

# Health Impacts of Unconventional Fossil Fuel Extraction

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# What do we mean by “fracking”?



Trucking

Drilling

Hydraulic Fracturing



Condensate Tanks

Flaring



Compressor Station

Processing Plant

Pipelines

Thanks to Robert Donnan

# Sentinels

- Animals: breeding schedules, generation times
- Children: higher metabolic rates, immature detoxifying systems
- Babies: birth defects,\* low birth weight, small for gestational age, reduction of APGAR scores §

\*McKenzie, L. et al. (2014) Birth Defects and Maternal Residential Proximity to Natural Gas Development in Rural Colorado, *Environ Health Perspect*, 122(4):412-417.

§ Hill, E. (2012) Unconventional Natural Gas Development and Infant Health: Evidence from Pennsylvania, <http://dyson.cornell.edu/research/researchpdf/wp/2012/Cornell-Dyson-wp1212.pdf>



# First Case Report Study

## **Did health change after drilling operations began?**

- 24 cases from 6 states; 9 food animal, 12 companion animal, 3 wildlife.
- 18 unconventional, 7 conventional, and 1 both.
- Industrial operations information; air, soil, and water testing results; veterinary and human health records.
- Timeline of events, routes of exposure

M. Bamberger & R.E. Oswald (2012) Impacts of gas drilling on human and animal health.  
*New Solutions*, 22 (1), 51-77.

# First Case Report Study

## Health changes after drilling:

- Food animals and companion animals—reproductive problems: failure to breed, abortions, stillbirths, failure to cycle.
- Humans: burning eyes, nose, throat, headaches, GI problems, nosebleeds, rashes.

M. Bamberger & R.E. Oswald (2012) Impacts of gas drilling on human and animal health. *New Solutions*, 22 (1), 51-77.



# Second Case Report Study

## **Do health impacts change over time? Does location matter?**

- 21 cases from 5 states; 7 food animal, 11 companion animal, 3 wildlife.
- 17 unconventional, 3 conventional, and 1 both.
- Follow-up period averaged 25 months (15-34 months).

Bamberger, M. and Oswald, R.E. (2014) Long-term impacts of unconventional drilling operations on human and animal health. *Journal of Environmental Science and Health Part A*, in press.

# Second Case Report Study

## Is case location important?

- 9/21 cases in areas where industrial activity decreased.
- 9/21 cases in areas where industrial activity remained the same.
- 3/21 cases in areas where industrial activity increased.

Bamberger, M. and Oswald, R.E. (2014) Long-term impacts of unconventional drilling operations on human and animal health. *Journal of Environmental Science and Health Part A*, in press.



# Second Case Report Study

## **9/21 cases where drilling activity decreased:**

- 8/9 cases, all health impacts decreased in people and animals.
- 1/9 cases, health impacts in animals increased more than six-fold.
- 3/9 cases moved.

