</td>
<td>51.9%</td>
<td>51.9%</td>
</tr>
<tr>
<td>Ohio</td>
<td>47.4%</td>
<td>50.1%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>51.9%</td>
<td>50.1%</td>
</tr>
<tr>
<td>Virginia</td>
<td>72.8%</td>
<td>72.8%</td>
</tr>
<tr>
<td>West Virginia</td>
<td>72.8%</td>
<td>72.8%</td>
</tr>
</tbody>
</table>

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 See Appendix A for data year by state as there are variations in what data was provided.

**Figure 13** shows the prevalence of having had a Digital Rectal Exam (DRE) in the past year among males 50 years and older. In the Appalachian regions, the proportion of males reporting having had a DRE in the past year ranged from 47.4% (Ohio) to 80.1% (Kentucky). The percent reporting having had a DRE in the past two year was slightly greater than the non-Appalachian regions of each of the states.

**FIGURE 13**

**Prevalence of Reporting Having Had a Digital Rectal Exam in the Past Year in Men 50 and Older, Appalachia compared to Non-Appalachia**

<table>
<thead>
<tr>
<th>State</th>
<th>Appalachia</th>
<th>Non-Appalachia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky</td>
<td>51.9%</td>
<td>51.9%</td>
</tr>
<tr>
<td>Ohio</td>
<td>47.4%</td>
<td>50.1%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>51.9%</td>
<td>50.1%</td>
</tr>
<tr>
<td>Virginia</td>
<td>72.8%</td>
<td>72.8%</td>
</tr>
<tr>
<td>West Virginia</td>
<td>80.1%</td>
<td>77.4%</td>
</tr>
</tbody>
</table>

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 (**) Insufficient or missing data
3 See Appendix A for data year by state as there are variations in what data was provided.

**Figure 14** shows the prevalence of having had a Pap Smear in the past three years among women 18 years and older and with an intact cervix. In the Appalachian regions, the proportion of females reporting having had a Pap Smear in the past three years ranged from 78.2% (Kentucky) to 84.4% (Virginia). The percent reporting having had a Pap Smear in the past three years was greater in the non-Appalachian regions of each of the states.

**FIGURE 14**

**Prevalence of Reporting Having Had a Pap Smear in the Past 3 Years in Women 18 and Older with an Intact Cervix, Appalachia compared to Non-Appalachia**

<table>
<thead>
<tr>
<th>State</th>
<th>Appalachia</th>
<th>Non-Appalachia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky</td>
<td>78.2%</td>
<td>84.4%</td>
</tr>
<tr>
<td>Ohio</td>
<td>75.6%</td>
<td>81.2%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>78.2%</td>
<td>84.4%</td>
</tr>
<tr>
<td>Virginia</td>
<td>84.4%</td>
<td>84.4%</td>
</tr>
<tr>
<td>West Virginia</td>
<td>84.4%</td>
<td>84.4%</td>
</tr>
</tbody>
</table>

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 See Appendix A for data year by state as there are variations in what data was provided.
Female Breast Cancer

In 2008, 182,460 cases of invasive female breast cancer were estimated to have occurred in the United States. Female breast cancer was the most frequently diagnosed cancer among females, making up an estimated 26% of invasive cancer cases in the United States in 2008. It was estimated that 15% of cancer deaths among females in 2008 were attributed to breast cancer.

As shown in Table 2, average annual age-adjusted female breast cancer incidence rates in the Appalachian regions, ranged from 112.2 (Kentucky) to 126.5 per 100,000 females (New York). New York was the only state for which the female breast cancer incidence rate was higher in the Appalachian region.

Also shown in Table 2, average annual age-adjusted female breast cancer mortality rates in the Appalachian regions, ranged from 23.4 (New York) to 26.6 per 100,000 females (Ohio). Kentucky was the only state whose mortality rate in the Appalachian region was greater than that for the non-Appalachian region.

Trends in age-adjusted female breast cancer mortality rates for Appalachian and non-Appalachian regions are shown in Figures 15 and 16, respectively. Population sizes are smaller, in general, in Appalachian regions compared to non-Appalachian regions; therefore, there was more variability in trends shown in Figure 15, as compared to Figure 16. Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006), the female breast cancer mortality rate decreased in both regions of all states. The percent decrease between the first and last years was greater for each of the states in the non-Appalachian region.

Average Annual Age-adjusted Female Breast Cancer Incidence and Mortality, Appalachia Compared to Non-Appalachia

<table>
<thead>
<tr>
<th></th>
<th>Incidence</th>
<th></th>
<th>Mortality</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appalachia</td>
<td>Non-Appalachia</td>
<td>% Difference</td>
<td>Appalachia</td>
</tr>
<tr>
<td>Kentucky</td>
<td>112.2</td>
<td>122.8</td>
<td>-8.6%</td>
<td>26.4</td>
</tr>
<tr>
<td>New York</td>
<td>126.5</td>
<td>123.9</td>
<td>2.1%</td>
<td>23.4</td>
</tr>
<tr>
<td>Ohio</td>
<td>115.5</td>
<td>121.9</td>
<td>-5.3%</td>
<td>26.6</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>119.2</td>
<td>126.5</td>
<td>-5.8%</td>
<td>25.9</td>
</tr>
<tr>
<td>Virginia</td>
<td>113.7</td>
<td>122.3</td>
<td>-7.0%</td>
<td>25.7</td>
</tr>
<tr>
<td>West Virginia</td>
<td>115.4</td>
<td>*</td>
<td>*</td>
<td>25.6</td>
</tr>
</tbody>
</table>

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 See Appendix A for data year by state as there are variations in what data was provided.

