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Use of text messaging to support completion of vaccination schedules

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Vaccine Series

- Number of vaccines are dosage series
 - *Pediatrics*: primary childhood vaccine series, influenza vaccine for certain children
 - *Adolescents*: human papillomavirus vaccine, meningitis vaccine
 - *Adults*: New shingles vaccine
 - *Travel vaccines*: Hepatitis A and B, Dengue vaccine

Vaccine Series Completion

Can be difficult to complete on time

- Only $\sim 2/3$ of U.S. 13-17 year olds who started the HPV vaccine series completed it (NIS-Teen)
- For children who need 2 doses of influenza vaccine in a season: 40-60% of those who receive 1st dose get 2nd dose
 - (Hofstetter *et al* Prev Med 2012
Pabst *et al* Vaccine 2013)
 - Timeliness of 2 doses: Average time was twice recommended

Reminder-recalls

- Remind about a dose that is coming up and recall notifies about a dose that is overdue
- Widely recommended
 - US Task Force on Community Preventive Services:
 - median increase of **8%**

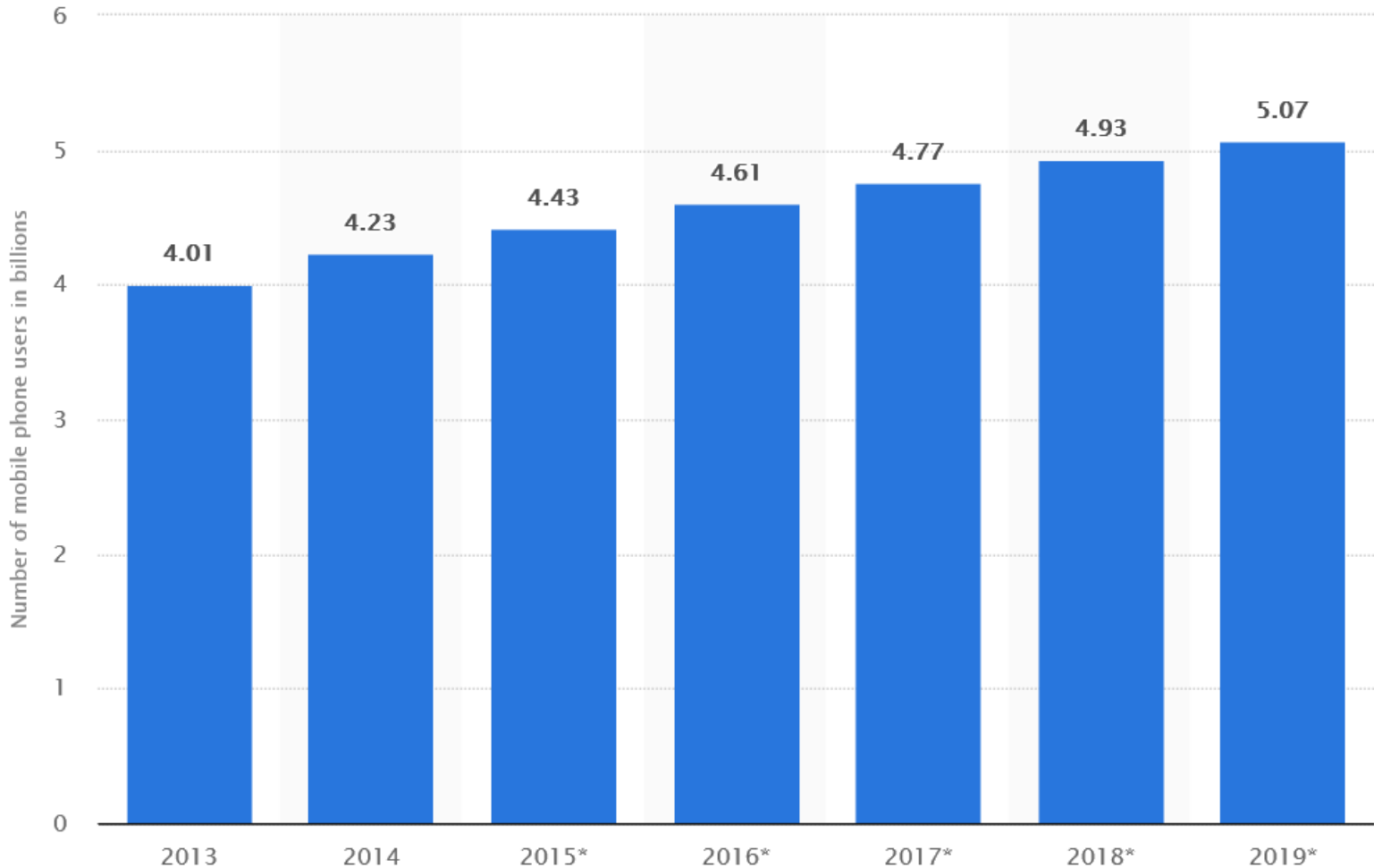
Briss et al, Am J Prev Med 2000; Jacobson, Szilagyi et al, Cochrane Database Syst Rev 2005;2006

