

Mixed Qualitative-Quantitative Methods Using Online Panels to Understand Never, Sometimes, and Always Flu Vaccinators

Andrew M. Parker

Caitlin Drummond

Matthew Walsh

Courtney A. Gidengil

Sarah Nowak

David Kennedy

Raffaele Vardavas

RAND Corporation

University of Michigan

University of Vermont



Acknowledgements & Disclaimer

Effort and data collection on this project was supported by:

- National Institute on Aging (R01AG20717),
- National Cancer Institute (R21CA157571),
- National Institute of Allergies and Infectious Diseases (R01AI118705), and
- Iowa State University Nanovaccine Initiative.

The views expressed are those of the authors and do not necessarily represent the views of these funders.

Taking a long view on flu vaccination

- Seasonal influenza accounts for over \$15 billion annually in morbidity and mortality in the US (Molinari et al., 2007).
- Influenza vaccination is the most effective means of preventing the illness.
- Influenza vaccination recommended for almost all individuals over age 6 months, but fewer than half vaccinate each year.
- Using the RAND American Life Panel, we've been assessing influenza vaccination since 2010 (H1N1).
 - Produced a novel longitudinal, mixed-methods characterization of influenza vaccination behavior and beliefs.

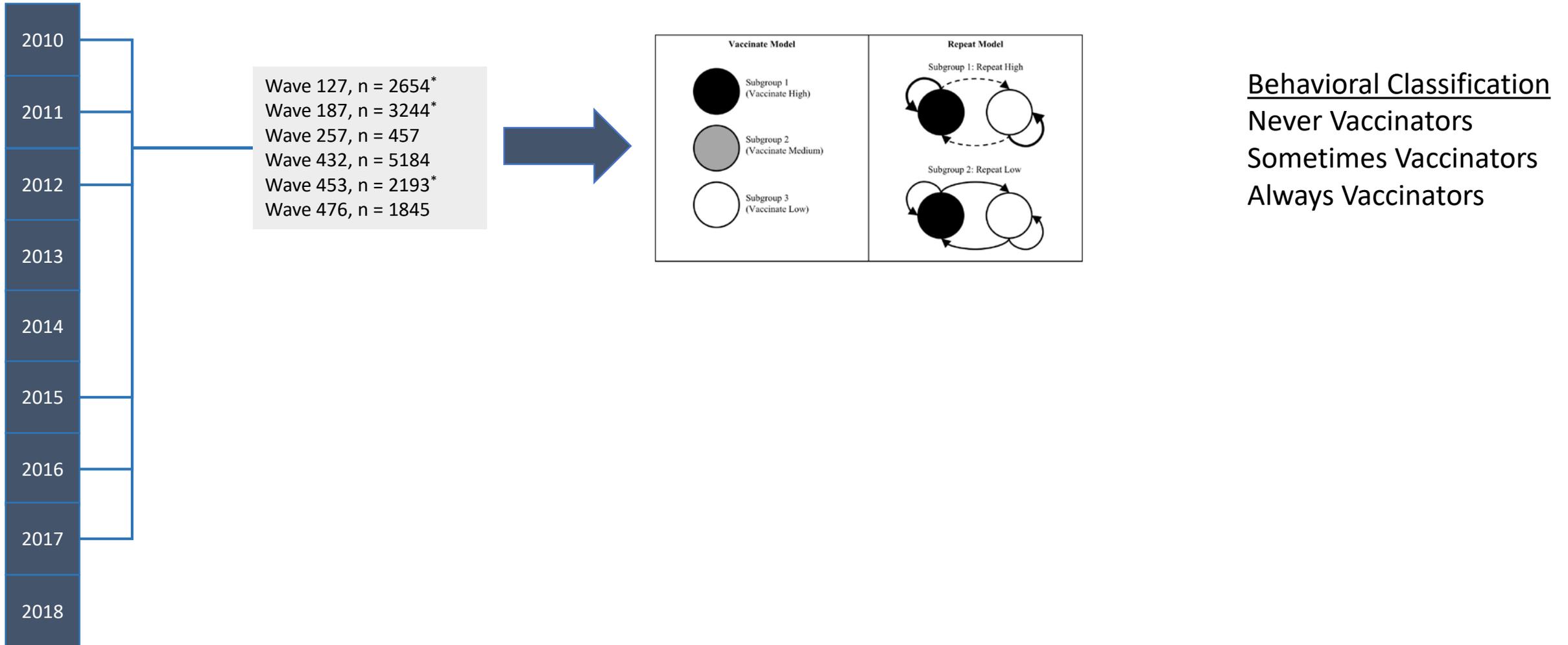
Categorizing people has great potential, but past attempts have been limited

Vaccinators		Nonvaccinators		
Benin et al., 2006				
Acceptors (61%)	Vaccine-hesitant (19%)	Late Vaccinators (8%)	Rejectors (12%)	
Gust et al., 2005				
Immunization advocates (33%)	Go Along to Get Alongs (26%)	Health Advocates (26%)	Fencesitters (13%)	Worrieds (3%)
Robbins et al., 2010				
Active -- Vaccinate (?)	Passive -- Vaccinate (?)	Passive -- Not Vaccinate (?)	Active -- Not Vaccinate (?%)	Active -- Antivaccinate (?%)

Research Questions

1. Can we use longitudinal data to identify groups with distinct vaccination behavior profiles?
2. How accurately do people report their own behavioral tendencies?
 - Could act as low-cost proxies multi-year behavioral data
3. How do these groups differ demographically?
 - Shed light on potential influences on group membership
4. Do vaccination beliefs differ across and within these groups?
 - Test the validity of the categorization
 - Identify potential points of intervention

