Impact of Text-message Recall for Influenza Vaccination by a Health Department

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New York City Department of Health and Mental Hygiene

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Introduction

Citywide Immunization Registry (CIR)

- Immunization Information System (IIS) for New York City (NYC)

- Started citywide since 1997

- Mandatory reporting of immunizations for children 0-18 years

- Reporting methods
  - HL7 Web service
  - Online Registry
  - Batch file transfer

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Text messaging functionality

- 2002 - Online Registry
    - Health care providers to report vaccinations and look up children's records

- 2015 - Text messaging service implemented
    - Recall patients via text messaging by sending one-time or recurrent texts
    - No cost to providers
    - Opt-out option by recipients
    - 20,000 text messages used in a typical month

- Literature has shown text messaging and multiple messaging to be successful methods of recalling individuals for their vaccinations [1]
    - Few studies on text message recall by health departments

1. Stockwell et al., *AJPH*, 2012; Feb, 102(2) e15-e21; Crocker-Buque et al., BMC Public Health. 2017 Jun 8;17(1):556
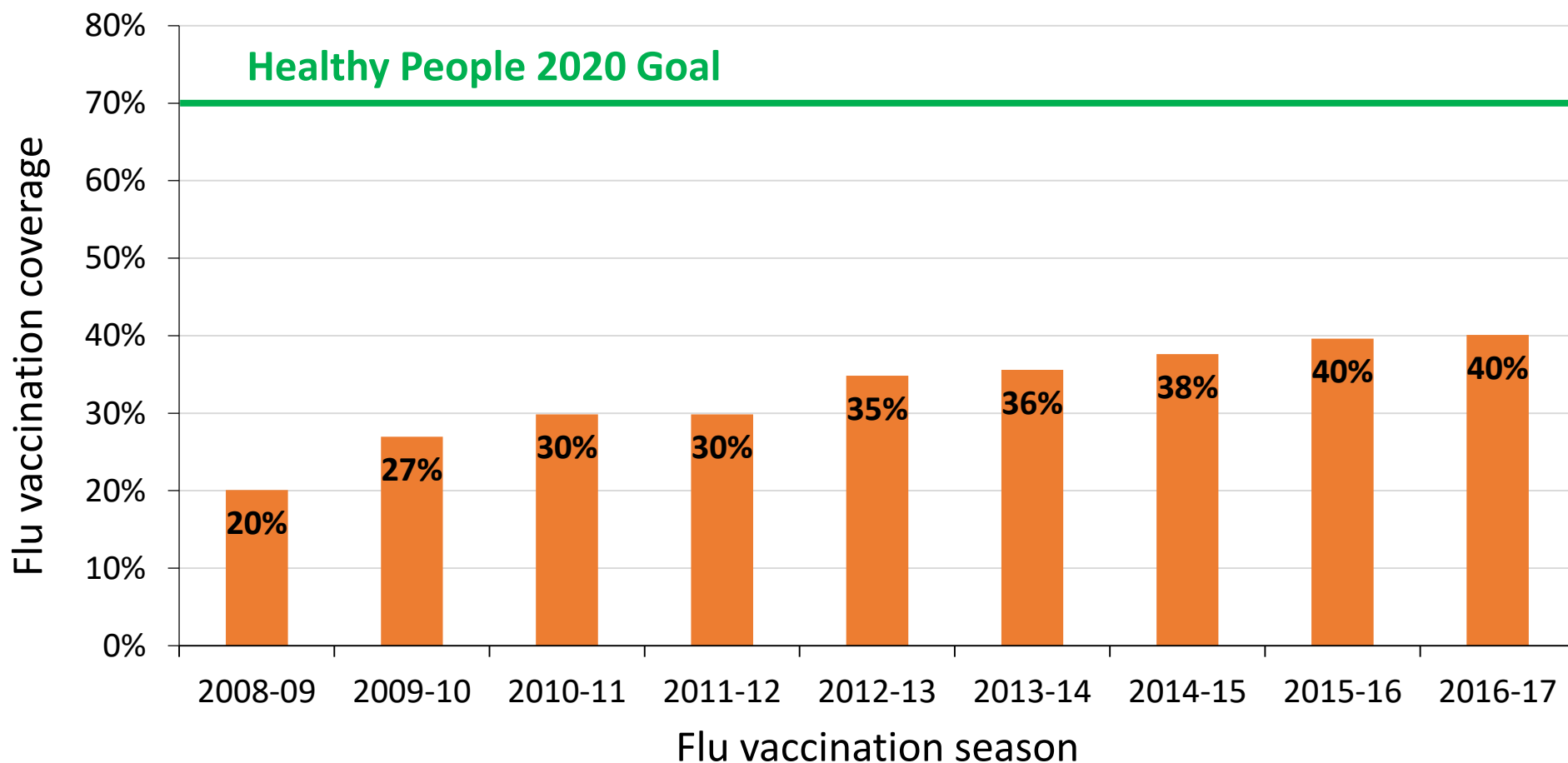
Influenza coverage among NYC 6-59 month olds: 2008-2017