Trends in Age-adjusted Mortality Rates for Female Breast Cancer, Appalachia, 1996-2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Appalachia</th>
<th>Kentucky</th>
<th>New York</th>
<th>Ohio</th>
<th>Pennsylvania</th>
<th>Virginia</th>
<th>West Virginia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>35.0</td>
<td>32.5</td>
<td>34.0</td>
<td>35.5</td>
<td>34.0</td>
<td>33.5</td>
<td>32.0</td>
</tr>
<tr>
<td>1997</td>
<td>34.5</td>
<td>33.0</td>
<td>34.5</td>
<td>35.0</td>
<td>33.5</td>
<td>33.0</td>
<td>32.5</td>
</tr>
<tr>
<td>1998</td>
<td>34.0</td>
<td>32.5</td>
<td>33.5</td>
<td>34.0</td>
<td>32.5</td>
<td>33.0</td>
<td>32.0</td>
</tr>
<tr>
<td>1999</td>
<td>33.5</td>
<td>32.0</td>
<td>33.0</td>
<td>33.5</td>
<td>32.0</td>
<td>32.5</td>
<td>31.5</td>
</tr>
<tr>
<td>2000</td>
<td>33.0</td>
<td>31.5</td>
<td>32.0</td>
<td>33.0</td>
<td>31.5</td>
<td>32.0</td>
<td>31.0</td>
</tr>
<tr>
<td>2001</td>
<td>32.5</td>
<td>31.0</td>
<td>32.5</td>
<td>32.0</td>
<td>31.0</td>
<td>32.5</td>
<td>31.0</td>
</tr>
<tr>
<td>2002</td>
<td>32.0</td>
<td>30.5</td>
<td>31.5</td>
<td>32.0</td>
<td>30.5</td>
<td>32.0</td>
<td>30.5</td>
</tr>
<tr>
<td>2003</td>
<td>31.5</td>
<td>30.0</td>
<td>31.0</td>
<td>31.5</td>
<td>30.0</td>
<td>31.5</td>
<td>30.5</td>
</tr>
<tr>
<td>2004</td>
<td>31.0</td>
<td>29.5</td>
<td>30.5</td>
<td>31.0</td>
<td>29.5</td>
<td>31.0</td>
<td>29.5</td>
</tr>
<tr>
<td>2005</td>
<td>30.5</td>
<td>29.0</td>
<td>29.5</td>
<td>30.0</td>
<td>28.5</td>
<td>30.5</td>
<td>28.5</td>
</tr>
<tr>
<td>2006</td>
<td>30.0</td>
<td>27.5</td>
<td>27.5</td>
<td>28.0</td>
<td>27.5</td>
<td>28.0</td>
<td>27.5</td>
</tr>
</tbody>
</table>

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 Note: Y axis has been broken to better display variation between states.
Figure 16 shows the trend in age-adjusted mortality rates for female breast cancer, Non-Appalachia, 1996-2006. The rates are age-adjusted to the 2000 US standard population. The Y-axis has been broken to better display variation between states.

Figure 17 shows the percent of female breast cancer cases diagnosed late stage (regional and distant stages combined). In the Appalachian regions, the proportion diagnosed late stage ranged from 27.0% (Ohio) to 36.2% (Virginia). In two states (Kentucky and Virginia), the proportion diagnosed late stage was greater in the Appalachian region.
Cervical Cancer

In 2008, 11,070 cases of invasive cervical cancer were estimated to have occurred in the United States. Among females, cervical cancer made up an estimated 2% of invasive cancer cases and 2% of cancer deaths in 2008.

As shown in Table 3, average annual age-adjusted cervical cancer incidence rates in the Appalachian regions, ranged from 7.7 (Pennsylvania and Virginia) to 11.1 per 100,000 females (Kentucky). The incidence rate in the Appalachian region was greater than that for the non-Appalachian region for three states (Kentucky, Ohio and Virginia).

Also shown in Table 3, average annual age-adjusted cervical cancer mortality rates in the Appalachian regions, ranged from 2.1 (Virginia) to 3.5 per 100,000 females (West Virginia). The mortality rate in the Appalachian region was greater than that for the non-Appalachian region of two states (Kentucky and Ohio).

**TABLE 3**

Average Annual Age-adjusted Cervical Cancer Incidence and Mortality, Appalachia Compared to Non-Appalachia

<table>
<thead>
<tr>
<th>Incidence</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appalachia</td>
<td>Non-Appalachia</td>
</tr>
<tr>
<td>Kentucky</td>
<td>11.1</td>
</tr>
<tr>
<td>New York</td>
<td>8.2</td>
</tr>
<tr>
<td>Ohio</td>
<td>8.7</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>7.7</td>
</tr>
<tr>
<td>Virginia</td>
<td>7.7</td>
</tr>
<tr>
<td>West Virginia</td>
<td>10.2</td>
</tr>
</tbody>
</table>

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 See Appendix A for data year by state as there are variations in what data was provided.

Trends in age-adjusted cervical cancer mortality rates for Appalachian and non-Appalachian regions are shown in Figures 18 and 19, respectively. Population sizes are smaller, in general, in Appalachian regions compared to non-Appalachian regions; therefore, there was more variability in trends shown in Figure 18, as compared to Figure 19. Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006), the cervical cancer mortality rate decreased in both regions of all states, with the exception of the Appalachian region of New York for which there was a slight increase. The percent decrease between the first and last years was greater in the Appalachian regions of Kentucky, Pennsylvania and Virginia, and was greater in the non-Appalachian regions of New York and Ohio.
Figure 20 shows the percent of cervical cancer cases diagnosed late stage (regional and distant stages combined). In the Appalachian regions, the proportion diagnosed late stage ranged from 34.0% (New York) to 48.7% (Pennsylvania). In Pennsylvania, the proportion diagnosed late stage was greater in the Appalachian region.

