

Community Impacts of Natural Gas Development and Human Health

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Workshop on the Health Impact Assessment of New Energy Sources:
Shale
Institute of Medicine

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Battlement Mesa HIA

Garfield County, Colorado

200 wells
10 pads
Residential
5000 residents
46 % <18, >65

What possible
health impacts?

What can be
done to avoid
them?



Battlement Mesa HIA

Predicted exposures	Possible Adverse Health Impacts	Recommendations
Chemicals Air (Water)	Physical health Acute, Chronic	Reduce chemical exposures
NON CHEMICAL STRESSORS		
Industrial activities Noise Traffic Industrial malfunctions	Safety risks Traffic accidents Fire/ explosion	Safe industrial operations
Community changes Quality of life Property value	Psychosocial stress Anxiety Insomnia Lifestyle changes	Multi-stakeholder communication

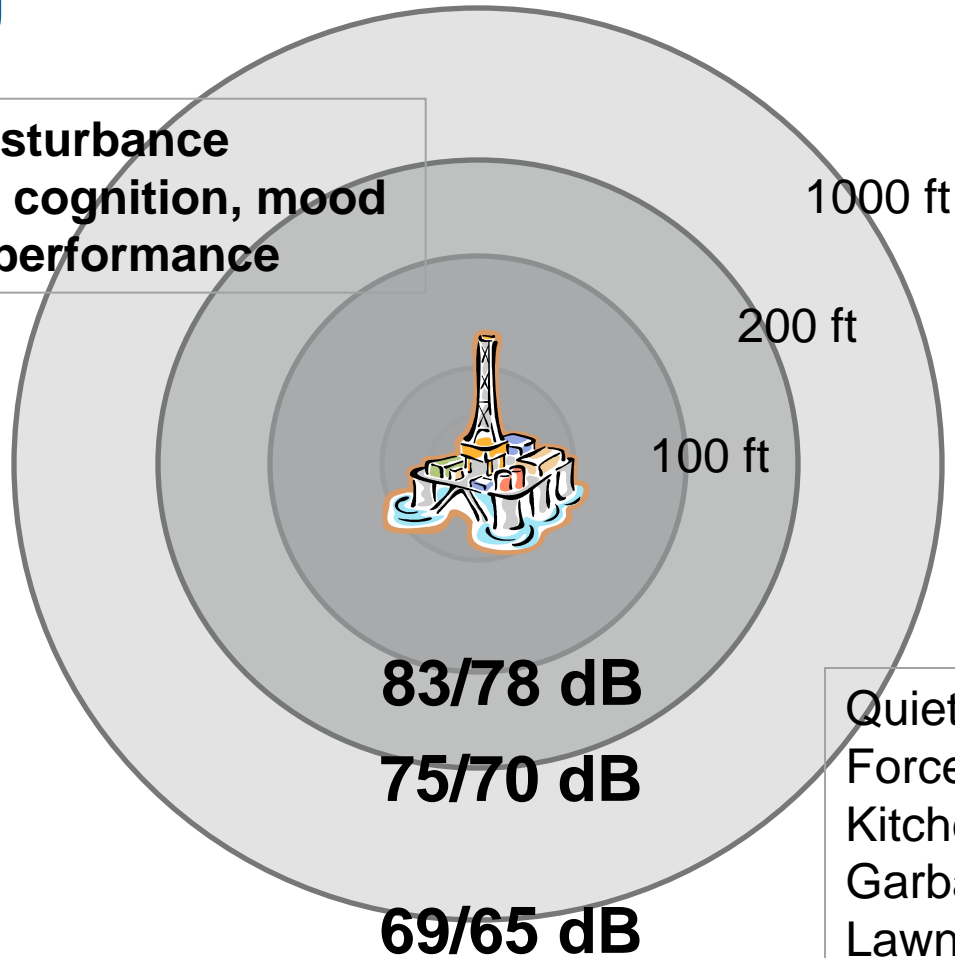
Noise levels (dB)

Drilling

30 dB: Sleep disturbance

55 dB: Fatigue, cognition, mood

70 dB: School performance



Quiet room	28-33 dB
Forced air heat	42-52 dB
Kitchen exhaust fan	69-71 dB
Garbage disposal	76-83 dB
Lawn mower	88-94 dB