- Largest drop observed between the 2015-16 and 2016-17 seasons
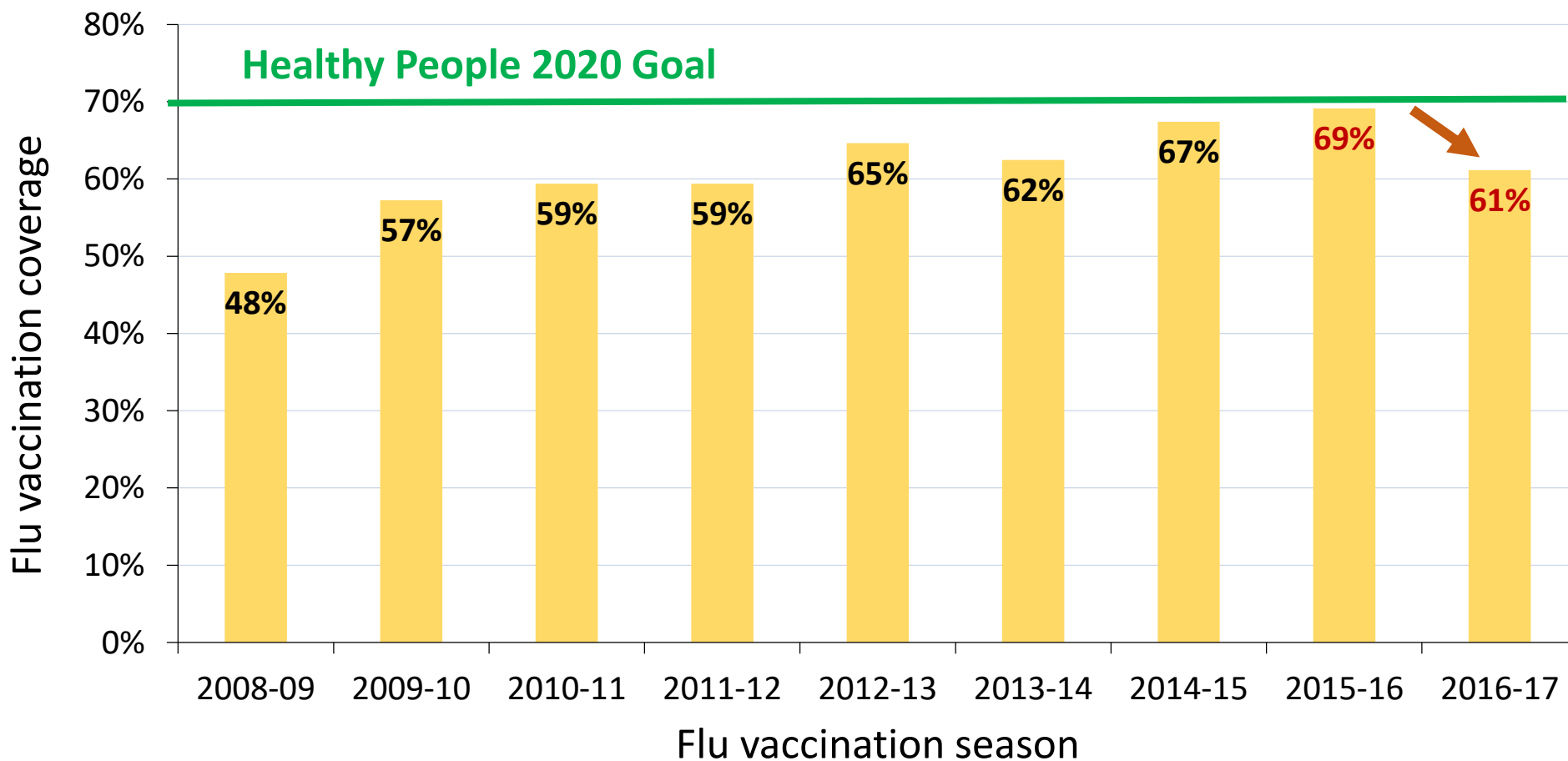
Influenza coverage among NYC 5-18 year olds: 2008-2017

