Why Doorstepping can increase household waste recycling

2014.11.15
Beijing
Municipal Solid waste (MSW) has become an import issue.

2.2 billion tons per year by 2025

Shanghai: 20,000 tons / day

2.5 tons truck for transport → 50 km

World (2025): 2.2 billion tons

2.5 tons truck → 5.5 million km

5.5 million km = 137.5 equator
Waste disposal

Developing countries: Landfill, No collection

Developed countries:
- England: 43.2% recycling
- Germany: 62% recycling
Waste composition

Global average

- Food waste: 46%
- Non-food waste: 54%

High income countries

- Food waste: 28%
- Non-food waste: 72%

Low income countries

- Food waste: 64%
- Non-food waste: 36%
Shanghai

23 million

Residential waste content

60-70%

food waste
none food waste

Urgent Goal

landfill

resources
biogas
fertilizer
compost

SBeRG
Processing facilities

Demand for products

Commercial possibilities

Collection infrastructure

Legislation and enforcement

Residents’ cooperation

Sufficient?

Success
Options to facilitate this behavior change

- Incentives
  - