Hydraulic Fracturing in Yukon:

An Overview of Public Health Impacts

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Address to the Select Committee on the Risks and Benefits of Hydraulic Fracturing

May 28, 2014

OUTLINE

- Definition of health + determinants
- Health Impact Assessments
  - Experience + lessons from Keno HIA
  - HIA process
- Health Impacts overview
- Conclusions
  - Broad vision of Health
- Recommendations

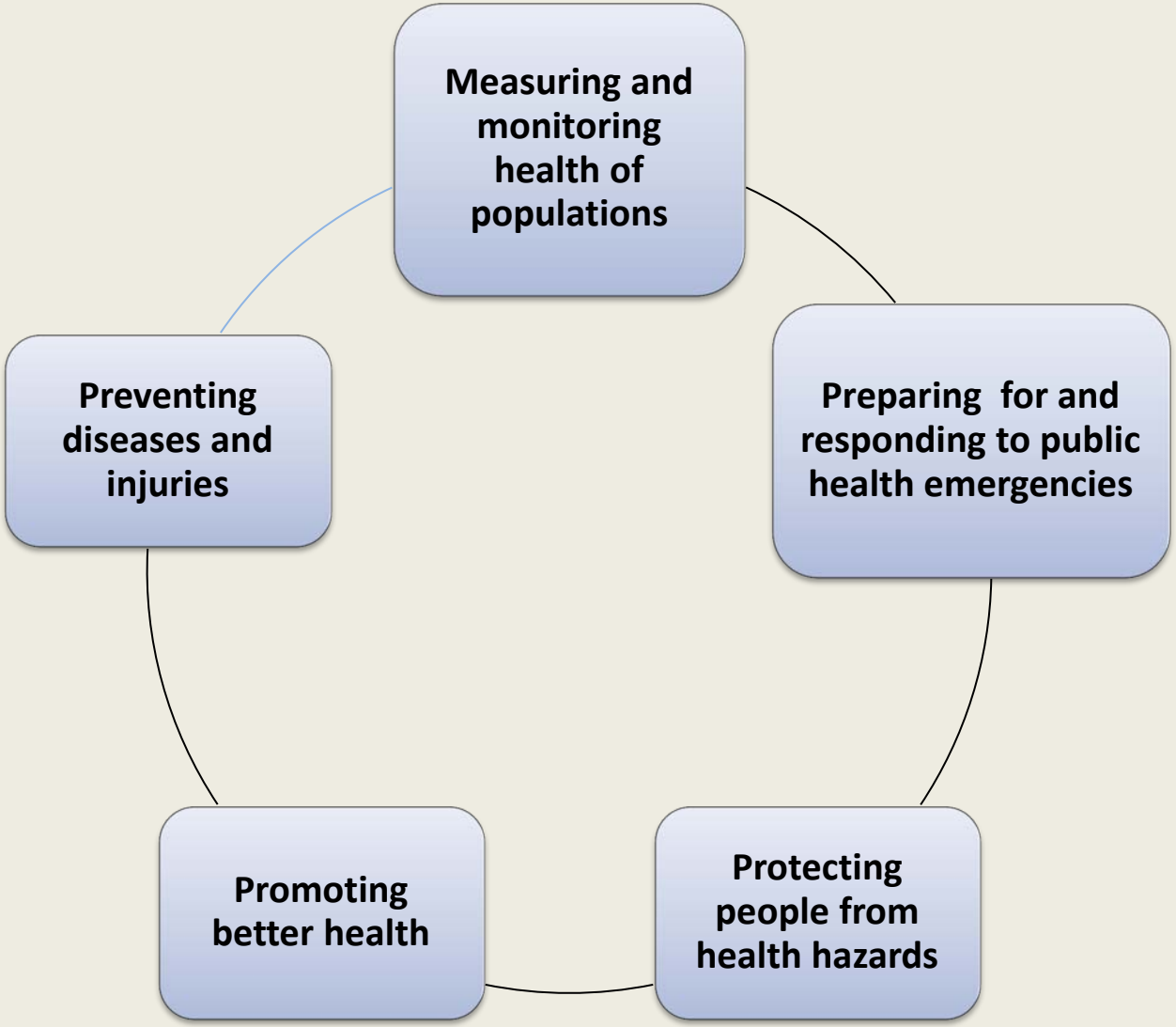
What is Health?