FIGURE 19

Trends in Age-adjusted Mortality Rates for Cervical Cancer, Non-Appalachia, 1996-2006¹²

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky Non-Appalachia</td>
<td>3.8</td>
<td>4.6</td>
<td>3.2</td>
<td>4.1</td>
<td>2.8</td>
<td>2.5</td>
<td>2.2</td>
<td>3.9</td>
<td>1.8</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>New York Non-Appalachia</td>
<td>3.3</td>
<td>3.4</td>
<td>2.8</td>
<td>3.2</td>
<td>2.9</td>
<td>2.6</td>
<td>2.7</td>
<td>2.7</td>
<td>2.5</td>
<td>2.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Ohio Non-Appalachia</td>
<td>3.2</td>
<td>2.9</td>
<td>3.1</td>
<td>2.6</td>
<td>2.6</td>
<td>2.4</td>
<td>2.3</td>
<td>2.3</td>
<td>2.2</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Pennsylvania Non-Appalachia</td>
<td>2.9</td>
<td>3.5</td>
<td>3.0</td>
<td>3.0</td>
<td>2.7</td>
<td>2.5</td>
<td>2.6</td>
<td>2.3</td>
<td>2.4</td>
<td>2.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Virginia Non-Appalachia</td>
<td>3.1</td>
<td>3.1</td>
<td>2.9</td>
<td>2.7</td>
<td>2.5</td>
<td>2.5</td>
<td>2.2</td>
<td>2.5</td>
<td>1.9</td>
<td>2.0</td>
<td>1.9</td>
</tr>
</tbody>
</table>

¹ See Appendix A for data year by state as there are variations in what data was provided.
² Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

FIGURE 20

Percent Late Stage Cervical Cancer at Diagnosis, Appalachia Compared to Non-Appalachia¹²

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 See Appendix A for data year by state as there are variations in what data was provided.
Colon & Rectum Cancer

In 2008, 77,250 cases of invasive colon and rectum cancer among males and 71,560 cases among females were estimated to have occurred in the United States. Colon and rectum cancer made up an estimated 10% of invasive cancer cases among both males and females in the United States in 2008. It was estimated that 8% of cancer deaths among males and 9% of cancer deaths among females in 2008 were attributed to colon and rectum cancer.

As shown in Table 4, average annual age-adjusted colon and rectum cancer incidence rates, in the Appalachian regions, ranged from 56.8 (Virginia) to 70.7 per 100,000 males (West Virginia); and from 39.9 (Virginia) to 52.3 per 100,000 females (Kentucky). For both genders combined, the incidence rate in the Appalachian region was greater than that for the non-Appalachian region for all states, with the exception of Virginia.

Also shown in Table 4, average annual age-adjusted colon and rectum cancer mortality rates, in the Appalachian regions, ranged from 21.1 (Virginia) to 26.6 per 100,000 males (West Virginia); and from 13.2 (Virginia) to 19.0 per 100,000 females (Kentucky). For both genders combined, the mortality rate in the Appalachian region was greater than that for the non-Appalachian region for all states, with the exception of Virginia.

TABLE 4

<table>
<thead>
<tr>
<th>Incidence Mortality</th>
<th>Appalachian</th>
<th>Non-Appalachia</th>
<th>% Difference</th>
<th>Appalachian</th>
<th>Non-Appalachia</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male Female Total</td>
<td>Male Female Total</td>
<td></td>
<td>Male Female Total</td>
<td>Male Female Total</td>
<td></td>
</tr>
<tr>
<td>Kentucky</td>
<td>69.7 52.3 59.8</td>
<td>67.3 48.9 56.7</td>
<td>5.5%</td>
<td>26.5 19.0 22.2</td>
<td>26.6 18.7 21.9</td>
<td>1.4%</td>
</tr>
<tr>
<td>New York</td>
<td>61.0 48.2 53.8</td>
<td>60.8 45.6 52.0</td>
<td>3.5%</td>
<td>22.8 16.0 19.0</td>
<td>22.0 15.6 18.2</td>
<td>4.4%</td>
</tr>
<tr>
<td>Ohio</td>
<td>68.1 48.9 57.1</td>
<td>60.5 44.2 51.0</td>
<td>12.0%</td>
<td>25.3 18.4 21.3</td>
<td>23.7 16.7 19.7</td>
<td>8.1%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>68.9 48.3 56.9</td>
<td>64.2 47.8 54.7</td>
<td>4.0%</td>
<td>25.5 16.5 20.1</td>
<td>24.8 16.8 20.0</td>
<td>0.5%</td>
</tr>
<tr>
<td>Virginia</td>
<td>56.8 39.9 47.1</td>
<td>55.5 42.2 48.0</td>
<td>-1.9%</td>
<td>21.1 13.2 16.6</td>
<td>22.1 15.3 18.2</td>
<td>-8.8%</td>
</tr>
<tr>
<td>West Virginia</td>
<td>70.7 51.7 61.4</td>
<td>* * *</td>
<td>* * *</td>
<td>26.6 18.4 21.8</td>
<td>* * *</td>
<td>* * *</td>
</tr>
</tbody>
</table>

Trends in age-adjusted colon and rectum cancer mortality rates for Appalachian and non-Appalachian regions are shown in Figures 21-24. Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006) for males and females, the colon and rectum cancer mortality rate decreased in both regions of all states. Among males, the percent decrease between the first and last years was greater in the non-Appalachian regions. Among females, the percent decrease between the first and last years was also greater in the non-Appalachian regions, with the exception of New York.

Figure 25 shows the percent of colon and rectum cancer cases diagnosed late stage (regional and distant stages combined). In the Appalachian regions, the proportion of males diagnosed late stage ranged from 46.5% (Ohio) to 54.9% (Virginia), and the proportion of females diagnosed late stage ranged from 46.7% (Ohio) to 55.2% (Virginia). Among both males and females in Kentucky, the proportion diagnosed late stage was greater in the Appalachian region. For other states, the proportion diagnosed late stage was greater in the non-Appalachian region.

FIGURE 21 Trends in Age-adjusted Mortality Rates for Male Colon & Rectum Cancer, Appalachia, 1996-2006

Note: Y axis has been broken to better display variation between states.