First we characterized behavior over time



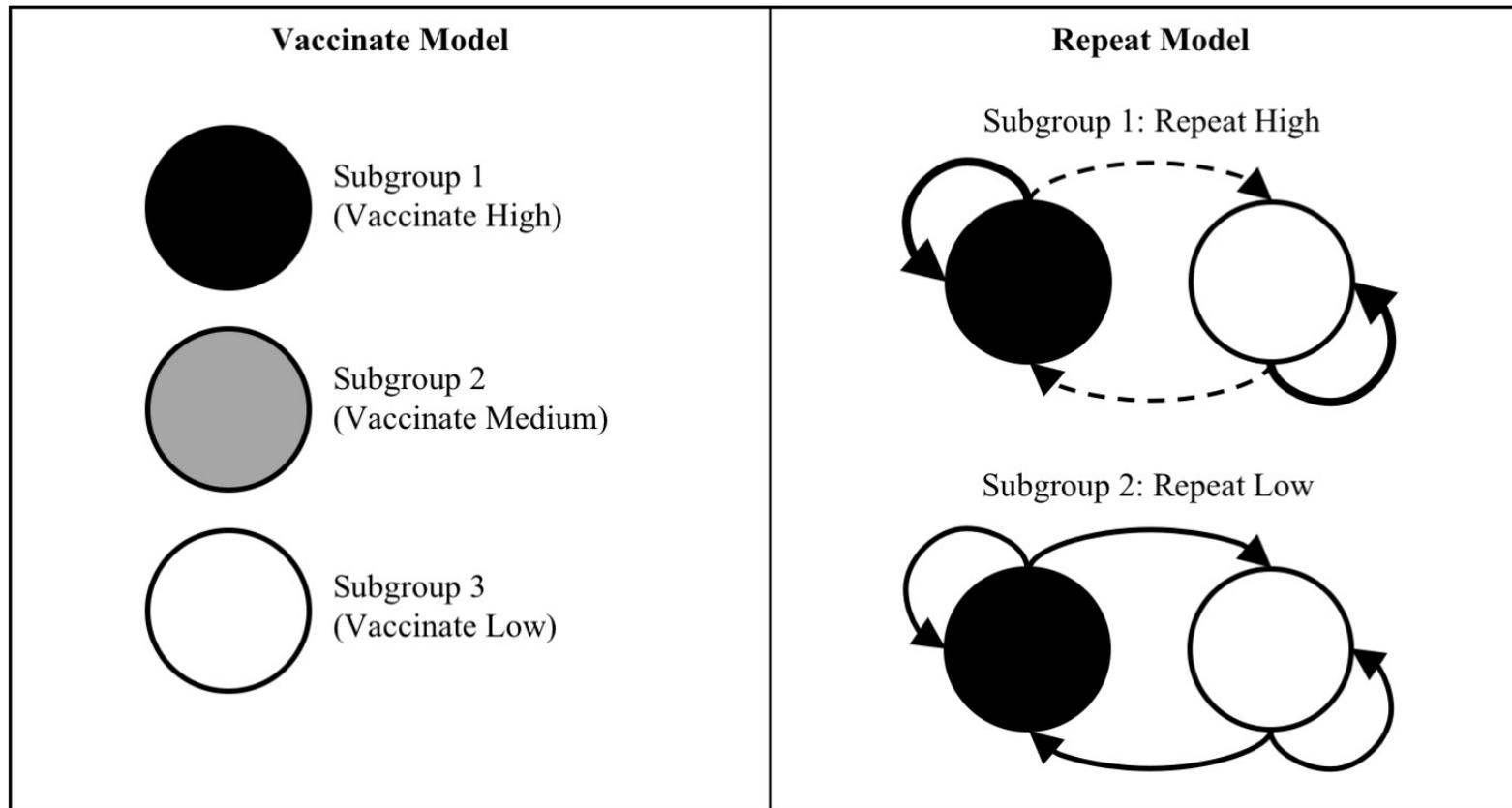
* Supplemented with data collected following Spring.

Results reported in Walsh, M.M., Parker, A.M., Vardavas, R., Nowak, S.A., Kennedy, D.P., & Gidengil, C.A. (under review). *The stability of influenza vaccination behavior over time: A longitudinal analysis of individuals across eight years.*

Examined self-reported vaccination in six seasons between 2009 and 2017

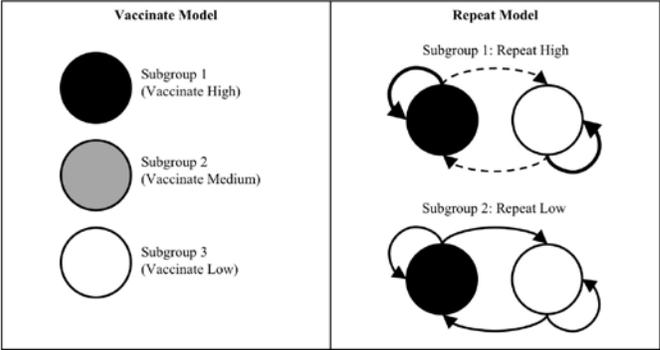
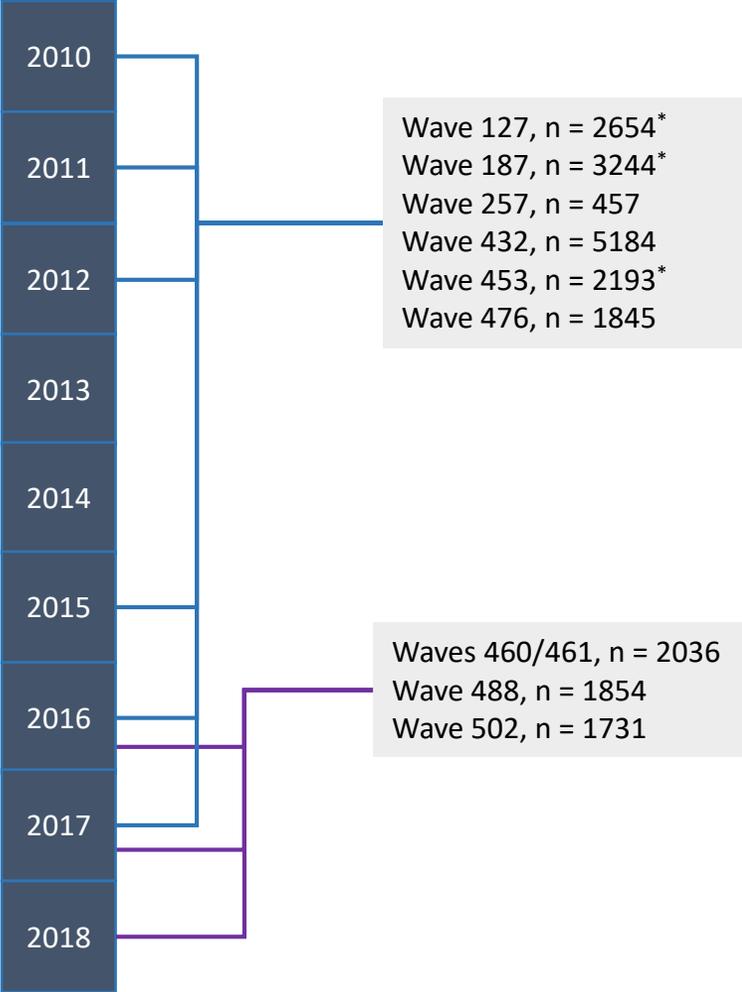
- On average, across two seasons:
 - $P(\text{vaccinate} | \text{vaccinated in prior year}) = .85$
 - $P(\text{vaccinate} | \text{not vaccinated in prior year}) = .15$
- On average, across eight seasons:
 - $P(\text{vaccinate} | \text{vaccinated eight years prior}) = .84$
 - $P(\text{vaccinate} | \text{not vaccinated eight years prior}) = .33$

Behavior more consistent with 2-parameter “Repeat” model than with 3-parameter “Vaccinate” model



Results reported in Walsh, M.M., Parker, A.M., Vardavas, R., Nowak, S.A., Kennedy, D.P., & Gidengil, C.A. (under review). *The stability of influenza vaccination behavior over time: A longitudinal analysis of individuals across eight years.*

Can they accurately self-report?