- WHO: “A state of complete physical, mental, social well-being and not merely the absence of disease or infirmity’’

- Wellness: “Wellness is a positive state of feeling good and functioning well that enables people to achieve their full potential, enjoy quality of life, and contribute positively to their community’’

http://www.yukonwellness.ca/

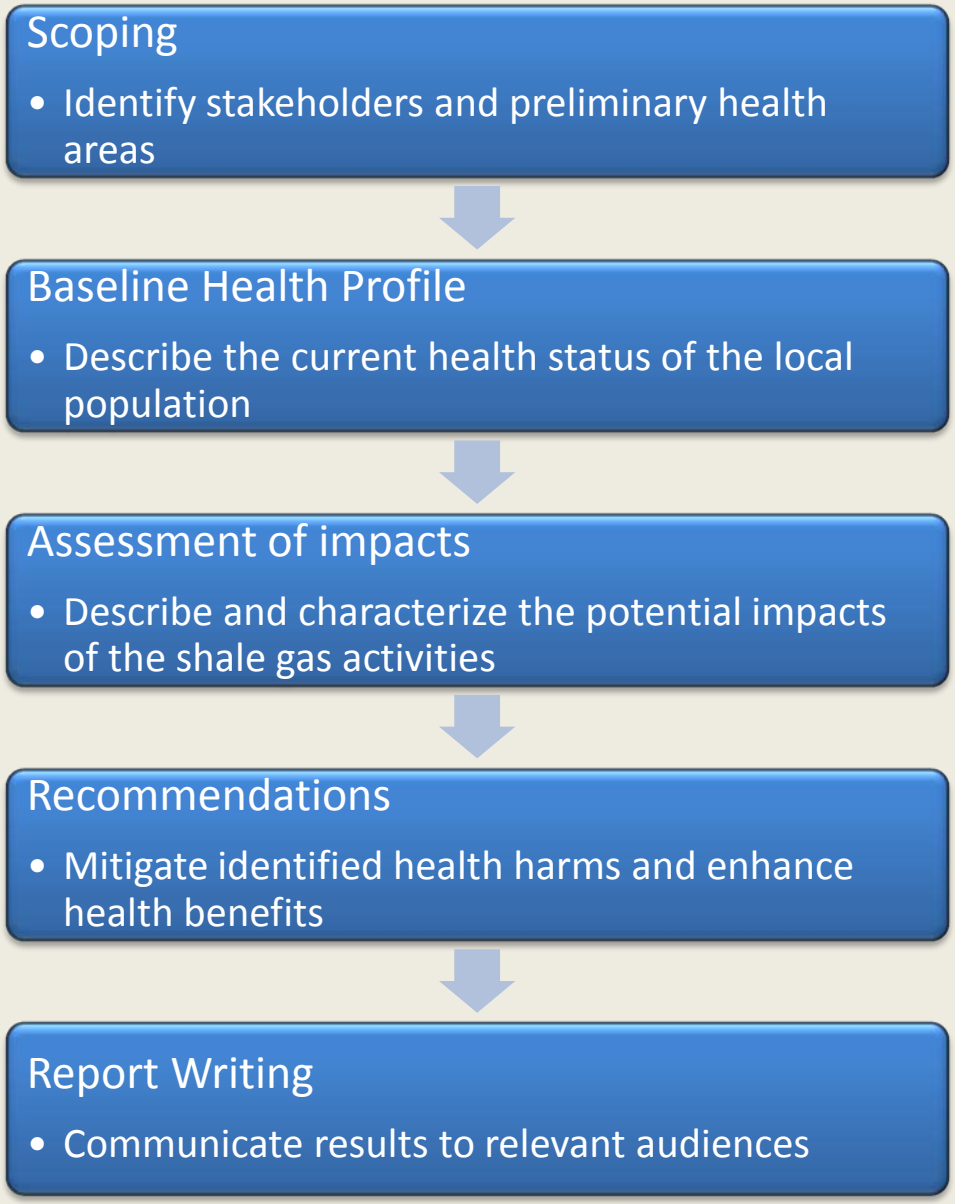
Core Functions of Public Health



Health Determinants

- **Income and Social Status**
- **Social environments**
- **Physical Environments**
  - Social support networks
  - Education and literacy
  - Employment/working conditions
  - Personal Health practices
  - Healthy child development
  - Biology and genetic endowment
  - Health services
  - Gender
  - Culture

Health Impact Assessment



CAN WE LEARN FROM KENO?

