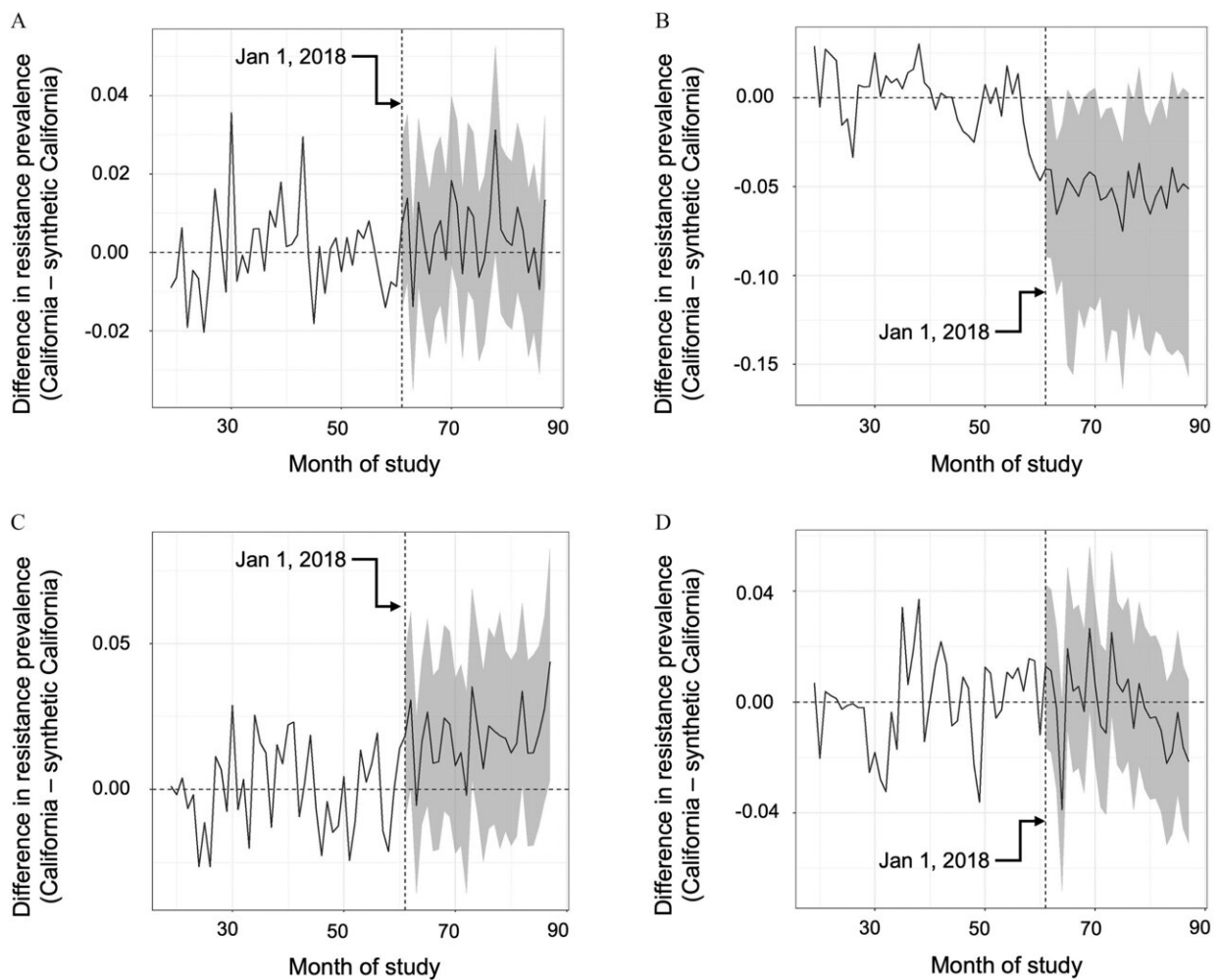


Restricting antibiotics for livestock could limit spread of antibiotic-resistant infections in people

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Difference between predicted and observed proportion of resistant urinary *E. coli* isolates by month from 2013–2020, before and after implementation of California’s Senate Bill 27 (SB27) for (A) Aminoglycosides; (B) Extended-

spectrum cephalosporins; (C) Fluoroquinolones; and (D) Tetracyclines. The vertical dotted line indicates SB27 implementation on 1 January 2018. Credit: *Environmental Health Perspectives* (2023). DOI: 10.1289/EHP11221

A California policy restricting antibiotic use in animals raised for food is associated with a reduction in one type of antibiotic-resistant infection in people in the state, according to a new study published today in the journal *Environmental Health Perspectives*.

