

# Pigs and the Neighbors Who Squeal

## Welfare Effects of U.S. Factory Farming

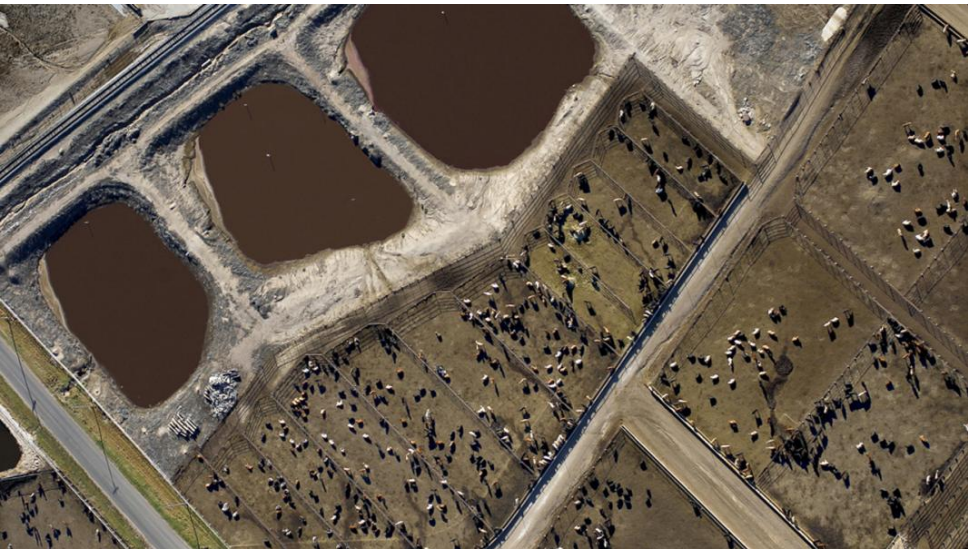
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# Background

- ▶ Increasing intensification of animal agriculture operations
  - ▶ “Concentrated Animal Feedlot Operations” (CAFOs)
- ▶ Concern over environmental implications of business-as-usual practices
- ▶ Numerous states report AFOs are significant cause of groundwater contamination



# Current Framing

- ▶ Increased implementation of right-to-farm (RTF) laws to preempt nuisance lawsuits
- ▶ Local actors plausibly face economic harm from ag practices
  - ▶ Unable to seek restitution
- ▶ This paper narrows in on effects in **housing markets** and **health outcomes**

# Potential Pollution Channels



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- ▶ Drinking water contamination
  - ▶ Our Prior: Water-borne medical conditions
  - ▶ Unknown longer-term costs and conditions
- ▶ Disamenity costs in housing markets from odor, chemical transport, PM (?)
- ▶ AFOs contributing to impaired rivers/streams
  - ▶ Affects leisure activities - fishing, swimming

# Potential Pollution Channels

<http://nocafos.org/stench-alerts-2003-to-2011>

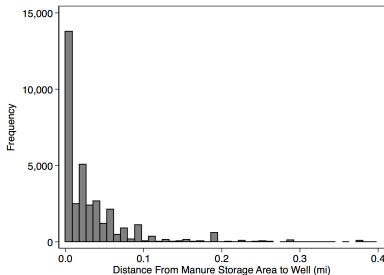
Aug 23 – more suffering from **White CAFO** hog manure emissions. Call from resident on Lime Lake, Prattville Rd – said for 2 days liquid manure stench has been so bad it is disrupting his activities of daily living and his wife's...they are senior citizens. Windows shut all the time now...his eyes watering last 2 days inside and outside of home...discomfort for him and his wife... **inhaling liquid pig emissions for over 24 hours and he cannot go outside.** "This manure should at the very least be turned under," he said. ECCSCM advised him to call MDA and DEQ. Second call from same resident. He tried calling MDA Right to Farm and DEQ and only got recordings at both places. He and wife are **leaving their home and going to Toledo because they cannot breathe in their own home.** "Pretty sad you have to go the city to be able to breathe clean air." Pure Michigan?

Also, **Hartland Farms** stockpiling heaps of manure, bottom of lagoon?, on wheat stubble (same field already sprayed with manure Aug 11-12, see below). Stench is really bad, says a neighbor, "gross."