Truck traffic

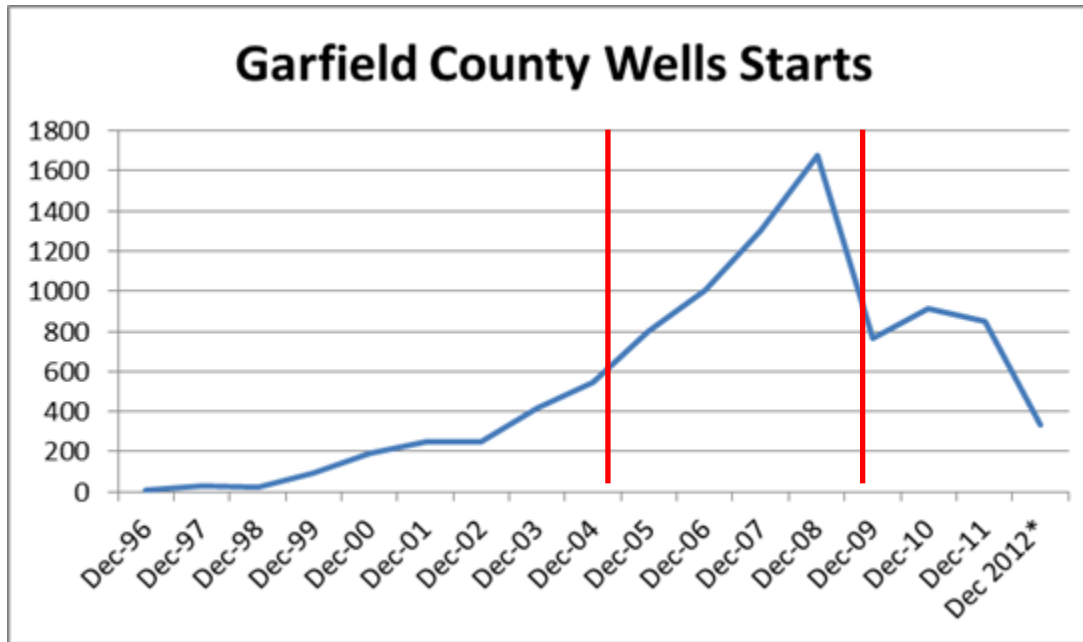
- NY state estimates: 1,000 trucks per well
 - Possibly less if recycling or piping fluids
- Dispersed and well pad impacts
 - Living along haul routes (trucks for more than 1 well/ pad)
 - Round the clock
- Variety of exposures
 - Diesel exhaust
 - Dust
 - Noise, vibration
 - *Engine brakes*
 - *Grinding gears*
 - Safety risks
 - *School routes*

Community changes

- What community changes occur?
- How are they measured?
- How do they impact individual health?
- What about community health?