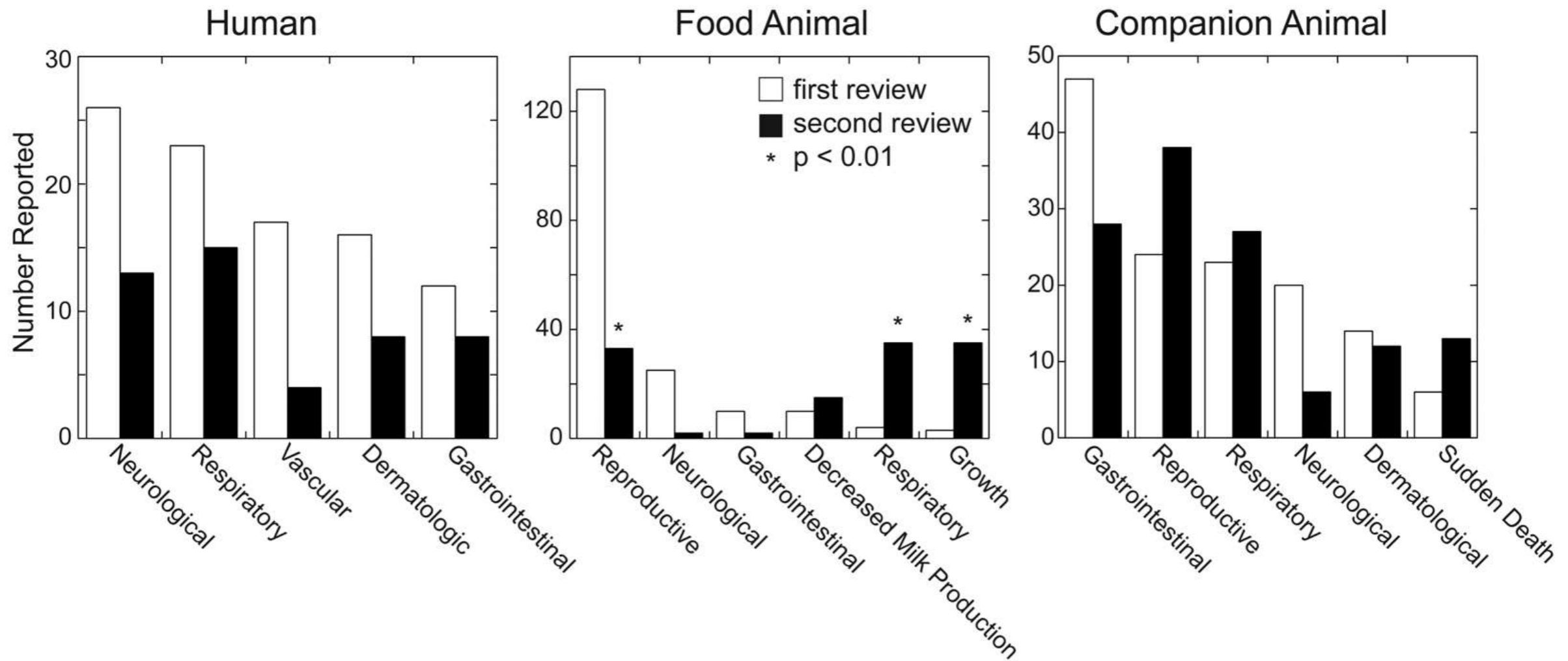
Bamberger, M. and Oswald, R.E. (2014) Long-term impacts of unconventional drilling operations on human and animal health. *Journal of Environmental Science and Health Part A*, in press.





# Second Study: Health Changes Over Time

## Number of Humans and Animals with Symptoms



# What are the issues?

- We must understand the human and animal health impacts.
- Decisions should be based on science, but we don't have good scientific data on the health impacts of high volume hydraulic fracturing.
- Where does the burden of proof lie\*? Who is bearing the burden?

\*Inmaculada del Melo-Martin, Jake Hays, Madelon L. Finkel (2014) The role of ethics in shale gas policies. *Science of the Total Environment*, **470-1**, 1114-9.



