

# Study shows significant increase in antibiotic use across the world

July 11 2014, by Wendy Plump

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Global use of antibiotics is surging, according to Princeton University researchers who have conducted a broad assessment of antibiotic consumption around the world.

The study, "Global Trends in Antibiotic Consumption, 2000-2010," found that worldwide antibiotic use has risen a staggering 36 percent over those 10 years, with five countries—Brazil, Russia, India, China and South Africa (BRICS)—responsible for more than three-quarters of that surge, according to study authors Thomas Van Boeckel, Simon Levin, Bryan Grenfell, Ramanan Laxminarayan and Quentin Caudron of Princeton.

Among the 16 groups of antibiotics studied, cephalosporins, broad-spectrum penicillins and fluoroquinolones accounted for more than half of that increase, with consumption rising 55 percent from 2000 to 2010.

The study quantifies the growing alarm surrounding antibiotic-resistant pathogens, and a loss of efficacy among antibiotics used to combat the most common illnesses. In addition, the report highlights an increasing resistance to carbapenems and polymyxins, two classes of drugs long considered "last resort" antibiotics for illnesses without any other known treatment.

Overall, the study reviewed patterns, seasonality and frequency of use of antibiotics in 71 countries. The findings of the report are featured July 10 in the journal *The Lancet Infectious Diseases*.

There was some good news. The data underscore the welcome evidence that more global citizens are able to access and purchase antibiotics. But that use is not being effectively monitored by health officials, from doctors to hospital workers to clinicians, noted the researchers. Consequently, antibiotic use is both rampant and less targeted.

That reality is driving antibiotic resistance at an unprecedented rate.

"We have to remember that before we had antibiotics, it was pretty easy to die of a [bacterial infection](#)," said Laxminarayan, a research scholar with the Princeton Environmental Institute. "And we're choosing to go back into a world where you won't necessarily get better from a bacterial infection. It's not happening at a mass scale, but we're starting to see the beginning of when the antibiotics are not working as well."

The study found that India was the single-largest consumer of antibiotics in the world in 2010, followed by China and the United States.

The study also found that antibiotic consumption has flattened in the United States, compared with the five BRICS countries. But U.S. citizens per capita still account for far more antibiotic consumption than any other population, with a rate of more than twice that of India.

"This paper breaks new ground with the comparative antibiotic consumption data by country of the first decade of the 21st century," said Professor Dame Sally Davies, chief medical officer for England and chief scientific adviser for the Department of Health, London. "There is a direct relationship between consumption and development of antibiotic resistance, so the data is key for us all developing 'National Action Plans Against Antimicrobial Resistance' as set out in the World Health Assembly Resolution in May."

The study noted that antibiotic use tended to peak at different times of

the year, corresponding in almost every case with the onset of the flu season. In the northern hemisphere, for example, consumption peaked between January and March, while in the southern hemisphere it peaked between July and November. One notable exception was India, for which usage peaked between July and September, correlating with the end of the monsoon season.

"This is a problem at the scale of climate change in terms of urgency," said Laxminarayan. "But we don't have anything close to the architecture of science to look at this problem, to look at solutions, to look at where the problem is the worst."

Laxminarayan and Levin received a grant from the University's Grand Challenges Program to study the problem of antibiotic resistance as part of general work on "common property" problems, those areas in which individuals or small groups make decisions—such as on how they use antibiotics—that have national or global consequences.

The research was conducted by Van Boeckel, postdoctoral research fellow; Caudron, postdoctoral researcher; Grenfell, the Kathryn Briger and Sarah Fenton Professor of Ecology and Evolutionary Biology and Public Affairs at the Woodrow Wilson School; Levin, the George M. Moffett Professor of Biology and professor of ecology and evolutionary biology; and Laxminarayan. In addition, two scholars from the Center for Disease Dynamics, Economics & Policy in Washington, D.C., were involved. The data supporting the study results were drawn from IMS Health, a private company that collects sales data on global drug pharmaceuticals.

The research group frames the issue of [antibiotic resistance](#) as more than a global health concern. Because the study found a strong correlation between seasonality and antibiotic consumption—for example during flu seasons, for which antibiotic use is "inappropriate"—Levin sees the issue

as having a strong environmental component, as well.

"Keep in mind that we're not the primary organism on this planet. It's really bacteria," Levin said. "And we in no way understand bacteria to the degree that we should. Instead, we're just dumping antibiotics on them, and then we think we're winning the war on bugs. There is no winning the war on bugs.

"We're modifying that bacteria, where we dump antibiotics into agriculture, we put them on fruit trees, we prescribe them in outpatient clinics—we have been running this massive experiment for about 50 years without really knowing what it's doing. What are the consequences of that?"

Programs promoting "rational use" of antibiotics should be a national and global priority, said the report's authors. That process has to begin with the BRICS countries, which are experiencing the highest rates of increase in antibiotic consumption.

While the report did not include specific recommendations, Laxminarayan suggested that a universally adopted algorithm for prescribing [antibiotics](#) might help assure their appropriate use. Such an algorithm would not require a doctor's authorization, he said. It would merely require a practitioner committed to observing it.

**More information:** Thomas P Van Boeckel, Sumanth Gandra, Ashvin Ashok, Quentin Caudron, Bryan T Grenfell, Simon A Levin, Ramanan Laxminarayan, "Global antibiotic consumption 2000 to 2010: an analysis of national pharmaceutical sales data," *The Lancet Infectious Diseases*, Available online 9 July 2014, ISSN 1473-3099, [DOI: 10.1016/S1473-3099\(14\)70780-7](#).

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