Community changes

Garfield County, CO 2005-2009

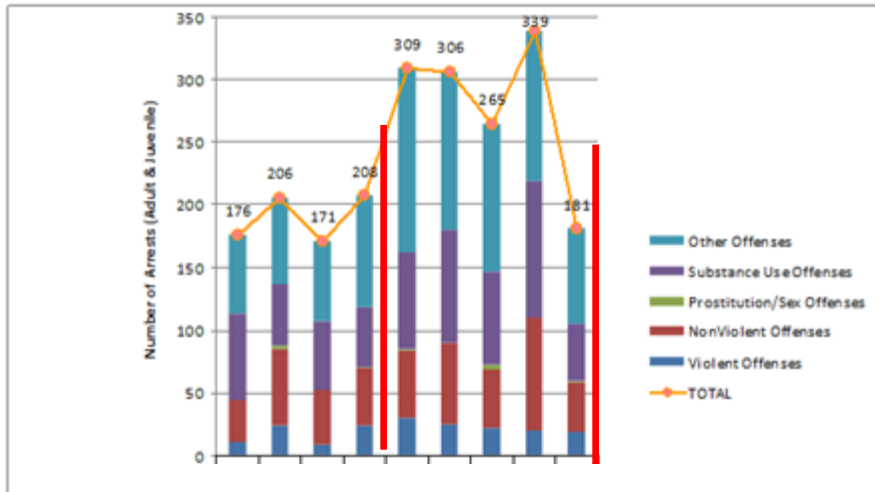


**Garfield County
population**
2000-09: ↑ 28%
2005-2009: ↑ 14%

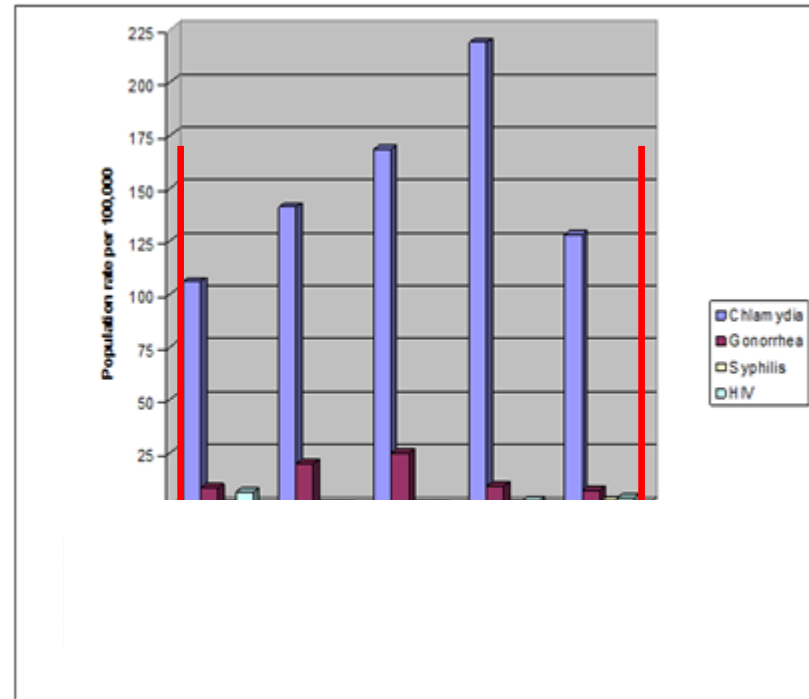
Community changes

Garfield County, CO 2005-2009

Police Arrests (number)



Sexually Transmitted Infections (rate)



*Same pattern seem with school enrollment

Expressions of stress

Garfield County, CO

“I feel angry...impending events weigh on my mind... stress, anger, anxiety, feelings of helplessness and (worry about) possible health problems...”

“There has been be personal distress... including depression, anxiety and insomnia...we don't know what will happen or when...”