- NEED FOR HIA PROCESS UP FRONT
- DEPT OF HSS TAKES THE LEAD ON HIA's
  - BUT YG AS A WHOLE RESPONDS

Assessing Public Health Impacts: Challenges

- **New for Yukon**
  - Need to learn from other jurisdictions

- **Data gaps**
  - Difficult to forecast
  - Focus on chemicals
  - Methodological obstacles
  - Lack of exposure data
  - Lack of baseline studies
  - Few long-term studies

Socio-Economic Impact

- Direct Economic Benefits:
  - Royalties, ↑ Income
- Boomtown Effect
- Inequitable distribution of risk and reward

DETERMINANTS OF HEALTH

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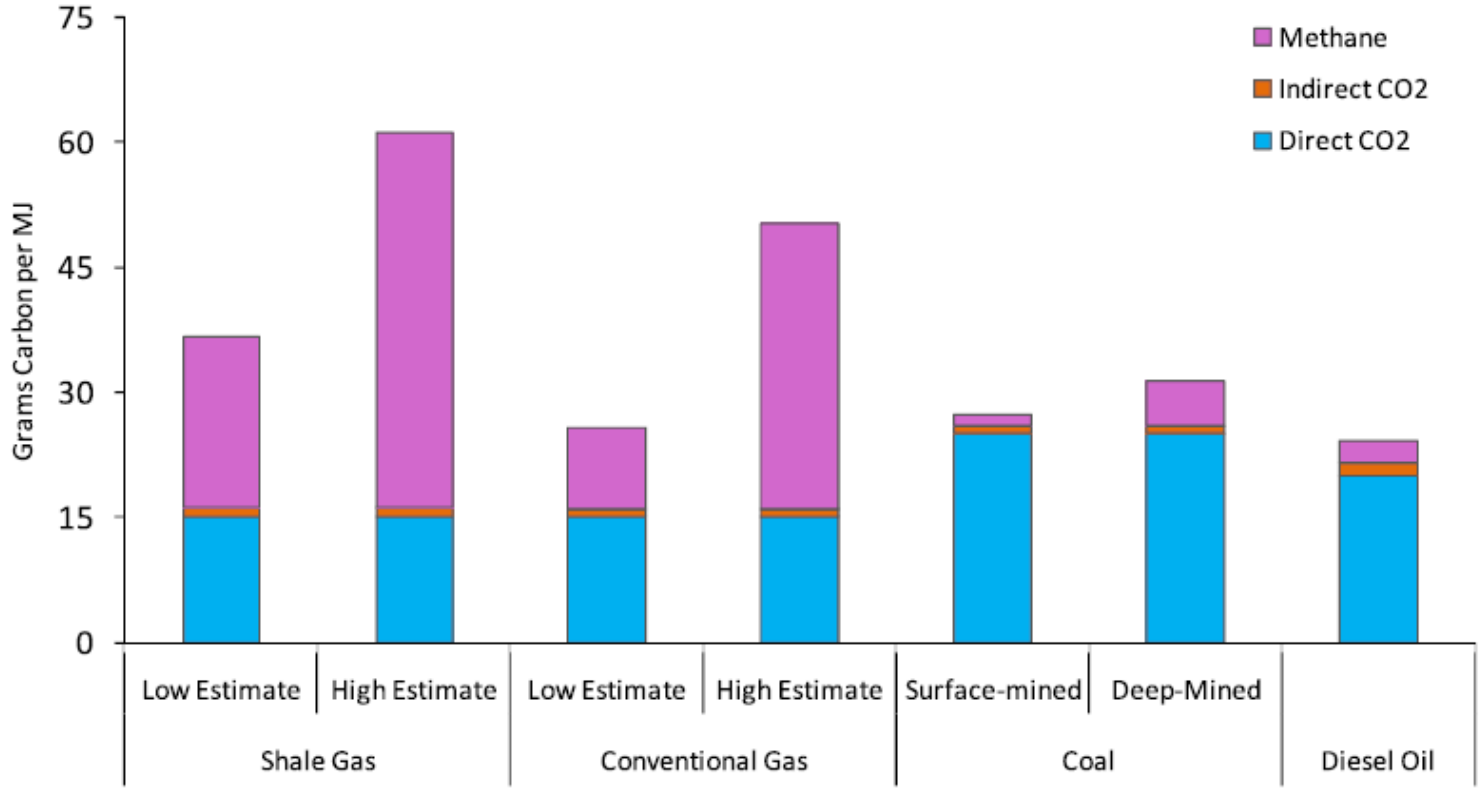
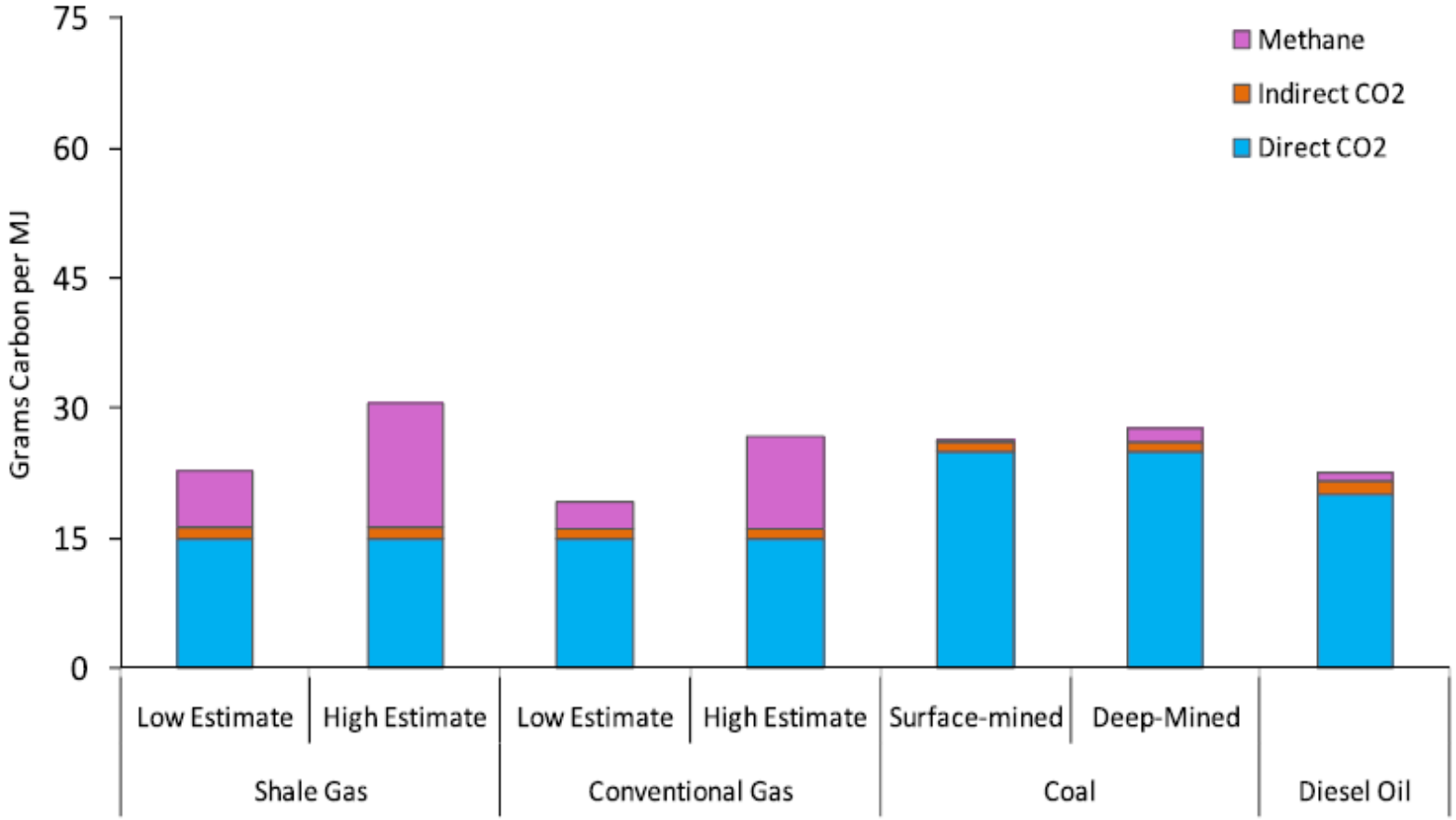
Greenhouse Gas Emissions

