Daily short message service surveys detect greater HIV risk behavior than monthly clinic questionnaires in Kenya

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Disclosures

I have no conflicts of interest to report.
New Technology for Health

• Mobile phones are common in Africa

• In Kenya:
  – 26 million own mobile phones (pop. ≈ 41 mil) \(^1\)
  – 18 million use phones for banking, business, paying bills \(^1\)

\(^1\)Talbot 2012
New Technology for Health

- Mobile technology for health in Africa
  - SMS reminders for ART adherence \textsuperscript{1,2}
  - SMS to collect health data from patients\textsuperscript{3,4}

- Short message service (SMS, i.e. text message) may reduce measurement bias
  - Recall & social desirability bias

\textsuperscript{1}Lester 2010, \textsuperscript{2}Pop-Eleches 2011, \textsuperscript{3}Haberer 2010, \textsuperscript{4}Mark 2010
Objective: To compare PrEP adherence & sexual behavior data collected through daily SMS surveys to monthly interviewer-administered questionnaires

Hypothesis: Daily SMS surveys reduce recall & social desirability biases & yield greater reports of unprotected sex missed PrEP doses
Context: The Partners PrEP Study

- Randomized controlled trial of PrEP among 4,758 HIV serodiscordant couples in 9 sites in Kenya & Uganda

- SMS Survey at Thika, Kenya site

- December 2011-April 2012, when PrEP known to be efficacious
Context: Daily SMS Surveys

• Eligibility criteria:
  – HIV-uninfected & taking PrEP
  – Literate
  – Owned a mobile phone
  – Knew how to send & receive SMS
  – Regular access to electrical outlet
  – High response rate (≥5 daily surveys) during week 1

• Automated daily SMS surveys for 60 days

• Compensated with “airtime” 2x week
Context: Daily SMS Surveys\textsuperscript{1}

- SMS data collection of sensitive health information is feasible & acceptable
  - High response rates (>90%)

- Self-reported PrEP adherence was high
  - Sexual activity a strong predictor
  - Not associated with unprotected sex

- Self-reported unprotected sex was infrequent, but common (~50% ever)

- Difficulty predicting sex

\textsuperscript{1}Curran 2013
### Monthly Clinic Questionnaire

**Sex**

- Did you have sex yesterday?

**Condom use**

- Did you or your partner use a condom when you had sex?

**PrEP use**

- Did you remember to take your study pill yesterday?

**In the past month, how many times did you have sexual intercourse with your study partner?**

**With someone other than your study partner?**

**How many times was a condom used?**

- (# with study partner + # with another partner)

**In the past month, how many days did you take neither of the study tablets?**

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**Observation Month**

- Median (range) = 28 (23-34) days

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**Daily SMS Survey**

**Monthly Clinic Questionnaire**

**Monthly clinic visit**

**Monthly clinic questionnaire**

**Daily SMS survey**
Statistical Methods

• To compare reports for any missed PrEP, any sex & any unprotected sex:
  – Percent agreement
  – McNemar’s Chi²

• To compare reports for number of missed PrEP doses, sex acts & unprotected sex:
  – Concordance correlation coefficients
  – Generalized linear latent and mixed models to calculate incidence rate ratios for count outcomes
94 participants had > 1 monthly clinic visit during SMS survey enrollment

179 monthly clinic visits during enrollment in SMS study

34 monthly clinic visits excluded:
• 8 had <21 days or >35 days between clinic visits
• 26 had <21 SMS surveys completed between clinic visits

145 monthly clinic visits among 85 participants included for comparison to SMS survey data
## Participant Characteristics (N=85)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%) or Median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>65 (76.5%)</td>
</tr>
<tr>
<td>Age, years</td>
<td>33 (31-37)</td>
</tr>
<tr>
<td>Married</td>
<td>82 (96.5%)</td>
</tr>
<tr>
<td>More than one wife*</td>
<td>7 (8.2%)</td>
</tr>
<tr>
<td>Living with study partner</td>
<td>81 (95.3%)</td>
</tr>
<tr>
<td>Number of children with study partner</td>
<td>1 (0-2)</td>
</tr>
<tr>
<td>Number of years in school</td>
<td>11 (8-12)</td>
</tr>
<tr>
<td>Earning any income</td>
<td>80 (94.1%)</td>
</tr>
<tr>
<td>Running water in the home</td>
<td>39 (44.9%)</td>
</tr>
<tr>
<td>Time spent in Partners PrEP Study, years</td>
<td>2.2 (1.7-2.4)</td>
</tr>
<tr>
<td>Weekly alcohol use reported at Partners PrEP Study enrollment</td>
<td>21 (24.7%)</td>
</tr>
<tr>
<td>HIV-infected study partner on antiretroviral therapy**</td>
<td>26 (30.6%)</td>
</tr>
<tr>
<td>Reported sex with someone other than study partner, past month**</td>
<td>7 (8.2%)</td>
</tr>
</tbody>
</table>

*Reported through interviewer-administered questionnaire at clinic visit prior to enrollment in SMS survey.
Frequency of Reporting Any Sex, Any Unprotected Sex & Any Missed PrEP, by Survey Method (n=145)