Boomtown Model

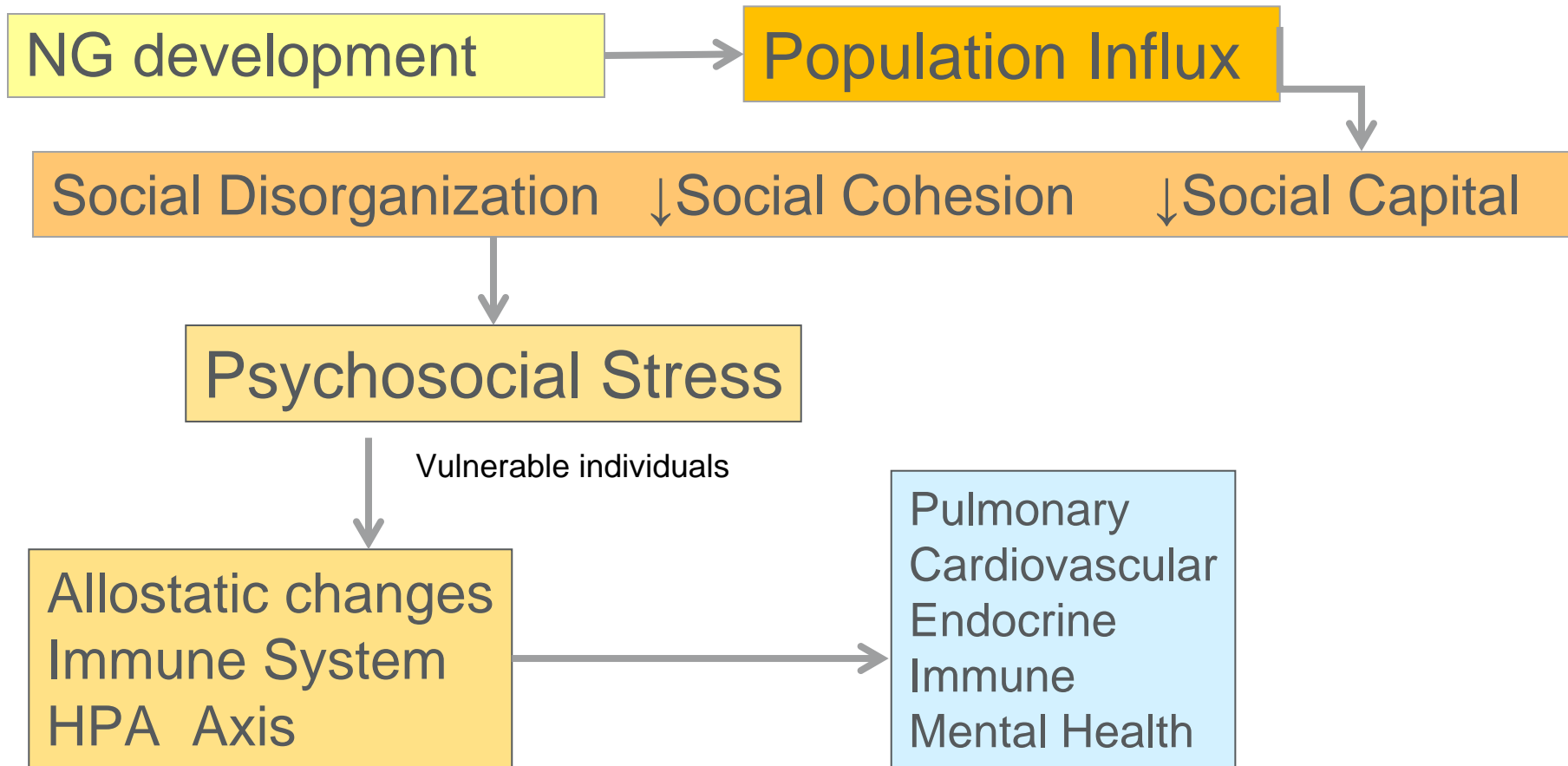
Jacquet J, 2009

- **Rapid population influx**
 - Overwhelm public health, law enforcement, schools
- **Unprepared local governments**
 - Lack of jurisdiction to control development, land use
 - No mitigation funds
- **Old timers vs. Newcomers**
 - Resentment about community changes, increased taxes to subsidize new infrastructure
 - Different values/ expectations
- **Volatile production patterns**
 - Boom/bust cycles unpredictable
 - Financially risky
- **Industry monopoly of information**
 - Distrust
 - (Power gap)
- **Economic impacts**
 - Inflation
 - Property values
 - Mixed for old timers, better for new comers