Average Annual Age-adjusted Colon & Rectum Cancer Incidence and Mortality by Gender, Appalachia Compared to Non-Appalachia

Trends in age-adjusted mortality rates per 100,000 for male colon and rectum cancer, Appalachian and non-Appalachian regions, are shown in Figures 25-28. Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006) for males and females, the colon and rectum cancer mortality rate decreased in both regions of all states. Among males, the percent decrease between the first and last years was greater in the non-Appalachian regions. Among females, the percent decrease between the first and last years was also greater in the non-Appalachian regions, with the exception of New York.


Note: Y axis has been broken to better display variation between states.
Trends in Age-adjusted Mortality Rates for Male Colon & Rectum Cancer, Non-Appalachia, 1996-2006

Kentucky Non-Appalachia: 32.5 30.3 28.1 29.6 31.6 26.9 31.2 27.7 22.6 24.7
New York Non-Appalachia: 30.0 29.9 27.0 26.9 27.5 24.9 24.9 23.4 22.0 20.0 19.8
Ohio: 30.0 30.1 29.3 28.7 26.1 26.5 25.4 24.2 25.0 21.9 22.4
Pennsylvania Non-Appalachia: 30.6 29.5 29.0 29.3 27.7 27.7 25.6 26.8 23.8 23.1 24.7
Virginia Non-Appalachia: 22.9 25.7 27.3 25.0 24.2 23.6 23.5 24.0 22.5 21.1 19.6

Kentucky New York Pennsylvania Virginia Ohio

Non-Appalachia:

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 Note: Y axis has been broken to better display variation between states.

Trends in Age-adjusted Mortality Rates for Female Colon & Rectum Cancer, Non-Appalachia, 1996-2006

Kentucky Non-Appalachia: 22.9 19.7 20.0 16.9 18.6 19.6 20.4 18.9 19.0 15.9
New York Non-Appalachia: 19.7 19.6 19.8 19.1 18.1 18.0 17.3 16.7 15.6 14.3 14.3
Ohio: 20.7 20.5 21.1 20.3 18.6 18.5 17.0 18.2 16.3 15.9 16.3
Pennsylvania Non-Appalachia: 21.6 20.8 20.9 20.1 19.6 19.2 17.7 17.1 17.0 16.6 15.6
Virginia Non-Appalachia: 19.3 18.9 19.9 18.9 18.6 17.2 17.8 15.8 14.4 14.3 14.2

Kentucky New York Pennsylvania Virginia Ohio

Non-Appalachia:

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 Note: Y axis has been broken to better display variation between states.

Trends in Age-adjusted Mortality Rates for Female Colon & Rectum Cancer, Appalachia, 1996-2006

Kentucky Appalachia: 22.9 18.9 19.4 22.5 19.8 19.6 20.3 20.4 15.6 19.2
New York Appalachia: 22.0 19.5 18.6 20.6 18.6 18.5 19.0 16.4 15.0 14.9 14.9
Ohio: 20.8 24.0 21.3 22.7 18.9 19.9 19.3 21.9 17.1 15.9 18.0
Pennsylvania Appalachia: 21.1 19.3 19.3 19.2 19.6 19.2 18.0 16.2 16.7 15.3 16.2
Virginia Appalachia: 18.0 15.5 20.4 15.4 19.6 16.7 12.3 16.4 12.1 11.6 13.7
West Virginia Appalachia: 21.0 22.5 19.3 20.1 20.0 20.1 18.8 20.0 18.3 17.0

Kentucky New York Pennsylvania Virginia Ohio

Appalachia:

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian; however, no gender specific staging data was provided.
2 See Appendix A for data year by state as there are variations in what data was provided.

Percent Late Stage Colon & Rectum Cancer at Diagnosis, Appalachia Compared to Non-Appalachia

Kentucky Male Appalachia: 61% Male Non-Appalachia: 49% Female Appalachia: 77% Female Non-Appalachia: 63%
New York Male Appalachia: 60% Male Non-Appalachia: 42% Female Appalachia: 78% Female Non-Appalachia: 60%
Ohio Male Appalachia: 59% Male Non-Appalachia: 41% Female Appalachia: 77% Female Non-Appalachia: 60%
Pennsylvania Male Appalachia: 63% Male Non-Appalachia: 47% Female Appalachia: 77% Female Non-Appalachia: 63%
Virginia Male Appalachia: 61% Male Non-Appalachia: 49% Female Appalachia: 77% Female Non-Appalachia: 63%

Kentucky New York Pennsylvania Virginia

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 Note: Y axis has been broken to better display variation between states.
Lung & Bronchus Cancer

In 2008, 114,690 and 100,330 cases of invasive lung and bronchus cancer were estimated to have occurred in the United States among males and females, respectively.\(^6\) Lung and bronchus cancer made up an estimated 15% of invasive cancer cases among males and 14% of invasive cancer cases among females in the United States in 2008.\(^6\) In 2008, it was estimated that 31% of cancer deaths among males and 26% of cancer deaths among females were attributed to lung and bronchus cancer.\(^6\)

As shown in Table 5, average annual age-adjusted lung and bronchus cancer incidence rates, in the Appalachian regions, ranged from 92.8 (Pennsylvania) to 147.6 per 100,000 males (Kentucky); and from 53.6 (Pennsylvania) to 79.9 per 100,000 females (Kentucky). For both genders combined, the incidence rate in the Appalachian region was greater than that for the non-Appalachian region for all states.

Also shown in Table 5, average annual age-adjusted lung and bronchus cancer mortality rates, in the Appalachian regions, ranged from 68.9 (New York) to 125.7 per 100,000 males (Kentucky); and from 38.7 (Pennsylvania) to 60.0 per 100,000 females (Kentucky). For both genders combined, the mortality rate in the Appalachian regions was greater than that for the non-Appalachian regions.

