Strengthening Chagas disease control systems in Southern Peru
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Arequipa, Peru
Chagas disease

- Vector-borne neglected tropical disease
- ~6-8 MM infections worldwide
- Source of more morbidity/mortality in the Americas than malaria
- Delayed onset (10-40 years) of cardiac, GI symptoms

*Triatoma infestans*  *Trypanosoma cruzi*
The Southern Cone Initiative to eliminate *Triatoma infestans*

Transmission disrupted through vector control:
- Uruguay (1997)
- Chile (1999)
- Brazil (2006)

Not Disrupted:
- Bolivia
- Paraguay
- Northern Argentina
- Southern Peru

Schofield et al. *Trends in Parasitology* 2006
Chagas Disease vector control campaign phases:
1. Survey  
2. Attack (Insecticide spray x2)  
3. Surveillance
Vector control campaign
Vector control campaign
Vector control campaign
Vector control campaign
How do vector and host get infected with parasite?

- **# infected bugs**
- **Bite rate on host**
- **Probability of transmission/contact**

**S_h** → **I_v** *

- \( I_v \) * \( a/N_h \) * \( t_{v \rightarrow h} \)
- Probability of picking up parasite/bite
- Bite rate

**S_v** → **I_h** *

- \( t_{h \rightarrow v} \) * \( a \) * \( I_h/N_h \)
- Recovery
- **I_h**
- **I_v**
- **Prob. host is infected**
How do vector and parasite disperse throughout the urban and peri-urban environment?
How have development and migration patterns affected disease dynamics and campaign success?

Sept-Nov 2009

March-May 2010

Sept-Nov 2010

March-May 2011

Pueblo Tradicional (Traditional community)
Pueblo joven (young community)
Invasion (land invasion)
How does the vector re-emerge after treatment? How is re-emergence optimally detected?
PROBLEM: In recently-sprayed districts, low household participation threatens campaign success

Lower participation observed:

- In higher-SES, established neighborhoods
- In households not infested with insect vectors.
- In households whose neighbors did not participate in spray
Use “Behavioral Design” approach to understand participation and design interventions to address barriers

**Intervention design:**
*Address bottlenecks with the right tool from the behavioral economic toolkit*

<table>
<thead>
<tr>
<th>Actionable bottlenecks</th>
<th>Advanced planning</th>
<th>Block leader recruitment</th>
<th>Contingent group lotteries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time/schedule constraints</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logistics: Furniture moving, renters</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Stigma</td>
<td></td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Lack of awareness</td>
<td></td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Stranger in home</td>
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<td></td>
<td>✓</td>
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<tr>
<td>Insecticide concerns</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

| Behavioral economic tools                                   |                  |                          |                           |
| Consistency and commitment                                  | ✓                |                          |                           |
| Present bias                                                | ✓                |                          | ✓                         |
| Bandwagoning                                                |                  | ✓                        | ✓                         |
| Framing                                                     |                  | ✓                        |                           |
| Reciprocity                                                 |                  |                          | ✓                         |
| Base-rate bias                                              |                  |                          | ✓                         |
| Regret aversion                                             |                  |                          | ✓                         |
| Attribution bias                                            |                  |                          | ✓                         |
Intervention #1:  
Advanced planning & responsive scheduling

Households offered **narrow-window appointments** with preferential access to **preferred times** when they **commit to spraying 2 weeks in advance**. Households also given **planning prompts**.

- Addresses time and scheduling bottlenecks
- Leverages present bias, consistency/commitment principles
Intervention #2: Block leader recruitment

Neighborhood **opinion leaders** given t-shirts with **social norms messages** and recruited as **campaign experts** and focal points. Households **informed** about neighbor participation.

- Messaging from respected opinion leaders increases salience
- Opinion leaders establish social norm for participation
Intervention #3: Contingent group lottery

5-7 houses on same block face assigned to **lottery groups**. Households in winning group eligible for a prize (hardware store voucher) **if they participated**. Larger prize for **100% participation of the group**.

- Lottery provides external attribution for participation
- Incentive provides tangible benefit for participation.
- Lottery structure leverages peer pressure, base rate bias, present bias, regret aversion

![Tinka Megabol](image1.png)
Mar-Oct 2015: Cluster-randomized controlled pragmatic trial: 4 interventions X 14 clusters per intervention X ~100 households per cluster = 5600 households
Aim 1: What is the effect of each intervention on participation?

Current Ministry of Health vector control campaign:
Traditional health communication

Advanced planning and responsive scheduling:
Commitment devices and planning prompts address present bias and consistency bias

Block leader recruitment:
Local opinion leaders leverage social norms; provide salient, gain-framed messages; address stigma

Contingent group lotteries:
Financial incentive counters present bias; group lottery uses peer pressure and regret avoidance

Aim 2: What is the relative cost-effectiveness of each intervention?

Aim 3: Do interventions crowd out motivation to participate?

Campaign phase:
Survey Attack 1 Attack 2 Surveillance

R01HD075869: Improving participation in vector control campaigns using behavioral economics
Opportunities for faculty collaboration, student research