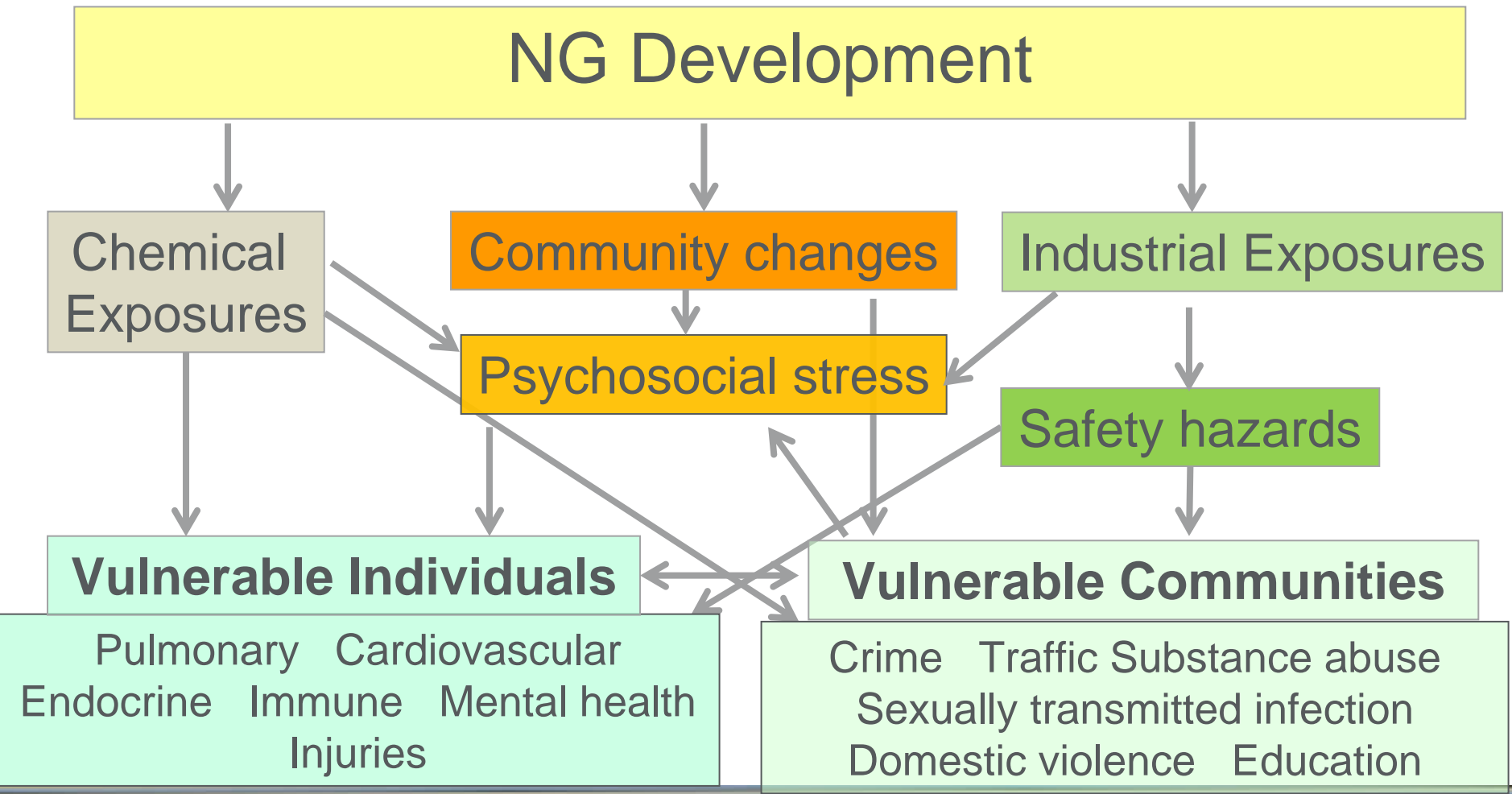
Social environment and health

- Social Disorganization [Yen IH, 1999](#)
 - Highly mobile, socially isolated groups unable to develop common values, devolve into social disorganization (measured by TB, suicide, murder, mental illness)
- Socioeconomic Environment [Lantz PM, 2010](#)
 - Levels of Social Cohesion (shared connectedness, trust, familiarity, values) and Social Capital (resources, benefits of strong social ties that facilitate collective action) are linked to health
- Neighborhood Impacts [Diez Roux AV, 2001](#)
 - Multilevel analysis can demonstrate that Ecological risk is more than simply the sum of individual risk factors
- Chemical exposure, Social Stress, Health [Clougherty JE, 2009](#)
 - Allostasis- adaption to stressors that produces “wear and tear on body systems” may enhance susceptibility to chemical exposures via the Hypothalamic-Pituitary-Adrenal axis; and immune system inflammation

Proposed Framework for NGD Impact on Community and Health



Overall Framework for Natural Gas Development Impact on Health



Opportunities to prevent community impacts and protect public health

1) Rapid population influx

Address the population influx

- Controlled/slow development
- Community planning

2) Unprepared local governments

Local gov't resources

- Jurisdictional control for land use
- Funds to implement proactive/mitigation measures

3) Industry monopoly of information

Information Transparency

- Comprehensive drilling plans

Residential empowerment

- Reduce power gap

4) Changing environment

Monitor impacts

- Dispersed and pad-side*
- Adaptive management plans*

Summary (1)

- Natural gas development can disrupt the social structure of local host communities.
- Social disruption may in turn impact individual health through stress mechanisms, as well as other possible mechanisms.
- A proposed framework for understanding NGD impact on community and health utilizes social epidemiology concepts.

Summary (2)

- Multilevel analytical methods may be employed to determine if and to what degree NGD related social change impacts public health.
- Opportunities to improve health may involve addressing changes to community structures, and allowing for thoughtful planning and mitigation efforts.

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