Leveraging Automaticity
for Healthy Behavior Change

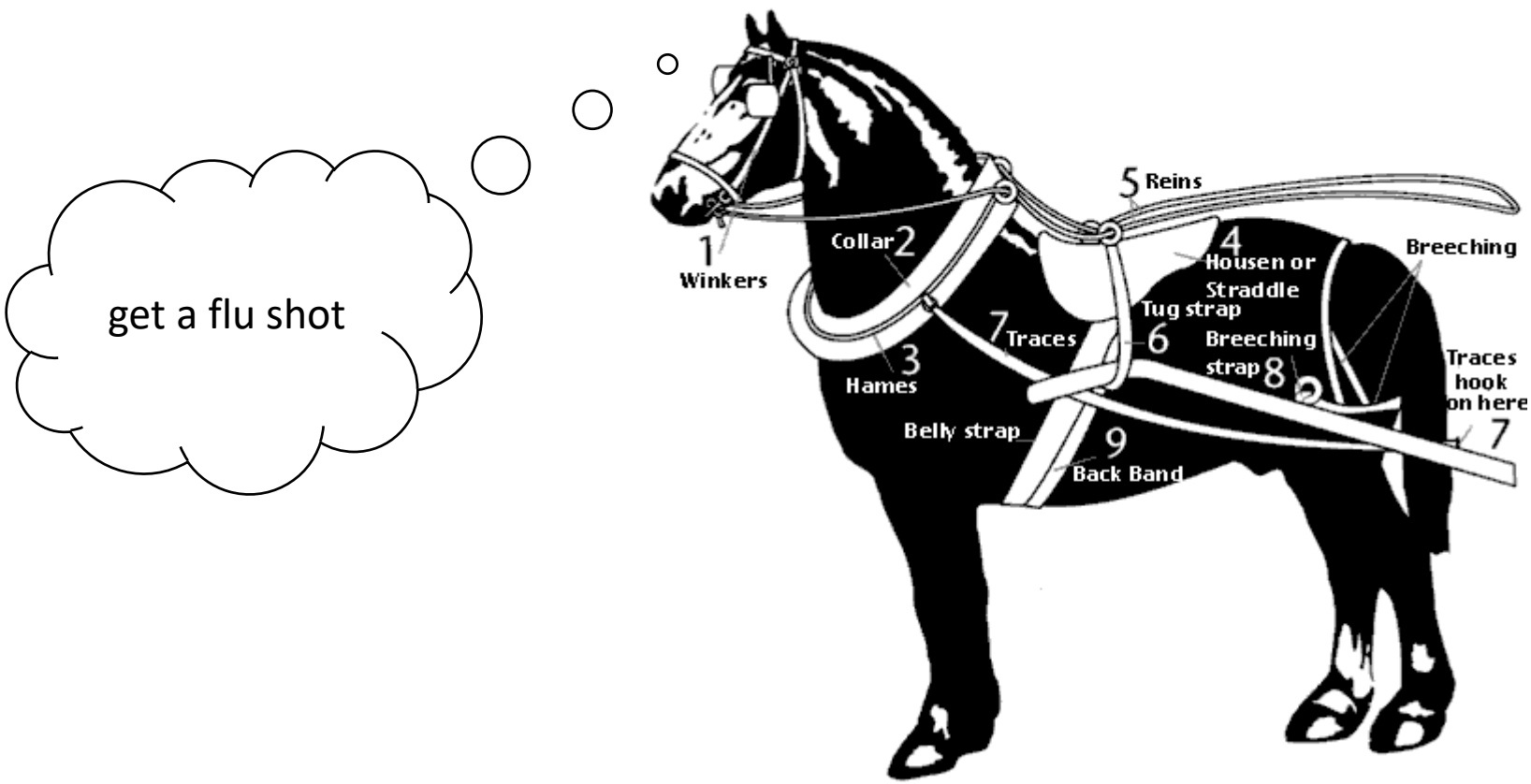
January 16, 2019 Aurora CO

ACCORDS, Children's Hospital Colorado

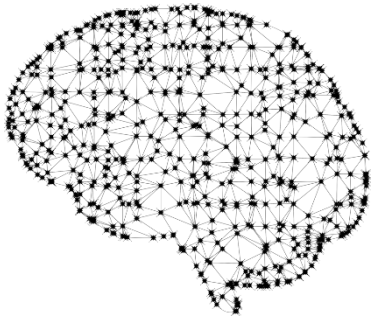
Gretchen Chapman, PhD

Carnegie Mellon University

Can we harness behavioral science to encourage healthy behavior?



Rational vs. Behavioral
Approaches to behavior change



Rational

- Beliefs & information
- Incentives
- Regulation

Behavioral

- Information format
- Social context
- Automation

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Increasing Vaccination: Putting Psychological Science Into Action

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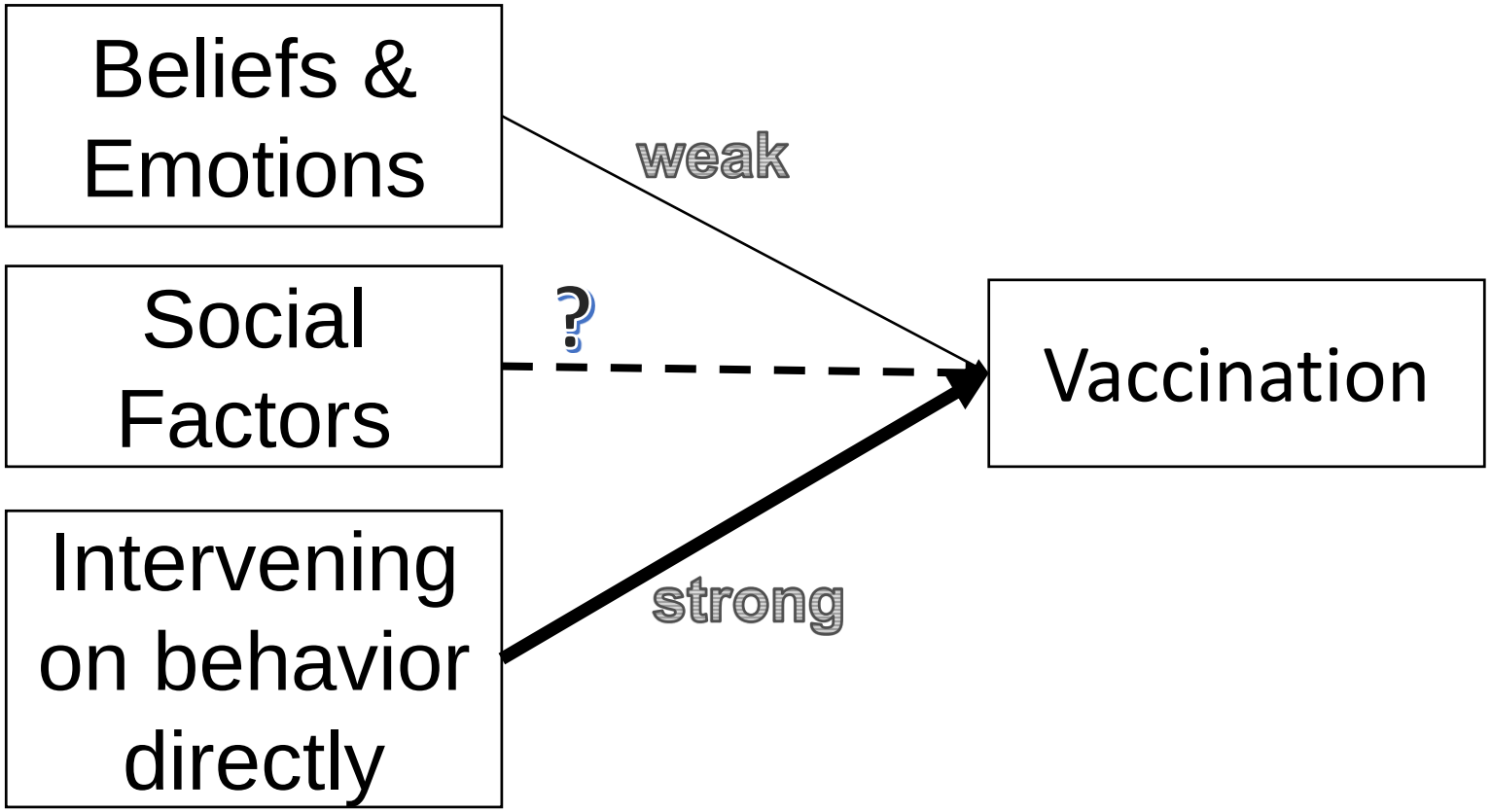
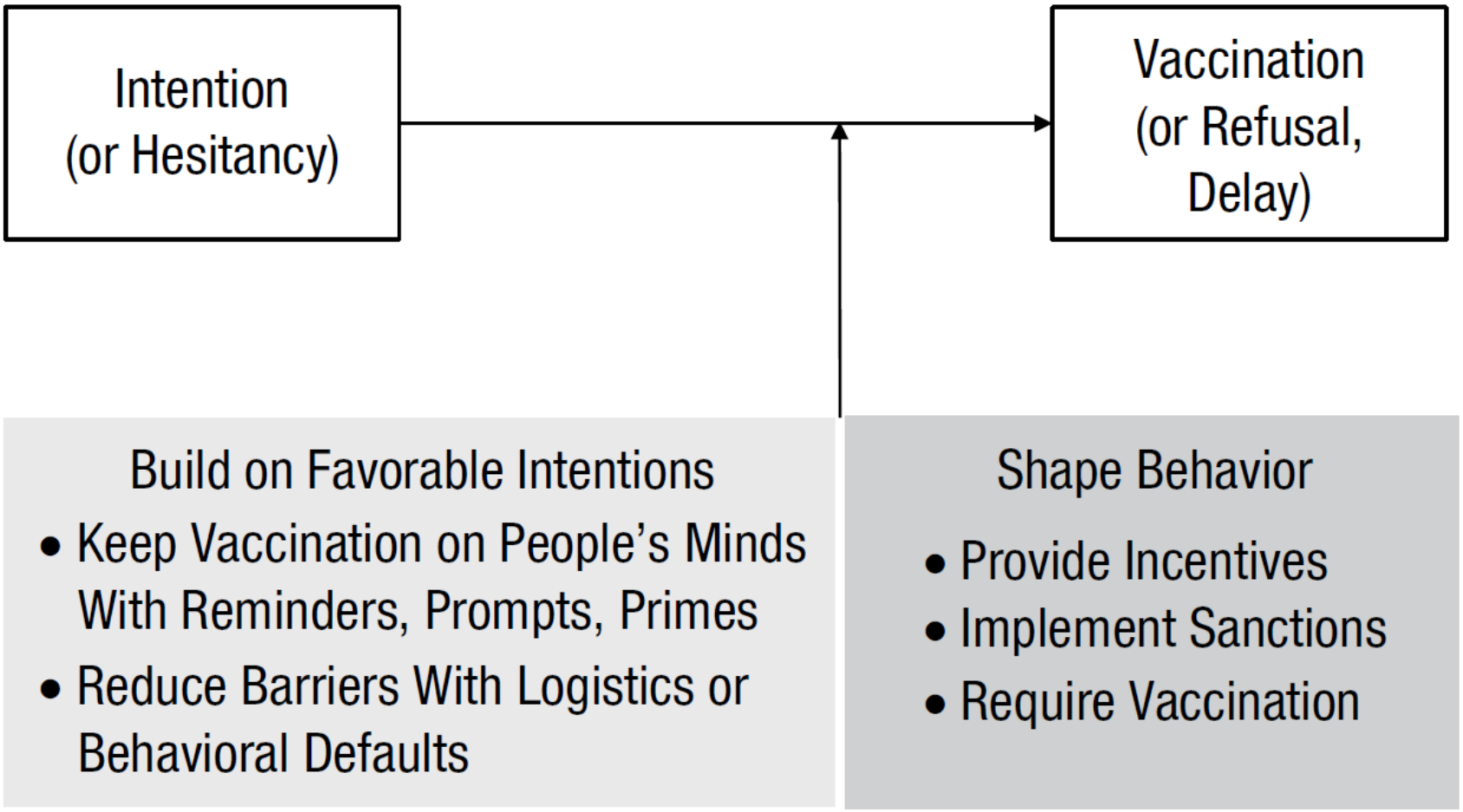
Increasing Vaccination: Putting Psychological Science Into Action