- Far below Healthy People 2020 goal of 70%

Objectives

Conduct the first time flu vaccination text messaging project to outreach to NYC children and adolescents who did not receive a flu vaccine in 2016-17 and had not yet received a flu vaccine in 2017-18 to receive their flu vaccine

1. Utilizing CIR's text messaging service to increase flu vaccination coverage among NYC children and adolescents

2. Using CIR to evaluate the effectiveness of text messaging recall for flu vaccination sent by the NYC Health Department

Methods

Cohort Selection

- 15 months to 18 years old

- No flu vaccine in 2016-17 and 2017-18

- Active in CIR
  - Last address in NYC
  - Not move out from NYC (MOGE – <u>M</u>oved <u>O</u>r <u>G</u>one <u>E</u>lsewhere)
  - Last immunization received after
    - 1 year of age   for   15-59 months old
    - 4 years of age   for   5-10 years old
    - 9 years of age   for   11-18 years old

- Mobile phone number was present

Population of Mobile Phones

- 2010 – Mobile phone field was created

- Prior to 2015 – Mobile phone was poorly captured in the CIR

- Mobile phone verification service to verify and distinguish **mobile phone number** present in the **home field**, populate to the **mobile field**
  - August 2015 – Populated >510,000 records of children aged 0-18 years
  - October 2017 – Populated >370,000 records of children aged 0-18 years

Sampling

- 323,620 unique mobile phones associated with 388,569 eligible children

- Two waves – October and December, 2017

- Planned to submit up to 75,000 text messages a month
  - 100,000 message contract limit each month

- Initial random samples of all mobile phones for the 2 waves:

Wave	Month	Intervention group	Control group
1	October	74,931	74,930
2	December	86,880	86,879