- GHG: Methane + CO2
- ↓CO2 emissions compared to diesel oil
- Fugitive methane emissions
- Methane more potent but shorter lived

A. 20-year time horizon



B. 100-year time horizon



Air Quality

- Emissions through total lifecycle
- NOx, VOC, PM 2.5, Methane, CO2, Diesel PM, (SO2)
- NOx +VOC+Methane+Sunlight = **Ozone** = Asthma aggravation, Decreased Lung Function
- VOC (Benzene): Known carcinogenic effect (leukemia)
- Caveat: no data on exposure risk related to shale gas exploitation
- Unknown effects when mixed in atmosphere

Source	NOx	VOC	PM	Air Toxics	Data Quality
Well development					
Drill Rigs	●	○	●	●	Medium
Frac Pumps	●	○	●	●	Medium
Truck Traffic	●	○	●	●	Medium
Completion Venting		●		●	Poor
Frac ponds		○		?	Poor
Gas Production					
Compressor Stations	●	●	○	●	Medium
Wellhead compressors	○	○	○	○	Medium
Heaters and dehydrators		○	○	○	Medium
Blowdown venting		○		○	Poor
Condensate Tanks		●		○	Poor
Fugitives		?		○	Poor
Pneumatics		○		○	Poor

● = major source ○ = minor source

FIGURE 5-1 Sources of emissions.
SOURCE: Robinson, 2012.