Intervening on behavior directly



Most effective interventions to boost vaccination (Brewer et al., 2017)

- Provider recommendation
- Presumptive recommendation
- On-site vaccinations
- Default vaccination appointments
- Incentives
- Vaccination requirements

Should Governments Invest More in Nudging?

Psychological Science
1–15
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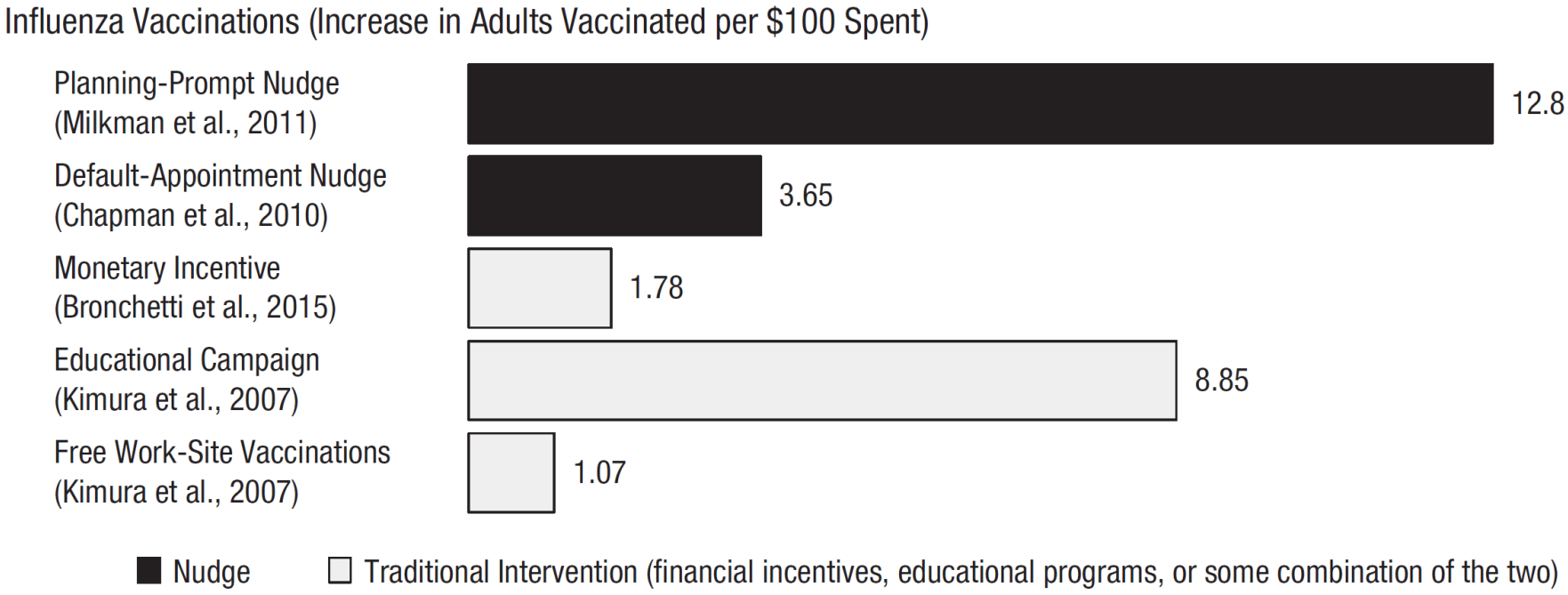
Shlomo Benartzi[1], John Beshears[2], Katherine L. Milkman[3], Cass R. Sunstein[4], Richard H. Thaler[5], Maya Shankar[6], Will Tucker-Ray[7], William J. Congdon[7], and Steven Galing[8]



Benartzi et al, 2017

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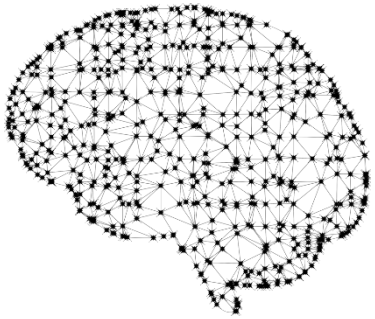

Rational

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Information Format

- It’s not what you say; it’s how you say it

Prostate Cancer Early Detection

HARDING CENTER FOR RISK LITERACY

by PSA screening and digital-rectal examination.
Numbers are for men aged 50 years or older, not participating vs. participating in screening for 10 years.

	1,000 men without screening	1,000 men with screening
Benefits		
How many men died from prostate cancer?	8*	8
How many men died from any cause?	200	200
Harms		
How many men were diagnosed and treated** for prostate cancer unnecessarily?	—	20
How many men without cancer got a false alarm and a biopsy?	—	180

* This means that about 8 out of 1,000 men (50+ years of age) without screening died from prostate cancer within 10 years.

