Consumers’ Online Social Network Topologies and Health Behaviours

Annie Y.S. Lau, Adam Dunn, Nathan Mortimer, Judith Proudfoot
Annie Andrews, Siaw-Teng Liaw, Jacinta Crimmins, Amaël Arguel, Enrico Coiera

Centre for Health Informatics
Australian Institute of Health Innovation
University of New South Wales

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The Lord of the Rings: The Return of the King (2003)
Network metrics

- **Degree centrality** (an indicator of relative importance of individuals in a network)
  - for each node, the number of connections to other nodes as a proportion of total.

- **Reciprocity** (indicator of mutuality in a social relationship)
  - calculated by the proportion of connections that are returned.
Many of the major diseases we worry about at a population level have strong social network effects underlying them (Christakis and Fowler, 2007, 2008, 2009) e.g.

- Infectious disease spread
- Mental health – depression
- Heart disease, obesity
- Alcohol, drugs and smoking
Obesity has strong social network effects.

The rate of becoming obese increases by 0.5 percentage points for each obese social contact we have (NEJM 2007;357(4):370-79).

Barabási A, NEJM 2007; 357:404-407
Social media

Social network

Social disease

?
Can social media treat social disease?

**Weak Hypothesis** - social media have a role in transforming health care services by creating new modes of interaction

**Strong Hypothesis** - where a disease is socially mediated, then social media are a channel for its cure

Will *network therapy* be major transformational tool in the way we manage the seemingly intransigent challenges of conditions such obesity, depression, diabetes, and heart disease?

(Coiera, BMJ, 2013)
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Record</td>
<td>Record and keep track of all your medical tests in one place.</td>
</tr>
<tr>
<td>Pillbox</td>
<td>Know exactly what medication to take at certain times of your journey.</td>
</tr>
<tr>
<td>Team</td>
<td>Keep a record of all your contacts throughout your medical journey.</td>
</tr>
<tr>
<td>Schedule</td>
<td>Monitor all of your scheduled tasks and appointments quickly and easily.</td>
</tr>
</tbody>
</table>
A Forum in each journey allows consumers to:
- Ask a GP / Counsellor questions, or
- Get advice from peers

Step 1: Learn how to identify unhelpful thoughts and...

Have you been getting trapped in unhelpful negative thinking, or stopped activities that you used to enjoy?...(more)

Step 2: Get started with lesson 2 of the Emotional Wellbeing Program...

***COMICS*** - In this lesson you learnt how our thoughts can affect our emotions and mood, and how to tackle low activity
inactivity during (era).
<table>
<thead>
<tr>
<th>TOPIC</th>
<th>REPLIES</th>
<th>FIRST POST</th>
<th>LAST POST</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much is a flu shot?</td>
<td>0</td>
<td>alex 29/09/2010 16:04</td>
<td>alex 29/09/2010 16:04</td>
</tr>
<tr>
<td>Had Flu Shot but still was in bed with flu</td>
<td>1</td>
<td>farshida 19/08/2010 09:26</td>
<td>Minh-Hien 19/08/2010 18:08</td>
</tr>
</tbody>
</table>
What's your Health like compared to others?

How many hours did you sleep last night?

- Last week: 3
- Last month: 16
Study design

- Design: Online prospective pre-/post- cohort study
- Participants: 1985 UNSW staff and students recruited, 709 followed-up
- Duration: 2011 (one semester)
- Location: UNSW
- Three journeys and associated forums:
  - Men health screening
  - Women health screening
  - Emotional wellbeing programs

*Exploratory analysis* of social aspects of system use.
## Results

**Use of social features associated with positive behaviour changes**

<table>
<thead>
<tr>
<th>Observed behavior</th>
<th>Used social feature 1 (n=332)</th>
<th>Did not use social feature (n=376)</th>
<th>Difference</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visited a healthcare professional</td>
<td>62.3% (207)</td>
<td>50.0% (188)</td>
<td>+12.3%</td>
<td>10.9</td>
<td>1</td>
<td>.001</td>
</tr>
<tr>
<td>Sought formal/informal help for physical wellbeing concern</td>
<td>59.3% (197)</td>
<td>50.0% (188)</td>
<td>+9.3%</td>
<td>6.33</td>
<td>2</td>
<td>.04</td>
</tr>
<tr>
<td>Self-rated being physically fit at post-study</td>
<td>91.9% (305)</td>
<td>84.6% (318)</td>
<td>+7.3%</td>
<td>8.88</td>
<td>1</td>
<td>.003</td>
</tr>
<tr>
<td>Reported a higher intention to practice a healthy lifestyle at post-study</td>
<td>58.4% (194)</td>
<td>50.8% (191)</td>
<td>+7.6%</td>
<td>4.14</td>
<td>1</td>
<td>.05</td>
</tr>
<tr>
<td>Had at least one person in their advice-seeking network at post-study</td>
<td>89.5% (297)</td>
<td>83.8% (315)</td>
<td>+5.7%</td>
<td>4.86</td>
<td>1</td>
<td>.03</td>
</tr>
</tbody>
</table>
Women’s health forum

GP dominates at center of a question-answer star network that is not actively social e.g. “I have condition x, what are my options?”
Men’s health forum

GP again at center of a question-answer network but more actively social, with secondary and independent discussion groups
Stay healthy forum

An active social network where choices are discussed, and clinicians are not central.
Results

Social network analysis

Table 3: Social network characterization for the three forums

<table>
<thead>
<tr>
<th></th>
<th>Women’s Health Forum</th>
<th>Men’s Health Forum</th>
<th>Stay Healthy Forum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>35</td>
<td>33</td>
<td>67</td>
</tr>
<tr>
<td>Density</td>
<td>2.8%</td>
<td>4.2%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Degree centrality of Healthy.me GP (% of connections)</td>
<td>37/46 (80%)</td>
<td>24/46 (52%)</td>
<td>6/146 (4.1%)</td>
</tr>
<tr>
<td>Reciprocity (% of connections)</td>
<td>18/46 (39%)</td>
<td>12/46 (26%)</td>
<td>42/146 (29%)</td>
</tr>
<tr>
<td>Reciprocity percentile (vs. random baseline)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Use of social features more strongly associated with changes in consumer behaviour. Forum network topology varied depending on type of activity. When consumers sought and received answers to medical questions from GP, there was little further discussion ("lurkers" could watch). When consumers shared lifestyle experiences, freely communicated with each other and GP "took a back seat". Does early exposure of "authority" stop the social conversation? Which topology will affect disease outcomes more?
Next steps

Crafting network interventions – need to build the empirical and theoretical evidence base that will allow us to:

1/ Identify which network topologies and behaviours more likely to lead to behaviour change that influences disease status?

2/ Design online social networks that meet the specific needs of different tasks and groups

2/ Intervene in networks to achieve behaviour change (e.g. structural repairs, new buddies, induction)
Thank You

Email: e.coiera@unsw.edu.au
Twitter: @enricocoiera