# An SMS and IVR Intervention Improves Medication Adherence among Adults with T2DM and Low SES

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# Background

- Rx non-adherence
  - Common in type 2 diabetes (T2DM)[1, 2]
    - Especially among disadvantaged adults[2, 3]
  - Strong, independent predictor of suboptimal glycemic control, hospitalizations, premature death, and higher healthcare costs [4, 5]

1 Kirkman et al., 2015 *Diabetes Care*
2 Capoccia et al, 2016, *Annals of Intern Med*
3 Rolnick et al., 2013, *J Clin Med Res*
4 Aikens & Piette, 2013, *Diabetic Med*
5 Osborn et al., 2015, *J Clin Pharm Ther*

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# Background



- Basic cell phone technology can improve adherence among disadvantaged adults[8]

- Over 90% of U.S. adults use cell phones[6]
  - Text messaging and voice communications are used equally across racial/ethnic and SES groups[7]

6 Raine & Zickuhr, 2015, *Pew Research Center*
7 Duggan, 2013, *Pew Research Center*
8 Saffari et al., 2014, *Prim Care Diab*

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# Study Objective

- Disadvantaged adults with T2DM have suboptimal Rx adherence and glycemic control

- Cell phones give access to a wide range of adults

**We used a mixed-methods approach to evaluate a mHealth intervention to promote Rx adherence among diverse adults with T2DM**

# MEssaging for Diabetes (MED)

- Tailors content and timing of text messages and IVR calls based on user needs and preferences

- Users receive 3 intervention elements:
  - A daily, tailored text message addressing barriers to adherence
  - A daily text message assessing adherence
  - A weekly IVR call providing adherence feedback, encouragement, and problem-solving opportunities
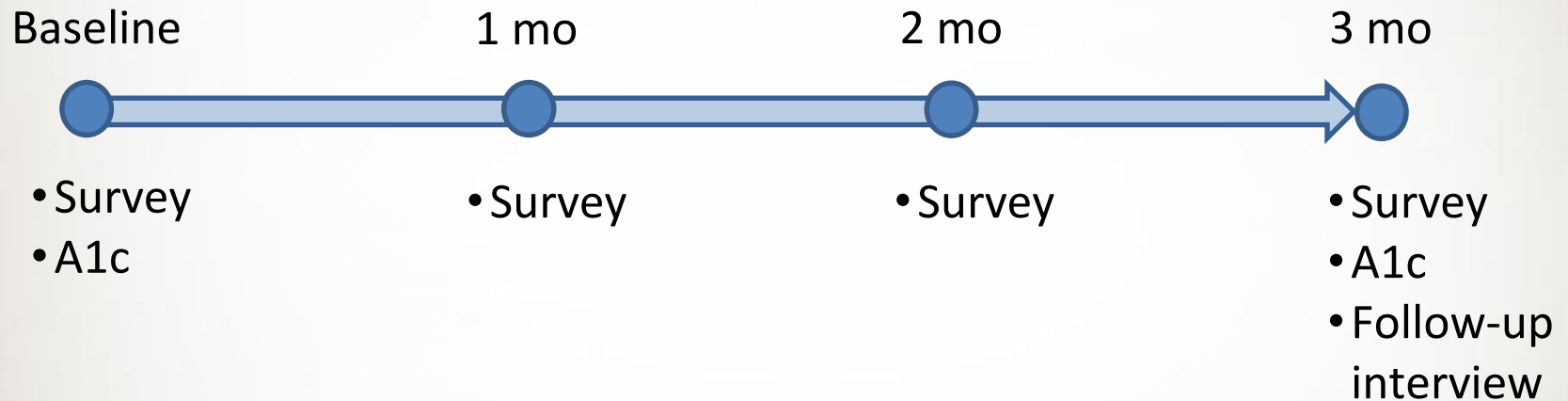
# Methods

- Sample and recruitment
  - 80 participants from a FQHC in Nashville, TN

| Inclusion Criteria | Exclusion Criteria |
|---|---|
| At least 18 years of age | Pre-existing diagnosis of dementia |
| Diagnosed with T2DM | Auditory limitations |
| Prescribed diabetes Rx | Inability to see/respond to texts |
| Owned a cell phone with SMS texting capability | |