### Table 5

<table>
<thead>
<tr>
<th>Region</th>
<th>Male Incidence</th>
<th>Female Incidence</th>
<th>Total Incidence</th>
<th>% Difference</th>
<th>Male Mortality</th>
<th>Female Mortality</th>
<th>Total Mortality</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky</td>
<td>147.6</td>
<td>79.9</td>
<td>108.8</td>
<td>12.0%</td>
<td>125.7</td>
<td>60.0</td>
<td>88.2</td>
<td>17.4%</td>
</tr>
<tr>
<td>New York</td>
<td>93.5</td>
<td>64.3</td>
<td>76.5</td>
<td>20.1%</td>
<td>68.9</td>
<td>43.9</td>
<td>54.3</td>
<td>18.8%</td>
</tr>
<tr>
<td>Ohio</td>
<td>107.5</td>
<td>60.1</td>
<td>80.3</td>
<td>9.5%</td>
<td>89.3</td>
<td>45.6</td>
<td>64.2</td>
<td>8.3%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>92.8</td>
<td>53.6</td>
<td>69.7</td>
<td>0.4%</td>
<td>74.9</td>
<td>38.7</td>
<td>53.4</td>
<td>0.4%</td>
</tr>
<tr>
<td>Virginia</td>
<td>106.2</td>
<td>57.1</td>
<td>77.9</td>
<td>15.4%</td>
<td>90.4</td>
<td>43.8</td>
<td>63.6</td>
<td>16.3%</td>
</tr>
<tr>
<td>West Virginia</td>
<td>116.2</td>
<td>63.5</td>
<td>89.1</td>
<td>*</td>
<td>95.7</td>
<td>51.2</td>
<td>69.8</td>
<td>*</td>
</tr>
</tbody>
</table>

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
3 See Appendix A for data year by state as there are variations in what data was provided.

Trends in age-adjusted lung and bronchus cancer mortality rates for Appalachian and non-Appalachian regions are shown in Figures 26-29 (Figures 26 & 27 have a different scale than Figures 28 & 29). Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006) found the following results. For males, the lung and bronchus cancer mortality rate decreased in both regions. The proportion of decrease observed for males was greater in the non-Appalachian regions. Among females, the lung and bronchus cancer mortality rate increased over the period for Appalachian regions, with the exception of Ohio, in which the mortality rate slightly decreased; by comparison, in the non-Appalachian regions, the mortality rate decreased, with the exception of Pennsylvania.

Figure 30 shows the percent of lung and bronchus cancer cases diagnosed late stage (regional and distant stages combined). In the Appalachian regions, the proportion of males diagnosed late stage ranged from 65.9% (Ohio) to 75.6% (Pennsylvania), and the proportion of females diagnosed late stage ranged from 61.7% (Ohio and Virginia) to 72.7% (Kentucky). Among males in Pennsylvania, the proportion diagnosed late stage was slightly greater in the Appalachian region. Among females, the proportion diagnosed late stage was greater in the Appalachian region of Kentucky.

### Trends in Age-adjusted Mortality Rates for Male Lung & Bronchus Cancer, Appalachia, 1996-2006\(^2\)

![Graph showing trends in age-adjusted mortality rates for male lung & bronchus cancer, Appalachia, 1996-2006](image)

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

Trends in Age-adjusted Mortality Rates for Female Lung & Bronchus Cancer, Appalachia, 1996-2006

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

Percent Late Stage Lung & Bronchus Cancer at Diagnosis, Appalachia Compared to Non-Appalachia

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian; however, no gender specific staging data was provided.
2 See Appendix A for data year by state as there are variations in what data was provided.
Melanoma of the Skin

In 2008, 34,950 and 27,530 cases of invasive melanoma of the skin were estimated to have occurred in the United States among males and females, respectively. Melanoma of the skin made up an estimated 5% of invasive cancer cases among males and 4% of invasive cancer cases among females in the United States in 2008. In 2008, it was estimated that 2% of cancer deaths among males and 1% of cancer deaths among females were attributed to melanoma of the skin.

As shown in Table 6, average annual age-adjusted melanoma of the skin incidence rates in the Appalachian regions, ranged from 18.8 (Pennsylvania) to 23.4 per 100,000 males (Kentucky), and from 13.3 (Pennsylvania) to 17.1 per 100,000 females (Kentucky). For both genders combined, the incidence rate in the Appalachian region of New York was greater than that for the non-Appalachian region.

Also shown in Table 6, average annual age-adjusted melanoma of the skin mortality rates in the Appalachian regions, ranged from 3.9 per 100,000 males (New York) to 5.9 per 100,000 males (West Virginia); and from 1.8 per 100,000 females (Pennsylvania) to 2.6 per 100,000 females (Virginia). For both genders combined, the mortality rate in the Appalachian region of New York was greater than that for the non-Appalachian region for all states, with the exception of Pennsylvania.

As shown in Table 6, average annual age-adjusted melanoma of the skin incidence rates in the Appalachian regions, ranged from 3.9 per 100,000 males (New York) to 5.9 per 100,000 males (West Virginia); and from 1.8 per 100,000 females (Pennsylvania) to 2.6 per 100,000 females (Virginia). For both genders combined, the incidence rate in the Appalachian region of New York was greater than that for the non-Appalachian region.

Also shown in Table 6, average annual age-adjusted melanoma of the skin mortality rates in the Appalachian regions, ranged from 3.9 per 100,000 males (New York) to 5.9 per 100,000 males (West Virginia); and from 1.8 per 100,000 females (Pennsylvania) to 2.6 per 100,000 females (Virginia). For both genders combined, the mortality rate in the Appalachian region of New York was greater than that for the non-Appalachian region for all states, with the exception of Pennsylvania.