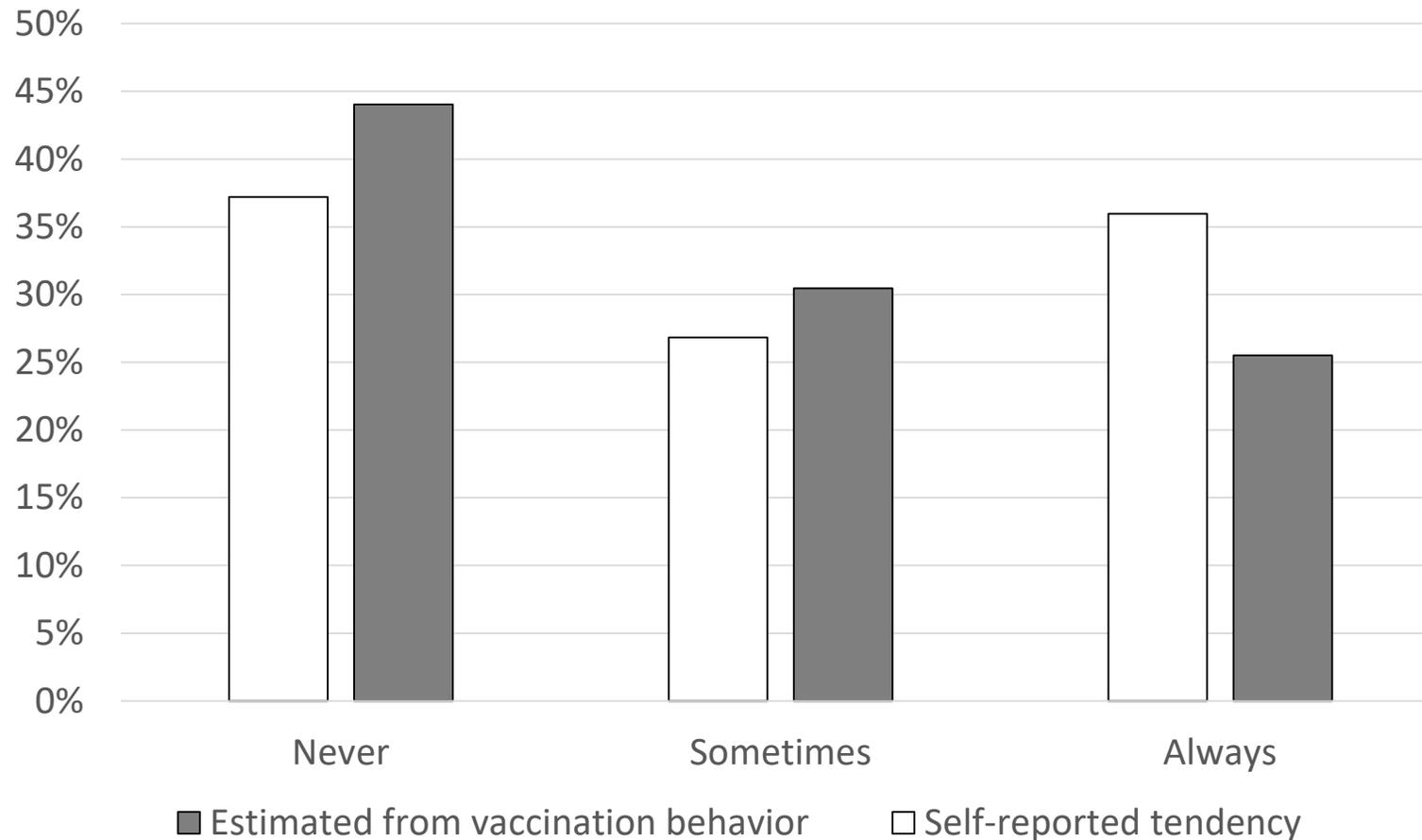
Would you say that you are generally the type of person who always get vaccinated for the flu (that is, you get vaccinated every year), sometimes get vaccinated for the flu, or never get vaccinated for the flu?

Behavioral Classification

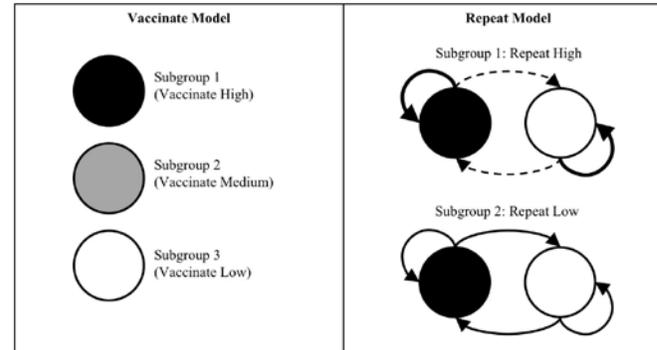
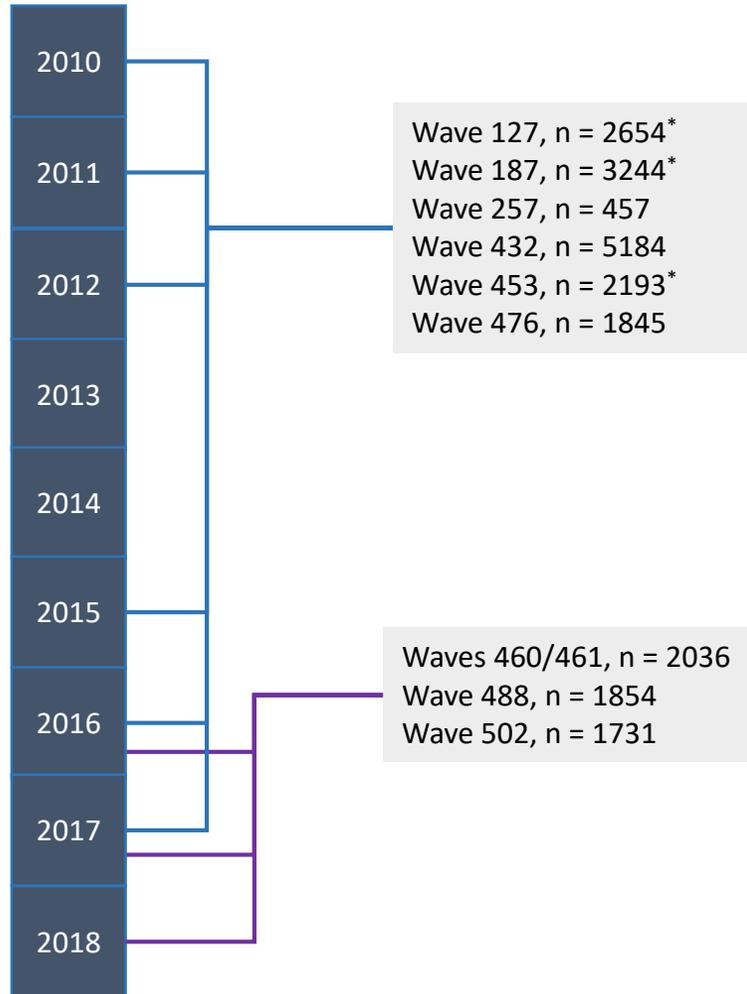
- Never Vaccinators
- Sometimes Vaccinators
- Always Vaccinators

Self-Reported Behavioral Classification

Never, Sometimes, and Always groups, defined behaviorally and through self-report



Do they have appropriate expectations?



