Competing Interests

• I do not have any competing or conflict of interests
Objectives

• Reach
• Technology infrastructure
• Research requirements
• Intervention design- method of delivery
Text Messaging in Healthcare

- Disease management and monitoring- DM, asthma
- Promoting healthy behavior- wt loss, exercise
- Health behavior intervention- smoking cessation
- Reminders - IZ
- Notifications
- Data collection
- Disease surveillance
Key Theories for Uptake

• Everett Rogers’s - Diffusion of Innovation Theory – uptake and use of innovation, e.g., EHR

• Clayton Christensen’s – Disruptive Innovation Theory – innovations have the capacity to change the way we do our work
Diffusion of Innovations

- Innovators: 2.5%
- Early Adopters: 13.5%
- Early Majority: 34%
- Late Majority: 34%
- Laggards: 16%
Disruptive Technology

• Innovator’s Dilemma, Innovator’s Solution, Innovator’s Prescription - Clayton Christensen

• Disruptive technology – unexpectedly displaces an established technology

• McKinsey Global – identified 12 DTs that will transform the US economy - #1 mobile Internet
Hype vs Hope- Texting

• Hope for disruptive technology that is transformational
• Real-time/right-time/right information
• Individualized
• Unfettered pilots and implementation without rigorous evaluation
• Call for evidence-based information
• Clinicaltrials.gov with increase in RCTs- in 2012, 215 relevant studies, 82% were RCTs – yesterday 393 focusing on text messaging.
mHealth Hype?

• Weakening of communication
• 30,000 – 90,000+ health apps, US-FDA has reviewed 100+
Mobile Phone Reach

- 2012 - ~322 million US wireless subscribers
- 184 billion text messages per month US
- 6.8 billion mobile subscriptions worldwide, ~96% of the world’s population
- 4.5 billion mobile subscribers
Text Messaging Stats

- 95-98% read within minutes of receipts
- 86% of consumers send or receive at least one per week
- 2.12 trillion sent in 2011
- Mobile coupons 10 times more likely to redeemed than print coupons

Ref
2) http://blog.nielsen.com/nielsenwire/online_mobile/40-percent-of-u-s-mobile-users-own-smartphones-40-percent-are-android/
3) http://www.ctia.org/media/industry_info/index.cfm/AID/10323
SMS Basics

- Person to person
- Bulk messaging – requires specialized software
Basic of Text Message
160 characters

Short code

- Short Short – dedicated or shared, leased from short code adm
  - common short codes – common to all providers vs some recognized by only one provider
  - Vanity codes- COKE - 2653

Long codes

- Long codes- 10 or 11 digit dedicated phone #
- Originally intended for person to person only but now supported for bulk and frequently used
SMS Application Features

• Uni- or bi-directional
• Scheduling texts, queuing
• Tailored/personalized texts
• Responses – closed ended (1-Yes, 2-No) or open ended
• Response branching logic – (If 1= Yes, then reply..) or automated replies
• Multimedia messages
• Voting/polling
Management features

• Opt-in/Opt-out- updating recipient lists
• Creating multiple groups
• End-user web portal access
• Integration with other information systems
• Back-up systems, hosting
Reporting-Administrative Features

• Tracking messages-sent, delivered, opened, and responses
• Usage metering
• Exportability of data
Implementing Text Intervention Component

• Interfacing with other components of intervention

• Engage target audience in design
  – #, timing, frequency of messages

• Use communication and behavioral change theory
  – Gain or loss frame appeals
  – Tailoring
    • Feedback
## Algorithm for cessation messages

**Message type**  **Number of messages per quitting stage**

<table>
<thead>
<tr>
<th>Prequit</th>
<th>Quit day and day 2</th>
<th>Early quit</th>
<th>Late quit</th>
<th>Relapse</th>
<th>Encouragement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparing to quit</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benefits of quitting</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>Coping and coping strategies</td>
<td>14</td>
<td>4</td>
<td>11</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Discomfort and difficulties</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Encouragement</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Michele L Ybarra, MPH, PhD; Jodi Summers Holtrop, PhD; A Tülay Bağcı Bosi, PhD; and Salih Emri, MD
Developing SMS Intervention