Trends in age-adjusted melanoma of the skin mortality rates for Appalachian and non-Appalachian regions are shown in Figures 31-34. Population sizes are smaller, in general, in Appalachian regions compared to non-Appalachian regions; therefore, there was more variability in trends shown in Figures 31 and 33 as compared to Figures 32 and 34. Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006) for males, the melanoma of the skin mortality rate increased in both regions of all states, with the exceptions of Appalachian Pennsylvania (in which the mortality rate remained the same) and non-Appalachian Virginia (in which the mortality decreased).

Figure 35 shows the percent of melanoma of the skin cases diagnosed late stage (regional and distant stages combined). In the Appalachian regions, the proportion of males diagnosed late stage ranged from 10.1% (Ohio) to 19.1% (Pennsylvania), and the proportion of females diagnosed late stage ranged from 6.3% (Ohio) to 13.7% (Pennsylvania). Among males, the proportion diagnosed late stage was greater in each of the Appalachian regions. Among females, the proportion diagnosed late stage was greater in the Appalachian regions, with the exception of New York.

Trends in Age-adjusted Mortality Rates for Male Melanoma of the Skin, Appalachia, 1996-2006

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
Trends in Age-adjusted Mortality Rates for Male Melanoma of the Skin, Non-Appalachia, 1996-2006\textsuperscript{1,2}

- Kentucky: 2.7, 4.5, 3.2, 4.9, 2.9, 3.2, 3.9, 5.8, 6.2, 4.9
- New York: 3.6, 3.5, 5.2, 3.6, 3.8, 5.7, 4.6, 4.3, 3.0, 3.7, 4.0
- Ohio: 3.2, 4.2, 3.6, 4.4, 4.9, 3.9, 4.2, 4.3, 4.3, 3.7, 5.0
- Pennsylvania: 3.8, 3.5, 3.6, 3.4, 4.0, 3.1, 3.5, 3.9, 4.4, 4.5, 3.8
- Virginia: 4.1, 4.1, 4.8, 3.9, 2.0, 6.0, 5.1, 4.0, 3.8, 3.5, 4.3
- West Virginia: 4.2, 5.1, 4.2, 3.3, 5.1, 3.7, 3.8, 5.7, 4.5, 4.5

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

Trends in Age-adjusted Mortality Rates for Female Melanoma of the Skin, Appalachia, 1996-2006\textsuperscript{1,2}

- Kentucky: 1.2, 0.9, 1.7, 2.5, 2.3, 3.3, 2.0, 1.6, 2.2, 1.7
- Ohio: 1.8, 2.1, 1.7, 2.3, 2.2, 2.5, 1.9, 1.8, 1.6, 2.5, 1.6
- Pennsylvania: 1.6, 2.2, 1.7, 1.5, 1.5, 2.0, 1.9, 1.8, 1.6, 2.0, 1.7
- Virginia: 2.6, 2.8, 2.0, 1.6, 2.4, 2.3, 3.3, 2.7, 2.0, 2.0, 3.3
- West Virginia: 1.8, 2.5, 1.4, 3.1, 2.1, 1.5, 1.8, 2.3, 1.4, 2.9

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

Percent Late Stage Melanoma of the Skin at Diagnosis, Appalachia Compared to Non-Appalachia\textsuperscript{1,2}

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian, however, no gender specific staging data was provided.
2 See Appendix A for data year by state as there are variations in what data was provided.
In 2008, 25,310 and 10,000 cases of invasive oral cavity and pharyngeal cancer were estimated to have occurred in the United States among males and females, respectively. Oral cavity and pharyngeal cancer made up an estimated 3% of invasive cancer cases among males and 1% of invasive cancer cases among females in the United States in 2008. In 2008, it was estimated that 2% of cancer deaths among males and 1% of cancer deaths among females were attributed to oral cavity and pharyngeal cancer.

As shown in Table 7, average annual age-adjusted oral cavity and pharyngeal cancer incidence rates in the Appalachian regions, ranged from 14.3 (Virginia) to 18.4 per 100,000 males (Kentucky); and from 4.7 (Virginia) to 6.7 per 100,000 females (New York). For both genders combined, the incidence rate in the Appalachian region was greater than that for the non-Appalachian region for three states (New York, Ohio and Pennsylvania).

Also shown in Table 7, average annual age-adjusted oral cavity and pharyngeal cancer mortality rates in the Appalachian regions, ranged from 3.7 (New York and Pennsylvania) to 4.4 per 100,000 males (Kentucky); and from 1.1 (Ohio and Virginia) to 1.4 per 100,000 females (Kentucky and New York). For both genders combined, the mortality rate in the Appalachian region was greater than that for the non-Appalachian region of New York.

**Average Annual Age-adjusted Oral Cavity & Pharyngeal Cancer Incidence and Mortality by Gender, Appalachia Compared to Non-Appalachia**

<table>
<thead>
<tr>
<th></th>
<th>Incidence</th>
<th></th>
<th></th>
<th></th>
<th>Mortality</th>
<th></th>
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<tr>
<td></td>
<td>Appalachia</td>
<td>Non-Appalachia</td>
<td>Difference</td>
<td>Appalachia</td>
<td>Non-Appalachia</td>
<td>Difference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>KY</td>
<td>18.4</td>
<td>6.1</td>
<td>11.8</td>
<td>18.8</td>
<td>6.0</td>
<td>11.8</td>
<td>0.0%</td>
<td>4.4</td>
</tr>
<tr>
<td>NY</td>
<td>16.7</td>
<td>6.7</td>
<td>11.4</td>
<td>14.5</td>
<td>5.9</td>
<td>9.7</td>
<td>17.5%</td>
<td>3.7</td>
</tr>
<tr>
<td>OH</td>
<td>16.1</td>
<td>5.5</td>
<td>10.4</td>
<td>14.1</td>
<td>5.3</td>
<td>9.3</td>
<td>11.8%</td>
<td>4.2</td>
</tr>
<tr>
<td>PA</td>
<td>16.2</td>
<td>5.7</td>
<td>10.5</td>
<td>14.9</td>
<td>5.7</td>
<td>9.8</td>
<td>7.1%</td>
<td>3.7</td>
</tr>
<tr>
<td>VA</td>
<td>14.3</td>
<td>4.7</td>
<td>9.1</td>
<td>15.1</td>
<td>5.8</td>
<td>10.0</td>
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<td>WV</td>
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<td>**</td>
<td>**</td>
<td>*</td>
<td>4.1</td>
</tr>
</tbody>
</table>

