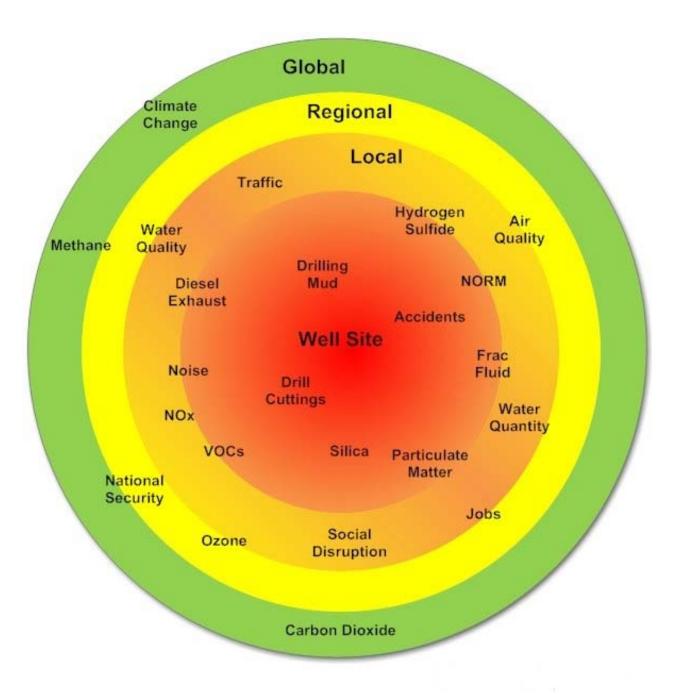
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Environmental Health Research and Unconventional Oil and Gas Extraction

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Funded in part by the National Science Foundation (NSF CBET-1240584) and RPSEA/DOE (EFDTIP2-TIP213)

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What the health studies tell us

- O&G workers have substantial risks from injuries, accidents, and chemical or physical agents
 - Traffic accidents are a major source of mortality
 - Some workers exposed to silica dust concentrations at or above current OSHA standards
- Risk Assessment Results
 - Cancer
 - Risk assessments indicate small increases in excess lifetime cancer risk for nearby residents, but the risks are generally within EPA's acceptable range.
 - Non-cancer
 - Risk assessments in Colorado indicate short-term exposures to concentrations of air emissions are
 potentially in the range of health concern for nearby residents; other research indicates that well
 completions and unloadings may be sources of hot spots of air toxics
- Residents living in areas with O&G development have self-reported health & psychosocial effects and there are a limited number of environmental epidemiology investigations
 - Air studies indicate the potential exposure of nearby residents to substantial levels of hazardous air pollutants (e.g. benzene, toluene, hydrogen sulfide, diesel exhaust)
 - Work we have done shows that there may a positive association between greater density and proximity
 of natural gas wells within a 10-mile radius of maternal residence in rural Colorado and greater
 prevalence of CHDs and possibly NTDs, but not oral clefts, preterm birth, or birth weight
 - Water studies show potential hazards most don't link to health outcomes

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What the health studies do not tell us

- The baseline: Did exposure to O&G occur before the health effect?
 - Exposure:
 - What were the concentrations of chemicals in air/water before O&G development?
 - Health Effects:
 - What was the incidence of disease (e.g. cancer, asthma) in the community prior to O&G development?
- What actual exposures are:
 - What are people exposed to if anything and at what concentration/level?
 - Is O&G development the source of the exposures or is it something else?
 - If it is O&G, what activities are the source of the exposure?
 - Chemical stressors or non-chemical stressor?
- The distance O&G development should be to minimize potential for health effects
 - Likely no one "right" answer for this question
 - Highly dependent on activities

What do we need assess links between exposure and health outcomes?

- What are the exposures and what is the source of the exposures?
 - Air and water concentrations for a range of chemicals over a range of activities and practices
 - Human exposures
 - Noise, traffic, accidents
 - Understand the effects of chemical mixtures and noise/traffic/accidents on health & quality of life
- What are the health outcomes?
 - Subclinical biomarkers
 - Systematic tracking
 - Psychosocial effects
- Establish Temporality cohort and case-control studies
 - Baseline conditions
 - Follow Populations