** With prostate removal or radiation therapy, which can lead to incontinence or impotence.

Prostate Cancer Early Detection

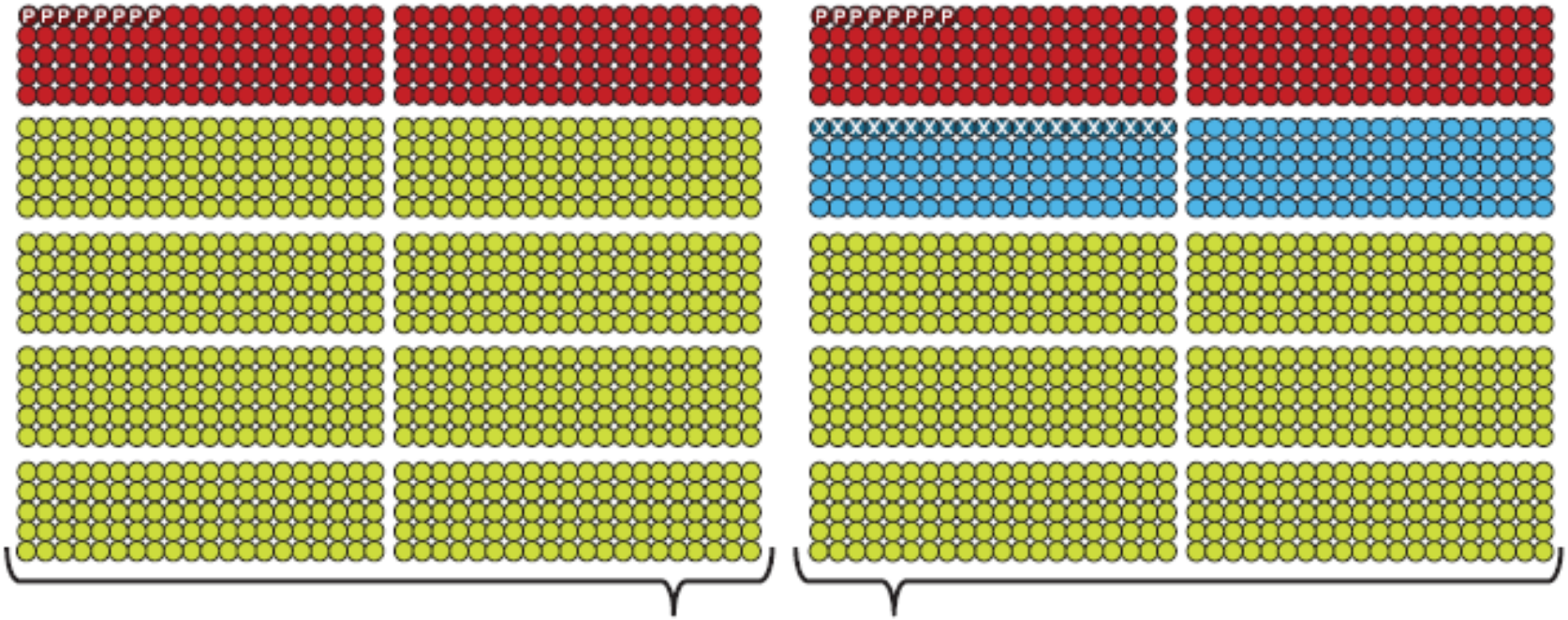
HARDING CENTER FOR RISK LITERACY

by PSA screening and digital-rectal examination.

Numbers are for men aged 50 years or older, not participating vs. participating in screening for 10 years.

1,000 men without screening:

1,000 men with screening:



	1,000 men without screening:	1,000 men with screening:
Men dying from prostate cancer:	8	8
Men dying from any cause:	200	200
Men that were diagnosed and treated for prostate cancer unnecessarily:	–	20
Men without cancer that got a false alarm and a biopsy:	–	180
Men that are unharmed and alive:	800	600

Framing Effects & the HPV Vaccine

- Gardasil (c 2006) protects against the two strains of HPV that cause 70% of cervical cancers

Framing Effects & the HPV Vaccine

Condition 1

80

- Imagine there is a vaccine available; it's very safe, and **100% effective in preventing virus infections that cause 70% of known cases** of a specific type of cancer. In people who aren't vaccinated, about 4% get this type of cancer. How likely would you be to get vaccinated?

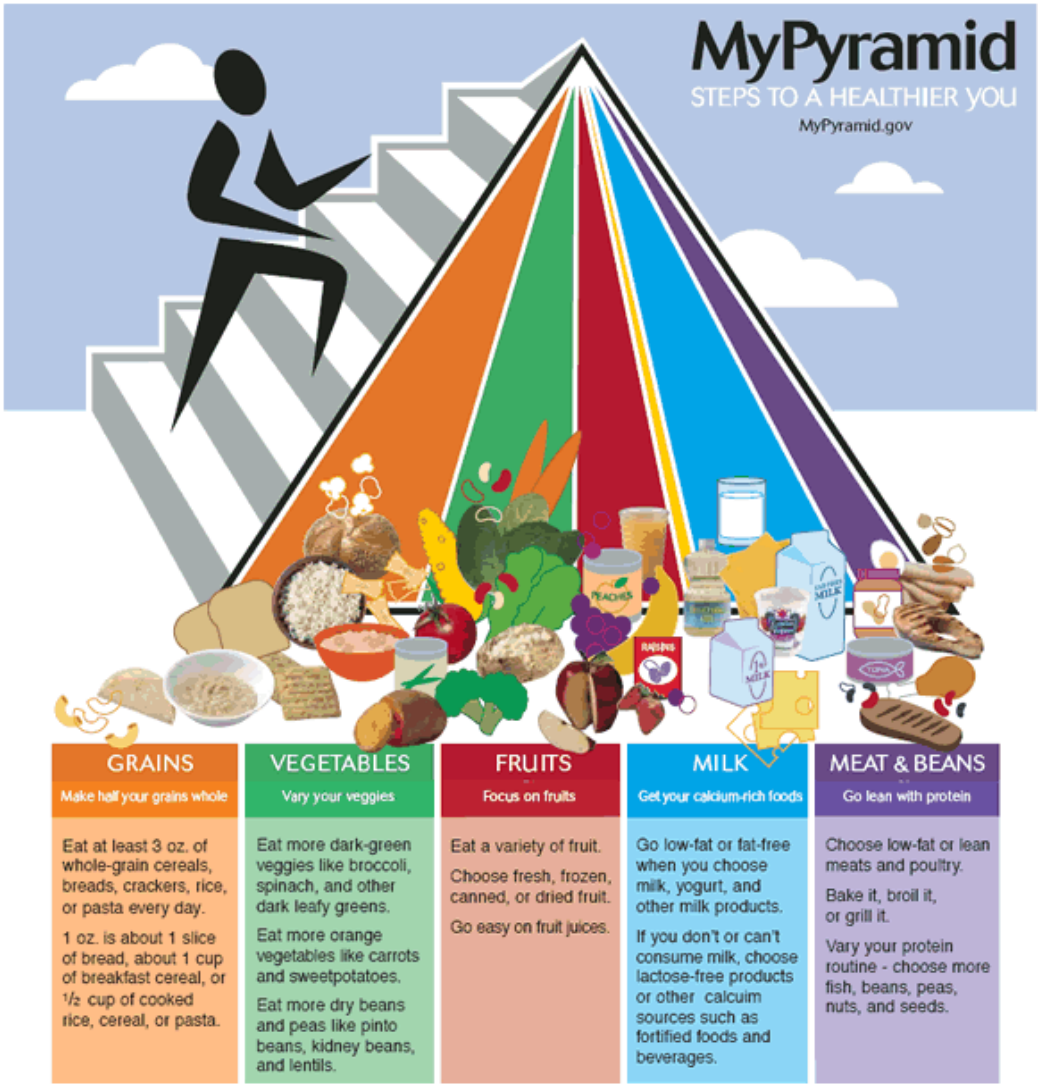
Condition 2

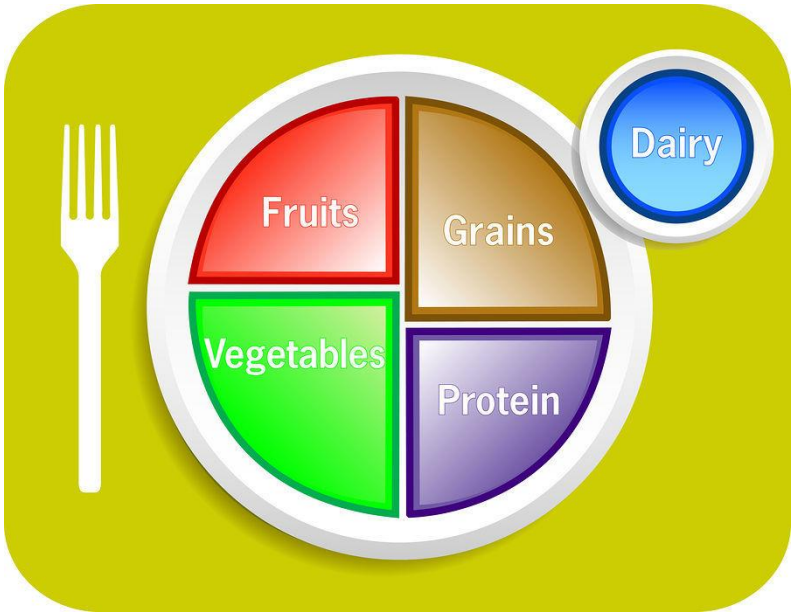
67

- Imagine there is a vaccine available; it's very safe, and **70% effective in preventing virus infections that cause all the known cases** of a specific type of cancer. In people who aren't vaccinated, about 4% get this type of cancer. How likely would you get vaccinated?

