

## REDUCING INFECTIONS WHILE CUTTING COSTS:

## ELIMINATING ANTIBIOTIC OVERPRESCRIPTIONS

*The overprescription of antibiotics for acute respiratory infections (ARIs) contributes to unnecessary patient harm by producing side effects, promoting opportunistic infection, and abetting the rise of antibiotic-resistant bacteria. The problem persists despite published clinical guidelines for diagnosing and treating ARIs, recommendations by the Centers for Disease Control and Prevention for more judicious use of antibiotics, and educational interventions. Clearly, other strategies are needed — ones that take into account the understanding that physicians are human and subject to the same pressures and social norms as the rest of us.*

*Research led by Jason Doctor at the USC Leonard D. Schaeffer Center for Health Policy & Economics has posed and proven multiple solutions to this challenge, including “nudges” based in social psychology and behavioral economics. Building on past work that reduced needless antibiotic prescriptions by having physicians sign and post pledges in their offices, more recent nudges take the form of accountable justification and peer comparison. Whether employed individually or together, such approaches can improve patient outcomes, reduce healthcare costs, and help prevent the strengthening of drug-resistant “superbugs.”*

### The Costs and Consequences of Antibiotic Overuse

Each year, American adults receive 41.2 million antibiotic prescriptions at a cost of \$1.1 billion<sup>1</sup>. While many of these are necessary, about half that number are not, according to the Centers for Disease Control and Prevention (CDC). Prescribing antibiotics for colds and other acute respiratory infections (ARIs) is not only wasteful but such excessive use can also kill healthy bacteria, putting patients at risk from harmful side effects and antibiotic-resistant illnesses. The CDC estimates that some 23,000 die every year as a result.

In response, Jason Doctor and his fellow researchers at the USC Leonard D. Schaeffer Center for Health Policy & Economics have developed methods for combating this problem that are rela-

tively simple and inexpensive to implement — and that make a demonstrable difference in alleviating it. This issue brief summarizes five peer-reviewed studies conducted by Schaeffer Center researchers that examine determinants of inappropriate antibiotic prescribing and novel interventions to target physician behaviors (see Data Sources).

#### Physician Accountability Through Public Commitments

Doctor’s team designed an intervention based on the theory that publicly stated commitments influence decision-making. The researchers had physicians in Los Angeles clinics put posters in their exam rooms explaining safe antibiotic use. Each poster provided the information

in English and Spanish in the form of a letter featuring the photo and signature of the participating physician.

After the posters were displayed, the team examined clinic records over the following three months, comparing the rates of inappropriate antibiotic prescriptions to a control group that did not display the poster. The results showed that unnecessary prescriptions were lower by nearly 20 percentage points in those who received the poster as compared to those who did not. Extrapolated to the entire United States, this low-cost and easily scalable intervention could lead to an annual reduction of 2.6 million unnecessary antibiotic prescriptions and a savings of \$70.4 million in drug costs alone.

## Public Accountability Posters



Source: Meeker, Daniella, et al., "Nudging Guideline-Concordant Antibiotic Prescribing: A Randomized Clinical Trial," *JAMA Internal Medicine* (March 2014)

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## Reorganized EHR Menu Options

Electronic health records (EHRs) are increasingly being adopted by healthcare providers to save time by enabling physicians to choose treatment options from predetermined menus. However, EHRs sometimes contain menu designs and layouts that may inadvertently bias a physician's choice. Previous research revealed that the manner in which available items in a menu are grouped can greatly influence subsequent selection.

Schaeffer Center researchers examined the potential of reducing antibiotic overprescribing by regrouping the options posed by EHR layouts. Using responses from 84 primary care providers to a designed questionnaire, the researchers looked at whether the grouping of menu items affected the treatments selected by physicians.

The questionnaire provided vignettes that described symptoms of various ARIs — categorized as "antibiotic-appropriate" or "antibiotic-inappropriate" — for which physicians selected an appropriate treatment from a list of options. Treatment choices were categorized as either aggressive or nonaggressive, and researchers manipulated whether aggressive treatment options were listed individually or grouped together.

After controlling for differences in provider characteristics, the researchers found that when the aggressive treatment options were grouped together — as compared to when those same options were listed individually — there was a 12 percent decrease in their selection by physicians. The magnitude of this effect varied per vignette, with greater decreases seen for antibiotic-appropriate vignettes (average of 14.4 percent decrease) than for antibiotic-inappropriate vignettes (average of 7.6 percent decrease).

## Socially Motivated Behavioral Interventions

More recently, Schaeffer Center researchers analyzed the impact of nudges that exploited peer connections and the competitive nature of physicians. These behavioral interventions, which were randomly implemented alone or in combination, involve:

- **Accountable justification**, in which physicians are asked to provide explicit justification from the patient's EHR when prescribing antibiotics for ARIs; and
- **Peer comparison**, with physicians being periodically emailed their inappropriate antibiotic prescribing rate in comparison to that of top-performing peers.

To test the effectiveness of these nudges, researchers gathered data on prescription rates of 248 clinicians at 47 primary care practices in Los Angeles and Boston over an 18-month period. They then spent another 18 months testing new approaches for 17,000 ARI cases in which antibiotics were unnecessary. Both interventions achieved considerable benefits.

