Environmental Health Surveillance Workshop:

Uses of surveillance: To follow the effects of development

Dr. James Irvine
Medical Health Officer

Ottawa, Feb 25 – 26, 2013
Uranium mining developments in northern Saskatchewan
2012 Northern Sask Population:

38,442

~ 70 communities
Population declaring Aboriginal identity, by Health Authority, 2006
Uranium mining developments in Saskatchewan
History

Mining since the 1950s

Legacy Sites:
abandoned/orphaned sites
Mine employees

Historical: Mining Towns

Now: Fly in / Fly out
Underground and Open-Pit Mines
Mills
Present day mines

Remote Technologies
3723 work at northern Saskatchewan uranium mines (employees or long term contractors):

47.5% are ‘residents of northern Saskatchewan (2011)
Environmental Health Surveillance
Partnerships for surveillance

- Northern Mines Monitoring Secretariat:
- Canadian Nuclear Safety Commission
- Environmental Quality Committees
- Environment Canada
- Health Canada
- Saskatchewan Watershed Authorities
- Universities
- Industry
Air, water, soil

Animals, fish, plant foods

Worker’s health & safety

Family’s socio-economic conditions

Community’s socio-cultural-economic factors
Monitoring community health
Many other factors affecting our communities

- Background environment
- Housing, water & sewage
- Smoking
- Communications
- Television
- Internet
- Social changes
- Incomes
- Education
- Transportation
- Road / air access
Joint Federal-Provincial Panel on Uranium Report 1993

- “Implementation of a program to collect & analyze changes in indicators of community health for impacted communities, & formulation & implementation of remedial health strategies”

- Following Feasibility Study
  - Health effects monitoring integration with overall health monitoring / needs assessment
Trends in Health Status

• Improvements in infant health
• Improvements in infectious disease
• Some infectious diseases still prevalent or emerging
• Continuing high rates of traumatic deaths
• Increasing influence of chronic disease (e.g. diabetes, heart disease)
• High levels of tobacco misuse
Infant mortality rate, 8-yr averages, NorthSask and Saskatchewan, 1993-2007

<table>
<thead>
<tr>
<th></th>
<th>1993-99</th>
<th>2000-7</th>
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</thead>
<tbody>
<tr>
<td>North Sask</td>
<td>13.6</td>
<td>10.4</td>
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<tr>
<td>Sask</td>
<td>8.3</td>
<td>6.3</td>
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</tbody>
</table>

Source: SaskHealth. Prepared by PHU Nov 2009
Causes of Infant Death
in Northern Saskatchewan and Saskatchewan by year groups
(rate per 1000 live births)

<table>
<thead>
<tr>
<th></th>
<th>Injury</th>
<th>Infection</th>
<th>Other</th>
<th>Congenital</th>
<th>Unclassified Incl. SIDS</th>
<th>Perinatal</th>
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<tbody>
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<td>North 1993-99</td>
<td>0.9</td>
<td>1.0</td>
<td>1.7</td>
<td>2.8</td>
<td>3.5</td>
<td>3.7</td>
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<tr>
<td>North 2000-7</td>
<td>*</td>
<td>1.3</td>
<td>1.3</td>
<td>2.5</td>
<td>2.5</td>
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<td>2.4</td>
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<td>Sask 2000-7</td>
<td>0.2</td>
<td>0.4</td>
<td>0.7</td>
<td>1.4</td>
<td>1.0</td>
<td>2.4</td>
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Source: SaskHealth, Prepared by PHU Nov 2009 * suppressed as cell < 5
Age-adjusted Cancer Incidence rate, 10-yr average, total invasive cancers, by sex, 1998-2007

<table>
<thead>
<tr>
<th></th>
<th>North Female</th>
<th>Sask Male</th>
<th>North Male</th>
<th>Sask Female</th>
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</thead>
<tbody>
<tr>
<td>Age-std rate</td>
<td>344.9</td>
<td>345.9</td>
<td>355.0</td>
<td>453.0</td>
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</tbody>
</table>

Trends in mortality rates for lung cancer by sex North Sask and Saskatchewan, 5-yr average age-std rates, 1998-2007