The results suggest that regulations limiting antibiotics in livestock can significantly impact [human health](#).

The study was led by Joan Casey, assistant professor in the UW Department of Environmental & Occupational Health Sciences (DEOHS), who conducted the research as an assistant professor at Columbia University, along with Kara Rudolph, an assistant professor in epidemiology at Columbia.

In 2018, California Senate Bill 27 (SB27) banned, for the first time in the U.S., routine preventive use of antibiotics in food-animal production and any antibiotic use without a veterinarian's prescription.

Casey and her collaborators found that the policy was associated with a 7% reduction in resistance to one class of antibiotics used in livestock, extended-spectrum cephalosporins, among *Escherichia coli* bacteria isolated from urine in people with urinary tract infections.

"After [climate change](#), [antibiotic resistance](#) is the second biggest public health problem we'll be facing in the next 50 years, because few new antibiotics are coming online and resistance is increasing," Casey said. "Anything we can do that reduces resistance is really exciting."

The study includes coauthors Sara Tartof and Hung Fu Tseng of Kaiser Permanente, Meghan Davis and Keeve Nachman of Johns Hopkins University, and others from George Washington University, Becton Dickinson, the University of Arizona, Sutter Health and the University of California San Francisco.

"Reducing [antimicrobial resistance](#) is a critical factor in improving community health," said Tartof, an epidemiologist with Kaiser Permanente Department of Research & Evaluation in Southern California. "This study shows that changes in clinical practice alone will not be sufficient to reduce this threat. We need to strengthen our efforts with larger public policy initiatives to reduce antimicrobial use beyond the hospital setting as well."

Researchers have previously demonstrated links between the widespread use of antibiotics on livestock and antimicrobial-resistant infections in people, which cause nearly 3 million infections and 35,000 deaths each year.

Antimicrobial-resistant pathogens can spread from livestock to people through contaminated meat, environmental pathways such as water and air, and exposures among people working in livestock operations or living near them.

To test the impact of the new legislation on antibiotic-resistant infections in people, the research team examined data on antibiotic-resistant E. coli in 7.1 million [urine samples](#) from people with [urinary tract infections](#) across 33 states from 2013 to 2021.

"In an ideal world, we'd have two Californias and we would observe both of them over time, but we don't have one of them," Casey explained. "We used [statistical methods](#) to create this dream, synthetic California" in which the bill had not been passed.

With this approach, called the synthetic control method, they first used a composite of data from states that did not have the policy change to match the patterns of antimicrobial resistance in California before the bill passed.

Then they compared the levels of four different antibiotic-resistant *E. coli* in the California samples to the corresponding levels in their "synthetic California" data before and after the bill passed.

"We saw a reduction in the actual California versus our synthetic California for one of the antibiotic classes that we hypothesized could be linked to on-farm antibiotic use," Casey said.

That class, extended-spectrum cephalosporins, is used in raising both cattle and poultry. Though it represents less than 1% of US antibiotic sales for livestock, 80% of these sales are for use in cattle, one of the most common food animals raised in California.

The researchers found no change linked with the bill in resistance patterns for three other classes of antibiotics: tetracycline, which is used in both livestock and humans, and aminoglycoside and fluoroquinolones, which are used only in humans.

Interpreting the results is complicated by the fact that California has not made data for on-farm antibiotic use public, despite being required to do so by SB27.

"California's Department of Food and Agriculture hasn't made data available in a way that allows the public to determine whether the implementation of SB27 has led to a reduction in on-farm [antibiotic use](#)," said Nachman, associate professor of environmental health engineering at Johns Hopkins University. "As a work-around, we leveraged a novel statistical technique to begin to assess the impact of

the law on an infection with a large public health burden," Nachman said.

The researchers are engaged in further analysis, including whole-genome sequencing of *E. coli* isolated from human urine and retail chicken meat in California, to help complete the picture.

European Union regulations to restrict antimicrobial use in the production of animals for food led to a 35% biomass-adjusted reduction in their use from 2011 to 2018. In the US, Maryland recently passed a similar law to California's.

"Generally what we see is an increasing upward trend in antimicrobial resistance," Casey said. "Policies that lead to a leveling off or a decline in this resistance are promising. A 7% reduction—for a bill where we aren't sure about its implementation quality—it's pretty exciting. I'm hopeful that this can spur other states to consider similar bills."

More information: Joan A. Casey et al, Impact of a Statewide Livestock Antibiotic Use Policy on Resistance in Human Urine *Escherichia coli* Isolates: A Synthetic Control Analysis, *Environmental Health Perspectives* (2023). [DOI: 10.1289/EHP11221](https://doi.org/10.1289/EHP11221)

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