- Traditional reminder-recalls in low-income, adolescent and rural populations
 - Not very successful

Irigoyen M et al, Ambul Pediatr 2006; LeBaron et al, Arch Pediatr Adolesc 2004; Hambidge et al, Arch Pediatr Adolesc Med 2004; Kempe et al, J Pediatr 2001, MMWR October 2012

Mobile phone use

Number of mobile phone users worldwide from 2013 to 2019 (in billions)



Text Messages as Vaccination Reminders

- Stability of contact information
 - Cell phone more stable over 6 month period than home address and phone Clark *et al*, *Pediatrics* 2011
- Grab attention
- Reach intended participant
- Stay visible on phone
 - Easily accessible, always with the person
- Low literacy (160 characters)
- Parental interest (Kharbanda *et al*, *AJPH* 2009, Hofstetter *et al*, *Prev Med* 2013, Ahlers-Schmidt *et al*, *Prev Med* 2010, Clark *et al*, *Pediatrics* 2011)
- Provider interest mixed (Hofstetter *et al*, *Prev Med* 2013; Hart *et al*, *Telemed J E Health* 2011)

Barriers to Vaccination

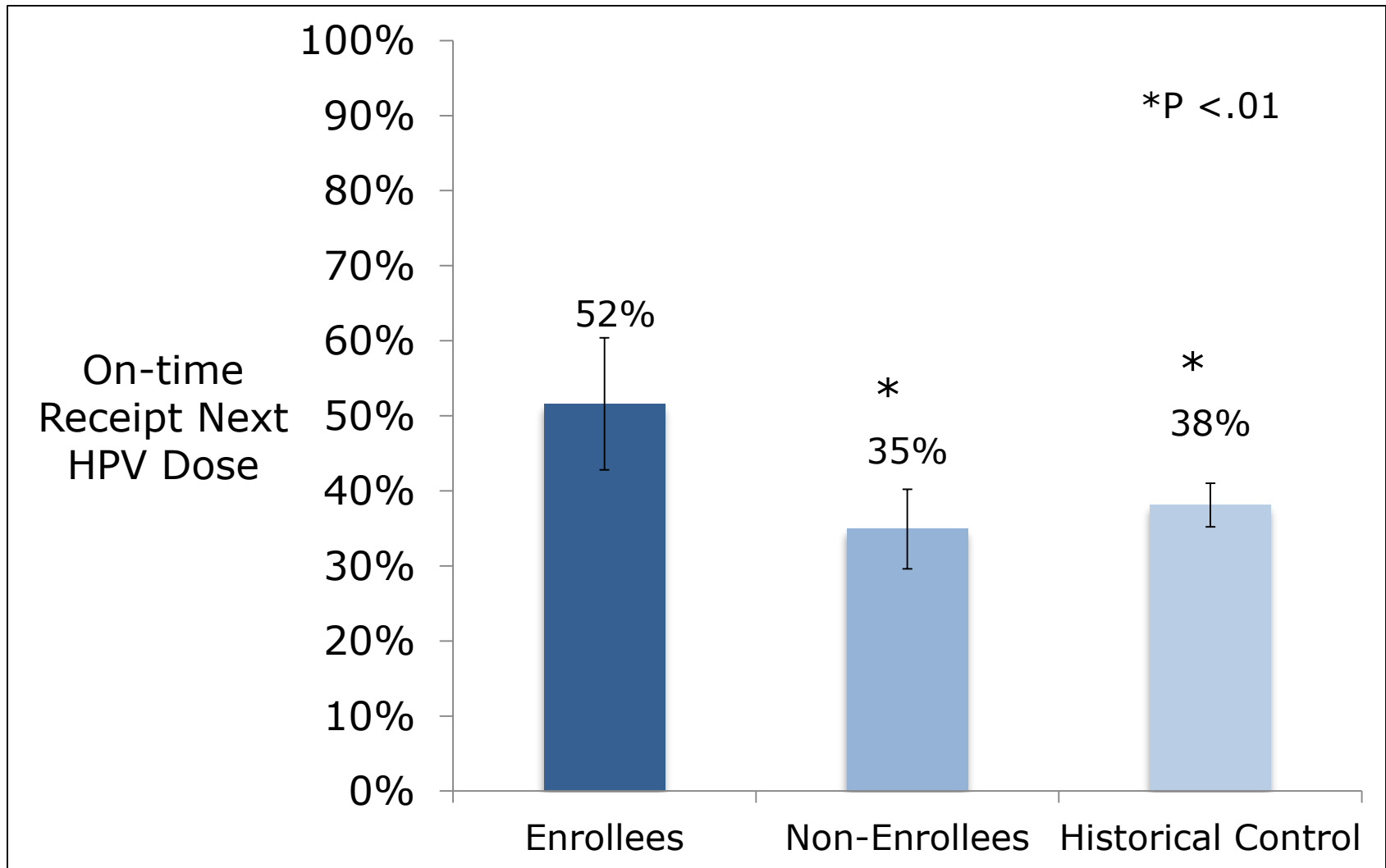
- Failure to remember to return
 - Forgetting (20% time)
- Education needs/lack health literacy regarding vaccination
 - Lack of knowledge need another dose
 - Efficacy of vaccine
 - Vaccine safety fears