Behavioral Classification

Never Vaccinators
Sometimes Vaccinators
Always Vaccinators

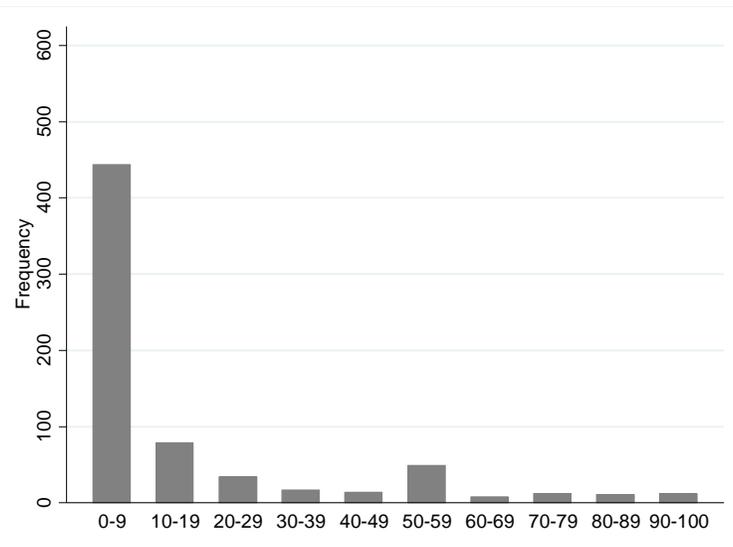
Would you say that you are generally the type of person who always get vaccinated for the flu (that is, you get vaccinated every year), sometimes get vaccinated for the flu, or never get vaccinated for the flu?

What do you think are the chances that you will choose to get the flu vaccine this flu season?

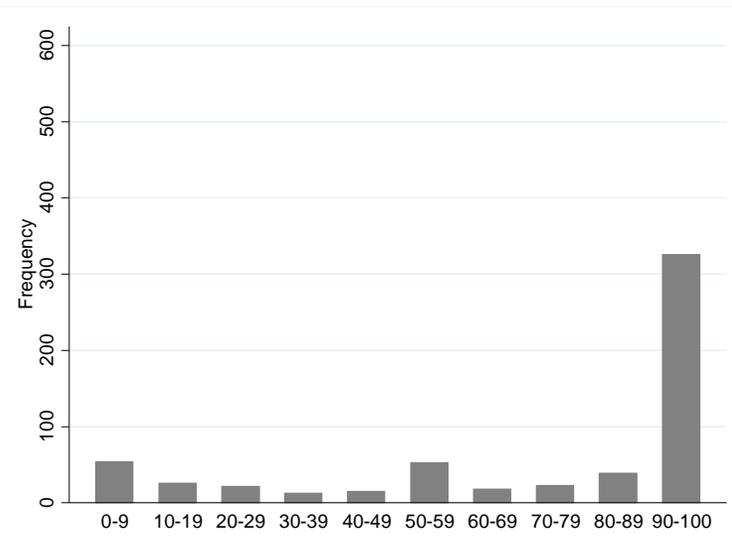
Self-Reported
Behavioral Classification,
Vaccination Expectation

Distribution of self-reported subjective probability of influenza vaccination

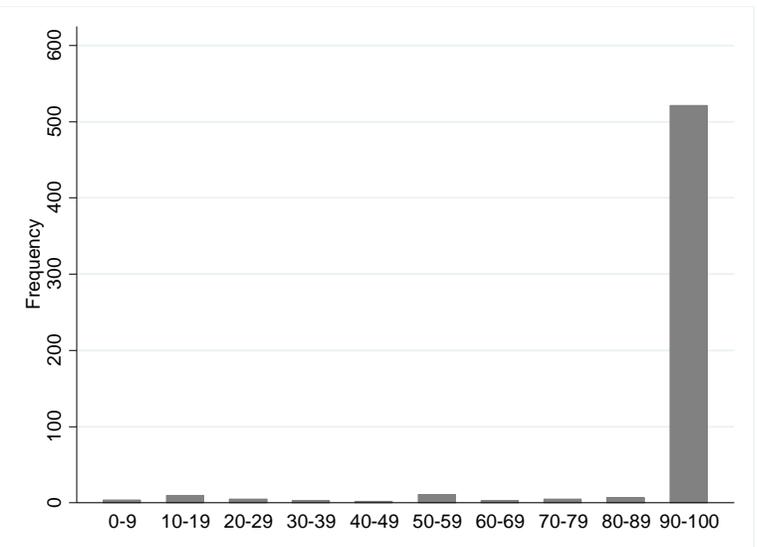
Never



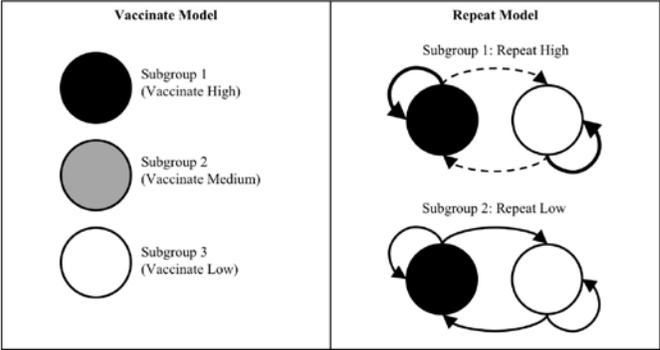
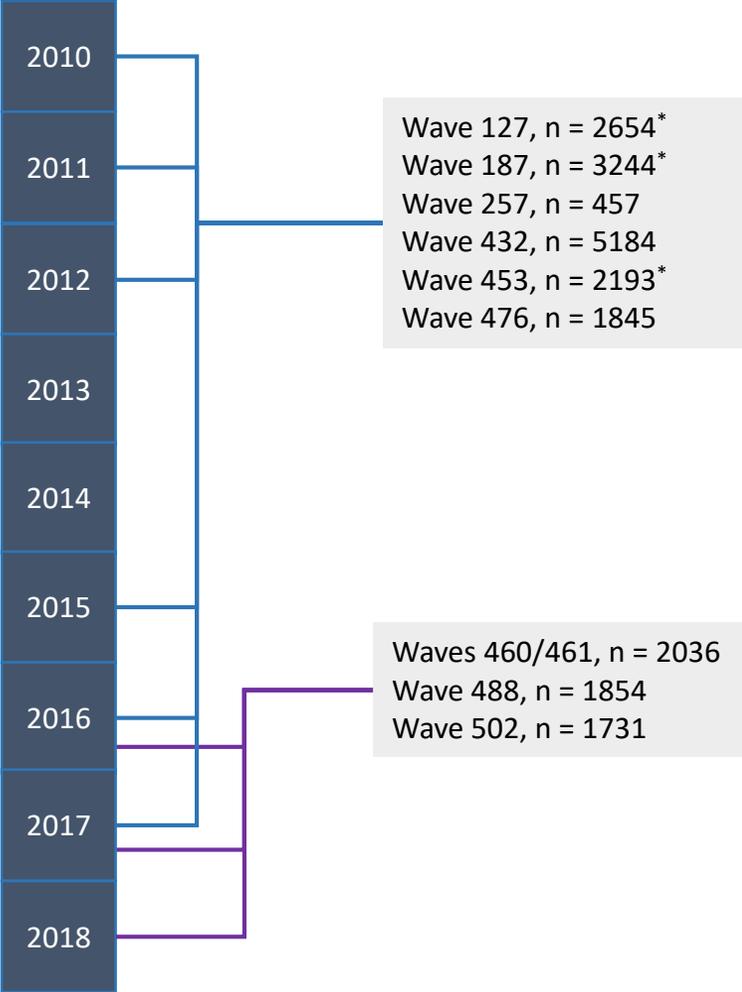
Sometimes



Always



Who are these people?



