Behavioral insights to curtail antibiotic overuse
Jason N. Doctor, PhD

University of Southern California
November 2018
What policies can improve the quality of decisions that are produced in healthcare?
Behavioral Insights

Peer Comparison
We look to others for how we should act.

Justifications
We want others to approve of our behavior.

Public Commitments
Commitments bind our future self to desires our present self wants to fulfill.

Decision Fatigue
Decision making gets worse with repeated decisions.

Choice Partitioning
We spread our choices over salient consumption options.
12.6% of outpatient visits result in an antibiotic prescription.

50% of these are inappropriate.

34,000,000 inappropriate outpatient prescriptions per year.
Effect of Behavioral Interventions on Inappropriate Antibiotic Prescribing Among Primary Care Practices A Randomized Clinical Trial

Daniella Meeke, PhD; Jeffrey A. Linder, MD, MPH; Craig R. Fox, PhD; Mark W. Friedberg, MD, MPP; Stephen D. Persell, MD, MPH; Noah J. Goldstein, PhD; Tara K. Knight, PhD; Joel W. Hay, PhD; Jason N. Doctor, PhD
Methods: Enrollment

- **Invited:** 355 clinicians

- **Enrolled:** 248 (70%)
  - Consent
  - Education
  - Practice-specific orientation to intervention
  - Honorarium
Methods: Primary Outcome

• *Antibiotic prescribing for non-antibiotic-appropriate diagnoses*
  – Non-specific upper respiratory infections
  – Acute bronchitis
  – Influenza

• **Excluded:** chronic lung disease, concomitant infection, immunosuppression

• **Data Sources:** EHR and billing data
Results: Clinicians (N = 248)

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<th>Control</th>
<th>Suggested Alternatives</th>
<th>Accountable Justification</th>
<th>Peer Comparison</th>
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## Results: Visits (N = 16,959)

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1. Peer Comparison

We look to others for how we should act.
Intervention 3: Peer Comparison

“You are a Top Performer”
You are in the top 10% of clinicians. You wrote 0 prescriptions out of 21 acute respiratory infection cases that did not warrant antibiotics.

“You are not a Top Performer”
Your inappropriate antibiotic prescribing rate is 15%. Top performers' rate is 0%. You wrote 3 prescriptions out of 20 acute respiratory infection cases that did not warrant antibiotics.
Main Results: Peer Comparison

\[ p = \textless .001 \]
2. Justifications

We want others to approve of our behavior.
Patient has asthma.
Main Results: Justification

\[ p < .001 \]
Persistence

• Evaluated prescribing for 12 months after interventions were turned off
• Difference of differences comparing 18-month treatment period to 12-month follow-up period
Persistence of Effects

Letters

RESEARCH LETTER

Effects of Behavioral Interventions on Inappropriate Antibiotic Prescribing in Primary Care 12 Months After Stopping Interventions

Inappropriate antibiotic prescribing contributes to antibiotic resistance and leads to adverse events. A cluster-randomized trial of 3 behavioral interventions intended to reduce inappropriate prescribing found that 2 of the 3 interventions were effective. This study examines the persistence of effects 12 months after stopping the interventions.

Methods | We randomized 47 primary care practices in Boston, Massachusetts, and Los Angeles, California, and

Results | There were 14,753 visits for antibiotic-inappropriate ARIAs during the baseline period, 16,959 during the intervention period, and 7,489 during the postintervention period. During the postintervention period, the rate of inappropriate antibiotic prescribing decreased in control clinics from 14.2% to 11.8% (absolute difference, -2.4%); increased from 7.4% to 8.8% (absolute difference, 1.4%) for suggested alternatives (difference-in-differences, 3.8% [95% CI, -10.3% to 17.9%]; P = .55); increased from 6.1% to 10.2% (absolute difference, 4.1%) for accountable justification (difference-in-differences, 6.5 [95% CI, 4.2% to 8.8%]; P < .001); and increased from 4.8% to 6.3% (absolute difference, 1.5%) for peer comparison (difference-in-differences, 3.9% [95% CI, 1.1% to 6.7%]; P < .001) (Figure). During the postintervention pe...
Persistence: Suggested Alternatives

Linder. JAMA
2017
Persistence: Accountable Justification

Linder. JAMA 2017
Persistence: Peer Comparison

Linder. JAMA
2017
Summary

- Peer comparison showed greater persistence than other interventions
- Possible hypotheses
  - Justification effects may depend on being prompted
  - Clinicians may have internalized being a “top performer” into their self-image and continued to act accordingly
- If interventions are time-limited peer comparison may be the best option
Conclusions and Implications

• Social motivation appears effective
• Interventions show durable effects post-intervention
Commitments bind the future self to desires the present self wants to fulfill.
Public Commitment

JAMA Internal Medicine
Original Investigation
Nudging Guideline-Concordant Antibiotic Prescribing
A Randomized Clinical Trial

Daniella Meeker, PhD; Tara K. Knight, PhD; Mark W. Friedberg, MD, MPP; Jeffrey A. Linder, MD, MPH; Noah J. Goldstein, PhD; Craig R. Fox, PhD; Alan Rothfeld, MD; Guillermo Diaz, MD; Jason N. Doctor, PhD
Dear Patient,

We want to give you some important information about antibiotics.