1 West Virginia is the only state in ACCN that is entirely Appalachian.
2 See Appendix A for data year by state as there are variations in what data was provided.
3 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
4 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

Trends in age-adjusted oral cavity and pharyngeal cancer mortality rates for Appalachian and non-Appalachian regions are shown in Figures 36-39. Population sizes are smaller, in general, in Appalachian regions compared to non-Appalachian regions; therefore, there was more variability in trends shown in Figures 36 and 38, as compared to Figures 37 and 39. Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006) for males, the oral cavity and pharyngeal cancer mortality rate increased in the Appalachian regions, with the exception of New York. In the non-Appalachian regions, the male oral cavity and pharyngeal cancer mortality rates increased in Kentucky and Virginia. Among females, the oral cavity and pharyngeal cancer mortality rate increased in the Appalachian regions of New York and West Virginia.

Figure 40 shows the percent of oral cavity and pharyngeal cancer cases diagnosed late stage (regional and distant stages combined). In the Appalachian regions, the proportion of males diagnosed late stage ranged from 52.9% (Kentucky) to 64.7% (Pennsylvania), and the proportion of females diagnosed late stage ranged from 39.7% (Kentucky) to 51.9% (Ohio). Among males, the proportion diagnosed late stage was greater in each of the non-Appalachian regions. Among females, the proportion diagnosed late stage was greater in the Appalachian region of New York and Ohio.

Kentucky New York Pennsylvania Virginia Ohio

Rate per 100,000

Kentucky New York Pennsylvania Virginia Ohio

Kentucky 2.8 1.9 1.6 1.4 1.9 1.0 1.2 1.4 1.7 1.8
New York 1.6 1.7 2.8 1.0 0.8 1.0 0.6 1.4 1.8 1.2 1.8
Ohio 1.6 1.3 1.6 1.4 1.2 1.0 1.2 1.2 1.4 0.9 1.0
Pennsylvania 1.1 1.4 1.3 1.2 1.3 1.3 1.2 1.3 1.1 1.5 1.0
Virginia 1.2 1.3 2.9 1.0 1.7 1.8 1.2 0.6 1.4 1.5 0.6

Percent Late Stage Oral Cavity & Pharyngeal Cancer at Diagnosis, Appalachia Compared to Non-Appalachia

Kentucky New York Pennsylvania Virginia Ohio

Percent

Kentucky New York Pennsylvania Virginia

1 See Appendix A for data year by state as there are variations in what data was provided.
2 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
Prostate Cancer

In 2008, 186,320 cases of invasive prostate cancer were estimated to have occurred in the United States. Prostate cancer was the most frequently diagnosed cancer among males, making up an estimated 25% of invasive cancer cases and 10% of cancer deaths among males in 2008 were attributed to prostate cancer.

As shown in Table 8, average annual age-adjusted prostate cancer incidence rates in the Appalachian regions, ranged from 116.8 (Virginia) to 181.7 per 100,000 males (New York). The incidence rate in the Appalachian region was greater than that for the non-Appalachian region of New York.

Also shown in Table 8, average annual age-adjusted prostate cancer mortality rates in the Appalachian regions, ranged from 23.6 per (Virginia) to 26.6 per 100,000 males (Kentucky and West Virginia). The mortality rate in the Appalachian region was greater than that for the non-Appalachian region of New York.

<table>
<thead>
<tr>
<th>TABLE 8</th>
<th>Average Annual Age-adjusted Prostate Cancer Incidence and Mortality, Appalachia Compared to Non-Appalachia²,³</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appalachia</td>
</tr>
<tr>
<td>Kentucky</td>
<td>134.2</td>
</tr>
<tr>
<td>New York</td>
<td>181.7</td>
</tr>
<tr>
<td>Ohio</td>
<td>138.4</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>148.5</td>
</tr>
<tr>
<td>Virginia</td>
<td>116.8</td>
</tr>
<tr>
<td>West Virginia</td>
<td>139.5</td>
</tr>
</tbody>
</table>

¹ (*) West Virginia is the only state in ACCN that is entirely Appalachian.
² Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
³ See Appendix A for data year by state as there are variations in what data was provided.

Trends in age-adjusted prostate cancer mortality rates for Appalachian and non-Appalachian regions are shown in Figures 41 and 42, respectively. Comparing the mortality rate for the first year (1996) to that of the last year (2005 or 2006), the prostate cancer mortality rate decreased in both regions of all states. The percent decrease between the first and last years was greater in the non-Appalachian regions, with the exceptions of Kentucky (in which the percent decrease was greater in Appalachia) and Pennsylvania (in which the percent decrease was equal in the Appalachia and non-Appalachia regions).

Trends in Age-adjusted Mortality Rates for Prostate Cancer, Appalachia, 1996-2006²,³
**Figure 42**
Trends in Age-adjusted Mortality Rates for Prostate Cancer, Non-Appalachia, 1996-2006\(^1,2\)

![Graph showing trends in age-adjusted mortality rates for prostate cancer, Non-Appalachia, 1996-2006.](image)

\(^1\) See Appendix A for data year by state as there are variations in what data was provided.

\(^2\) Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

**Figure 43** shows the percent of prostate cancer cases diagnosed late stage (distant stage). In the Appalachian regions, the proportion diagnosed late stage ranged from 2.7% (Ohio) to 12.0% (Kentucky). The proportion diagnosed late stage was greater in the Appalachian region of Pennsylvania.