Would you say that you are generally the type of person who always get vaccinated for the flu (that is, you get vaccinated every year), sometimes get vaccinated for the flu, or never get vaccinated for the flu?

What do you think are the chances that you will choose to get the flu vaccine this flu season?

Age, gender, race/ethnicity, education, income, children under 18, healthcare provider

Behavioral Classification
Never Vaccinators
Sometimes Vaccinators
Always Vaccinators

Self-Reported
Behavioral Classification,
Vaccination Expectation,
Demographics

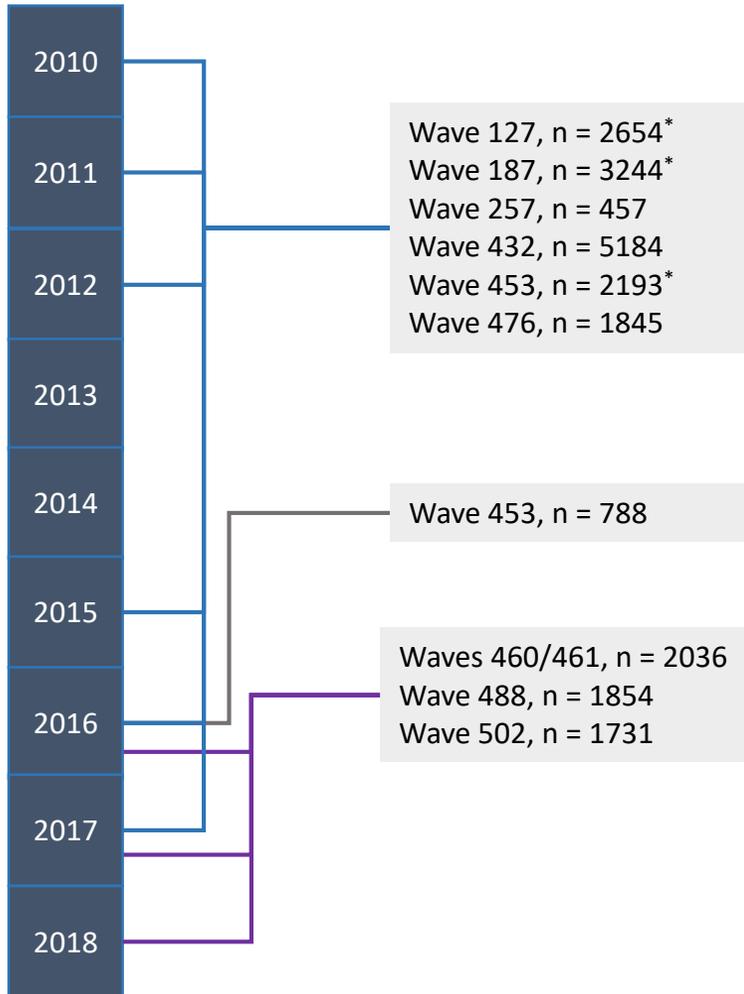
Demographic characteristics among never, sometimes, always vaccinators

	Never	Sometimes	Always	Test of Group Differences ^a
Mean age (SE)	43.4 (1.22)	47.9 (1.46)	55.2 (1.50)	18.7***
% Female	47.4%	58.1%	51.4%	15.1***
% Non-white	24.1%	16.8%	21.7%	10.7**
% Hispanic	21.3%	18.1%	13.3%	12.9**
% Bachelor's	27.4%	32.1%	35.4%	9.3**
% Income				
< \$25,000	22.7%	23.7%	14.9%	14.5***
\$25,000-\$49,999	28.3%	21.3%	27.3%	9.0*
\$50,000-\$74,999	18.2%	17.4%	22.1%	4.2
\$75,000+	30.8%	37.7%	35.8%	7.6*
% with children under age 18 living at home	37.1%	36.3%	28.5%	10.7**
% Healthcare provider	1.8%	5.1%	5.9%	15.5***

^a For age, F-test from ANOVA; otherwise, χ^2 test of independence with 2 degrees of freedom.

* p-value < .05; ** p < .01; *** p < .001

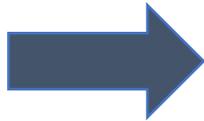
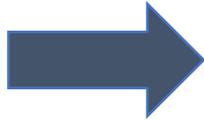
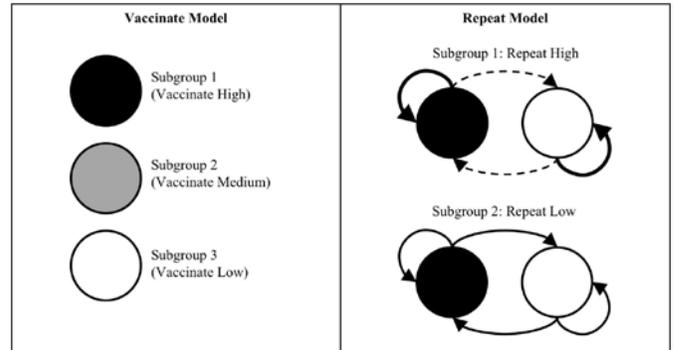
Used open-ended questions to identify beliefs



Wave 127, n = 2654*
 Wave 187, n = 3244*
 Wave 257, n = 457
 Wave 432, n = 5184
 Wave 453, n = 2193*
 Wave 476, n = 1845

Wave 453, n = 788

Waves 460/461, n = 2036
 Wave 488, n = 1854
 Wave 502, n = 1731



When you think of getting yourself vaccinated against the flu, what do you see as the main reasons for [against] getting vaccinated?

Would you say that you are generally the type of person who always get vaccinated for the flu (that is, you get vaccinated every year), sometimes get vaccinated for the flu, or never get vaccinated for the flu?

What do you think are the chances that you will choose to get the flu vaccine this flu season?

Age, gender, race/ethnicity, education, income, children under 18, healthcare provider

Behavioral Classification

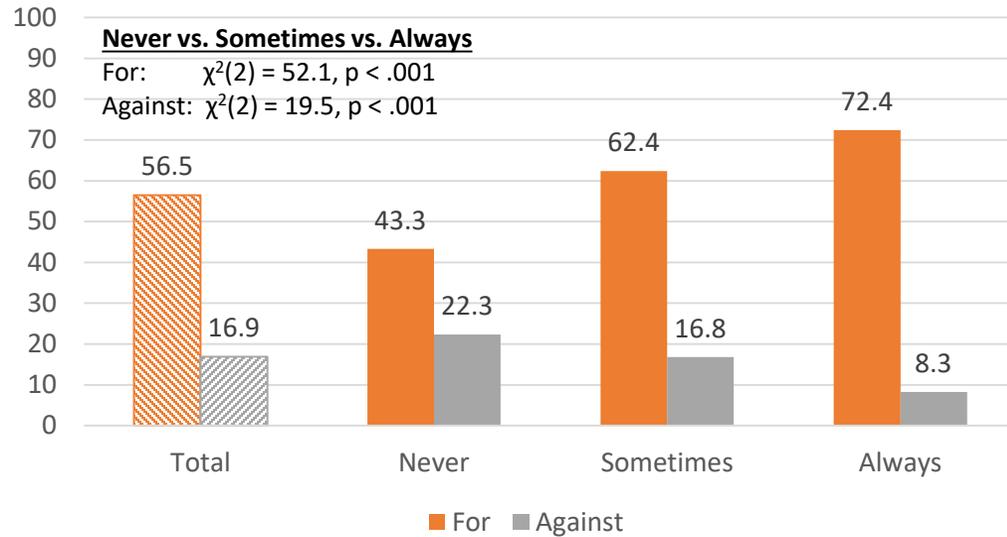
- Never Vaccinators
- Sometimes Vaccinators
- Always Vaccinators