Antibiotics, like penicillin, fight infections due to bacteria that can cause some serious illnesses. But these medicines can cause side effects like skin rashes, diarrhea, or yeast infections. If your symptoms are from a virus and not from bacteria, you won’t get better with an antibiotic, and you could still get these bad side effects.

Antibiotics also make bacteria more resistant to them. This can make future infections harder to treat. This means that antibiotics might not work when you really need them. Because of this, it is important that you only use an antibiotic when it is necessary to treat your illness.

How can you help? Carefully follow your doctor’s advice. You should or should not take antibiotics.

When you have a cough, sore throat, or other cold symptoms, consult your doctor with the best possible treatments. If an antibiotic is prescribed, your doctor will explain this to you and why you need it.

Your health is very important to us. As your doctors, we promise to treat your illness in the best way possible. We are also dedicated to avoid prescribing antibiotics when they are likely to do more harm than good.

Sincerely,

[Signatures]
Results: Public commitment

![Bar chart showing percentage of public commitment between control and commitment groups.]

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<tr>
<th>Characteristic</th>
<th>Poster Condition</th>
<th>Control Condition</th>
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<tbody>
<tr>
<td>Inappropriate prescribing rate, % (95% CI)</td>
<td>43.5 (38.5 to 49.0)</td>
<td>42.8 (38.1 to 48.1)</td>
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<td>33.7 (25.1 to 43.1)</td>
<td>52.7 (44.2 to 61.9)</td>
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<td>Absolute percentage change, baseline to final measurement</td>
<td>-9.8 (0.0 to -19.3)</td>
<td>9.9 (0.0 to 20.2)</td>
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<td>(95% CI)</td>
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<td>Difference in differences between poster condition and</td>
<td>-19.7 (-5.8 to -33.04)</td>
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<td>and control (95% CI)</td>
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Abbreviation: ARI, acute respiratory infection.

*Adjusted for demographic characteristics and insurance status.

**P=.02 for the difference.

**JAMA – Internal Medicine, 174, 425-431, 2014.*
CDC funded Replications: IDPH & NYSDH

PDSB Campaign Goals

- Increase **provider and patient knowledge** & provide **resources** about antibiotic resistance and use

Phase I Participation

- March 2015 ➔ Present
- 55 practices representing > 385 providers

CDC Core Elements Outpatient Antibiotic Stewardship (2017)

EU Draft Guidelines for Antibiotic Stewardship

The NYS Department of Health recently rolled out a “Get Smart Guarantee” poster for healthcare providers to pledge to only prescribe antibiotics when they are needed.
4. Decision Fatigue

Decision making gets worse with repeated decisions.
If you have to force yourself to do something you are less willing or able to exert self-control when the next challenge comes around. —Daniel Kahneman
Extraeaneous factors in judicial decisions

Shai Danziger, Jonathan Levav, and Liora Avnaim-Pesso

*Department of Management, Ben Gurion University of the Negev, Beer Sheva 84105, Israel; and Columbia Business School, Columbia University, New York, NY 10027

Edited by Daniel Kahneman, Princeton University, Princeton, NJ, and approved February 25, 2011 (received for review December 8, 2010)

Are judicial rulings based solely on laws and facts? Legal formalism holds that judges apply legal reasons to the facts of the case. The two panels, based on a survey of all legal cases in the country, show that the proportion of favorable decisions decreases as the ordinal position increases.
Time of Day and the Decision to Prescribe Antibiotics

- Antibiotics sometimes indicated (n = 7544)
- Overall (n = 21867)
- Antibiotics never indicated (n = 14323)

Antibiotic Prescribing, %

Hour of the Day

8 AM 9 AM 10 AM 11 AM Lunch 1 PM 2 PM 3 PM 4 PM
Replication: Athena Research

Antibiotic prescriptions over the course of a day

SOURCE: athenaResearch

https://insight.athenahealth.com/expert-forum-decision-fatigue-antibiotics/
Acknowledgements

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Thank you!

Questions?