**Figure 43**
Percent Late Stage Prostate Cancer at Diagnosis, Appalachia Compared to Non-Appalachia\(^1,2\)

![Bar chart showing percent late stage prostate cancer diagnoses by state.](image)

\(^1\) (*) West Virginia is the only state in ACCN that is entirely Appalachian.

\(^2\) See Appendix A for data year by state as there are variations in what data was provided.
Testicular Cancer

In 2008, 8,090 cases of invasive testicular cancer were estimated to have occurred in the United States.\(^{16}\) It was estimated that testicular cancer comprised 1% of invasive cancer cases and less than 1% of cancer deaths among males in the United States in 2008.\(^{16}\)

As shown in Table 9, average annual age-adjusted testicular cancer incidence rates in the Appalachian regions, ranged from 3.7 (Virginia) to 6.6 per 100,000 males (New York). The incidence rate in the Appalachian region was greater than that for the non-Appalachian region for two states (New York and Pennsylvania).

Also shown in Table 9, average annual age-adjusted testicular cancer mortality rates in the Appalachian regions, ranged from 0.1 per 100,000 males (New York) to 0.3 per 100,000 males (Ohio, Pennsylvania and Virginia). The mortality rate in the Appalachian region was greater than that for the non-Appalachian regions, with the exception of New York. However, due to comparisons of small numbers of cases, percent differences vary widely and should be interpreted with caution.

### TABLE 9

<table>
<thead>
<tr>
<th></th>
<th>Incidence</th>
<th></th>
<th>Mortality</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appalachia</td>
<td>Non-Appalachia</td>
<td>% Difference</td>
<td>Appalachia</td>
</tr>
<tr>
<td>Kentucky</td>
<td>4.8</td>
<td>4.9</td>
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<tr>
<td>New York</td>
<td>6.6</td>
<td>5.3</td>
<td>24.5%</td>
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</tr>
<tr>
<td>Ohio</td>
<td>5.5</td>
<td>5.7</td>
<td>-3.5%</td>
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</tr>
<tr>
<td>Pennsylvania</td>
<td>6.3</td>
<td>6.2</td>
<td>1.6%</td>
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<tr>
<td>Virginia</td>
<td>3.7</td>
<td>4.8</td>
<td>-22.9%</td>
<td>0.3</td>
</tr>
<tr>
<td>West Virginia</td>
<td>4.7</td>
<td>*</td>
<td>**</td>
<td>*</td>
</tr>
</tbody>
</table>

1 (*) West Virginia is the only state in ACCN that is entirely Appalachian.
2 (**) Insufficient or missing data
3 Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
4 See Appendix A for data year by state as there are variations in what data was provided.

Trends in age-adjusted testicular cancer mortality rates for Appalachian and non-Appalachian regions are shown in Figures 44 and 45, respectively. Population sizes are smaller, in general, in Appalachian regions compared to non-Appalachian regions; therefore, there was more variability in trends shown in Figure 44, as compared to Figures 45. Due to the small number of testicular cancers observed in both Appalachian and non-Appalachian regions, no inferences could be made regarding trends in testicular cancer mortality.
**Figure 45**

*Figure 45 shows the percent of testicular cancer cases diagnosed late stage (regional and distant stages combined). In the Appalachian regions, the proportion diagnosed late stage ranged from 22.5% (New York) to 32.6% (Ohio). The proportion diagnosed late stage was greater in the Appalachian regions of each of the states, with the exception of New York.*

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**Figure 46**

*Figure 46 shows the percent of testicular cancer cases diagnosed late stage (regional and distant stages combined). In the Appalachian regions, the proportion diagnosed late stage ranged from 22.5% (New York) to 32.6% (Ohio). The proportion diagnosed late stage was greater in the Appalachian regions of each of the states, with the exception of New York.*
Executive Summary

The ACCN collaborates with Appalachian communities and other partners to conduct evidence-based cancer initiatives and education and awareness activities, community-based participatory research, and to provide training throughout the region.

Below is a summary of the data contained in this report.

• **Cancer-related Behaviors**: From BRFSS data, the prevalences of the following cancer-related behaviors were greater in the Appalachian regions of more than half of ACCN states: current cigarette smoking (among males and females), current use of smokeless tobacco (among males), inadequate fruit and vegetable consumption (among males and females), no physical activity in the past month (among males and females), and obesity (among males and females).

• **Early Detection**: The prevalences of the following cancer screening behaviors were lower in the Appalachian regions of more than half of ACCN states: mammogram in the past two years (among females 40 and older), colonoscopy/sigmoidoscopy in the past five years (among adults 50 and older), digital rectal exam in the past year (among males 50 and older), and Pap smear in the past three years (among females 18 and older with an intact cervix) – based on BRFSS prevalence data.

• **Incidence**: Based on the most recent age-adjusted average annual incidence rates, there were greater incidence rates in the Appalachian regions of more than half of ACCN states for cancers of the cervix, colon and rectum, lung and bronchus, and oral cavity and pharynx, as well as for all sites and types of cancers combined.

• **Mortality**: Using the most recent age-adjusted average annual mortality rates, there were greater mortality rates in more than half of the Appalachian regions of ACCN states for cancers of the colon and rectum, lung and bronchus, skin (melanoma), and testes, as well as for all sites and types of cancers combined.

• **Late Stage at Diagnosis**: The most recent data indicate that the proportion of late stage at diagnosis (regional and distant stages combined) was greater in more than half of the Appalachian regions of ACCN states for cancers of the skin (melanoma) and testes.
References

Appendix A: Years of Data Provided by ACCN Participating States

<table>
<thead>
<tr>
<th>Surveillance &amp; Vital Statistics</th>
<th>Incidence Data</th>
<th>Mortality Data</th>
<th>Staging Data</th>
<th>Mortality Trends</th>
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<tr>
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<th>PSA</th>
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<th>Diet</th>
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