Moose Creek Cancer Study

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Today’s Presentation

- Background
- Moose Creek cancer incidence study
- Next steps in cancer prevention for Greater Fairbanks area
Background

- Health concern from several communities in the Greater Fairbanks Area, Fairbanks North Star Borough
- PFAS contamination of drinking water wells
  - PFOS and PFOA exceeding EPA lifetime health advisory (LTHA) level of 70 ppt
- Source believed to be firefighting foam used at the main airport, the city’s regional fire training center, and Eielson AFB since 1980s
Background

- Section of Epidemiology’s Environmental Public Health Program working with these communities
- Approached ACR for a cancer study
- Moose Creek borders Eielson AFB
- PFOS and PFOA contamination above LTHA in 170 home drinking water wells
ACR Study

- Two reports:
  - Incidence case count review
  - Cancer incidence study to compare reported vs expected # of cases

- DxYear 1996-2015

- Completed studies in March 2018
Mystery Community

- Queried the ACR database for cases with DxAddress of Moose Creek
- Found zero cases!
- Consulted with Alaska PFD database
  - Covers 93% of AK residents
  - Annual record of physical and mailing addresses
  - Includes DOB, SSN, and place of birth
- People using physical addresses of Moose Creek used mailing addresses of North Pole
We Need a GIS Solution!

North Pole Addresses

North Pole  Moose Creek  Eielson AFB
We Need a GIS Solution!

- Used the NAACCR Geocoder to geocode 1,306 North Pole addresses
- Reviewed the GIS Coordinate Quality code
- 1,218 (93.3%) geocoded to house address
- 36 failed geocoding
  - Manually researched & corrected using PFD
  - 1 additional Moose Creek address
- 52 were PO Boxes
  - Manually researched & corrected using PFD
  - 0 additional Moose Creek addresses
  - 8 did not have physical addresses
We Need a GIS Solution!

- Used MapInfo GIS software to plot location of North Pole cases.
- Performed a spatial query using the boundaries of Moose Creek to find Moose Creek cases.
- Found 39 Moose Creek cases
  - 3% of total Community B addresses
## Incidence Study: Observed vs Expected

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Location</th>
<th>Number of Observed Cancer Cases 1996-2015</th>
<th>Number of Expected Cancer Cases 1996-2015</th>
<th>Difference (Observed minus Expected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Cancer Sites Combined</td>
<td>Moose Creek</td>
<td>39</td>
<td>37</td>
<td>+2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Location</th>
<th>Standard Incidence Ratio (SIR)</th>
<th>Lower Confidence Interval</th>
<th>Upper Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Cancer Sites Combined</td>
<td>Moose Creek</td>
<td>106.1</td>
<td>72.8</td>
<td>139.4</td>
</tr>
</tbody>
</table>

- Ran a “Standard Incidence Ratio” (SIR) significance test
- Additional cancer cases were found not to be statistically significant
39 cancer cases reported between 1996-2015
Averaged 2 cases per year
Random number of cases occurring each year
5 types of cancer having more than 2 occurrences with 62% of all cancers: Female Breast, Lung, Prostate, Colorectal, Oral Cavity & Pharynx
All commonly occurring types of cancers except Oral Cavity & Pharynx
Lung cases 31% of total compared to 13% statewide
# Lung Incidence Study: Observed vs Expected

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Location</th>
<th>Number of Observed Cancer Cases 1996-2015</th>
<th>Number of Expected Cancer Cases 1996-2015</th>
<th>Difference (Observed minus Expected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>Moose Creek</td>
<td>12</td>
<td>5</td>
<td>+ 7</td>
</tr>
<tr>
<td>All Cancer Sites Combined Except Lung</td>
<td>Moose Creek</td>
<td>27</td>
<td>32</td>
<td>- 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Location</th>
<th>Standard Incidence Ratio (SIR)</th>
<th>Lower Confidence Interval</th>
<th>Upper Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>Moose Creek</td>
<td>274.6</td>
<td>119.2</td>
<td>430.0</td>
</tr>
<tr>
<td>All Cancer Sites Combined Except Lung</td>
<td>Moose Creek</td>
<td>83.4</td>
<td>51.9</td>
<td>114.8</td>
</tr>
</tbody>
</table>
Smoking as a Risk Factor

- Cigarette smoking leading risk factor for lung cancer
- ACR tobacco use history for Moose Creek cases:
  - All cancers: 85% current or former smokers
  - Lung cancers: 100% current or former smokers
- Alaska BRFSS tobacco data showed statistically significant difference between statewide and North Pole residents, 2007-2016:

<table>
<thead>
<tr>
<th>Area</th>
<th>Percent Current and Former Smokers</th>
<th>Lower Confidence Interval</th>
<th>Upper Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statewide</td>
<td>48.4%</td>
<td>47.8%</td>
<td>49.1%</td>
</tr>
<tr>
<td>Zip Code 99705</td>
<td>53.1%</td>
<td>50.2%</td>
<td>58.0%</td>
</tr>
</tbody>
</table>
Study was triggered by community concern regarding PFOS and PFOA contamination in wells

Did not find statistically significant number of observed cancer cases for all sites combined

Found statistically significantly higher numbers of observed lung cancer cases than expected

Lung cancer cases correlated with smoking history in this community

Higher than expected lung cancer cases consistent with high smoking prevalence from BRFSS
Some Caveats…

- Study conclusion is an assumption based on correlation with known smoking prevalence data but not proven by the analysis.
- Analysis is focused at the population level & is not meant to imply that individuals are to be blamed for their cancer.
- Extent to which smoking may be a co-factor along with certain environmental exposures on the risk of lung cancer is unknown and not explored in this study.
Findings indicate where public health efforts could be focused to decrease the burden of cancer for residents of Moose Creek.

Strategies to reduce lung cancer rates could be identified by partnering with State of Alaska Tobacco Prevention & Control Program.

- Quit Line 800-QUIT-NOW
Acknowledgments

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Thanks very much!

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