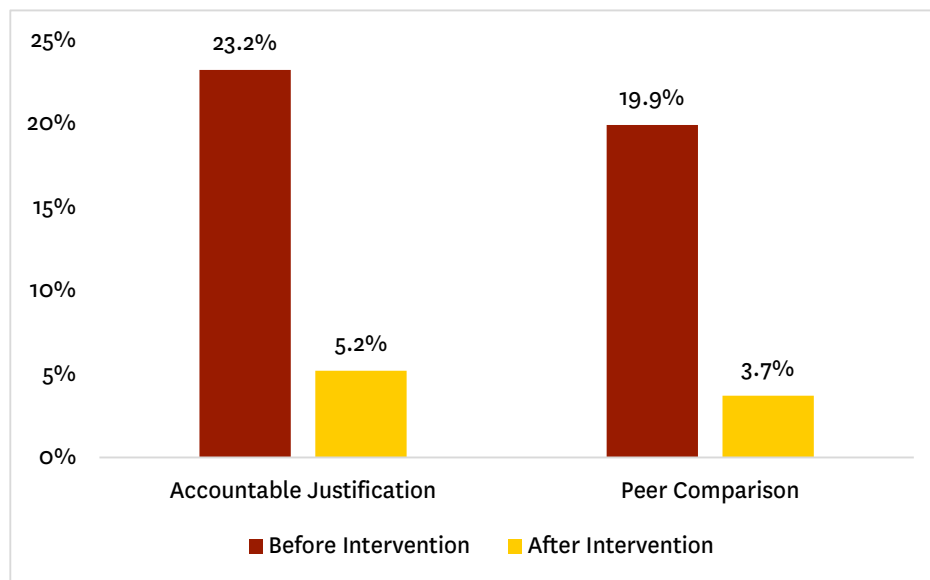
### **Accountable Justification**

This nudge asked each clinician planning to prescribe an antibiotic for a quick justification of the treatment decision through an electronic prompt in the file. The prompt also informed clinicians that this written justification would be visible in the patient's medical record as an "antibiotic justification note" and that, if none was entered, the phrase "no justification given" would appear. Entries into the EHR could not be closed without the clinician's acknowledgment of the prompt, but clinicians could choose to cancel the antibiotic order to avoid creating a justification note. This brief pause in the workflow, along with the prospect of social accountability, reduced the inappropriate prescribing rate from 23.2 percent to 5.2 percent — a 77 percent reduction.

### Peer Comparison

This email-based intervention used EHR data and ranked physicians from highest to lowest in terms of inappropriate prescribing rate in their region. The participating doctors then received monthly emails informing them of their performance relative to that of their peers. Those with the lowest inappropriate antibiotic prescribing rates were congratulated for being “top performers.” Doctors who were not top performers were informed, “You are not a top performer.” The email also included a personalized count of unnecessary antibiotic prescriptions and the count for a typical top performer. This approach reduced inappropriate prescribing 81 percent, from 19.9 percent in the pre-intervention period to 3.7 percent during the post-intervention period.

### Change in Inappropriate Antibiotic Prescribing Rate, Before and After Implementation of Socially-Motivated Behavioral Interventions



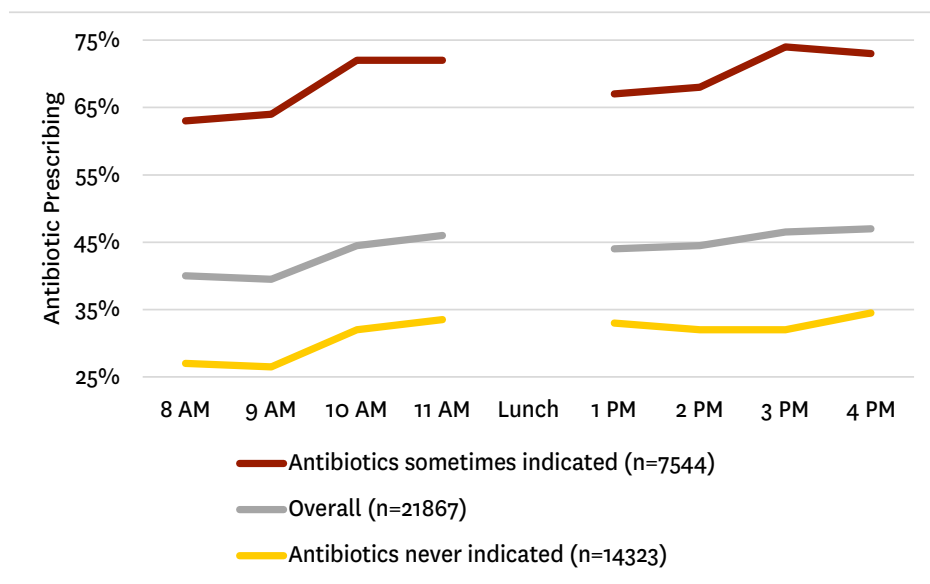
Source: Jason N. Doctor, PhD, et al., “Effect of Behavioral Interventions on Inappropriate Antibiotic Prescribing Among Primary Care Practices: A Randomized Clinical Trial,” *Journal of the American Medical Association* (February 2016)

### Time of Day and Decision Fatigue

Another factor affecting antibiotic overprescription turns out to be fatigue resulting from physicians having to make repeated decisions concerning patients on a daily basis as well as clinicians’ frequently long work hours. This pressure and repetition can build up to weaken physicians’ ability to resist making inappropriate choices. Psychologists refer to this as decision fatigue, and even the most diligent professional can fall victim to it. For physicians, its results often include prescribing unnecessary antibiotics for ARIs.

