

## Out-of-pocket health costs tied to antimicrobial resistance, study finds

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The high out-of-pocket costs for antimicrobial drugs in many developing countries is leading to an increase in drug-resistant pathogens, according to a study by Stanford University researchers.

Many government-run [public health](#) systems in developing countries have instituted copayments for visits to clinics and prescription drugs. However, the study's authors found evidence to suggest that such policies are associated with increased antimicrobial resistance, likely because high out-of-pocket costs have prompted low-income patients to turn to the black market or informal clinics for antibiotic and antiparasitic drugs.

The quality of drugs on the black market and at informal clinics is often poor. In addition, caregivers at such clinics may prescribe antimicrobials excessively and inappropriately, as well as provide inaccurate course and dose instructions, the researchers said. If patients don't take the proper dose of a drug, or take one that's been improperly manufactured, microbes can more easily evolve resistance to it.

Some four-dozen countries—from the Central African Republic to Sri Lanka to Russia—are particularly vulnerable to antimicrobial resistance, given their high burden of infectious disease and the high cost of treating resistant microbes. What's unfolding in these countries could undo decades of progress in declining morbidity and mortality from infectious diseases around the world, the researchers said.

"Understanding the drivers of antibiotic resistance in low- to middle-income countries is important for wealthier nations because antibiotic-resistant pathogens, similar to other communicable diseases, do not respect national boundaries," said Marcella Alsan, MD, PhD, MPH, the lead author of the study, which will be published July 9 in *The Lancet Infectious Disease*.

Alsan is an assistant professor of medicine at Stanford, an investigator at the Veterans Affairs Palo Alto Health Care System and a core faculty member at the Center for Health Policy/Center for Primary Care and Outcomes Research.

"Out-of-pocket health expenditures are a major source of [health-care](#) financing in the developing world," said Jay Bhattacharya, MD, PhD, senior author of the study and a professor of medicine, a senior fellow at the Freeman Spogli Institute for International Studies and another core faculty member at CHP/PCOR.

## **Fostering drug resistance**

Purchases of drugs, including antimicrobial agents, constitute an estimated 70 percent of out-of-pocket health expenditures in India and 43 percent in Pakistan. In the sample of low- and middle-income countries used in the study, 49 percent of health expenditures are, on average, private. And the majority of those private health expenditures—some 76 percent—are out-of-pocket.

The study included 47 countries: 23 in Africa, eight in the Americas, three in Europe, eight in the Middle East, three in Southeast Asia, and two in the Western Pacific.

The data set for the main analysis is from the first global report by the World Health Organization on antibiotic resistance. The report, which

came out last year, indicates that antimicrobial resistance is a "serious, worldwide threat to public health."

And the Stanford researchers believe this is, in part, due to high out-of-pocket costs.

"To our knowledge, we are the first to emphasize the idea that copayments imposed in the public sector of a health-care system lead to overuse of a medication or product in the private sector," the authors wrote. "Conventional teaching in health economics—which focuses on their effect on the demand for care within a single insurance system—is that copayments tend to discourage use."

The most prominent and convincing evidence for this, the authors wrote, was the 15-year RAND health insurance experiment conducted in six U.S. cities on 2,000 households. That study found that the increase in copayments led to a significant decline in the use of antibiotics, "providing evidence that the demand for health care is not completely inelastic."

However, when the regulated public sector and unregulated private sector are selling the same or similar products, a price increase in one does not necessarily reduce the overall demand, the authors found. In fact, it may increase demand because higher dosages of drugs will be required to fight more resistant microbes, which are the result of poorly made and prescribed drugs in the private sector

"Even if total consumption of antibiotics were unchanged, the shift of more patients to less-regulated providers could lead to more antibiotic resistance," the authors wrote.

## **Global health challenge**

"Antimicrobial resistance is a growing, global public health challenge that could undo decades of progress in declining morbidity and mortality from infectious diseases," the authors noted. "Common bacterial pathogens have increasingly developed resistance to most of the currently available antibiotics. This phenomenon, coupled with a dry antibiotic pipeline, has led the World Health Organization to warn of a 'post-antibiotic era, in which common infections and minor injuries can kill.'"

Resistant organisms are more difficult to treat and associated with higher morbidity and mortality than their susceptible counterparts. The U.S. Centers for Disease Control and Prevention estimates that resistance to antibiotics causes 2 million illnesses and 23,000 deaths a year in the United States. Estimates of the impact of antimicrobial resistance on the U.S. economy include \$20 billion in direct health-care costs, with additional indirect costs as high as \$25 billion a year.

The concern over rising antimicrobial resistance is not limited to the developed world, the authors wrote, noting the accelerating rates of resistance among intestinal, respiratory and sexually transmitted pathogens in developing countries.

Alsan and her co-authors believe that controlling the spread of resistant bacterial pathogens is an urgent, global public health priority.

Though no previous research has examined the relationship between out-of-pocket payments and [antibiotic resistance](#) in low- and middle-income countries, the authors wrote that their findings are consistent with the work of researchers who have found that supplier-induced demand is an important determinant for excess use of health care.

Traditionally, cost-sharing in the form of copayments has been viewed as a way to curtail the overuse of medical care. However, in many low- and

middle-income countries, copayments may have an unintended consequence, the authors wrote.

Most developing economies have a robust, informal, private health-care sector that operates alongside the more traditional one. If the public and private health sectors serve as substitutes for one another to some degree, the prediction from consumer theory is that higher copayments for medication will shift more consumers to the [private sector](#) in search of cheaper drugs. The authors developed a mathematical economic model to demonstrate this point.

They used the recently published data set collected by the WHO to assess the role of such out-of-pocket payments, while adjusting for other key predictors, on the prevalence of antimicrobial resistance across a sample of low- and middle-income countries.

The authors found that out-of-pocket health expenditures were statistically more important than any other country-level environmental factors—including poverty, livestock production, access to sanitation and other institutional features of the [health](#) sector—in predicting patterns of antimicrobial resistance across low- and middle-income countries. Moreover, this pattern was driven by countries that require copayments on medications in the public sector.

"Our work highlights an underappreciated policy lever to address this problem of antimicrobial resistance: rolling back cost-sharing arrangements for medications in the public sector," they wrote. "While the causes of [antimicrobial resistance](#) are complex, our analysis supports an increasing role of the [public sector](#) in regulating and subsidizing the distribution of [antimicrobial agents](#)."

Provided by Stanford University Medical Center

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