<table>
<thead>
<tr>
<th></th>
<th>North female</th>
<th>North male</th>
<th>SK female</th>
<th>SK male</th>
<th>North female</th>
<th>North male</th>
<th>SK female</th>
<th>SK male</th>
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<tr>
<td>1998-2002</td>
<td>67.8</td>
<td>105.3</td>
<td>32.8</td>
<td>57.3</td>
<td>64.5</td>
<td>83.1</td>
<td>34.5</td>
<td>50.8</td>
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<td>2003-2007</td>
<td></td>
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Environmental monitoring: air, water, & sediment around mines and near communities

Ministry of Environment’s Boreal Watershed Initiative
The Eastern Athabasca Regional Monitoring Program (EARMP) – earmp.ca
Human Exposures

Community drinking water

Uranium: Maximum Acceptable Concentration of 0.02 milligrams/litre (mg/L).
% of radon levels above guideline values in Saskatchewan homes by health area 2009/10

Source: Cross-Canada Survey of Radon Concentrations in Homes, Health Canada, 2010
Radionuclides and Trace Metals in Northern Saskatchewan Country Foods
Country food consumption surveys

• Hatchet Lake First Nation
  • 1998-1999
  • Site specific dietary information
  • Comprehensive, summer and winter
  • By age, gender
  • By food, body part, cooking process

• Uranium City
  • 2010-2012
Mine Workers: Uranium Mine Workers Epidemiologic Study

- Old Mines
  - Eldorado (1932 to 1982)
- Modern mines
  - 1982 to 2030
Past Radon Exposures

Average Radon Progeny Exposures

Radon Progeny (WL/m²/year)

Time

- Port Radium
- Beaverlodge

1940s 1950s 1956-60 1960s 1970s

Exposures
Modern Radon Exposures

Average Radon Progeny Exposures

Radon Progeny (WLM/year)

<table>
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<tr>
<th>Time</th>
<th>1970s</th>
<th>1980s</th>
<th>1990s</th>
<th>2000s</th>
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<td>2.5</td>
<td>1.0</td>
<td>0.5</td>
<td>0.5</td>
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<tr>
<td>1980s</td>
<td>1.0</td>
<td>1.0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>1990s</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>2000s</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Expected vs Observed Deaths for all Males (1950-1999) for all Causes

Circulatory Diseases, Cancer, Respiratory Diseases, Injury and Poisonings, Digestive Diseases, External Causes, Diabetes, Nervous System Diseases, Genitourinary Diseases, Mental Disorders, Infectious Diseases, Alcoholism and related, Musculoskeletal Diseases

Canada, Eldorado
Present Day Mines
Saskatchewan Uranium Miners Cohort Feasibility Study (1975-2030)

Lifetime Radon Exposures in Homes and Mine (with range)

Source: SENES
Saskatchewan Uranium Miners Cohort Feasibility Study (1975-2030)

Predicted Lung Cancers 2030

- Population 1: Average Canadian smoking rate
- Population 2: Average mine worker’s smoking rate (early 2000s)
Social Health: Community Vitality Monitoring Partnership

www.cvmpp.ca
Community Vitality Monitoring Project Goals:

• “…provide insight into community vitality such that stakeholders can use that knowledge to improve and maintain the quality of life in Northern Saskatchewan”

• “Provide information related to uranium mining impacts on community vitality that is useful to northern communities.”
Projects:

- Migration Survey
- Healthy Food Costing
- Northern Youth Initiatives
- 7 in / 7 out work schedule impact on individual, family & community
- Athabasca Education
- Career Counseling Initiatives in Schools
- Northern Recognition
- Socio-economic impact of uranium mining
Assessment of Impacts of Work Schedule

• Household level

• Relationships

• Children

• Traditional activities

• Community / volunteerism
Socio-economic impact of uranium mining

- Northern labour force changes over time
- Northern education levels & industry contributions
- Northern employment #s and rates – industry contribution
- Northern incomes over time and industry contributions
- Northern business opportunities related to uranium industry
- Workers health
- Industry’s engagement with northern communities
- Community well-being index
- Uranium industry contributions to vitality of northern communities.
Community Involvement

- Northern Environmental Quality Committees, and Athabasca Working Group
- Northern Health Boards
- Community consultations

Input into the what, where, how, when for surveillance and how best to disseminate results
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