Evaluating Oil and Gas Community Health Concerns

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Oil and Gas Development in Colorado

- 10s of thousands of active oil and gas wells in Colorado
- ~30 active drilling rigs currently operating in Colorado
- Current setback distance is 500' from residences
- Expansion of O&G and population are occurring simultaneously

Governor's Oil and Gas Task Force

O&G Task Force…"heard from many citizens who expressed concern and uncertainty about potential human health risks associated with exposure to emissions from oil and gas activities. The Task Force believes citizens deserve and need accurate, credible, peer-reviewed scientific information to help them evaluate risk" (Task Force Final Report, 2015)

➢ Health concerns were reported to multiple different agencies
➢ Limited health department resources to address health related issues

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2015 Governor's Oil and Gas Task Force

❖Create a centralized health concern line

❖Outfit a mobile air quality monitoring unit

❖Create an oil and gas information clearinghouse

❖Perform human health risk assessments
   ❖Initially with existing data
   ❖Later with CSU emissions data

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Oil and Gas Health Information and Response Program

- Health concern hotline
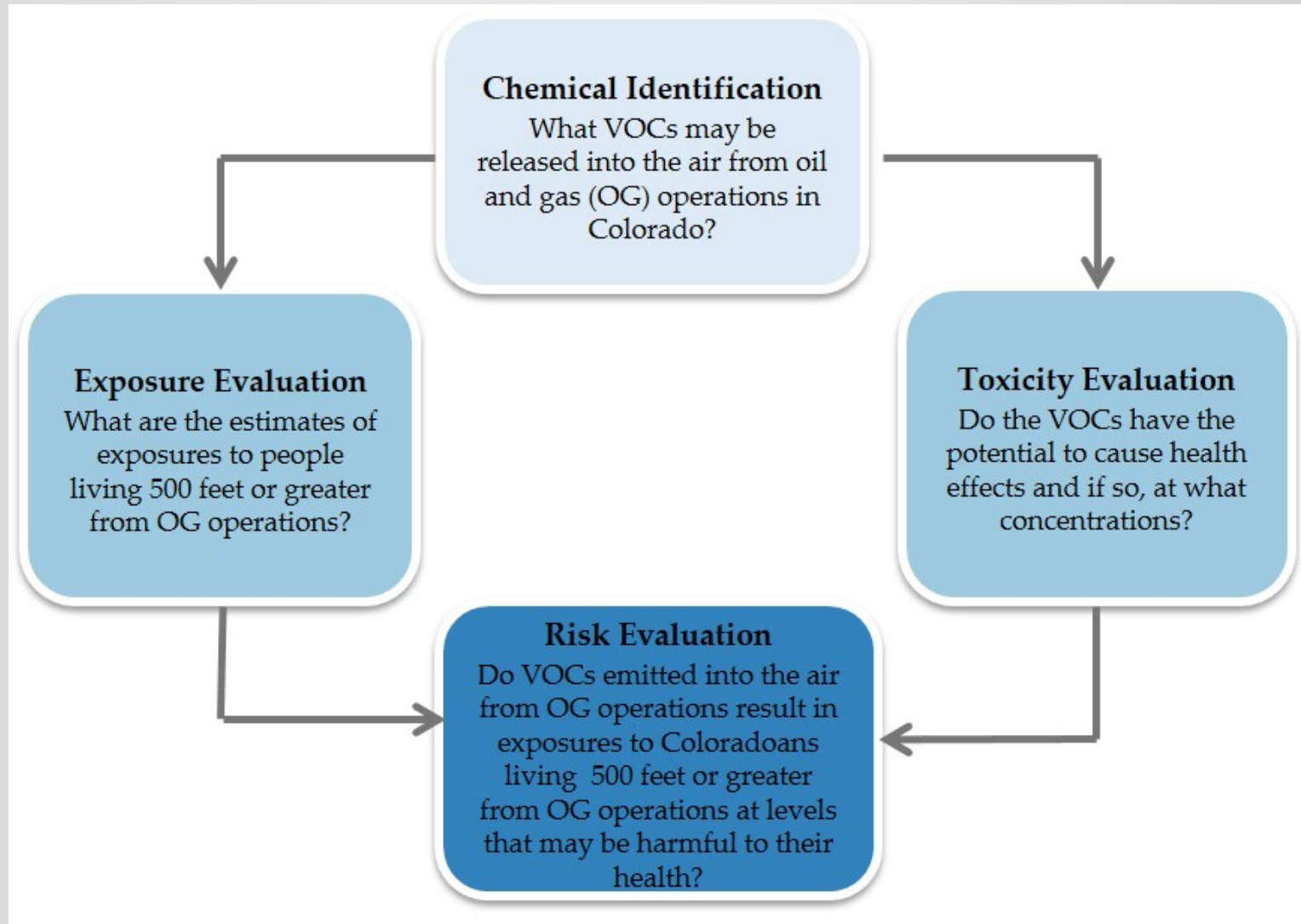- Information clearinghouse
- Community meetings
- Community Investigations
- Science evaluations

