Leveraging Open Data to Promote Environmental Health: Innovative Applications in Climate Change and Agriculture

Joan Casey, Postdoctoral Scholar @ UC Berkeley (joanacasey@berkeley.edu)
To be discussed

- CAFO CliffsNotes
- Links to antibiotic-resistant *Staph* infections
- Senate Bill 27 in California
Calf Source, Wisconsin

Source: George Steinmetz for NYTimes Magazine, 2016
Gary’s Gobbler’s, Iowa

Source: George Steinmetz for NYTimes Magazine, 2016
Simplot Cattle Feedlot, Iowa

Source: George Steinmetz for NYTimes Magazine, 2016
pig market consolidation

## Slaughter Stats

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Chickens</td>
<td>803,230,000</td>
<td>+7%</td>
</tr>
<tr>
<td>Hogs</td>
<td>10,390,000</td>
<td>+10%</td>
</tr>
<tr>
<td>Cattle</td>
<td>2,750,000</td>
<td>+18%</td>
</tr>
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</table>

USDA 2016
industrial food animal production

Characterized by
- high-throughput production methods
- single site
- highly controlled conditions
- uniform consumer product
- small profit margins
- antibiotic use?
antibiotics in animal feeds – why?
antibiotics in animal feeds – why?

• Therapeutically (occasionally)
antibiotics in animal feeds – why?

• Therapeutically *(occasionally)*
• Sub-therapeutically *(routinely)*
antibiotics in animal feeds – why?

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- Sub-therapeutically *(routinely)*

**Growth promotion**

**Disease prevention**

Source: pixabay
sold for use - stats

Human: 7.7

Livestock: 20.9

Source: U.S. FDA 2016
Antibiotic resistance can develop
bacteria, some resistant
antibiotics kill susceptible bacteria
resistant bacteria takes over
on-site and proximate exposure
on-site and proximate exposure
on-site and proximate exposure

>760x MRSA colonization rate of patients admitted to Dutch hospitals

Source: Voss et al. 2005 EID
links to MRSA infection in nearby populations?
the data

Health
• geisinger health system
• electronic health records

Animal feeding operations
• county conservation districts
• department of environmental protection
the data

Health
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Animal feeding operations
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Geisinger Health System

Source: behance.net
Geisinger Health System

Electronic health record
outpatient 2001
inpatient 2005

Source: behance.net
A population-based study of the epidemiology and clinical features of methicillin-resistant *Staphylococcus aureus* infection in Pennsylvania, 2001–2010
A population-based study of the epidemiology and clinical features of methicillin-resistant *Staphylococcus aureus* infection in Pennsylvania, 2001–2010

1703 community-associated (CA) MRSA cases
34% increase
Range = 6-94%
where the hogs at?

Growth cycle from birth to slaughter (in pounds)

Source: Tyson Foods Inc. Fiscal Fact Book
also, where the hog manure at?

Source: Wikimedia Commons
nutrient management plans

From County Conservation Districts

From Department of Environmental Protection
nutrient management plans

Phosphorus Based Nutrient Management Plan

Animal Equivalent Units: 533.79 AEU

Operation Description:
own a 4,160 head swine feeder to finish farm in Union County, Pennsylvania. The farmstead is approximately 80 acres. There are 59.2 acres of potentially tillable ground that Mr. owns. However, all of Mr. farm is in the Conservation Reserve Enhancement Program (CREP). Therefore, there are no tillable acres. All manure will be exported off the farm to other agricultural operations. This operation is considered a total exporting operation.

Manure Summary Table:

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<td>Swine Manure</td>
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nutrient management plans

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4) The exporter will, as the supply of manure allows, provide the following amounts of manure during the seasons outlined below:

Tons of dry solids (circle one) of manure, per season:
- Spring: 1,024,617
- Summer: 1,024,617
- Fall: 1,024,617
- Winter: 1,024,617

5) The importer's location and other relevant information as it relates to this manure transfer, is as follows (maps indicating the location of importing fields must be attached to the supporting Nutrient Balance Sheets if manure is to be land applied at the importing site):

a) Phone number: 570-335-8174
b) County(s): Union
c) Township(s): Kelly Twp
livestock operation locations

1. Address
2. Number of livestock
livestock operation locations

1. Address
2. Number of livestock
livestock operation - exposure
1. Distance
   - Closer operations count more towards exposure!

2. Number of livestock
   - Operations with more livestock count more towards exposure!
crop field locations

1. Location
2. Acreage
3. Volume of manure
crop field locations

1. Location
2. Acreage
3. Volume of manure

A. Photo/map, N = 180
B. Address, N = 418
C. Only township/county, N = 131
a. ariel photo/map
b. address
c. township/county

Yellow = cropland, pastureland, agricultural land
c. township/county

C. Yellow = cropland, pastureland, agricultural land
c. township/county

Yellow = cropland, pastureland, agricultural land
assign exposure to participants

• Inverse-distance weighted crop field exposure
High-Density Livestock Operations, Crop Field Application of Manure, and Risk of Community-Associated Methicillin-Resistant *Staphylococcus aureus* Infection in Pennsylvania

Joan A. Casey, MA; Frank C. Curriero, PhD, MA; Sara E. Cosgrove, MD, MS; Keeve E. Nachman, PhD, MHS; Brian S. Schwartz, MD, MS

**take-away**

living near denser and more manure-applied crop fields and livestock operations associated with increased odds of community-associated MRSA infection
policy implications

FDA Launches Voluntary Plan To Reduce Use Of Antibiotics In Animals

- Federal guidance bans use for growth promotion
- Permits routine use for disease prevention
policy implications

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“We do **not** see this announcement being a material event.”
- President of Elanco, the animal-health division of Eli Lilly
policy implications

Self-regulation
Nationwide voluntary plan
policy implications

Self-regulation
Nationwide voluntary plan
Food industry-led efforts?

2017 Scorecard on Antibiotics Policies & Practices

Source: Consumer Reports
policy implications

Self-regulation
Nationwide voluntary plan
Food industry-led efforts?
State-based policies?
California’s Senate Bill 27

- Signed into law by Jerry Brown in 2015
- Goes into effect January 1, 2018
California’s Senate Bill 27

- Prohibits antibiotic use for growth promotion
California’s Senate Bill 27

- Prohibits antibiotic use for growth promotion
- Allows antibiotic use to treat or control infection in sick animals
- Allows antibiotic use to prevent infection if "disease risk is elevated"
  - But, no regular pattern use
  - Requires a veterinarian’s order

Disease prevention?
Growth promotion

Source: pixabay
California’s Senate Bill 27

- Veterinary feed directives will be used to track type and pattern of antibiotic use
California’s Senate Bill 27

- First legislation of its kind in the United States
California’s Senate Bill 27

• First legislation of its kind in the United States
• Opportunity to study
  ➢ Effectiveness of implementation
  ➢ Economic implications
  ➢ Impact of health
    Animal
    Human
thank you!

Collaborators on MRSA work

Johns Hopkins Bloomberg School of Public Health
Karen Bandeen-Roche
Sara Cosgrove
Frank Curriero
Keeve Nachman
Brian Schwartz

Funding
Dr. Casey is supported in part by the National Institute of Environmental Health Sciences by grant K99ES027023