Li & Chapman (2009, *PBR*)

Dietary Guidelines





RUTGERS

Dining Service

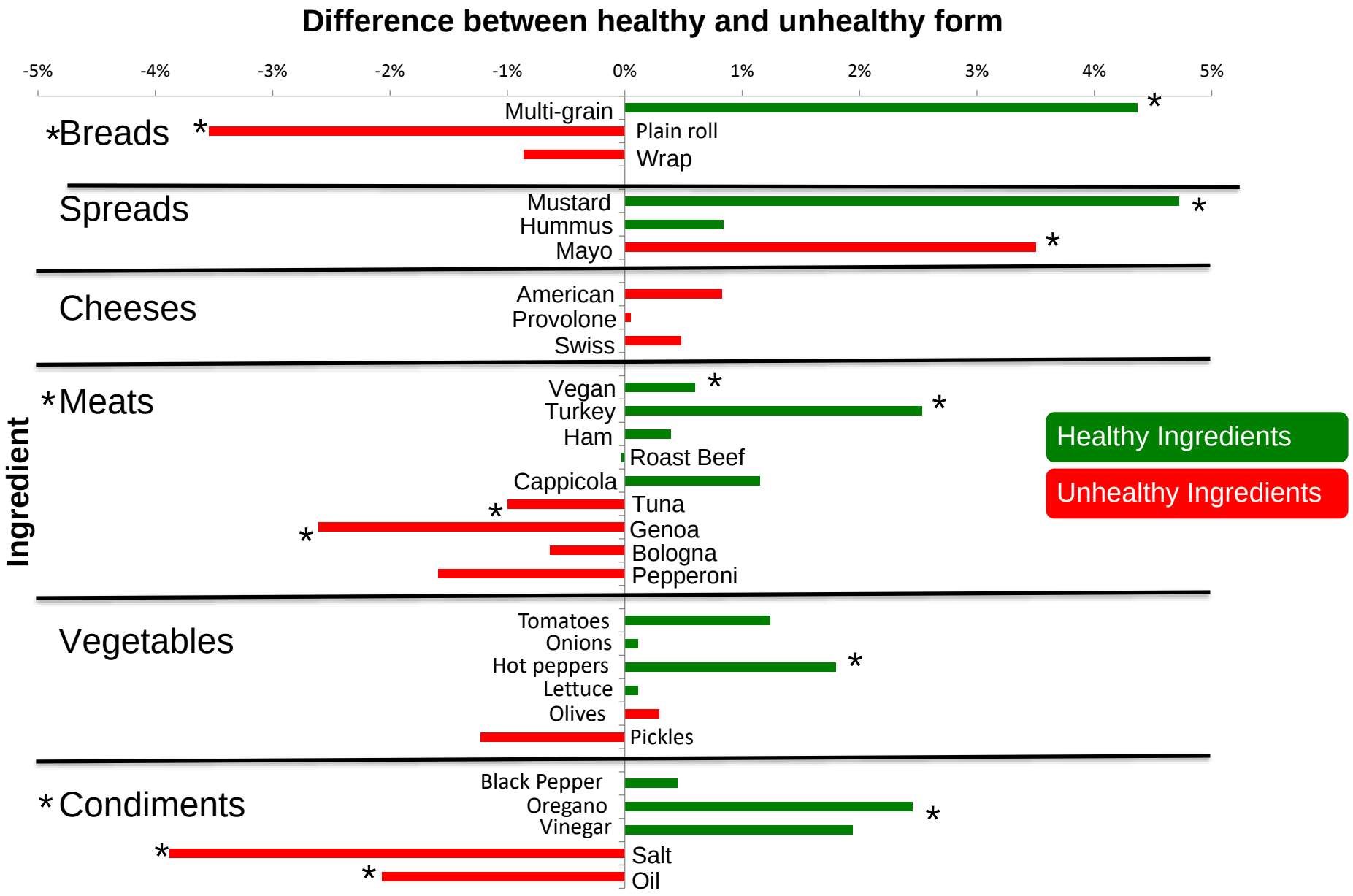
Hoagie Night

9,765 hoagie orders
over 8 weekly hoagie nights

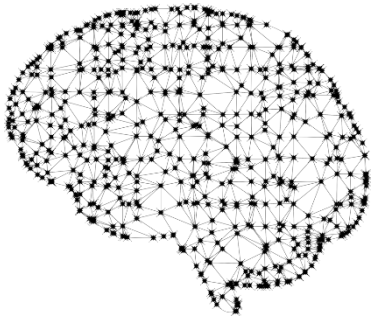
Policastro, Smith, & Chapman, 2015

_____ Plain Roll	_____ Multi Grain Roll ☆
_____ Multi Grain Roll	_____ Plain Roll
_____ Wrap	_____ Wrap
_____ Mayo	_____ Mustard ☆
_____ Mustard	_____ Hummus ☆
_____ Hummus	_____ Mayo
_____ American	_____ American
_____ Provolone	_____ Provolone
_____ Swiss	_____ Swiss
_____ Vegan Deli Meat	_____ Vegan Deli Meat ☆
_____ Turkey	_____ Turkey ☆
_____ Ham	_____ Ham ☆
_____ Roast Beef	_____ Roast Beef ☆
_____ Cappicola	_____ Cappicola ☆
_____ Genoa Salami	_____ Tuna
_____ Bologna	_____ Genoa Salami
_____ Pepperoni	_____ Bologna
_____ Tuna	_____ Pepperoni
_____ Tomato	_____ Tomato ☆
_____ Onions	_____ Onions ☆
_____ Pickles	_____ Hot Peppers ☆
_____ Black Olives	_____ Lettuce ☆
_____ Hot Peppers	_____ Black Olives
_____ Lettuce	_____ Pickles
_____ Salt	_____ Pepper ☆
_____ Pepper	_____ Oregano ☆
_____ Oregano	_____ Vinegar ☆
_____ Oil	_____ Salt
_____ Vinegar	_____ Oil

"☆" indicates healthy food


Difference between healthy and unhealthy form
-5%
-4%
-3%
-2%
-1%
0%
1%
2%
3%
4%
5%
Ingredient
*Breads
Multi-grain
Plain roll
Wrap
Spreads
Mustard
Hummus
Mayo
Cheeses
American
Provolone
Swiss
*Meats
Vegan
Turkey
Ham
Roast Beef
Cappicola
Tuna
Genoa
Bologna
Pepperoni
Vegetables
Tomatoes
Onions
Hot peppers
Lettuce
Olives
Pickles
*Condiments
Black Pepper
Oregano
Vinegar
Salt
Oil
Healthy Ingredients
Unhealthy Ingredients

Rational vs. Behavioral
Approaches to behavior change



Rational

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Behavioral

- Information format
- Social context
- Automation

Social Norms

- Help the hotel save energy 16%
- Partner with us to help the environment 31%
- Almost 75% of guests reuse towels 44%
- 75% of the guests who stayed in this room reuse towels 49%

Goldstein, Cialdini, & Griskevicius (2008) *JCR*
Schultz, Wesley, Nolan, Cialdini, Goldstein, & Griskevicius (2007) *Psych Sci*

Social Comparison & Electricity Use

OPower

Social Norms

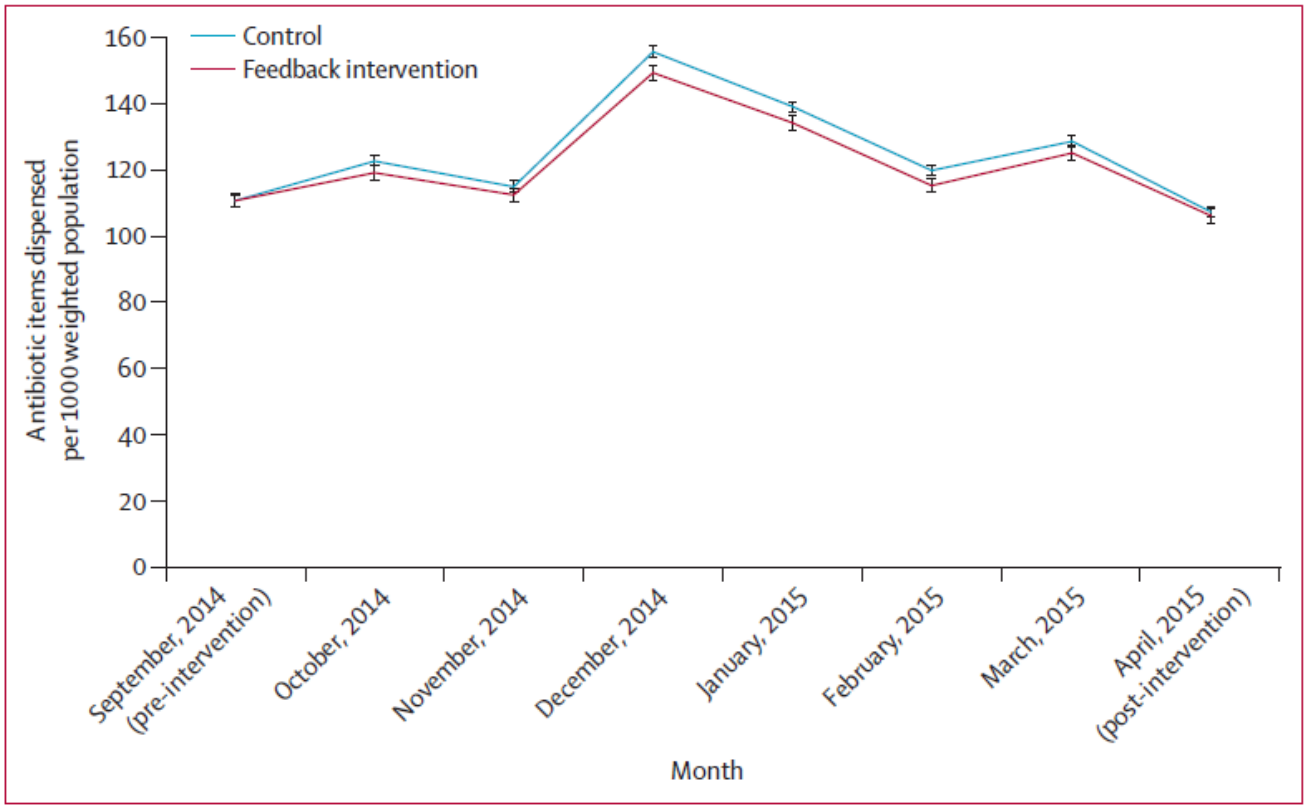


Figure 2: Rate of antibiotic items dispensed per 1000 weighted population for the feedback intervention, September, 2014, to April, 2015
Error bars represent 95% CIs.