Open-ended Beliefs

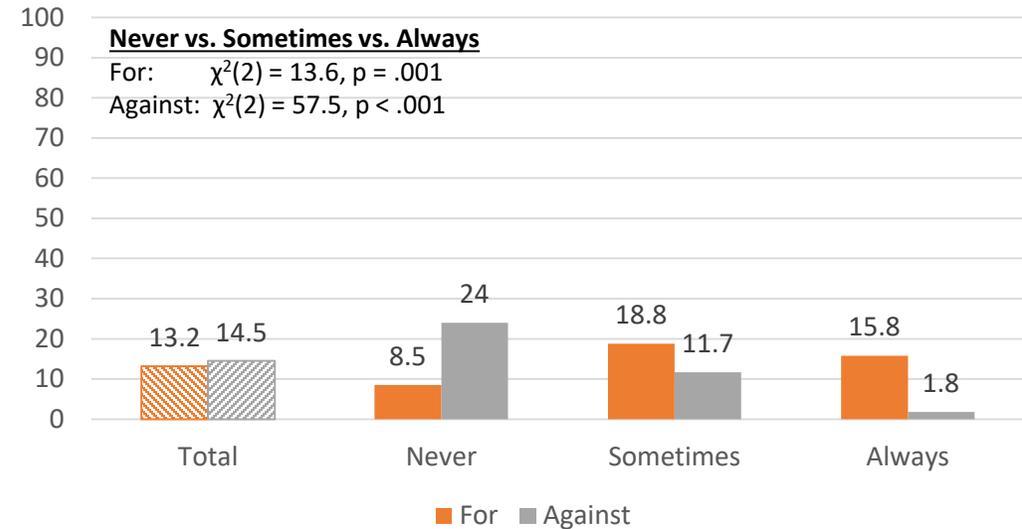
Self-Reported Behavioral Classification, Vaccination Expectation, Demographics

In 2016, open-ended questions assessed reasons for and against vaccination

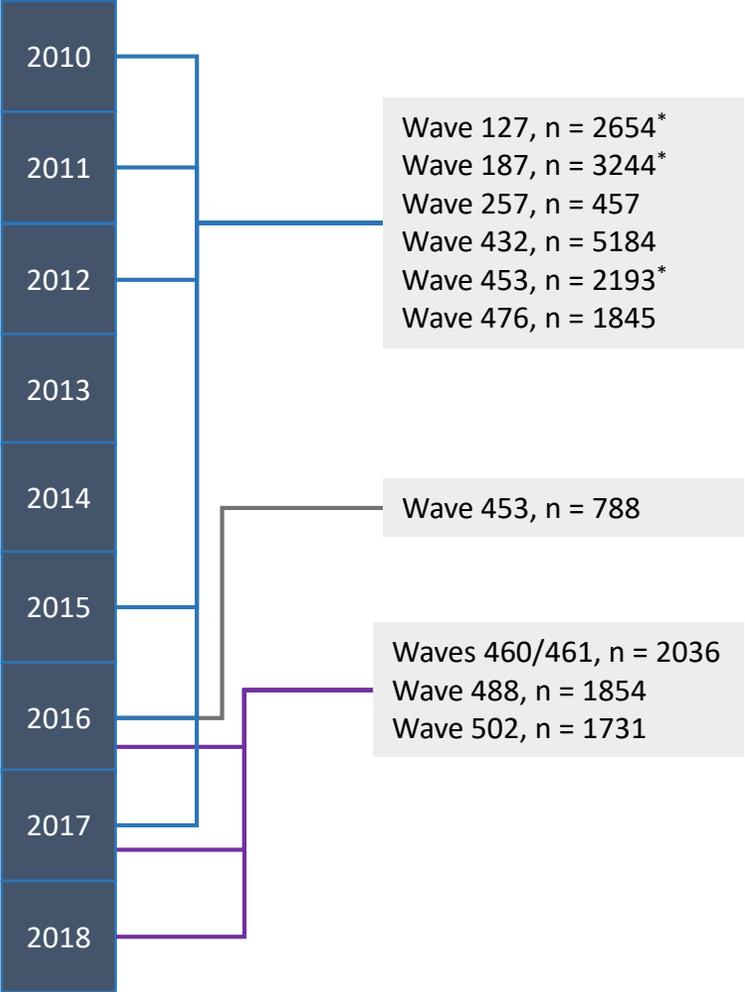
Percent Discussing Efficacy



Percent Discussing Need



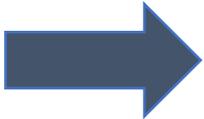
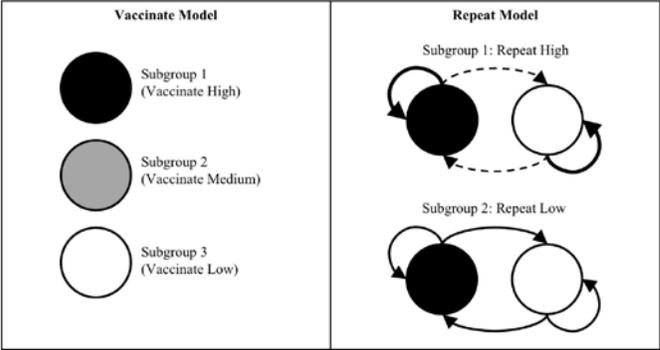
Which we used to create closed-ended questions



Wave 127, n = 2654*
 Wave 187, n = 3244*
 Wave 257, n = 457
 Wave 432, n = 5184
 Wave 453, n = 2193*
 Wave 476, n = 1845

Wave 453, n = 788

Waves 460/461, n = 2036
 Wave 488, n = 1854
 Wave 502, n = 1731



When you think of getting yourself vaccinated against the flu, what do you see as the main reasons for [against] getting vaccinated?

Would you say that you are generally the type of person who always get vaccinated for the flu (that is, you get vaccinated every year), sometimes get vaccinated for the flu, or never get vaccinated for the flu?

What do you think are the chances that you will choose to get the flu vaccine this flu season?