Use of Text Message Reminders for Human Papillomavirus Vaccine (HPV)

- 9-20 year olds given enrollment card to sign up
 - Visited one of 9 practices
 - Received HPV1 or HPV2
- Signed up using interactive voice response system
- 3 weekly text message reminders starting 3 weeks prior to due date for next dose
- Compared enrollees (n= 124) vs. non-enrollees (n = 308) and historical controls (n= 1080)

Khambanda *et al*, *Vaccine* 2011

On-time Receipt of Next HPV Vaccine Dose



Impact on HPV vaccine series completion

- Effective adolescent population (49% vs 31% with 3 doses, $p < .001$) Rand J Adolesc Health. 2016
- May not be effective young adults/college age (34% vs. 32%) Richman J Am Coll Health. 2016; (17.2% vs. 18.9%) Patel Vaccine. 2014,

Second Dose Influenza Text Reminders

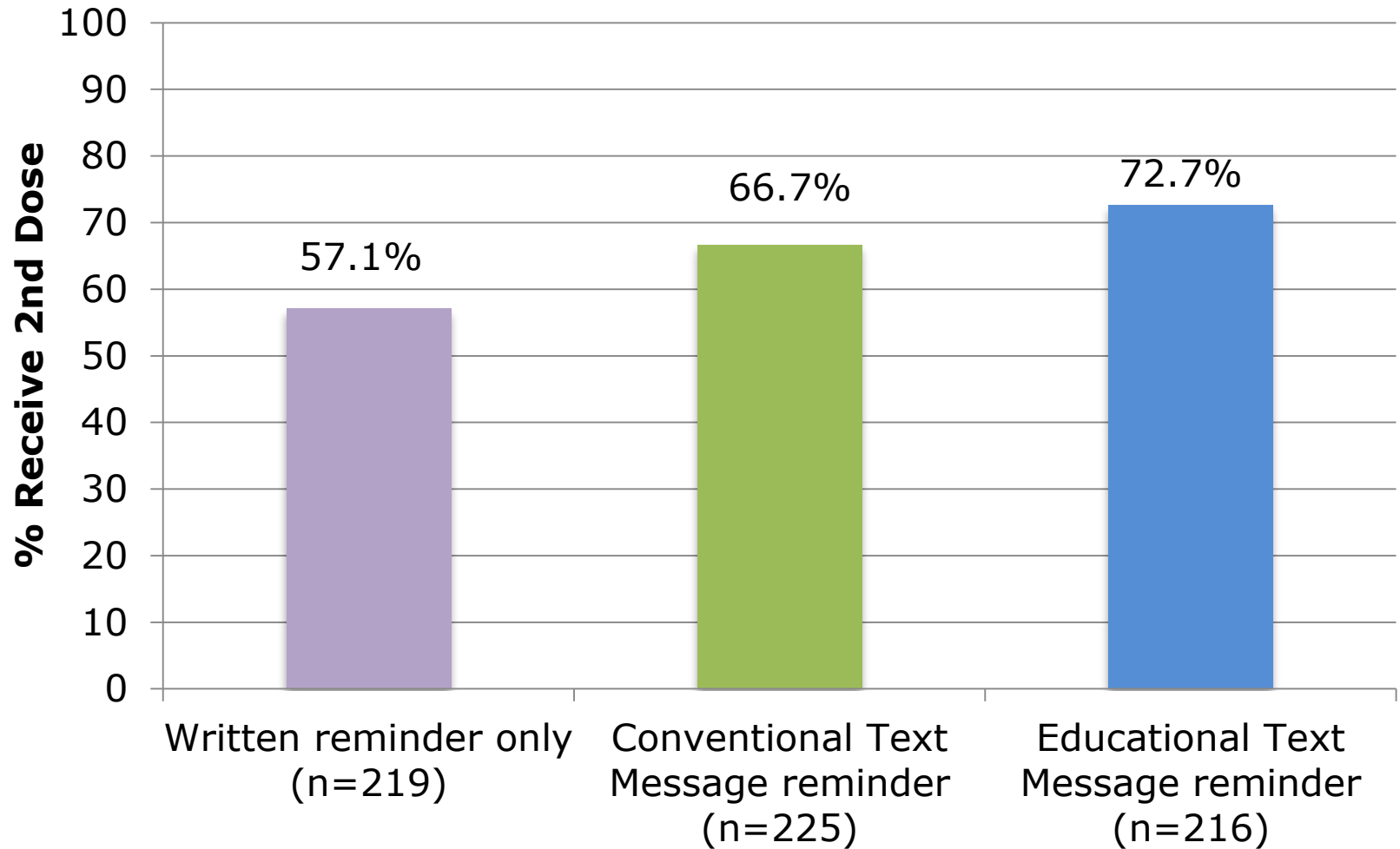
Parents (n=660) of 6 months-8 years need 2 doses a given season (2012-13): 3 community clinics in NYC

Randomized

- *Usual care*: Written reminder at enrollment only
- *Conventional text message reminders*
 - Date after which due; site-specific walk-in hours
- *Educational text message reminders*
 - Plus: Educational information
 - One interactive: timing is important; why 2 doses are needed; adverse effects