Provision of social norm feedback to high prescribers of antibiotics in general practice: a pragmatic national randomised controlled trial

Michael Hallsworth, Tim Chadborn, Anna Sallis, Michael Sanders, Daniel Berry, Felix Greaves, Lara Clements, Sally C Davies

The Lancet, 387.10029 (2016): 1743-1752.

Opioid prescribing decreases after learning of a patient's fatal overdose

Jason N. Doctor[1]*, Andy Nguyen[1], Roneet Lev[2], Jonathan Lucas[3], Tara Knight[1], Henu Zhao[1], Michael Menchine[4]

Table 3. Adjusted daily average milligram morphine equivalents (MMEs) dispensed per prescriber among persons randomized to the intervention or control groups. Values in parentheses are 95% CIs with 5% trimmed means.

Parameter	Randomization group	
	Letter	Control
Prescribers followed	388	438
Preintervention	72.5 (71.3 to 73.7)	71.6 (70.3 to 72.8)
Postintervention	65.7 (63.8 to 67.5)	71.7 (70.0 to 73.5)
Increment (pre- to post-)	−6.8 (−9.9 to −3.8)	0.1 (−2.8 to 3.2)
Difference in increment	−6.9 (−13.1 to −1.0)	
P value	0.001	

Implied Norms

Reicks et al., 2012; Melnick & Li, 2018

Social Comparisons

Pedometers

- Encourage walking
- Track progress
- Provide feedback

Research Question

- Is feedback more motivating when it is compared to a reference point?

Chapman, Colby, Convery, & Coups (2015)
Funded by the Robert Wood Johnson Foundation

Social Comparison

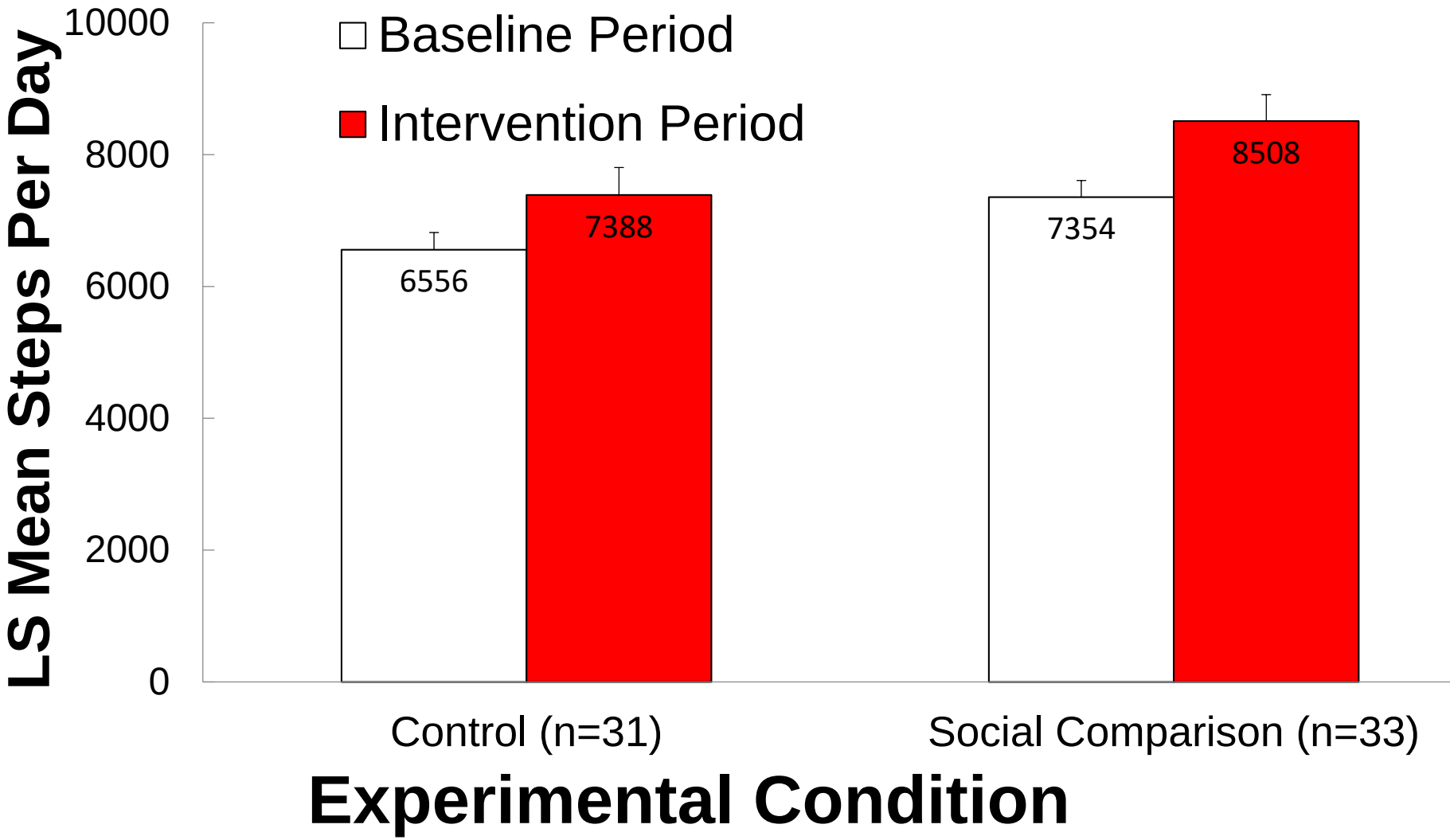
1 week of baseline with sealed pedometer

Random assignment to condition

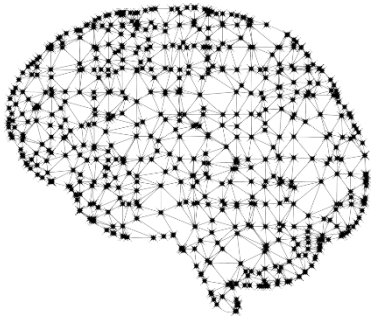
Control	Social Comparison

2 weeks of active phase with open pedometer

	Example	Day One	Day Two
Date:	*5/15/13 Wed.*	Tuesday 6/11/13	Wednesday 6/12/13
Time On Pedometer	*X:XX*	7:00 AM Edit time	6:15 AM Edit time
Time Off Pedometer	*X:XX*	10:00 PM Edit time	7:30 PM Edit time
Pedometer reading at end of day	*X,XXX*	8945 Edit steps	15872 Edit steps
Rank	*You did better than 70% of other people.*	You did worse than 79% of other people.	You did better than 87% of other people.
Notes	*Walked more during break & lunch*	Enter Note	Enter Note


LS Mean Steps Per Day
10000
8000
6000
4000
2000
0
Baseline Period
Intervention Period
6556
7388
7354
8508
Control (n=31)
Social Comparison (n=33)
Experimental Condition

Rational vs. Behavioral
Approaches to behavior change



Rational

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Automation

Intervening on behavior directly

Reminders & Recalls

Automating the action prompt

HPV vaccination	Intervention, Enrolled, *n* = 374, %	Control, *n* = 555, %	Adjusted Relative Risk (95% CI)	*P*
Received dose 2	83	71	1.14 (1.07–1.22)	<.001
Received dose 3	63	38	1.59 (1.39–1.83)	<.001

Kempe, A., O'Leary, S. T., Shoup, J. A., Stokley, S., Lockhart, S., Furniss, A., ... & Daley, M. F. (2016). Parental choice of recall method for HPV vaccination: A pragmatic trial. *Pediatrics*, *137*(3), e20152857.

JAMA Network™

From: **Collaborative Centralized Reminder/Recall Notification to Increase Immunization Rates Among Young Children: A Comparative Effectiveness Trial**

JAMA Pediatr. 2015;169(4):365-373. doi:10.1001/jamapediatrics.2014.3670

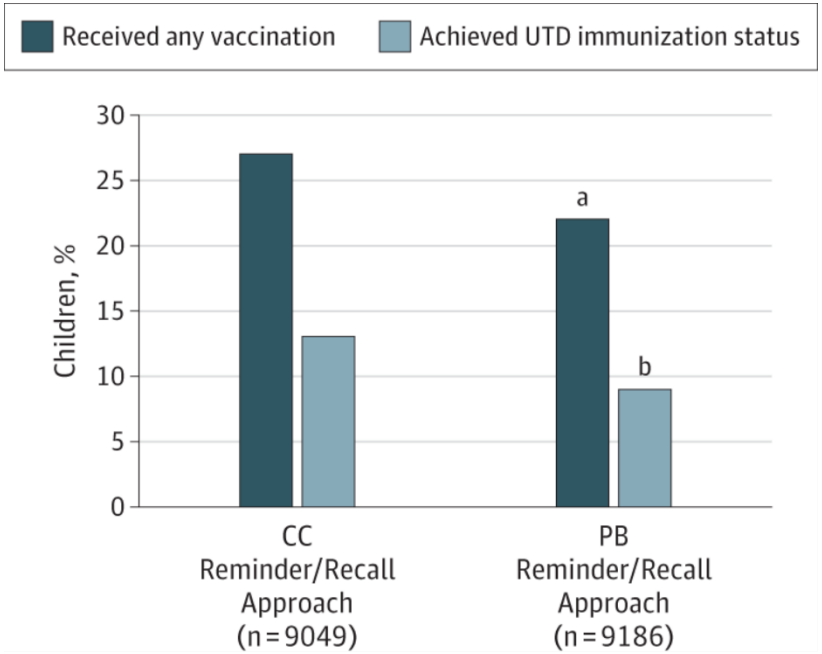

Figure Legend:

Effectiveness of Collaborative Centralized (CC) vs Practice-Based (PB) Reminder/Recall ApproachesA, Percentage of children receiving any vaccination (absolute percentage point difference, 5%). B, Percentage of children achieving up-to-date (UTD) status with vaccinations (absolute percentage point difference, 4%). Data are unadjusted.