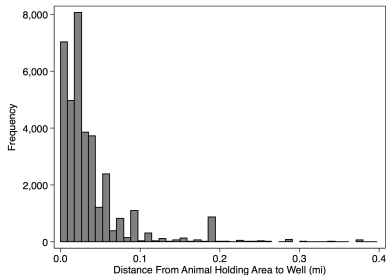


# Histogram of [C]AFO Distance to Nearest Well

Minnesota



(a) Manure Storage



(b) Animal Holding Area

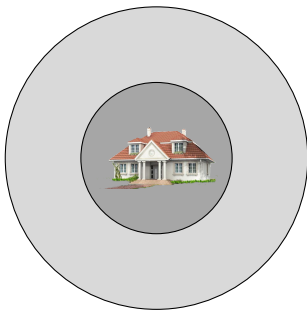
# Repeat Sales Method



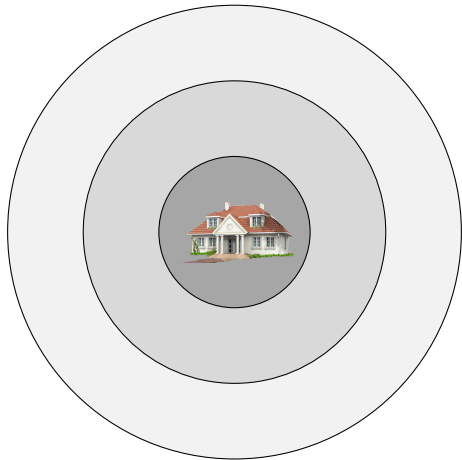
# Repeat Sales Method



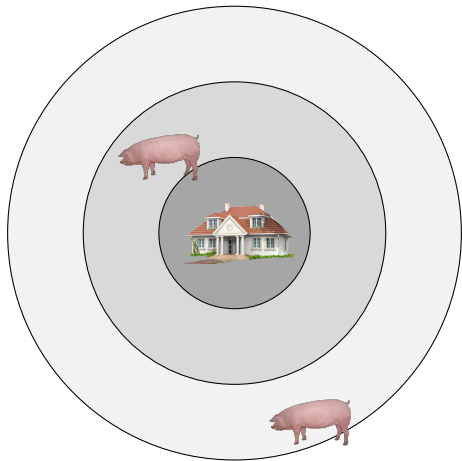
# Repeat Sales Method



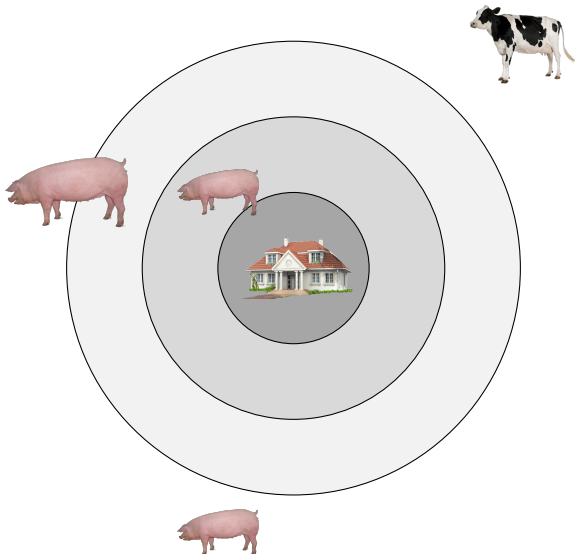
# Repeat Sales Method



## Repeat Sales Method - Transaction in Year $t$



## Repeat Sales Method - Transaction in Year $t + j$



# Repeat Sales Method

## Preferred Housing Analysis Specification

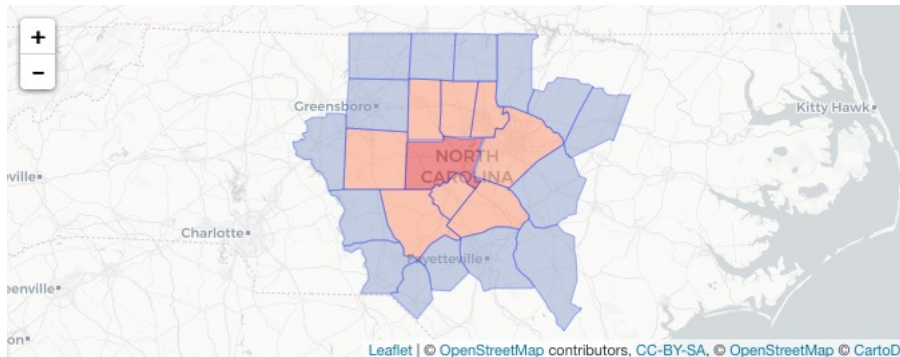
$$y_{ict} = \sum_{k=0}^K \beta_k g\left(\left\{\text{CAFO}_{ict}^j \text{ s.t. } \delta_k < \|d_{i,j}\| \leq \delta_{k+1}, \right\}\right) + \\ \alpha X_{ict} + \gamma_{ict} + t\lambda_{ct} + \rho_t + \epsilon_{ict}$$



