How to overcome challenges in forecasting antimicrobial resistance

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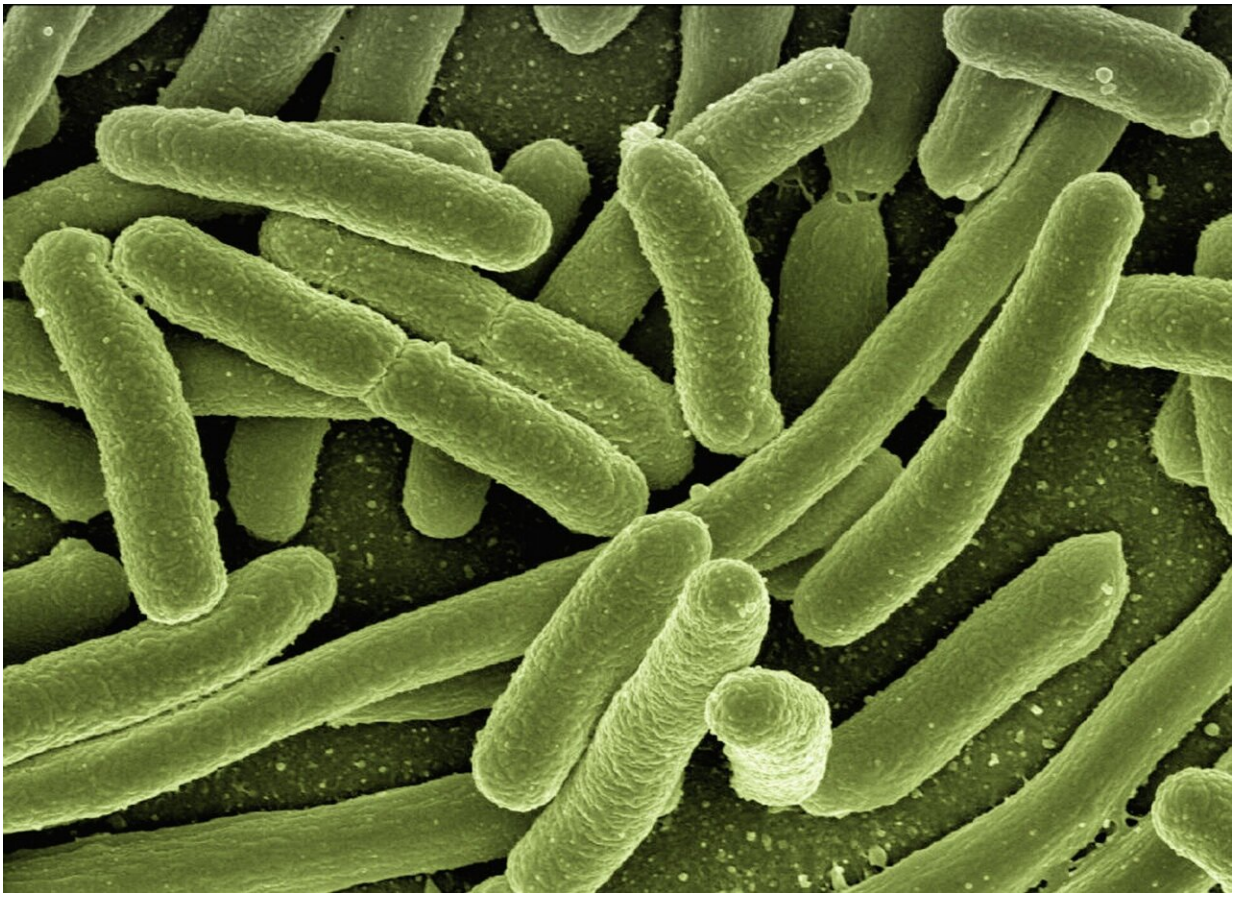

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A group of researchers led by Sen Pei at Columbia University's Mailman School of Public Health discussed the utility of real-time forecasting

models for antimicrobial-resistant organisms. The article appears in the journal *Emerging Infectious Diseases*.

Antimicrobial resistance (AMR)—the ability of infectious bacteria, viruses, and fungi to withstand the drugs meant to kill them—is a major threat to human health. An estimated 4.95 million deaths were associated with bacterial AMR in 2019 worldwide; most were caused by six pathogens: Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Streptococcus pneumoniae, Acinetobacter baumannii, and Pseudomonas aeruginosa.

In the journal article, Pei, an assistant professor of environmental health sciences, and co-authors identify several hurdles that make forecasting antimicrobial-resistant organisms more challenging than forecasting other acute infectious diseases like influenza and COVID-19. These challenges include the lack of understanding around the processes like the role of antibiotic use in driving the spread of AMR; a lack of robust surveillance data, including those on asymptomatic colonization, that can inform forecasts of AMR; and guidelines on operationalizing forecasts.

The article outlines four research priorities to improve predictive models for antimicrobial-resistant organisms. First, better communication among multiple sectors and stakeholders, including academic researchers , public health agencies, healthcare providers, and the public, must occur. Second, researchers should make better use of existing data and guide collection of new data that are essential to understand AMR. Third, more effective algorithms are needed to calibrate complex AMR models. Fourth, predictive AMR models should be applied in real-world settings in real time so that their usefulness can be assessed by researchers and public health agencies, who should set appropriate expectations for performance of AMR predictions and establish sensible criteria for successful forecasting.

"As the world confronts the growing challenge of antimicrobial resistance, stakeholders must work together to develop new ways to forecast their emergence," says Pei.

Previously, Pei published a study in the journal *Proceedings of the National Academy of Sciences* (*PNAS*) that introduced a method that more accurately predicts the likelihood individuals in hospital settings are colonized with MRSA than existing approaches.

More information: Challenges in forecasting antimicrobial resistance, *Emerging Infectious Diseases* (2023). DOI: 10.3201/eid2904.221552. wwwnc.cdc.gov/eid/article/29/4/22-1552_article

Provided by Columbia University's Mailman School of Public Health

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