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# HEI Energy Research Program Scoping Meeting

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# Assessing study quality

- Study design
- Potential for measurement error (of exposure or outcome)
- Potential for confounding
- Analytic methods
- Appropriate interpretation of results



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## Distance-based exposure metrics in URD\* epidemiology studies

- Is an arbitrary distance between homes and wells useful for defining exposed and unexposed populations?
- Is the nature of unconventional oil and gas operations conducive to using distance-based calculations as a proxy for personal exposure to URD?
- Do we understand the degree of exposure misclassification in distance-based URD studies and the potential impact on risk estimates?

\*Unconventional Resource Development

# Confounding - impact of unobserved maternal characteristics

SCIENCE ADVANCES | RESEARCH ARTICLE

## ENVIRONMENTAL STUDIES

### Hydraulic fracturing and infant health: New evidence from Pennsylvania

Janet Currie,<sup>1,2\*</sup> Michael Greenstone,<sup>2,3</sup> Katherine Meckel<sup>4</sup>

The development of hydraulic fracturing (“fracking”) is considered the biggest change to the global energy production system in the last half-century. However, several communities have banned fracking because of unresolved concerns about the impact of this process on human health. To evaluate the potential health impacts of fracking, we analyzed records of more than 1.1 million births in Pennsylvania from 2004 to 2013, comparing infants born to mothers living at different distances from active fracking sites and those born both before and after fracking was

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**Table 2. Effect of fracturing on infant health.** Each coefficient and SE (shown in parentheses) is from a different regression and represents the effect on the given infant health outcome of in utero exposure to fracturing (when conception occurs after well spud date) within the indicated distance. The data sources for the regression are all birth certificates issued in Pennsylvania from 2004 to 2013 and the Pennsylvania DEP Internal Operator Well Inventory. We calculate the distance between maternal residence and well sites using Vincenty’s formula. The infant health index ranges from 0 to 1; an increase indicates better health. Each regression specification includes region of maternal residence\*year FE, year\*month of birth FE, and county of maternal residence FE. The following demographic controls are also included: mother is married, marital status missing, maternal race and ethnicity (black, Hispanic, missing), maternal education (no HS, HS diploma, some college, college, advanced degree, missing), maternal age (<20, 20 to 24, 25 to 29, 30 to 34, 35+, missing), child is male, child sex missing, and child parity (first, second, third, fourth born and higher, parity missing). Where indicated, we include a vector of maternal ID fixed effects (“mother FE”). “Under 15 km” indicates the subset of mothers living less than 15 km from the nearest well site. SEs are clustered on maternal ID. \*P < 0.10; \*\*P < 0.05; \*\*\*P < 0.01.

Dependent variable	(Near, 0–1 km) × after			(Near, 1–2 km) × after			(Near, 2–3 km) × after		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Low birth weight	0.016**	0.015**	0.012	0.006 <sup>+</sup>	0.005	0.004	0.009***	0.008***	0.007
(mean, 0.065)	(0.007)	(0.007)	(0.014)	(0.004)	(0.004)	(0.007)	(0.003)	(0.003)	(0.005)
Birth weight	<b>-38.654**</b>	<b>-36.707**</b>	<b>-13.034</b>	-3.534	-2.023	-10.439	-7.092	-5.294	0.803
(mean, 3319.6)	(15.558)	(15.595)	(81.137)	(8.487)	(8.530)	(14.349)	(6.515)	(6.575)	(10.608)
Health index	-0.054***	-0.052***	-0.004	-0.020**	-0.018 <sup>+</sup>	-0.018	-0.028***	-0.025***	-0.015
(mean, 0.000)	(0.019)	(0.019)	(0.040)	(0.010)	(0.011)	(0.020)	(0.008)	(0.008)	(0.015)
n	1,086,917	231,578	231,578	1,102,424	247,085	247,085	1,117,919	262,580	262,580
Mother FE	No	No	Yes	No	No	Yes	No	No	Yes
Under 15 km	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes

aring siblings who were  
cts of in utero exposure  
n for in utero exposure  
th weight babies as well  
. There is little evidence  
e highly local. Informal  
km of an active fracking

Source: Currie, Greenstone, Meckel, *Sci. Adv.* 2017; 3:e1603021.

# URD birthweight studies – inconsistent results, lack of dose-response