Intervention

- **Intervention group:**
  A general message focusing on childhood flu vaccination was sent to the parent/guardians via mobile text
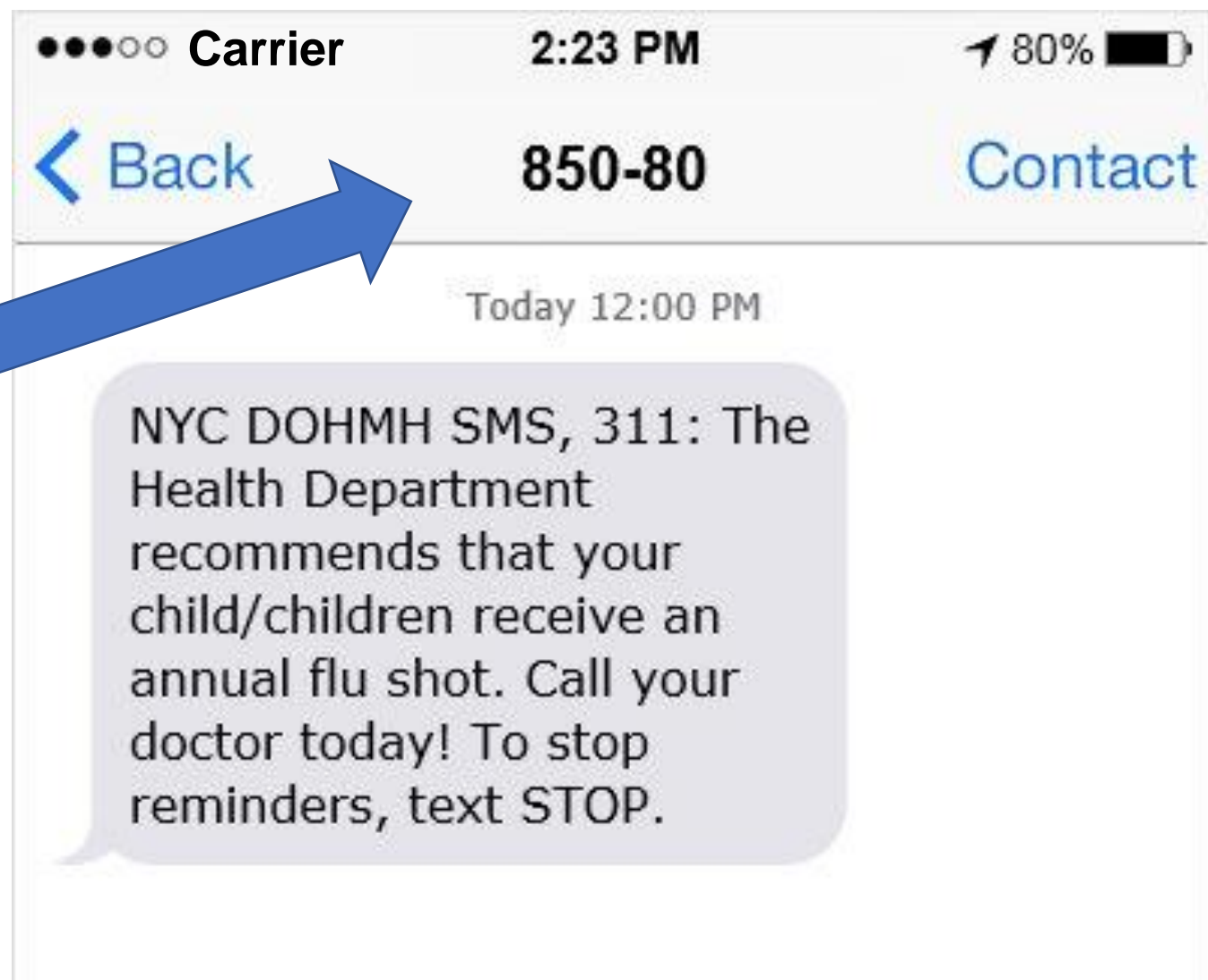
- **Control group:**
  No text message from this study was sent to the parent/guardians

- **Measures:**
  Proportion of children who received a flu vaccine within 28 days of receiving text message was compared to proportion of children vaccinated in the same period in the control group

Text message

Short-code number

NYC DOHMH SMS, 311: The Health Department recommends that your child/children receive an annual flu shot. Call your doctor today! To stop reminders, text STOP.

Results

Wave 1

- October 25-26, 2017
  - 74,931 mobile phone numbers sent to the text messaging service
  - October   -   72% received text
  - Opted out rate   -   4.9%
- Within 28 days following text message:

Group	Adjusted population*	Received flu vaccine
Intervention	74,553	3,243 (4.3%)
Control	74,526	3,108 (4.2%)

*Adjusted population: Removed patients who received flu vaccines before the text due to late reporting to the CIR

# Wave 1 – Percentage of Children Vaccinated Stratified by Age Group

- Within 28 days following text message:

Group	15-59 months	5-10 years	11-18 years	All ages
Intervention	4.7%	4.7%	3.9%	4.3%
Control	4.3%	4.4%	3.9%	4.2%
Odds ratio	1.10	1.05	1.00	1.05
95% CI	(1.00, 1.21)	(0.96, 1.15)	(0.93, 1.09)	(0.99, 1.10)