Health Impact Assessment of Shale Gas extraction: Workshop Summary, Roundtable on Environmental Health Sciences, Research, and Medicine Board on Population Health and Public Health Practice, 2013

Water Impacts

- Consumption
  - 12 to 80 million litres/well
- Contamination
  - Possible mechanism: hydraulic connectivity, well integrity
- Disposal: Ideal solution yet to be found
  - Deep-well injection

Chemicals + Frac Sand

- Industrial chemicals
  - Some carcinogenic
    - Real risk due to exposure is unknown
    - Combined versus isolated effects
- Natural waste water chemicals
  - Carcinogenic potential may be higher
    - Heavy metals, radionuclides(radium-226), brine
  - Managing radioactive waste challenging
- Frac sand: water+silica sand+chemicals: silicosis, lung cancer, COPD

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Physical Environment

- Noise
  - Air compressors
    - Psychological impact
- Light
  - 24hr/24 for exploration, drilling and exploitation
- Traffic →Vibration
  - Estimated 2,000 truck trips / well
    - Risk of road crashes
    - Deterioration of roads

Impacts are not equal

- Vulnerable Populations
  - Children
    - Higher rate of metabolism
    - Closer contact with environmental contaminants
  - Prenatal
    - Airborne benzene = NTD, cognitive impairment, childhood leukemia
  - Low-Income households
    - ↓ financial ability to mitigate exposures

Mitigating Impacts: Evolving Industry Technologies

- Can GHG emissions be reduced?
  - Green technologies
    - EPA estimates ↓ 40% of methane emissions with new technologies
    - Carbon capture and sequestration strategy
- Water Disposal
  - On site waste water treatment
  - Deep-well injection of waste water
- Caveat: New tech does not replace risk assessment

Conclusions

- Complex public health considerations
  - Lack of studies
  - Public Health not often at the table
  - Difficult to assess certain risks due to lack of data
  - Rapidly evolving industry technologies
    - Forecasting difficult
- Best considered in context as an alternative fossil fuel industry.

Conclusions

- Shale Gas development and other Oil and Gas projects deserve Health Impact Assessments (HIA)
- HIA need to be integrated into government approval processes along with implementation plans.
- Shale Gas projects can bring economic benefit if carefully managed and if the Boomtown effects are avoided.
- Greenhouse Gas contributions are significant and must be factored into an energy strategy.
- Other health risks can be managed in a climate of progressive legislation and best industry practices.

RECOMMENDATIONS

- Optimize Socioeconomic effects
- Reduce Greenhouse Gases
- Anticipate and Mitigate Physical effects
- Optimize Mental Health and Wellness
- Formalize HIA and Implementation Processes

Optimize Socioeconomic Effects

- Keep Regional/Community planning ahead of the boom
  - Land use planning should precede development
- Ensure equitable sharing of risks and rewards
  - Community Planning: ensure benefit to all
  - Consider vulnerable populations
  - Royalty and Revenue sharing: Community, First Nation, Yukon

Anticipate and Mitigate Physical Effects

- Air and water quality monitoring
- Dust monitoring and managment
- Improving waste water management
- Full disclosure of chemicals used
- Monitoring and mitigations for noise, vibration, and light
- Traffic management
- Promote and protect workers' health

Optimize Mental Health and Wellness

- Support and encourage community and land use planning
- Maximize transparency and accountability
- Validate and respond to citizen concerns
- Encourage industry to support health and wellness
- Pay attention to inequities and protect the vulnerable
- Include crisis and emergency planning

Formalize HIA and Implementation Processes

- High-level scenario based HIA
- Specific HIA's integrated with YESSA
- Implementation Process
- Public accountability
- Monitor health of persons living, working, attending school in proximity with industry

Reduce Greenhouse Gases

- Set goals for reducing carbon footprint and fossil fuel usage
- Review, monitor and publicize achievement of Energy and Climate Change action goals
- Adapt and update Yukon Energy Strategy
  - Sustainability, Self-sufficiency
  - Increase renewable energy supply in Yukon by 20% by 2020 and reduce GHG
  - Reduce energy consumption from housing (Green Homes) and transportation (e.g. invest in local agriculture)

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