All significantly greater over daily SMS, according to McNemar’s Chi² test statistic at P<0.01
# Comparison of Daily SMS Surveys & Monthly Questionnaires (n=145)

<table>
<thead>
<tr>
<th></th>
<th>Daily SMS Median (Range)</th>
<th>Monthly Questionnaire Median (Range)</th>
<th>Incidence Rate Ratio (95% CI)</th>
<th>P</th>
<th>Concordance Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of sex acts</td>
<td>9 (0-32)</td>
<td>5 (0-22)</td>
<td>1.5 (1.3-1.7)</td>
<td>&lt;0.00</td>
<td>0.5</td>
</tr>
<tr>
<td>Number of unprotected sex acts</td>
<td>0 (0-14)</td>
<td>0 (0-21)</td>
<td>1.2 (0.8-1.8)</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Number of missed PrEP doses</td>
<td>1 (0-7)</td>
<td>0 (0-5)</td>
<td>5.1 (3.0-8.5)</td>
<td>&lt;0.00</td>
<td>0.10</td>
</tr>
</tbody>
</table>
Study Limitations

• Small, selected population limits generalizability
  – Clinical trial, literate, owned phone, high response during week 1

• Survey questions serve as reminders for condom use & adherence

• Accuracy of self-reported behaviors unknown
Key Findings

• Sex, unprotected sex, & missed PrEP doses reported on more days through daily SMS surveys
  – 24% of observations-months had reports of unprotected sex & 45% had any missed PrEP by SMS but not by monthly questionnaire
  – Most likely reflects under-reporting on monthly questionnaires

• Both methods: majority report perfect PrEP adherence or small number of missed PrEP doses

• Daily SMS surveys may capture more frequent reports of HIV risk behavior, greater accuracy
Summary & Implications

• SMS may offer new method for measuring behaviors related to HIV risk & adherence
  – Privacy, reduced recall period
  – Greater reporting of HIV risk behaviors & non-adherence
  – Examine patterns of risk and pill-taking
  – Capture behaviors in real-time to enable response

• Large-scale daily SMS survey of PrEP adherence & sexual behavior in Partners Demonstration Project in Kenya & Uganda
  – 1 week before, 1 week after quarterly clinic visits

• Consider research question, timing, literacy, & cost
Acknowledgments

- Partners PrEP Study team
- Study participants
- Dimagi
- Funding:
  - National Institutes of Health R21 NR012663, D43 TW000007 & T32 AI07140
  - Bill & Melinda Gates Foundation

Tuesday, 10:15am: Session 12, Oral Abstract 317, Jessica Haberer
Adherence to PrEP in the Partners Demonstration Project
Thank you!
Survey Questions

• Daily questions:
  1. What is your secret password?
  2. Did you have sex yesterday?
  3. Did you or your partner use a condom when you had sex?
  4. Do you think you will have sex tomorrow?
  5. Did you remember to take your study pill yesterday?

Please respond
  • 1: yes,
  • 2: no,
  • 3: I choose not to respond.
Flow of Enrollment

206 approached

- 14 failed during week 1 run-in
- 110 enrolled

- 17 declined
- 79 ineligible
  - 4 illiterate
  - 28 no phone / shares phone
  - 42 didn’t know how to send SMS
  - 5 no access to electrical outlet

- 79 ineligible

96 followed for 60 days

- 14 failed during week 1 run-in

Respond to <5 of 7 surveys
## Participant Characteristics (N=96)

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<th>Characteristic</th>
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<tr>
<td>Male</td>
<td>72 (75.0%)</td>
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<tr>
<td>Age, years</td>
<td>33.3 (30.9 – 37.3)</td>
</tr>
<tr>
<td>Married</td>
<td>93 (96.9%)</td>
</tr>
<tr>
<td>Living with study partner</td>
<td>91 (94.8%)</td>
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<td>Number of children with study partner</td>
<td>1 (0-2)</td>
</tr>
<tr>
<td>Number of years in school</td>
<td>11 (8-12)</td>
</tr>
<tr>
<td>Electricity available in the home</td>
<td>46 (48.9%)</td>
</tr>
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<td>Time spent in Partners PrEP Study, years</td>
<td>2.1 (1.7-2.4)</td>
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<td>HIV-infected study partner on antiretroviral therapy*</td>
<td>29 (30.2%)</td>
</tr>
<tr>
<td>Number of sex acts, prior month*</td>
<td>4 (2-8)</td>
</tr>
<tr>
<td>Any unprotected sex with study partner, prior month*</td>
<td>8 (8.3%)</td>
</tr>
<tr>
<td>Any sex with other partners, prior month*</td>
<td>7 (7.3%)</td>
</tr>
<tr>
<td>Any unprotected sex with any sexual partner, prior month*</td>
<td>13 (13.5%)</td>
</tr>
</tbody>
</table>

*Reported through interviewer-administered questionnaire at clinic visit prior to enrollment in SMS survey.
SMS Survey Response Rates

96 participants * 60 days = 5,760 surveys planned

5,412 surveys distributed

327 surveys not answered

5,085 surveys answered
(94.0% of surveys distributed)