www.colorado.gov/oghealth

Screening Risk Assessment

Identifying VOC Emissions

- Colorado-specific
- Data Review
  - CDPHE operator emissions inventories
  - Collett et al. (2016) characterization studies
  - Gilman et al. (2013) source apportionment study
- 56 VOCs identified

Exposure Data Criteria

- Samples collected at 500 feet and greater from O&G operations

- Representative of ground-level exposures

- Collected during any type of O&G operation

- Collected between 2008 and 2017

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Exposure Data

- Identified 11 data sets
  - 3 from Piceance Basin
  - 8 from D-J Basin
- Various temporal and seasonal scales
- Represent 500-3700 feet from O&G operations
- Various phases of operations
- Data sets ranged from 36 to 28,000 individual samples

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Exposure Scenarios

- Chronic exposure
  - Maximum average VOC level across 10 datasets (one data set excluded)

- Acute exposure
 - Maximum single sample across the 11 datasets

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Health Guideline Values

| Tier	Source	Health Guidance Value
Tier I	U.S. EPA's Integrated Risk Information System (IRIS)	Chronic: Reference Concentration (RfC) Cancer: Inhalation Unit Risk (IUR)
Tier II	Center for Disease Control - Agency For Toxic Substances and Disease Registry	Acute & Chronic: Minimal Risk Level (MRL)
Tier III	US EPA Peer-Reviewed Toxicity Values (PPRTV's)	Chronic: PPRTV
Tier IV	California EPA (Cal EPA)	Acute and Chronic: Reference Exposure Level (REL) Cancer: Inhalation Unit Risk (IUR)
Tier V	Texas Commission on Environmental Quality (TCEQ)	Short & Long-Term: Air Monitoring Comparison Value (AMCV)
Tier VI	surrogate approach	Not applicable

Hazard Quotients for Acute Exposure
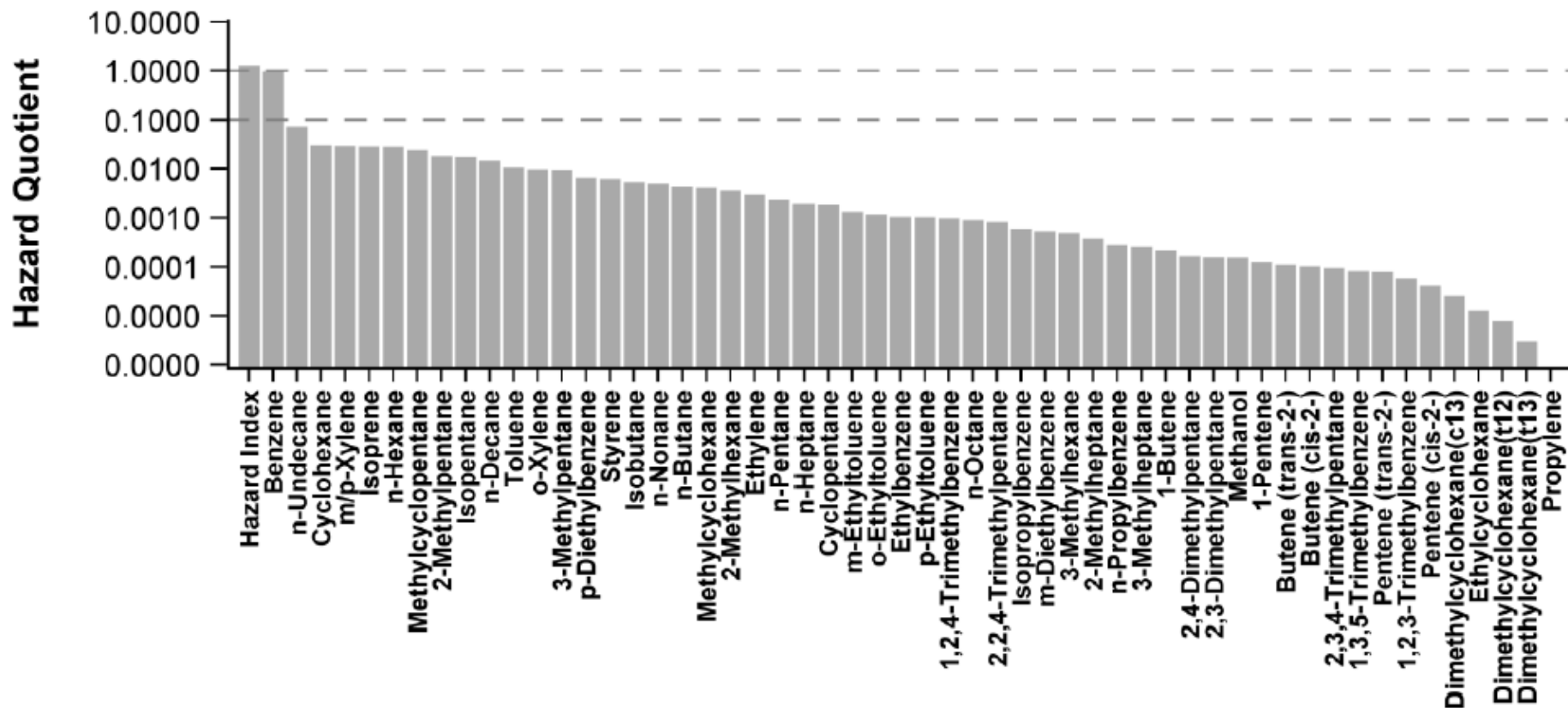
Benzene: Acute
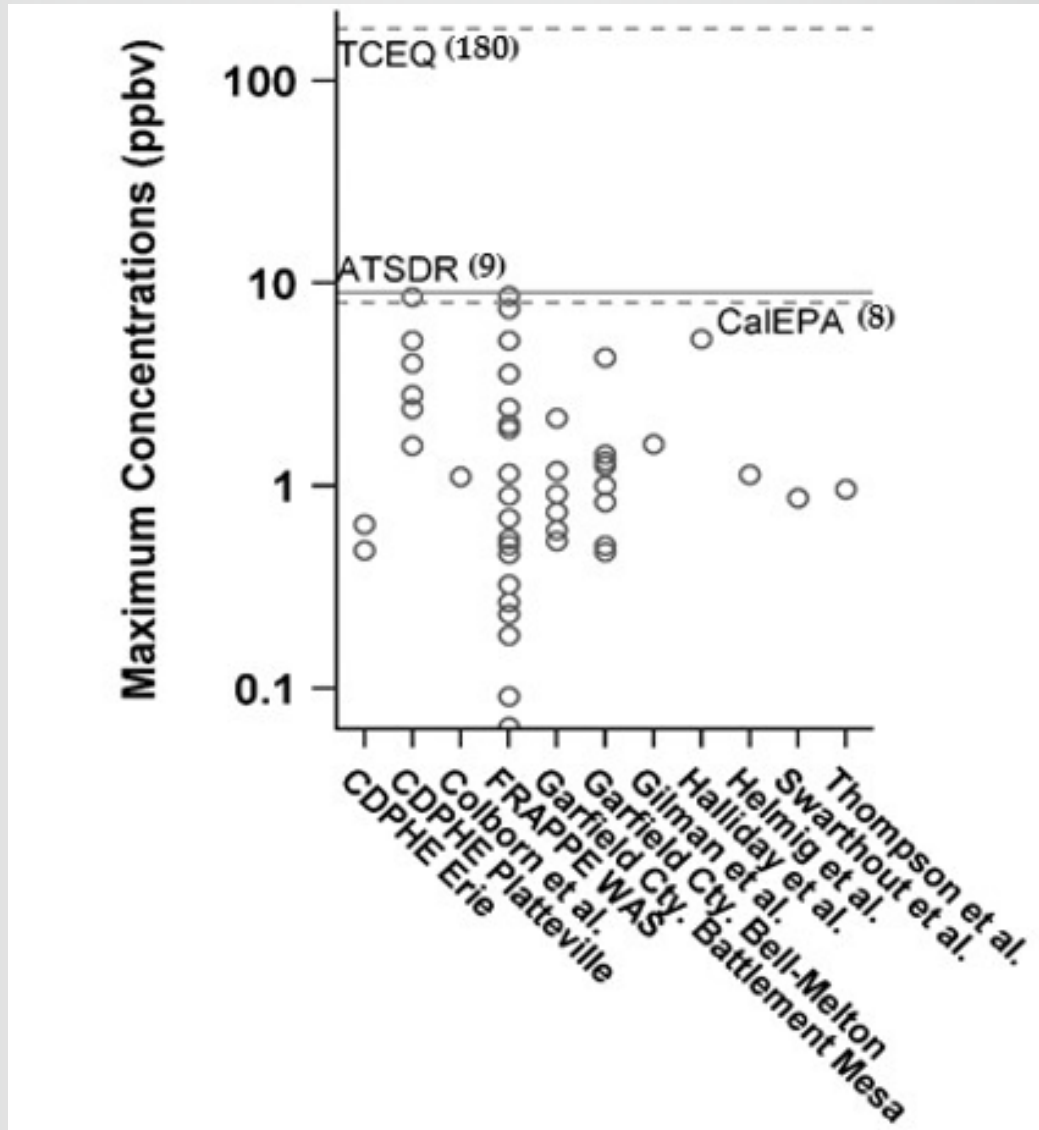
Hazard Quotients for Chronic Exposure

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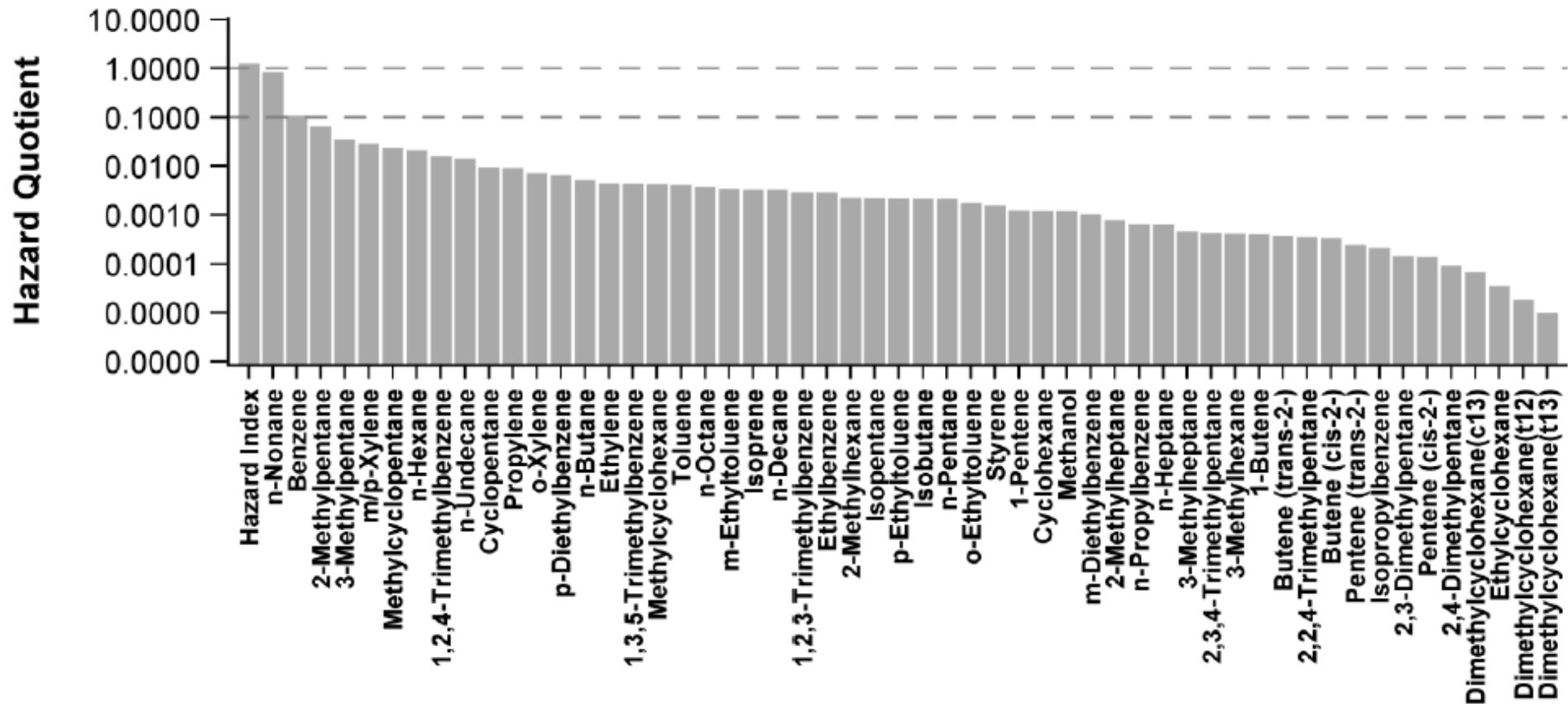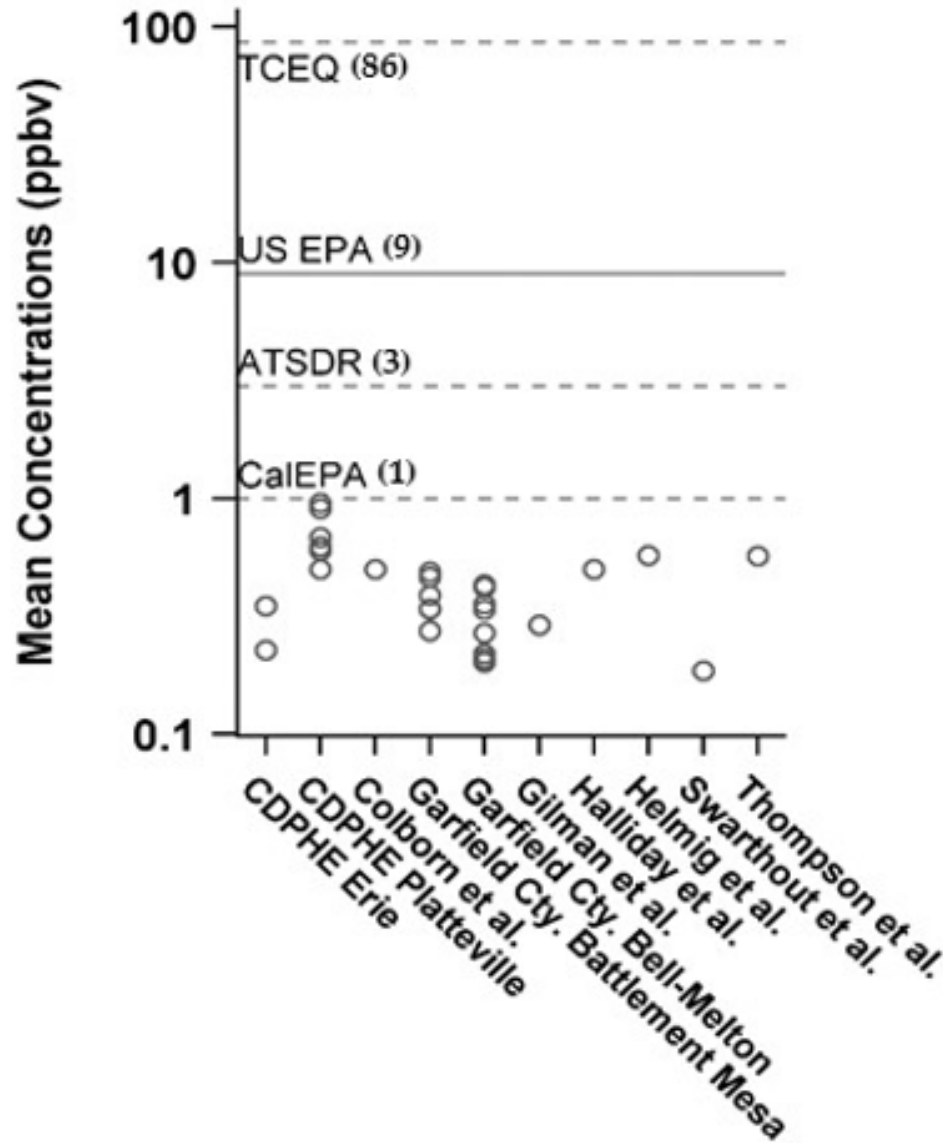
Nonane: Chronic

- Maximum average was 3.3 ppb from Helmig et al. where nearest O&G operation was 1500-2000 feet away
- Maximum average from any other data set was 0.2 ppb
  - HQ=0.05
  - HI=0.46

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Benzene: Chronic

Cancer Risk

Substance	Highest Mean Concentration ($\mu g/m^3$)	IUR (Source)	Excess Cancer Risk
Benzene	4.6	2.2×10^{-6} - 7.8×10^{-6} (U.S. EPA)[1]	1.0×10^{-5} - 3.6×10^{-5}
Ethylbenzene	2.9	2.5×10^{-6} (CalEPA)	7.3×10^{-6}
Aggregate Risk			4.3×10^{-5}

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Conclusions

- All individual VOCs were below levels that may pose non-cancer health risks (both acute and chronic)

- Excess cancer risks were within the EPA "acceptable range"

- All risks driven primarily by benzene exposure

- LOTS of uncertainty in acute exposure guideline levels AND acute exposure measurements

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Ongoing Activities

- Tracking reported health concerns
- Community investigations of health concerns
- More extensive health risk assessment

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Colorado Air Monitoring
Mobile Laboratory (CAMML)

- 1 minute resolution: Ozone, NOx, meteorology, PM2.5, PM10, Greenhouse Gases, NH3, H2S
- VOCs (by GC-MS) PAMS (55 compounds)
  - Integrated 30 min samples, once per hour
  - Possible expansion to include more compounds including diesel hydrocarbons, TO-15/17, oxygenates, terpenes

2017-18 Risk Assessment
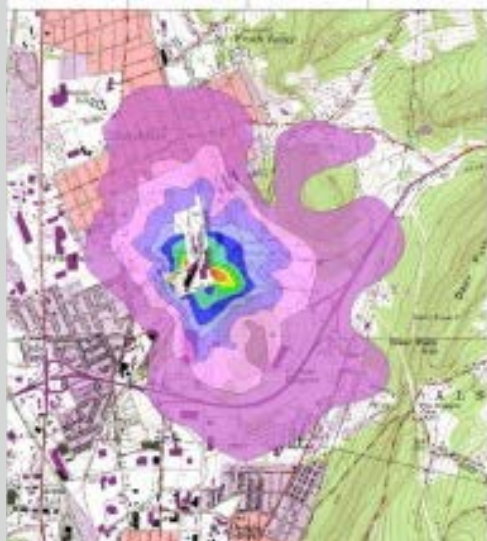
- Emission data from CSU studies
(North Front Range and Garfield County)
- Dispersion model-based exposures
- Calculate potential health risk
  - By distance
  - By operation
  - Directly attributable to oil and gas activities
- Data available June 2016
- Summer 2018 completion

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Questions?

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