• Gain frame – reminded of positive reward
  – Smoking cessation aimed at smoking mothers of young children-reminding them of the benefits to their young children

• Loss frame – reminded on negative consequences
  – Lack of sun protection leads to wrinkles and skin cancer

• Tailoring messages- specifically modified to the recipient
Gain vs Loss Frame

- Framing impacts an individual’s willingness to incur risk either to encourage a desirable outcome or to avoid an unwanted outcome.
- Prospect theory espouses that when benefits are fairly certain, gain-frame messaging may be more effective.
- Some evidence to suggest that gain-frame messages better than loss-frame for preventive behavior.
- Lack of consistency in results, poor to med quality evidence.


Health message framing effects on attitudes, intentions, and behavior: a meta-analytic review. Gallagher KM, Updegraff JA.

Mammography Example

• If you get mammography you will be less likely to die of breast cancer (gain-frame)
• If you do not get mammography you will be more likely to die of breast cancer (loss-frame)
Tailoring

• Expectation of great impact, improved outcomes
• Typically tailored messages are more effective than non-differentiated
• Using information about an individual to determine:
  – Content
  – Context or framing of the content
  – Delivery method- by whom, how
Tailoring Goals

• Enhance cognitive pre-conditions for message processing
• Enhance message impact – affect behaviors
• Need to know what aspects of tailoring matter?
Continua of Tailoring

Understanding tailoring in communicating about health Robert P. Hawkins,1,†* Matthew Kreuter,2,† Kenneth Resnicow,3,† Martin Fishbein,4 and Arie Dijkstra5
Mechanisms of Action

• Attention- paying better attention

• Effortful processing - wt control messages-tailored messages stimulated greater processing of the information

• Peripheral or Emotional Processing – “they understand me”, “I trust the source”

• Self-reference- linking material to one’s own needs
Tailoring Strategies

• Personalization- enhance processing, may also directly impact behavior
  – This communication is for ‘you’.., tailoring material for new mothers

• Feedback – may impact behaviors
  – Presenting pts with information about themselves-descriptive, evaluative, comparative

• Content matching –
  – Direct messages to individuals’ position on key determinants (knowledge, outcome expectations, normative beliefs, efficacy and/or skills) of the behavior of interest

Text messaging library matrix

<table>
<thead>
<tr>
<th>Message Type/Outcome</th>
<th>Message Content</th>
<th>Character Count</th>
<th>Date</th>
<th>Time</th>
<th>Tailoring</th>
<th>Theoretical Construct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reminder: regular exercise for increased fitness and weight loss</td>
<td>30 minutes of exercise each day can improve your mood, increase your energy, and help you get back into your favorite pair of jeans!</td>
<td>132</td>
<td>4/8</td>
<td>8am</td>
<td>Women ages 35-50</td>
<td>Gain frame Risk: Exercise Gain: mood, energy, and appearance</td>
</tr>
</tbody>
</table>
Security & Privacy

• Restrict the amount of information sent

• Advise participants to
  – Protect their phone- log-in passwords
  – Anti-theft, remote locking, wiping of data
  – Restrict amount of information displayed with incoming text notification

• Encryption – text messages are encrypted in the air, encryption strength is debatable, 3rd party systems exist to ensure encryption in air and at rest

• Self-destructing
Health Insurance Portability and Accountability Act

• Security rule - includes specific standards for disclosure and storage of electronic health data and safeguarding of PHI – includes text messaging

• The Federal Trade Commission (FTC) enacted the CAN-SPAM – applies to text messaging campaigns – opt-in/opt-out options are required
Parting Thoughts

• Widespread use of text messaging potential for disruptive innovation or diluted value due to increasing noise:value ratio
• Intervention method of delivery
• We need more evidence about the best way to construct & deliver information to impact outcomes
• Rapidly evolving technologies & applications – need rapid prototyping
• Academic-industry partnerships
Discussion