[a]P < .001 compared with the CC reminder/recall approach.

[b]P = .001 compared with the CC reminder/recall approach.

Date of download: 1/8/2019

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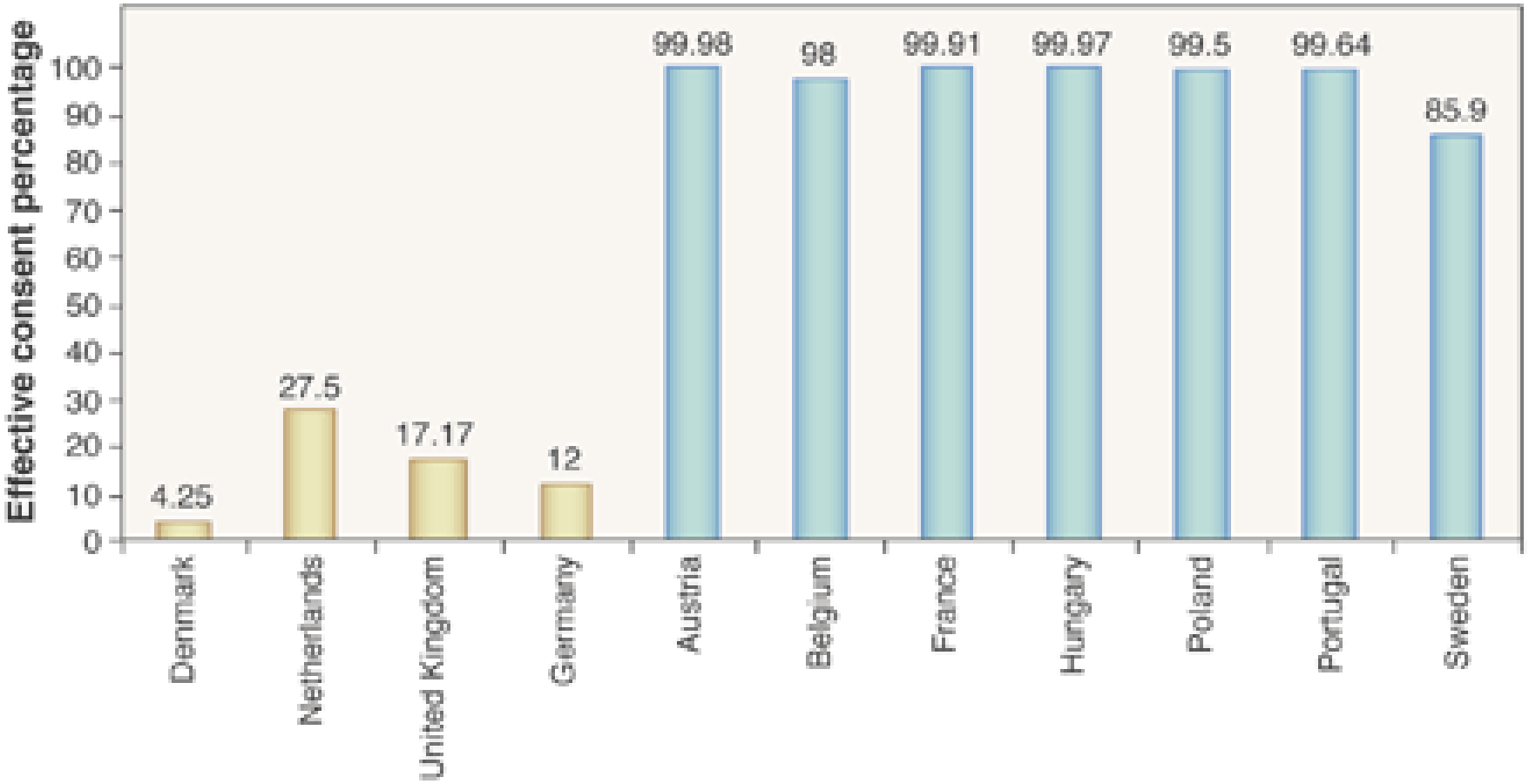
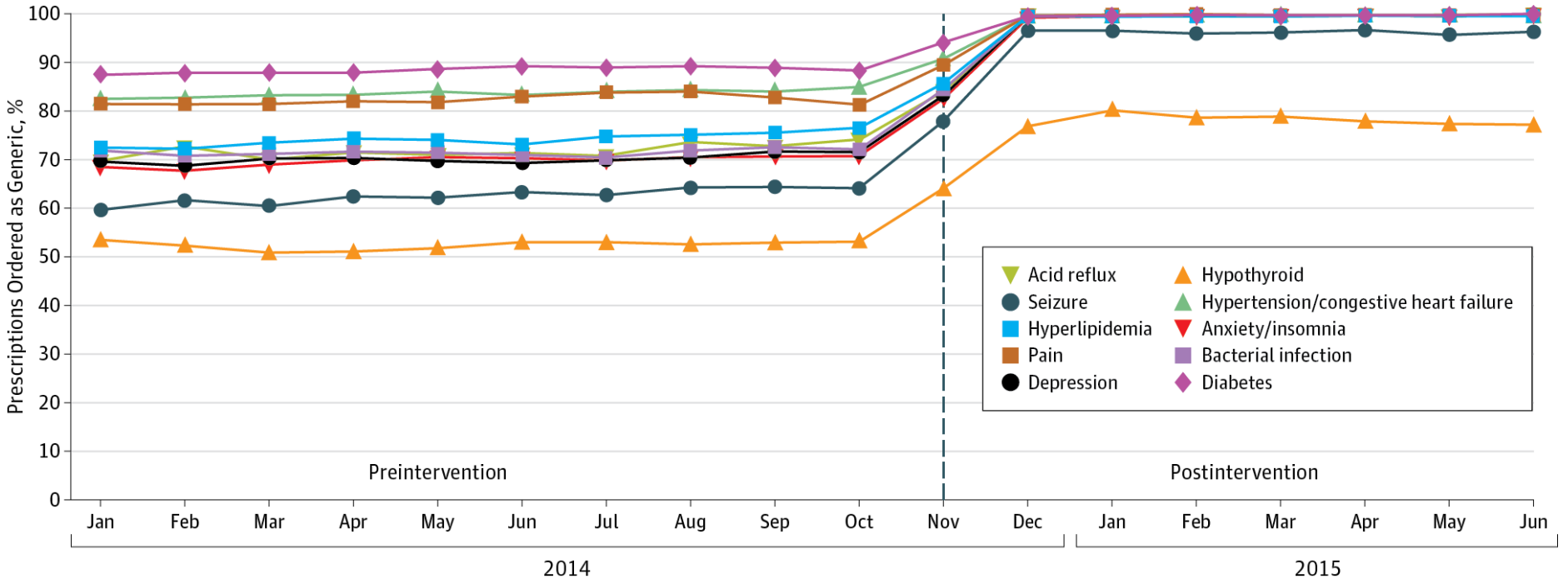
Default Effect



Effective organ donation consent rates, by country. Explicit consent (opt-in, gold) and presumed consent (opt-out, blue). Johnson & Goldstein (2003)

Generic Medication Prescriptions by Default



Patel et al., 2016, JAMA

Opioid Prescriptions by Default

- Before: default number of opioid pills auto-populated in the EMR = 30
  - Median number of pills prescribed: **20**
- After: default number of opioid pills auto-populated in the EMR = 12
  - Median number of pills prescribed: **12**

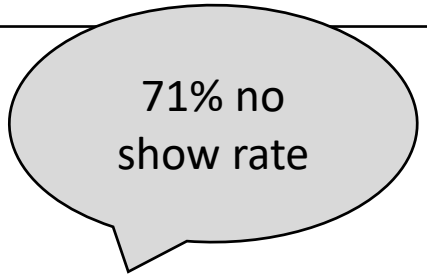
Chiu, A. S., Jean, R. A., Hoag, J. R., Freedman-Weiss, M., Healy, J. M., & Pei, K. Y. (2018). Association of lowering default pill counts in electronic medical record systems with postoperative opioid prescribing. *JAMA surgery*, *153*(11), 1012-1019.

