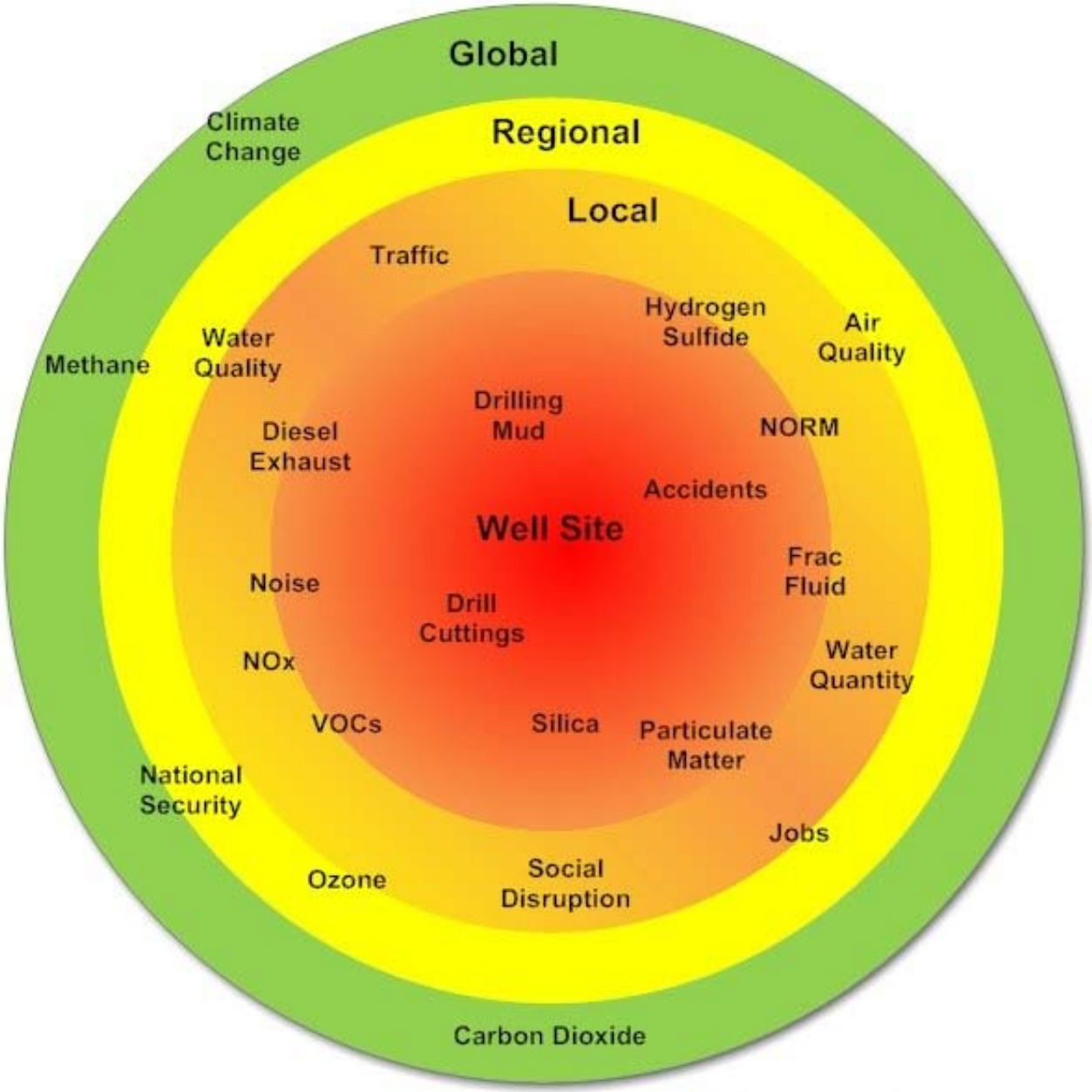
Colorado School of Public Health

Environmental Health Research and Unconventional Oil and Gas Extraction

John L. Adgate / Lisa M. McKenzie
Department of Environmental and Occupational Health
Colorado School of Public Health, University of Colorado

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


Global
Climate Change
Regional
Local
Traffic
Hydrogen Sulfide
Air Quality
Water Quality
Methane
Drilling Mud
Diesel Exhaust
NORM
Accidents
Well Site
Frac Fluid
Noise
Drill Cuttings
Water Quantity
NOx
VOCs
Silica
Particulate Matter
National Security
Jobs
Ozone
Social Disruption
Carbon Dioxide

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 & psycho-social 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

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