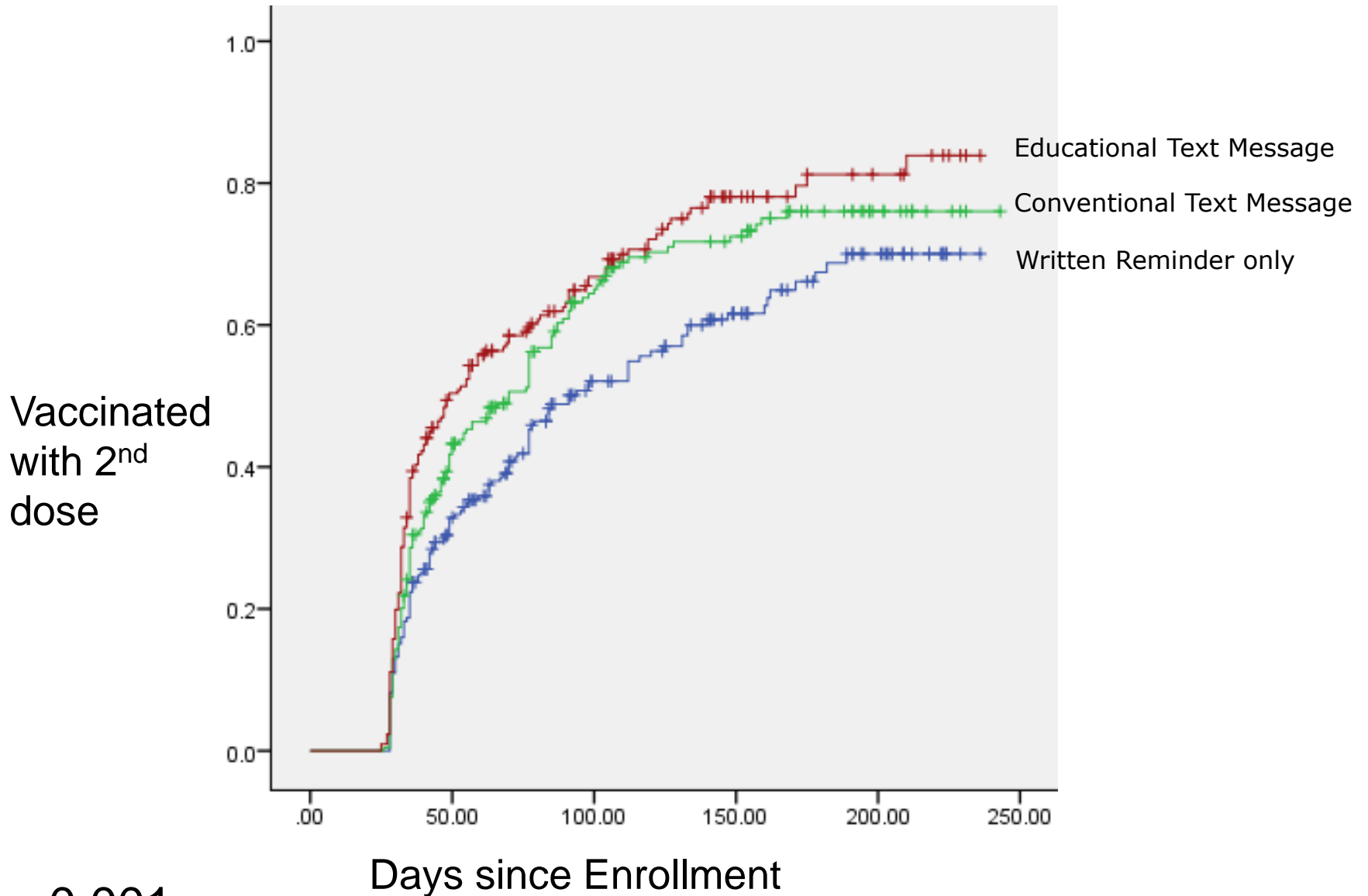
Text message schedule: Day 7, 21, 25, 28, 42 post-vaccination

Influenza Text Reminders: Most effective?



P = 0.003

Timeliness of Vaccination



$P < 0.001$

Stockwell *et al Pediatrics* 2015

Parents Thoughts

- 96.0% recommend to other parents
- 60.8% credited message for impacting their child getting the 2nd dose overall, and 70.1% for getting it sooner
- Most common liked: reminder, provided information, quick, demonstrated “caring”

Lessons Learned: Messages

- Messages more effective if brief, personal
 - Add educational information, interactive
- Series of 5 messages well tolerated in U.S.
- Need to validate content with target users
 - Need to be careful of translations and character count, forward and back translate
 - Someone who knows population and texting
- No abbreviations or slang, check tone
- Max 160 characters

Lessons Learned Process

- Limits of capacity of practices
- Need method to get cell phone numbers
- Incoming texts need to be monitored
 - Implement mechanism to deal with unsolicited messages
- Allow for opt out and language choice
- Good way to quickly reach population about changes (need for vaccination, special vaccine clinics)

Conclusions

Text messages, especially with embedded educational information, make effective vaccine reminders

- Effective for series completion (other studies of ours have shown effectiveness on first dose as well)
- Scalable
- High satisfaction

Next steps: Better understanding of

- Which groups and contexts text messaging work best
- Which messages work best for whom

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