Flu Shot Default Appointments

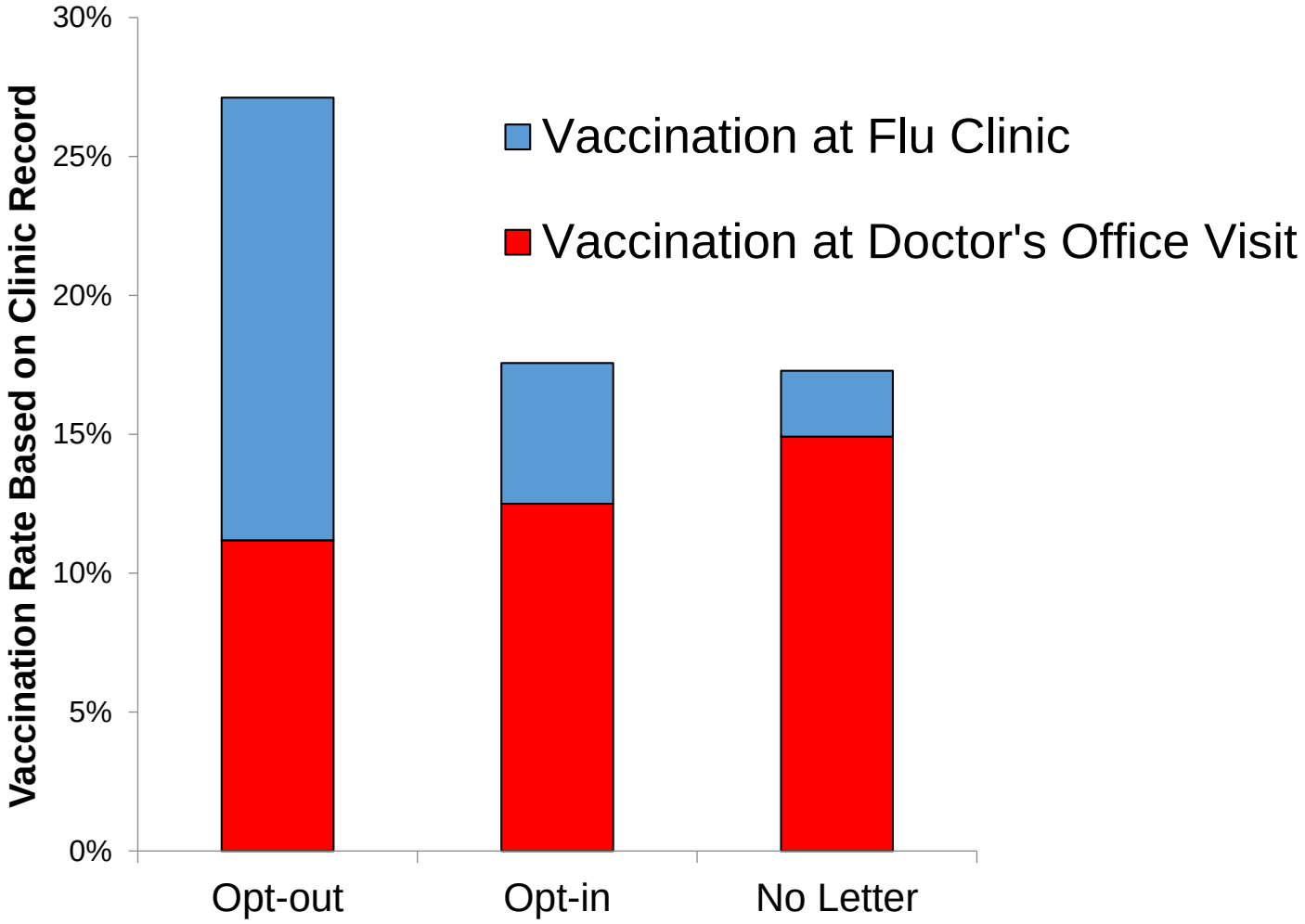
- Opt-in condition
  - Letter stating that flu shots were available
  - Call to make an appointment
- Opt-out condition
  - Letter with pre-scheduled appointment
  - Call to change or cancel appointment
- No letter control

Defaults Affect Vaccination

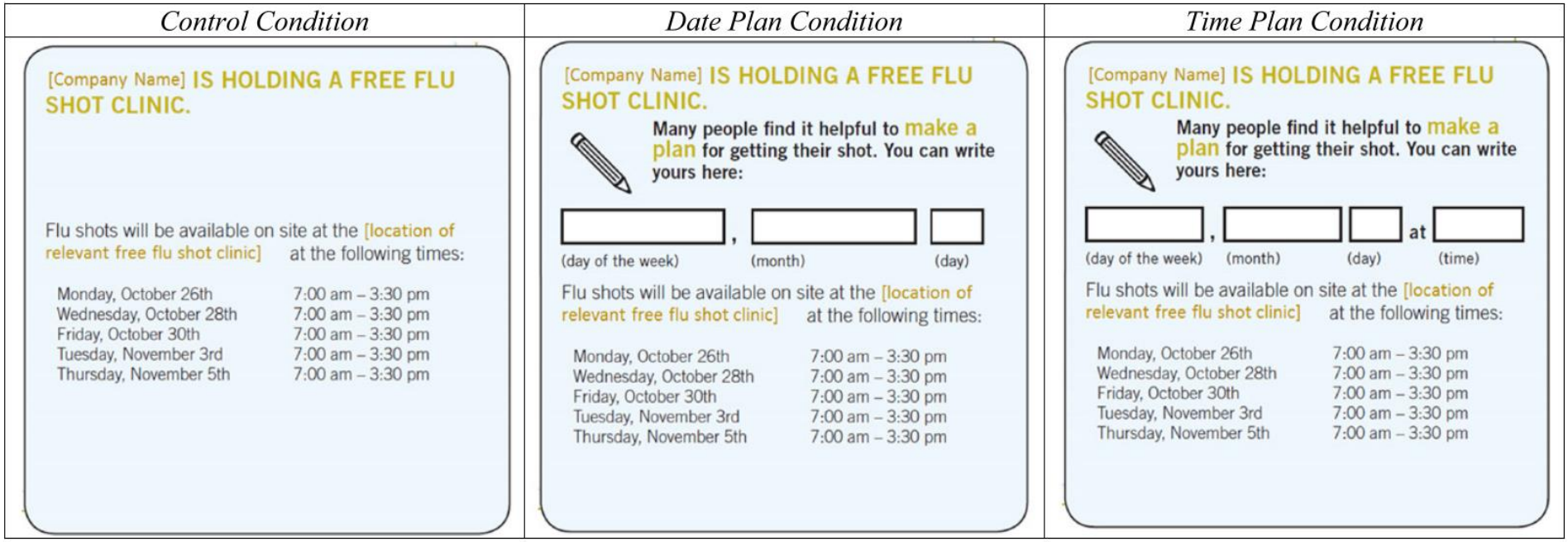
Condition
Opt-out (n=295)
Opt-in (n=296)
No Letter (n=295)
OR 95% CI p-value



Chapman, Li, Leventhal, & Leventhal (2016), funded by NIH 1R01AG037943-01


Vaccination Rate Based on Clinic Record
30%
25%
20%
15%
10%
5%
0%
Vaccination at Flu Clinic
Vaccination at Doctor's Office Visit
Opt-out
Opt-in
No Letter