ORANGE – Borderline significant difference
GREEN – Not significant difference

Wave 1 – Number of Children Vaccinated Stratified by Age
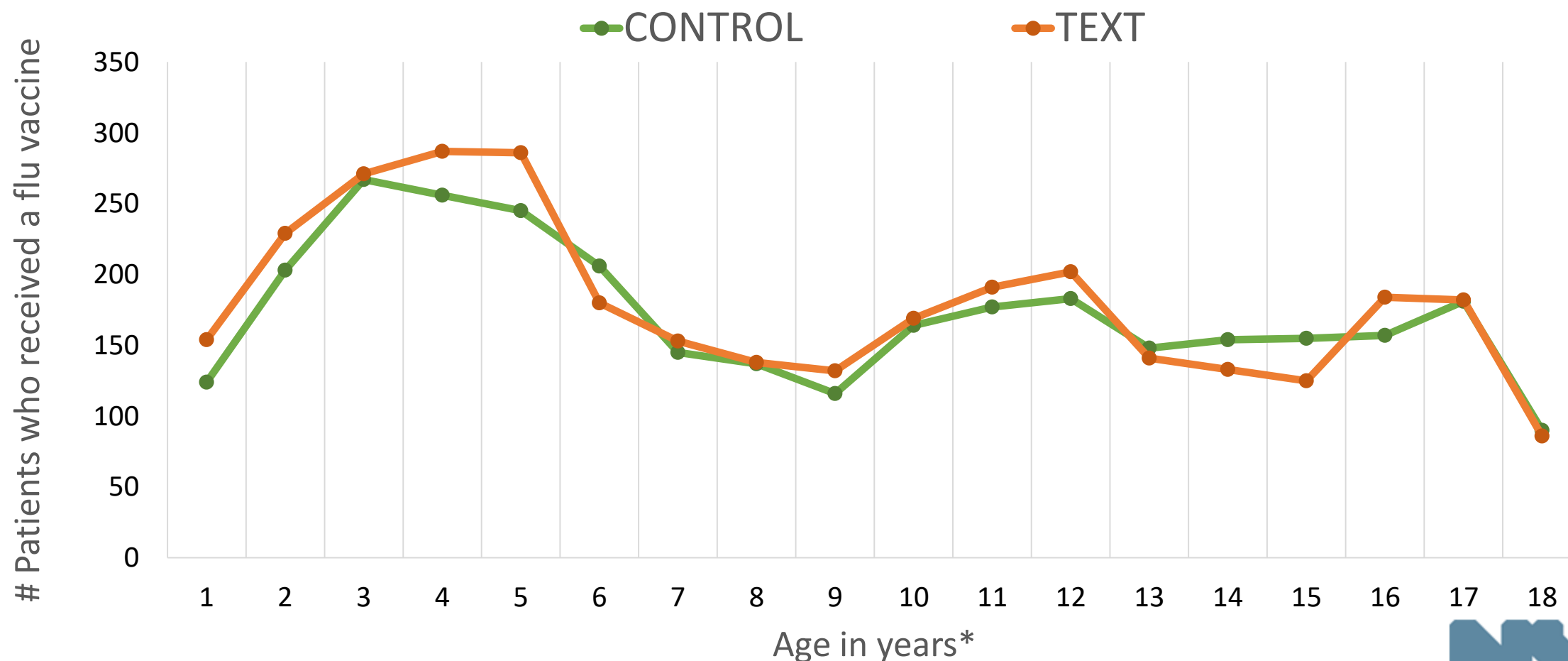
*Age 1 category contains only patients 15-18 months old.

Wave 2 – Revised Methods

- Wave 1 showed largest impact on individuals aged 15 months through 5 years old

- Revised methodology for Wave 2 based on findings from Wave 1
  - Limited cohort
    - 15 months old through 5 years old

Month	Intervention group	Control group
December	27,221	26,835

  - Two messages 1 week apart
    - December 14, 2017
    - December 21, 2017

Wave 2

- December 14, 2017 followed by December 21, 2017
  - 27,221 mobile phone numbers sent to the text messaging service
  - December 14 and 21   -   49% (13,447) received text
  - At least one text   -   82% (22,296) received text
  - Opted out rate   -   4.7%
- Within 28 days following the second text message

Group	Adjusted population*	Received flu vaccine
Intervention	27,138	848 (3.1%)
Control	26,751	787 (2.9%)

*Adjusted population: Removed patients who received flu vaccines before the text due to late reporting to the CIR

Wave 2 – Percentage of Children Vaccinated Stratified by Age

- No significance differences by age

Group	Age 1*	Age 2	Age 3	Age 4	Age 5	All ages
Intervention	3.7%	3.0%	3.0%	3.2%	3.1%	3.2%
Control	3.5%	2.8%	2.6%	2.8%	3.3%	2.9%
Odds ratio	1.05	1.09	1.14	1.14	0.75	1.06
95% CI	(0.79, 1.40)	(0.87, 1.35)	(0.93, 1.40)	(0.93, 1.41)	(0.92, 1.13)	(0.96, 1.17)

GREEN – Not significant different

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*Age 1 category contains only patients 15-18 months old.