Age, gender, race/ethnicity, education, income, children under 18, healthcare provider

Behavioral Classification

- Never Vaccinators
- Sometimes Vaccinators
- Always Vaccinators

Open-ended Beliefs

- Self-Reported Behavioral Classification, Vaccination Expectation, Demographics, Closed-Ended Beliefs

In 2017, closed-ended questions assessed beliefs from all respondents

Concept	Belief	Never Mean (SD)	Sometimes Mean (SD)	Always Mean (SD)	F	R ²
Efficacy	Flu vaccines protect people from getting sick from the flu.	3.11 (1.08)	3.97 (0.84)	4.38 (0.80)	311.4***	.25
Efficacy	This year's flu vaccine is unlikely to work against this year's flu strains. (R)	2.91 (0.87)	3.29 (0.84)	3.64 (0.86)	113.4***	.11
Need	I do not need to get the flu vaccine to protect myself. (R)	2.29 (0.95)	3.68 (1.09)	4.40 (0.86)	768.2***	.46
Safety	The flu vaccine is not safe. (R)	3.10 (1.10)	4.00 (0.91)	4.44 (0.82)	316.5***	.26
Safety	Vaccines are generally safe for healthy children.	3.45 (1.08)	3.89 (0.95)	4.16 (0.95)	80.1***	.08
Safety	I am worried about side effects from the flu vaccine. (R)	2.55 (1.25)	3.51 (1.15)	4.04 (0.94)	283.9***	.24
Safety	I am worried that the flu vaccine can give me the flu. (R)	2.68 (1.29)	3.68 (1.12)	4.27 (0.93)	321.5***	.26
Trust	I trust health care providers who recommend that I get the flu vaccine.	3.04 (1.05)	3.92 (0.91)	4.27 (0.97)	263.7***	.22
Protect Others	By getting the flu vaccine I protect everyone around me.	2.77 (0.97)	3.71 (0.95)	3.98 (1.03)	268.4***	.23
Protect Others	By getting the flu vaccine I protect my loved ones.	2.82 (0.99)	3.83 (0.90)	4.11 (0.95)	325.6***	.26
Fear of Needles	I am afraid of the needles used for vaccination. (R)	3.91 (1.18)	4.13 (1.06)	4.35 (0.96)	26.6***	.03
Job Requirement	My job requires me to get the flu vaccine.	1.75 (0.85)	2.14 (1.12)	2.32 (1.32)	42.7***	.04
Medical Reason	I have a medical reason that makes it important that I get the flu vaccine.	1.82 (0.91)	2.33 (1.24)	2.74 (1.46)	91.4***	.09
Medical Reason	I have a medical reason that keeps me from getting the flu vaccine. (R)	4.04 (1.09)	4.29 (0.85)	4.48 (0.80)	35.4***	.04
Convenience	It is inconvenient for me to get the flu vaccine. (R)	3.81 (1.02)	3.89 (1.05)	4.29 (1.03)	36.3***	.04
Cost	I cannot afford the cost of getting the flu vaccine. (R)	4.12 (0.92)	4.26 (0.87)	4.60 (0.71)	51.8***	.05
Time	I don't have time to get the flu vaccine. (R)	3.95 (0.92)	4.12 (0.88)	4.51 (0.75)	68.9***	.07
Availability	I am concerned about whether the flu vaccine will be available in my area. (R)	4.16 (0.78)	4.10 (0.84)	4.32 (0.83)	11.3***	.01

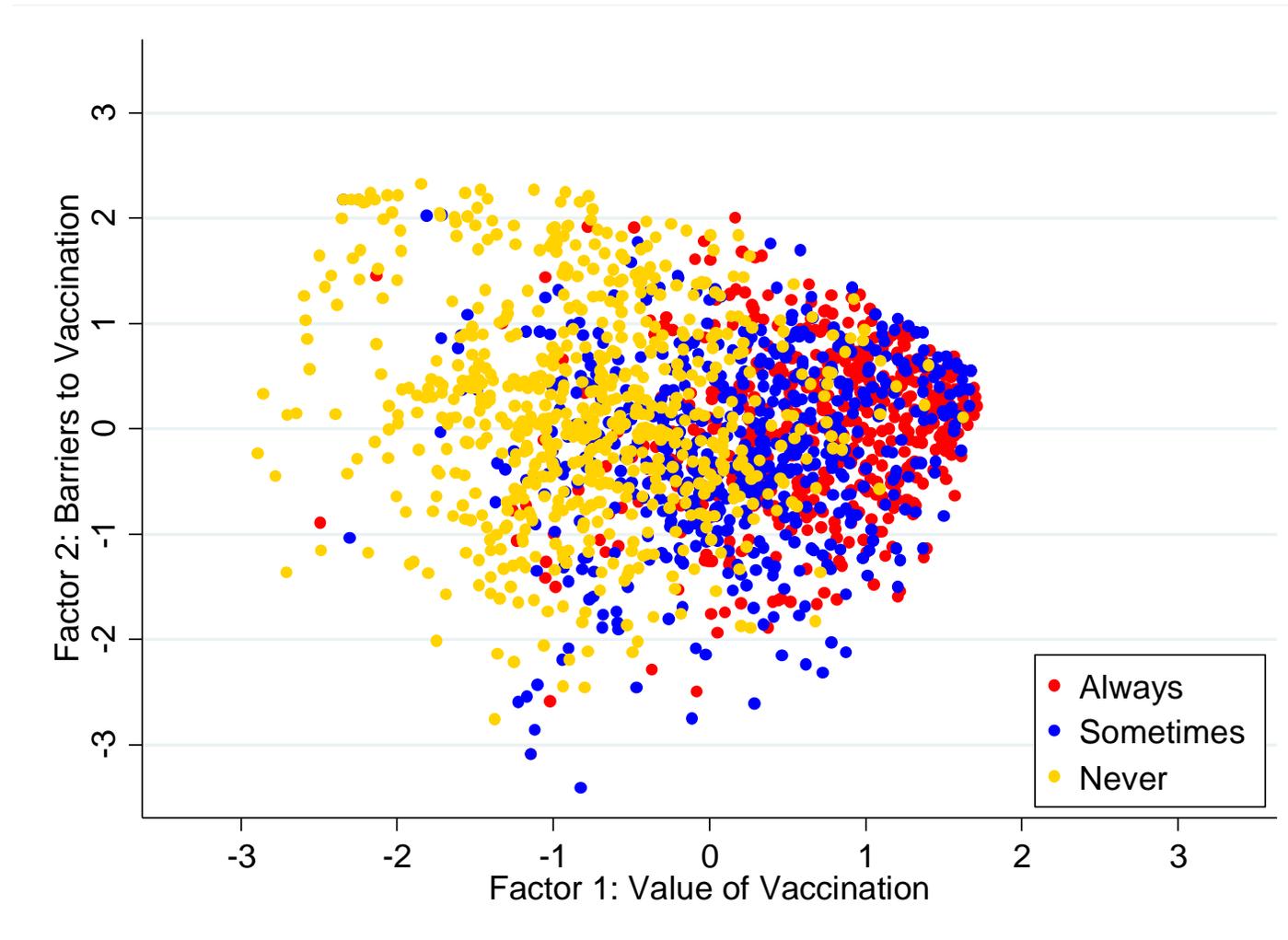
NOTE: Responses coded 1 = strongly disagree, ..., 5 = strongly agree; Responses to anti-vaccine statements reverse coded (R)