# Methods

## Study Procedures

Baseline       1 mo       2 mo       3 mo

- Survey
- A1c

- Survey

- Survey

- Survey
- A1c
- Follow-up interview

– **Matched each participant with two archival controls at baseline and compared A1c between groups at 3 months**

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# Analyses

- Rx adherence – SDSCA-MS[9, 10]
  - Proportional odds logistic regression model
  - Spearman rank correlation coefficient

- Hemoglobin A1c – Lab value
  - Wilcoxon rank sum test
  - ANCOVA

- Experiences with MED
  - Inductive content analysis identified patterns and categories from follow- up interview responses.

9 Mayberry et al. 2013, *Diabetes Res Clin Pract*
10 Toobert et al. 2000, *Diabetes Care*

# Results

| Participant Characteristics (N=80) | |
|---|---|
| **Variable** | *M* ± *SD* or *n* (%) |
| Age, years | 50.1 ± 10.5 |
| Female | 54 (68) |
| Non-White | 55 (69) |
| Education, years | 12.9 ± 2.3 |
| Annual Income | |
| <10,000 | 29 (36) |
| 10,000 – 20,000 | 27 (34) |
| >20,000 | 24 (30) |
| Insurance Status | |
| Private | 14 (18) |
| Public | 38 (48) |
| None | 28 (35) |
| Insulin status | 51 (64) |
| A1c | 8.3 ± 2.0 |