# Empirical Obstacles

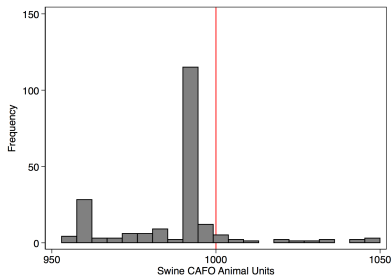
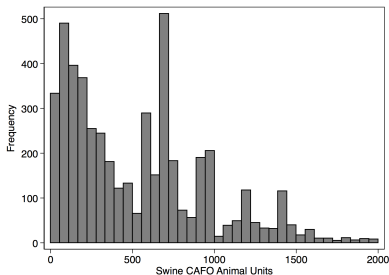
- ▶ Lack of uniform reporting requirements of CAFO details
  - ▶ Analysis driven by data availability
  - ▶ Poor/inaccurate opening/closure records → robustness checks
- ▶ US Census ZIP5 shapefile incomplete
- ▶ Devising code responsive to facility openings and closings
- ▶ Stata does not naturally retain numeric accuracy beyond 7 digits

## sf 1st Degree Neighbors



# Regression Discontinuity Failure

- ▶ Facilities  $\geq 1000$  animal units (AUs) regulated under Clean Water Act
  - ▶  $\rightarrow$  manipulation of running variable

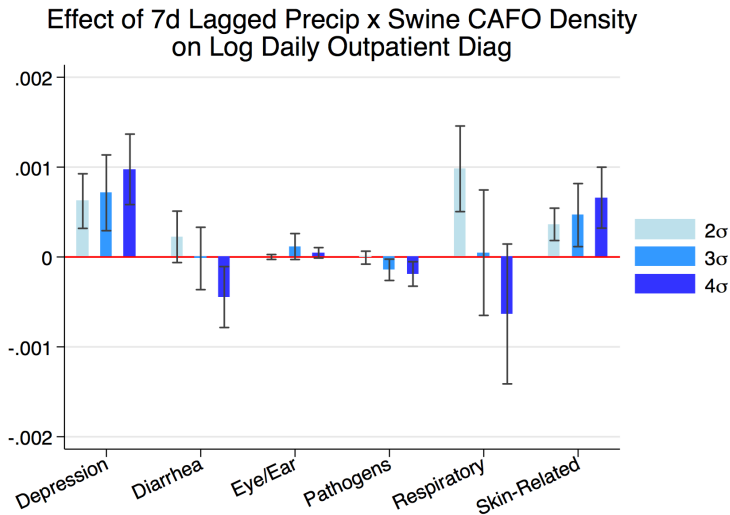


# NC Swine - 7day Rainfall Intensity

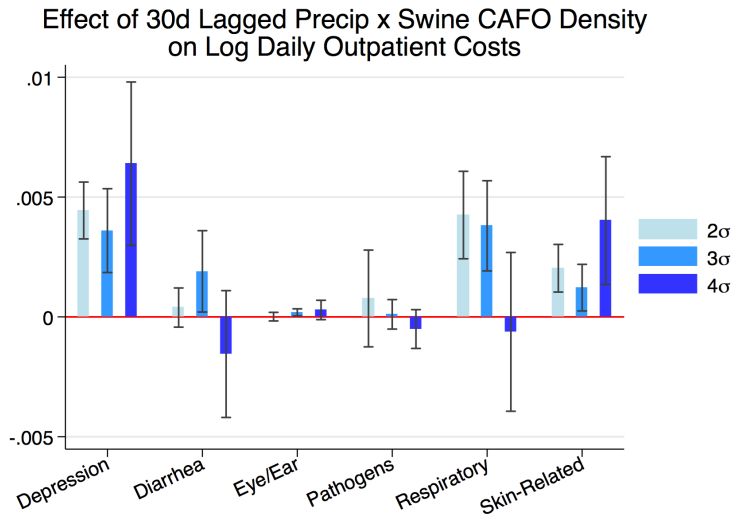
## Preferred Health Analysis Specification