Found two strong factors using exploratory factor analysis

Concept	Belief	Factor 1	Factor 2	
Efficacy	Flu vaccines protect people from getting sick from the flu.	0.74	-0.23	Value of Vaccination
Efficacy	This year's flu vaccine is unlikely to work against this year's flu strains. (R)	0.52	-0.03	
Need	I do not need to get the flu vaccine to protect myself. (R)	0.75	-0.12	
Safety	The flu vaccine is not safe. (R)	0.80	-0.01	
Safety	Vaccines are generally safe for healthy children.	0.57	-0.07	
Safety	I am worried about side effects from the flu vaccine. (R)	0.73	0.07	
Safety	I am worried that the flu vaccine can give me the flu. (R)	0.72	0.08	
Trust	I trust health care providers who recommend that I get the flu vaccine.	0.68	-0.12	
Protect Others	By getting the flu vaccine I protect everyone around me.	0.75	-0.37	
Protect Others	By getting the flu vaccine I protect my loved ones.	0.78	-0.38	
Fear of Needles	I am afraid of the needles used for vaccination. (R)	0.27	0.38	Barriers to Vaccination
Job Requirement	My job requires me to get the flu vaccine.	0.04	-0.39	
Medical Reason	I have a medical reason that makes it important that I get the flu vaccine.	0.21	-0.34	
Medical Reason	I have a medical reason that keeps me from getting the flu vaccine. (R)	0.32	0.41	
Convenience	It is inconvenient for me to get the flu vaccine. (R)	0.31	0.55	
Cost	I cannot afford the cost of getting the flu vaccine. (R)	0.38	0.54	
Time	I don't have time to get the flu vaccine. (R)	0.39	0.55	
Availability	I am concerned about whether the flu vaccine will be available in my area. (R)	0.23	0.60	

NOTE: Exploratory factor analysis with principal factors method and no rotation, extracting two factors with eigenvalues of 5.7 and 2.2, respectively.

Plotting factor scores shows clear group differences in Value of Vaccination



Methodological conclusions

- Ongoing panels enable both planned and unplanned analyses
 - Engage diverse topics and investigators over long periods of time
 - Collecting analogous behavioral data across many years can enable policy-meaningful classifications
- Qualitative assessments valuable on large surveys
 - Allows panelists to volunteer issues most important to them
 - Gives traditional pilot data, but in numbers sufficient for data-driven questionnaire design
- Drawing together behavioral and psychological (e.g., belief) data gives a rich assessment of people's mental models

Substantive conclusions

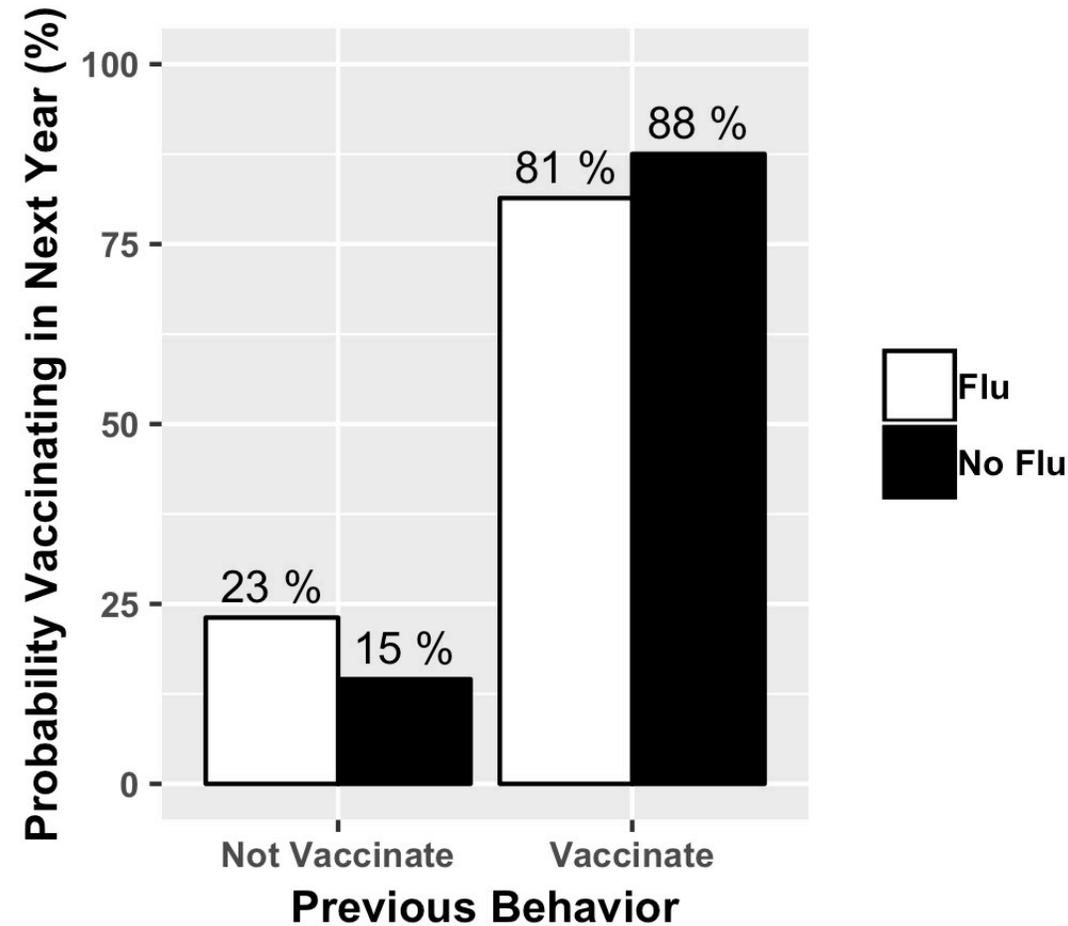
- Strong empirical evidence for three groups, distinct in both behavior and self-perception
 - Differ in propensity to repeat, rather than propensity to vaccinate
 - Always a stickier state than Never – a hopeful finding for intervention
 - Self-reports a decent proxy for behavior
- Closed-ended belief responses partition into Value and Barriers
 - Behavior appears to vary mostly on Value
 - Data-driven development helps ensure domain of beliefs is covered
 - Provides useful scale for future research



Infectious Disease Risk Perception Surveys on the ALP

		ALP Survey Wave	Sample Size
2009	Eleven waves on H1N1 Flu	76-82, 94, 101, 110, 127	1873 - 2654
2010			
	Seasonal/H1N1 Flu	153	2628
2011	Seasonal/H1N1 Flu	187	3211
	Seasonal Flu / Social Networks (R21)	216	534
	Seasonal Flu (PHASYS)	220	1052
2012	Seasonal Flu (R21)	257	459
2013			
2014	Ebola (Election survey)	410	1236
2015	Seasonal Flu / Antivirals (Survey of Surveys)	432	5252
	Zika	451	1015
2016	Nanovaccine / Seasonal Flu	453	1022
	Seasonal Flu (R01)	460/461	2040
2017	Seasonal Flu (R01)	476	1852
	Seasonal Flu (R01)	4883	1857
2018	Seasonal Flu (R01)	502	1819
	Child Vaccine/Conspiracy	505	647
	Seasonal Flu (R01)	512	1749
2019	Seasonal Flu (R01)	527	1695
	Seasonal Flu (R01)	532	1570
2020	Seasonal Flu (R01)	Planned	Planned

Experiencing flu shifted these probabilities slightly



Results reported in Walsh, M.M., Parker, A.M., Vardavas, R., Nowak, S.A., Kennedy, D.P., & Gidengil, C.A. (under review). *The stability of influenza vaccination behavior over time: A longitudinal analysis of individuals across eight years.*

Sidebar: Do people endorse free riding?

- Used qualitative data to detect people voluntarily endorsing free riding behavior.
- Out of 1022 respondents, only 1 coded as stating free riding as a reason against vaccination:
 - “I believe the country COULD be overly/abundantly vaccinated and to date I haven’t been ill with the virus so I choose not to.”
- In contrast, 116 people cited protecting others as a reason for getting vaccinated.