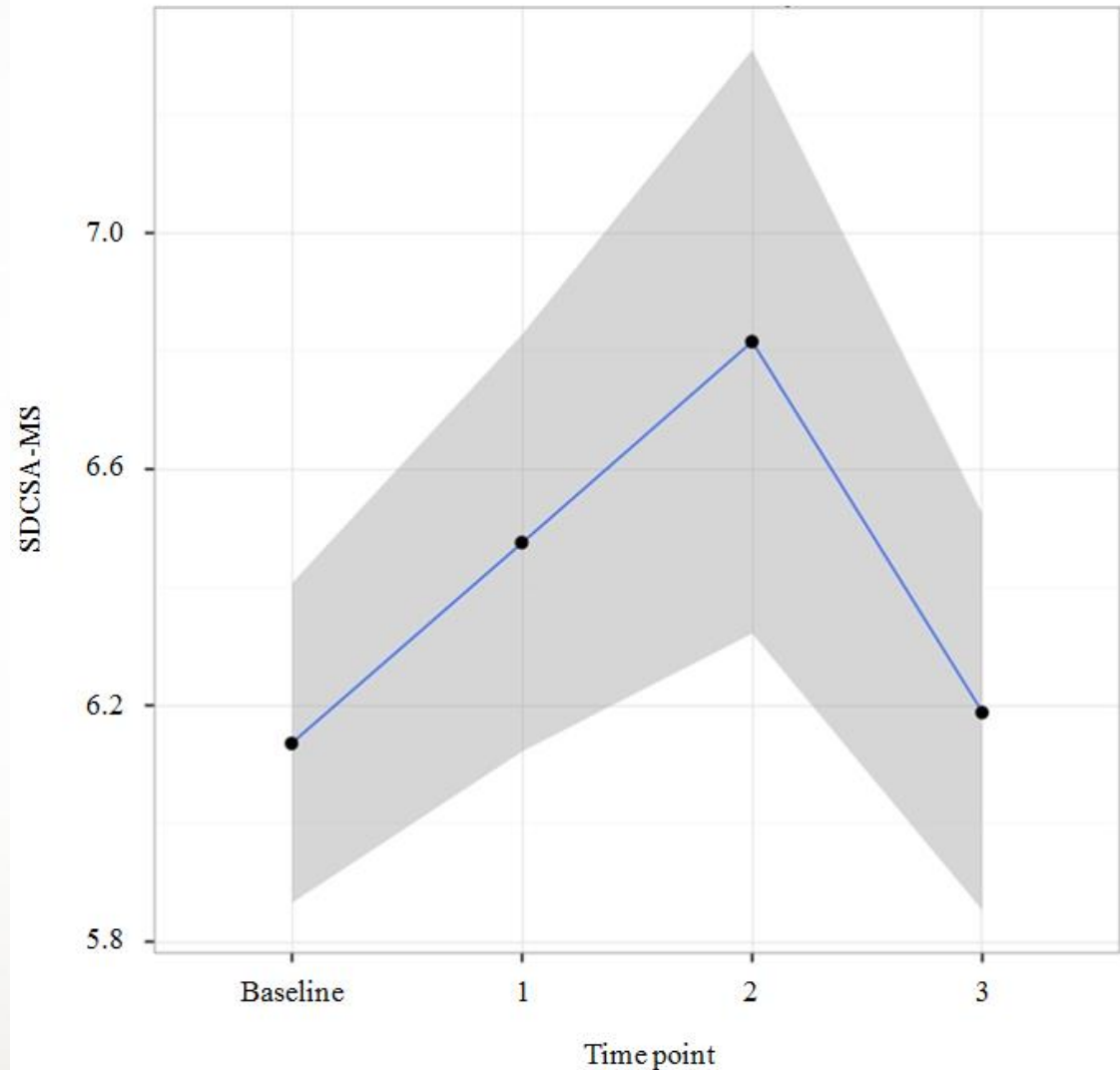# Results
## Rx Adherence

- Compared to baseline, adherence improved at one and two months, but not at three months.

| Month | AOR | 95%CI |
|-------|------|-------------|
| 1 | 3.88 | 1.79, 10.86 |
| 2 | 3.76 | 1.75, 17.44 |
| 3 | 1.49 | 0.66, 3.10 |

- Responding to text messages was marginally associated with improved adherence (rho=0.23, *P*=0.07).



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# Results
## A1c

- The MED and matched control group had similar stable A1c change at 3 months ($P$=0.40).

- Using ANCOVA adjusted for baseline A1c and covariates, 3-month A1c did not differ between groups ($P$=0.42).

# Follow-up Interview Results

Daily, tailored text message addressing barriers to adherence

- "Cell phone reminder alarms and pill boxes are great ways to help you remember when to take your meds."

- **Why were these messages helpful?**
  – Gave new ideas and information about taking Rx (31.7%)
  – Encouraging; provided emotional support (26.7%)
  – Reinforced importance of taking Rx (15%)
- **Suggestions for improving messages**
  – More variety, outside of Rx-related content
  – More cutting-edge news

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# Follow-up Interview Results

Daily text messages assessing adherence

- "On Sat, 04/02, did you take ALL your diabetes meds? Reply with YES or NO."

- **Did these messages help with taking Rx?**
  - Yes, extra reminder to take Rx (66.7%)
  - Yes, kept them on track/accountable (30%)
  - No, already had habit of taking Rx every day (15%)

# Follow-up Interview Results

Weekly IVR calls providing adherence feedback, encouragement, and problem-solving questions

- "This week you told us you took your diabetes medications as prescribed on 4 days. Last week you told us you took your diabetes medications as prescribed on 3 days.
- "Based on what you told us, you've taken your diabetes medications as prescribed on more days this week. Keep up the good work!"
- "Describe a day when you were successful with taking your meds."
- "Describe a day when you were unsuccessful with taking your meds."

- **Why were calls helpful or not helpful?**

  – More aware of how often taking Rx (31%)

  – Motivated to improve the following week (31%)

  – Not particularly helpful (23.7%)

    - Already knew how often taking Rx; Calls were bothersome; Adherence feedback not accurate; Could not call system back after midnight

# Discussion

- MED had a positive, short-term impact on Rx adherence

- A1c remained stable

- Overall, participants viewed MED favorably
  - Tailored messages provided information and support
  - Assessment messages served as a reminder
  - Text messages viewed more favorably than IVR calls

# Limitations and Future Directions

– Attrition

– Quasi-experimental study

– Limited generalizability

– Improving intervention to examine effects in a RCT

- Using feedback to improve content and delivery of content
- Excluding patients with optimal control

# Conclusions

- Leveraging technology available to the widest audience has far-reaching potential.

- Our findings provide preliminary support for using text messaging to improve Rx adherence among disadvantaged adults with T2DM.

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  - Nothing to disclose
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# Thank You!

# Questions?