Text Message Failure Rate by Carrier

Wireless Carrier	Wave 1	Wave 2
Carrier A	39%	58%
Carrier B	35%	43%
Carrier C	31%	31%
Carrier D	12%	13%
Carrier E	8%	10%
Other (Aggregated)	8%	4%
Overall	**20,256/74,481** **(27%)**	**16,988/53,189** **(32%)**

- Reasons for delivery failure
  1. Inactive mobile phone numbers
  2. Short-code message blocking

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Limitations

- MOGE information for children are not well captured in the CIR

- Study children may have been more hesitant to flu vaccination
  - Children did not receive flu vaccine in the previous season

- Recall was late in season and around holidays

- Large number of failed texts prevented to reach to the entire intervention group

- Text message content may have been too general

- No way to assess if the messages were actually read

Conclusions

- Impact of text messaging on flu vaccination in this population was small

- Largest impact was on younger children 15 months – 59 months

- Issues on low delivery rate identified from the text messaging service

Future Plans

- Work with providers to improve mobile phone and MOGE reporting to the CIR

- Reduce number of failed messages

- Include children who received a flu vaccine in the previous season

- Send text earlier in the season for flu vaccination

- Include more targeted message content
  - Clinic information
  - Spanish language
  - Links to educational materials

Thank You!

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Bureau of Immunization

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Additional Slides

Online Registry Text Messaging Functionality

- Deployed in August 2015 in CIR's Online Registry (OR).

- Enable providers to send text messages to their own patients.

- Providers select vaccine types and children to be included for a recall.

- Schedule one-time or recurrent jobs in OR.

- OR submits mobile phone number of patient to a text messaging service.

- Over 199 facilities have used, 25 facilities monthly average.

- Typical message use 20,000 each month.

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Stratified by Age Group at least one message received

Within 28 days following text message:

Group	15-59 months	5-10 years	11-18 years	All ages
Intervention	4.9%	4.9%	3.9%	4.5%
Control	4.3%	4.4%	3.9%	4.2%
Odds ratio	**1.15**	**1.12**	**1.00**	**1.08**
95% CI	(1.04, 1.27)	(1.01, 1.23)	(0.92, 1.09)	(1.02, 1.14)

GREEN – Substantially difference
RED – Not statistically significant difference

72% patients received the text message successfully

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1 or 2 Messages Results

- Wave 2 – patients attempted to send two messages

- Vaccination coverage after receiving texts:

Number of messages	Adjusted population*	Received flu vaccine
1 message	7,785	198 (2.54%)
2 messages	13,403	337 (2.51%)

- No difference between 1 and 2 messages

*Adjusted population: Removed patients who received flu vaccines before the second text

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Text Message Failure Rate by Carrier Details

Wireless Carrier	Wave 1	Wave 2
Company A	2,641/6,829 (39%)	2,241/3,882 (58%)
Company B	11,065/32,033 (35%)	9,816/22,825 (43%)
Company C	4,353/14,177 (31%)	3,025/9,706 (31%)
Company D	1,429/12,066 (12%)	1,220/9,533 (13%)
Company E	671/8,189 (8%)	660/6,661 (10%)
Other (Aggregated)	97/1,187 (8%)	26/582 (4%)
Overall	**20,256/74,481** **(27%)**	**16988/53189** **(32%)**

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Longer Follow Up Time - Up to February 1, 2018

- Wave 1 – No difference

Group	Adjusted population*	Received flu vaccine
Intervention	74,553	8282 (11.1%)
Control	74,527	8085 (10.9%)

- Wave 2 - No difference

Group	Adjusted population*	Received flu vaccine
Intervention	27,137	1426 (5.3%)
Control	26,752	1416 (5.2%)

*Adjusted population: Removed patients who received flu vaccines before the text with late reporting (no restriction date up to February 1, 2018) to the CIR