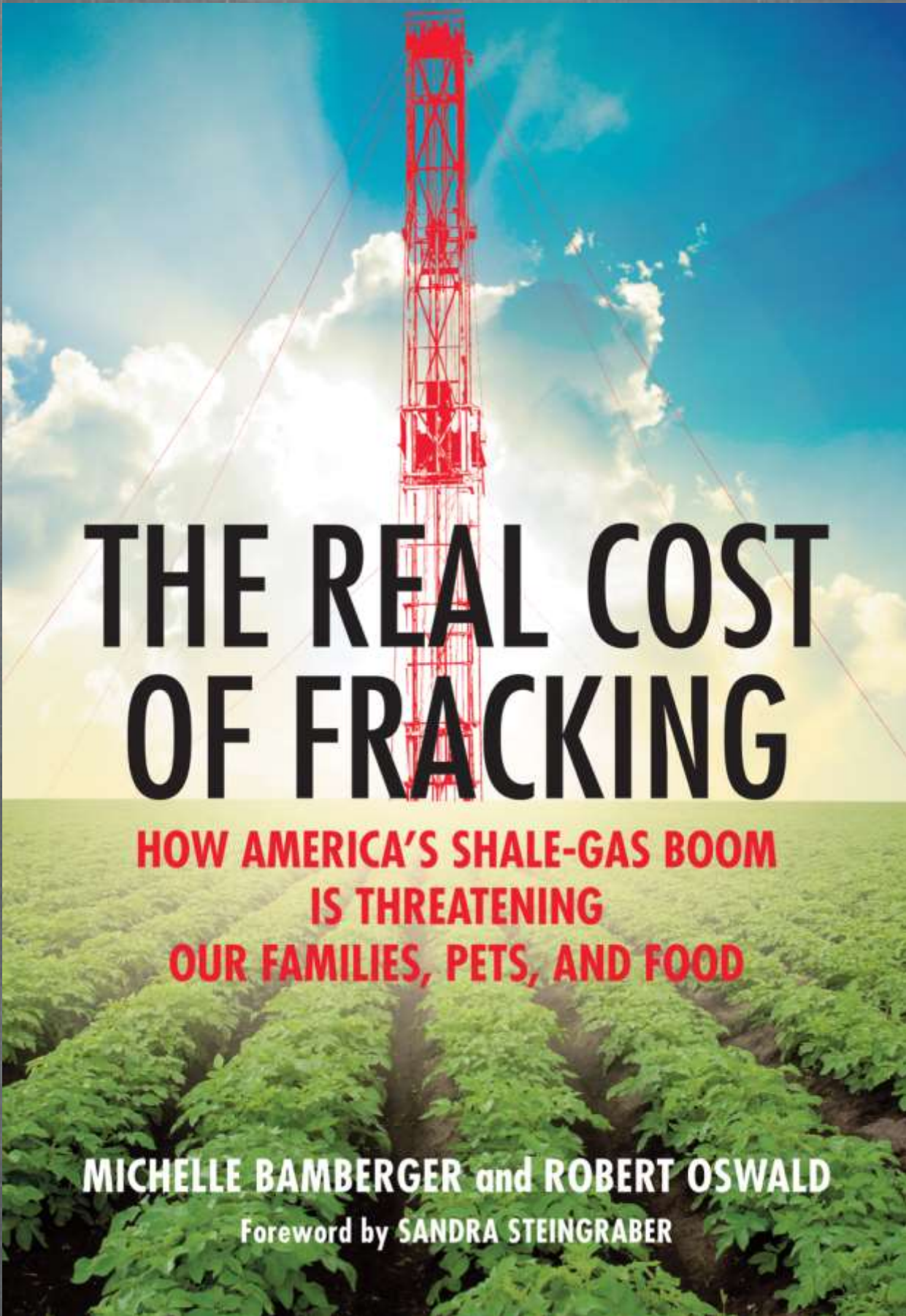
# Biological Testing

- Biological testing asks if a substance is present in a water sample that can interact with a receptor in your body (e.g., estrogen receptor, Ah receptor, androgen receptor, etc).
- Effects are measured so that identification of a compound or detection limits are not an issue.
- Has the potential to be relatively inexpensive so that changes over time can be measured. It is essential to test before, during and after drilling and during the production phase.
- When effects are detected, chemical testing (mass spectrometry) can be used to identify the relevant substances.

# Food Safety

- Is our food supply safe?
- Do animals or plants concentrate toxicants from drilling (biological integration)?
- Community-based monitoring of environment, health, food
- Identify toxicants that may concentrate in plants, animals, people
- Goal: decrease exposure, improve public health





# THE REAL COST OF FRACKING

**HOW AMERICA'S SHALE-GAS BOOM  
IS THREATENING  
OUR FAMILIES, PETS, AND FOOD**

**MICHELLE BAMBERGER and ROBERT OSWALD**

Foreword by **SANDRA STEINGRABER**