To determine if decision fatigue would result in different antibiotic prescription rates throughout the day — with higher rates occurring later in a shift — Schaeffer Center researchers examined billing and EHR data in 21,867 cases from 23 different primary care practices over nearly 18 months. Throughout this timeframe, researchers analyzed physician likelihood of prescribing antibiotics for ARIs and linked these data to the time of the patient visit. Specific ARI diagnoses were categorized as “antibiotics sometimes indicated” or “antibiotics never indicated,” consistent with national guidelines.

### Antibiotic Prescribing Rate Associated with Time of Day



Source: Linder, Jeffrey A., et al., “Time of Day and the Decision to Prescribe Antibiotics,” *JAMA Internal Medicine* (December 2014)

## Data Sources

This Issue Brief summarizes five peer-reviewed studies conducted by researchers affiliated with the USC Schaeffer Center for Health Policy & Economics, with additional support from external funders. The five articles are as follows:

Meeker, Daniella, et al., “Effect of Behavioral Interventions on Inappropriate Antibiotic Prescribing Among Primary Care Practices: A Randomized Clinical Trial,” *Journal of the American Medical Association* (February 2016)

Linder, Jeffrey A., et al., “Time of Day and the Decision to Prescribe Antibiotics,” *JAMA Internal Medicine* (December 2014)

Meeker, Daniella, et al., “Nudging Guideline-Concordant Antibiotic Prescribing: A Randomized Clinical Trial,” *JAMA Internal Medicine* (March 2014)

Persell, Stephen D., et al., “Use of behavioral economics and social psychology to improve treatment of acute respiratory infections (BEARI): rationale and design of a cluster randomized controlled trial [1RC4AG039115-01] — study protocol and baseline practice and provider characteristics,” *BMC Infectious Diseases*, Vol. 13 (2013)

Tannenbaum, David, et al., “Nudging Physician Prescription Decisions by Partitioning the Order Set: Results of a Vignette-Based Study,” *Journal of General Internal Medicine*, Vol. 30, Issue 3 (March 2)

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In two-thirds of the cases, antibiotics were prescribed even though they were not indicated. Regardless of whether or not antibiotics were required, the number of prescriptions increased with time. Compared to the first hour, the probability of a prescription for antibiotics increased by 1 percent in the second hour, 14 percent in the third hour, and 26 percent in the fourth.

These findings suggest that decision fatigue may influence decision-making with respect to antibiotic prescribing and that interventions that target reducing such fatigue have the potential to improve medical care. Proposed policy solutions to this issue include better decision support for physicians, modified schedules, fewer continuous work hours, and mandatory breaks.

## Policy Implications

Collectively, the Schaeffer Center research findings published in the *Journal of the American Medical Association* (JAMA), *BMC Infectious Diseases*, *JAMA Internal Medicine*, and the *Journal of General Internal Medicine* provide policymakers with important new information about how to reduce antibiotic overprescribing to save costs and enhance public health. Among primary care practices, the use of accountable justification and peer comparison as behavioral interventions significantly lowered the rates of inappropriate antibiotic prescribing for ARIs.

To date, the suggested interventions have been adopted by the CDC and health departments in four states. The U.S. surgeon general also has requested copies of these strategies and findings. These nudges are even reaching across the Atlantic, as Public Health England is conducting a study together with Prime Minister David Cameron’s Behavioural Insights Team on 400 physicians in London to replicate Schaeffer Center researchers’ earlier results. In summary, concrete policy changes that can be enacted include:

- Better decision support for physicians, modified schedules, fewer continuous

work hours, and mandatory breaks to reduce both physical and mental fatigue

- Ensuring that EHR menu designs actively promote more judicious prescription practices by maximizing visibility of appropriate treatment options (i.e., listing them individually) and dissuading against the selection of inappropriate medications (i.e., grouping them together)
- Implementing the poster intervention in physicians’ examination rooms nationwide to signal their public commitment to responsible use of antibiotics
- Accountable justification, requiring physicians to explain why an antibiotic is being used for an ARI
- Peer comparison of antibiotic prescription rates among physicians

Multiple strategies can help address the widespread problem of antibiotic overprescription. Since each approach provides a partial solution, combining them may greatly curtail overuse of antibiotics, making us healthier in the long run while reducing overall healthcare costs. ■

## Notes

1. Fendrick, Mark, et al., “The Economic Burden of Non-Influenza-Related Viral Respiratory Tract Infection in the United States,” *Archives of Internal Medicine*.