Implementation Intentions



Milkman, Beshears, Choi, Laibson, & Madrian, 2011, PNAS

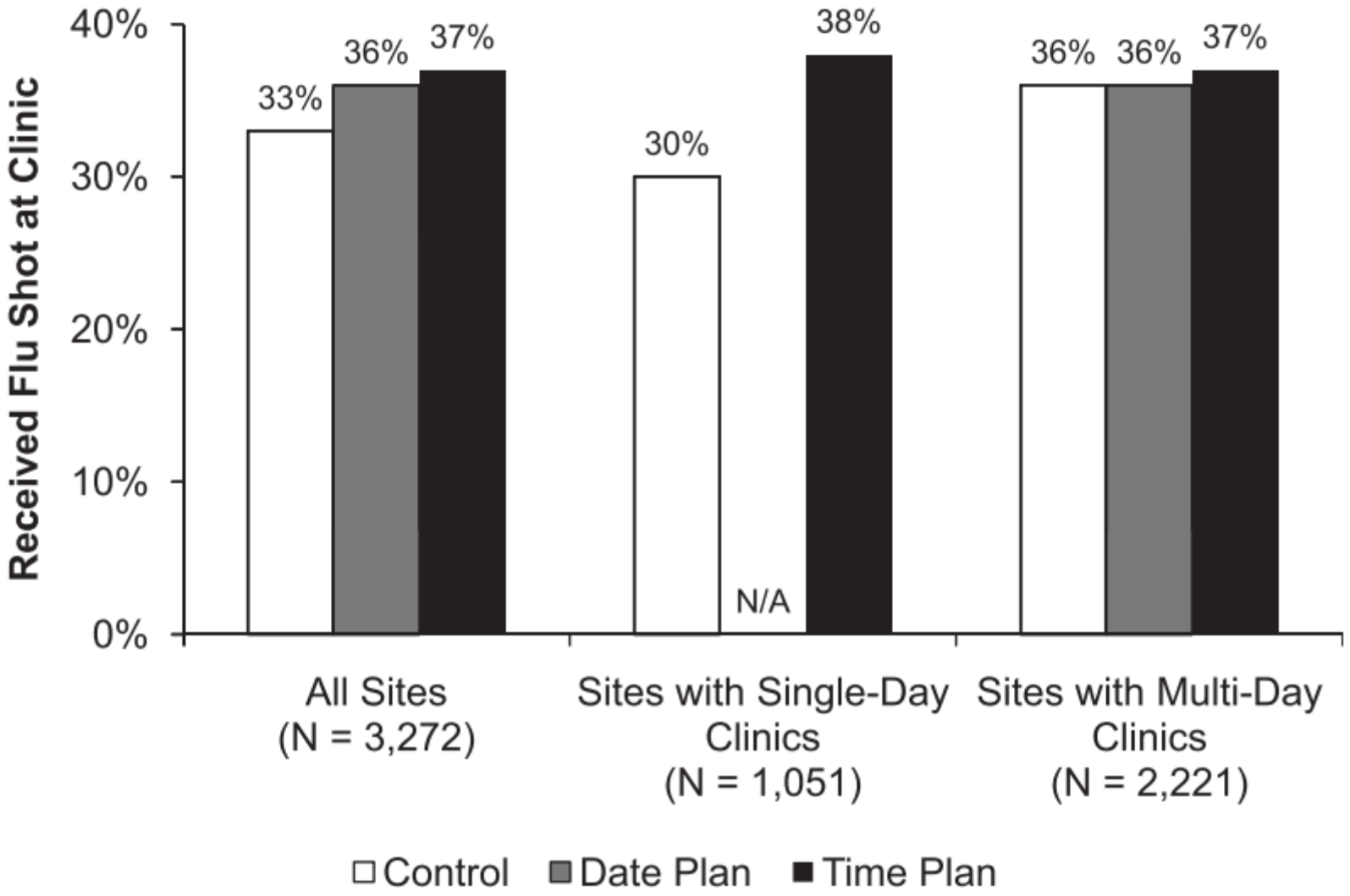
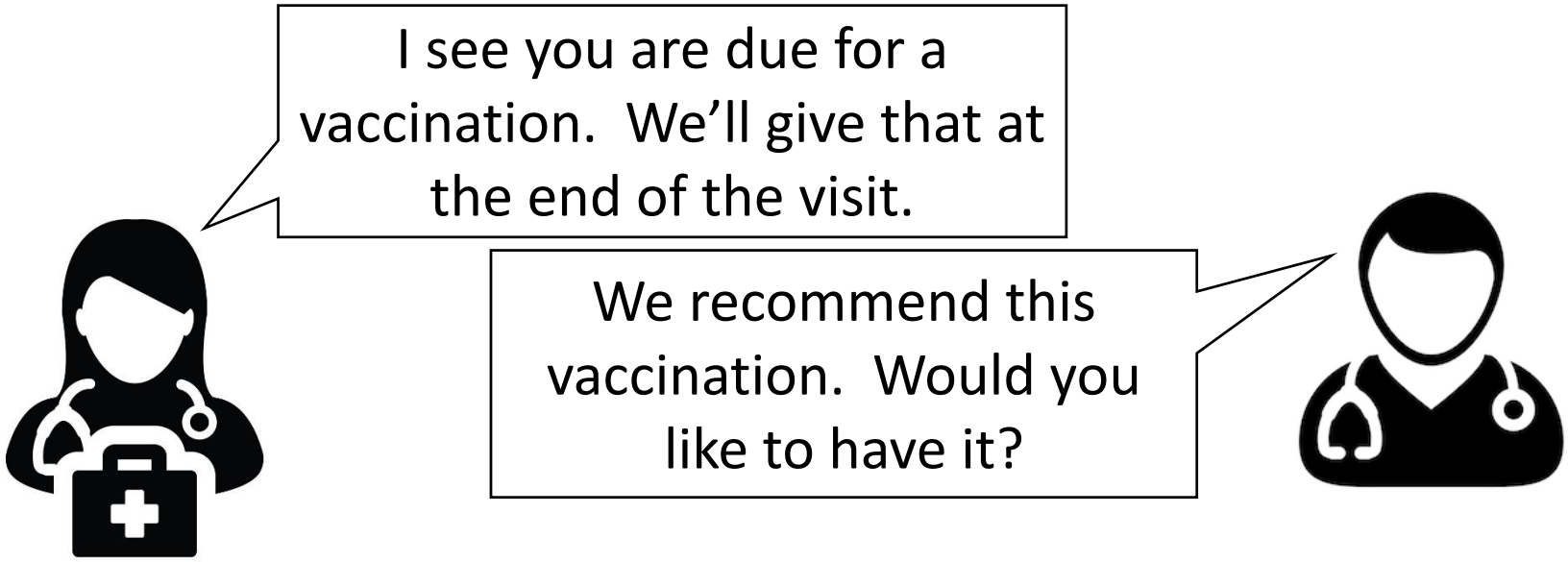


Fig. 2. Vaccination rates by experimental condition and flu shot clinic length.

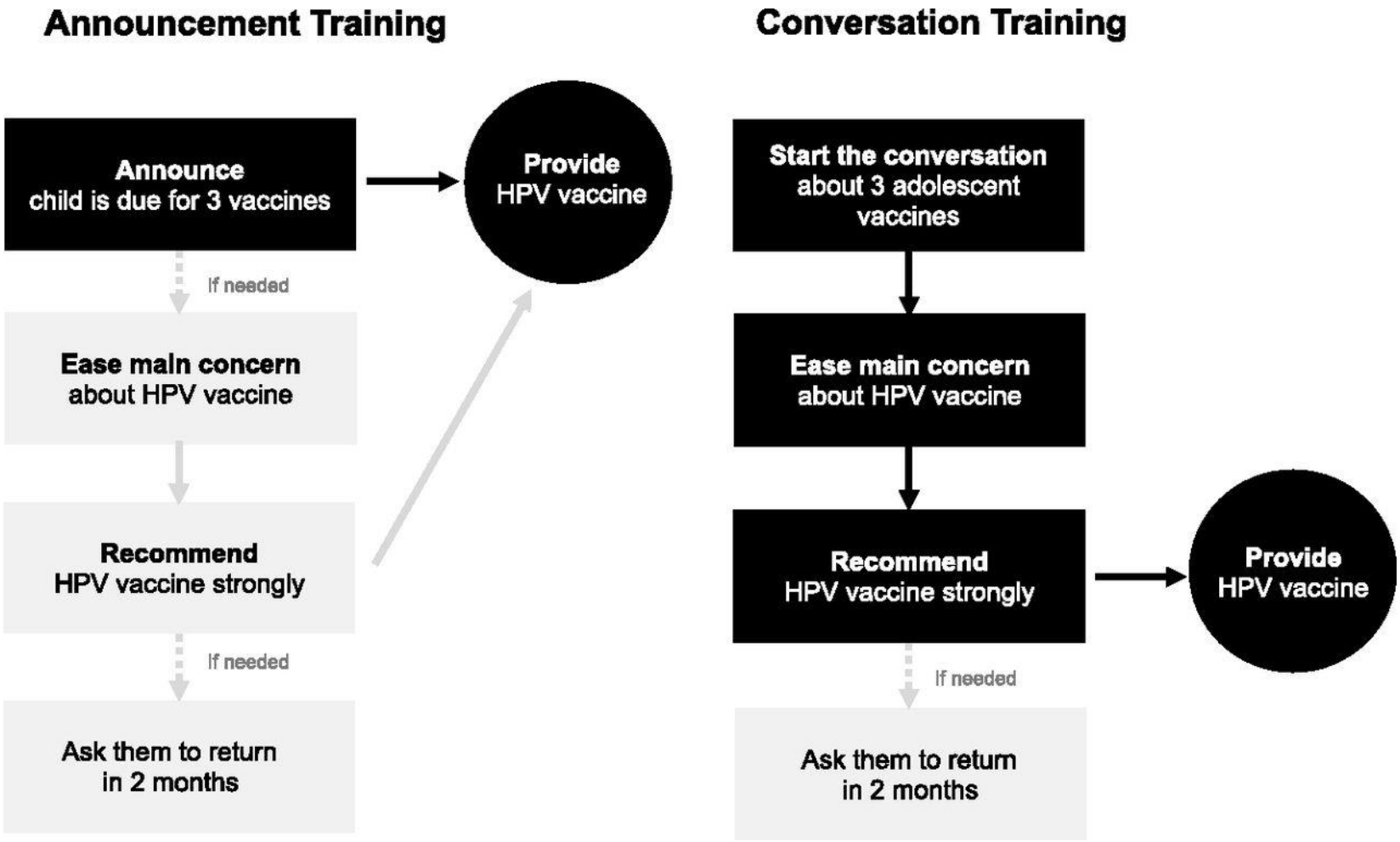
Presumptive Recommendation



≥1 dose at 3 Mo (%)	Coverage at 3 Mo (%)	Coverage Change Over Previous 3 Mo (%)	Difference From Control (%) (95% CI)
Control	37.3	6.4	Reference
Announcement	38.0	11.5	5.1 (2.0 to 8.2)
Conversation	30.3	8.4	2.0 (–0.4 to 4.4)

Brewer, N. T., Hall, M. E., Malo, T. L., Gilkey, M. B., Quinn, B., & Lathren, C. (2017). Announcements versus conversations to improve HPV vaccination coverage: a randomized trial. *Pediatrics*, *139*(1), e20161764.

Announcement and conversation training content.



Noel T. Brewer et al. Pediatrics 2017;139:e20161764

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Conclusions

1. Information format as important as information content
2. Social comparison and social norms affect behavior
3. Automating behavior
   - Reminders & prompts
   - Defaults
   - Implementation Intentions
   - Recommendations

Thank You

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https://www.cmu.edu/dietrich/sds/chapmanlab/