$$y_{zt} = \beta_0 f \left( \sum_{j=\rho}^0 \text{Precip}_{z,t+j} \right) + \beta_1 f \left( \sum_{j=\rho}^0 \text{Precip}_{z,t+j} \times \text{CAFO}_{zt} \right) + \tau \text{CAFO}_{zt} + \gamma_z + \rho_t + \epsilon_{zt}$$

# NC Swine - 7day Lagged Cumulative Rainfall

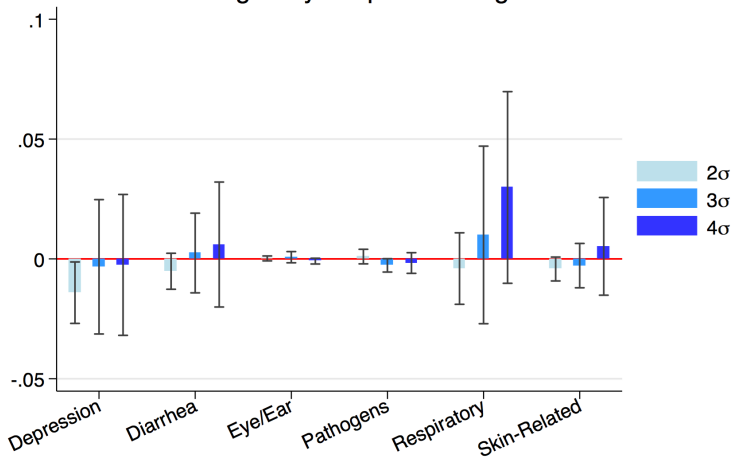


# NC Swine - 30day Lagged Cumulative Rainfall



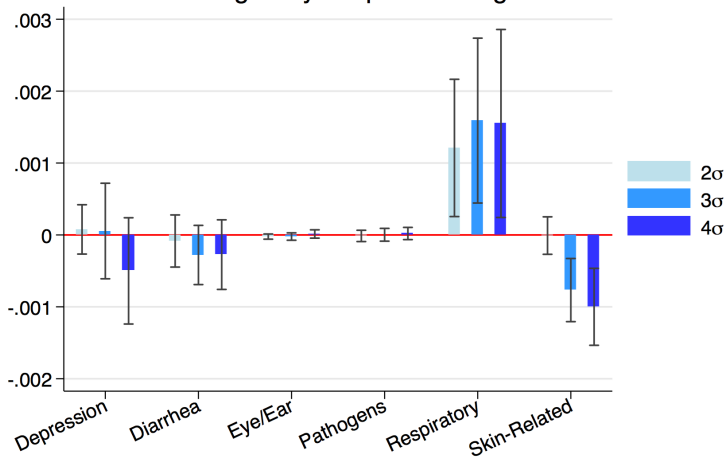
# NC Cattle - 30day Lagged Cumulative Rainfall

Effect of 30d Lagged Precip x Cattle CAFO Density  
on Log Daily Outpatient Diag



# Iowa Swine - 30day Lagged Cumulative Rainfall

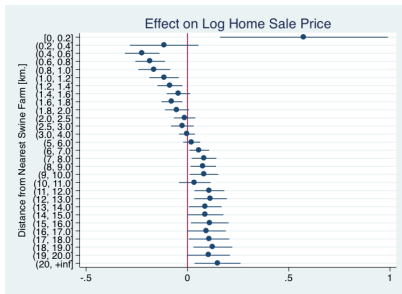
Effect of 30d Lagged Precip x # Swine Facilities  
on Log Daily Outpatient Diag





# NC Housing Results

Still processing...



(c) Cross Sectional

# On the Docket

- ▶ Water quality indicators (surface and drinking) in panel models
  - ▶ Improve on earlier cross-sectional evidence from EnvSci literatures
- ▶ Manure spills data analysis
  - ▶ Missouri results not promising
- ▶ Health analysis using CAFO and precip terciles
- ▶ Build lagoon classifier - complement DSD class (?)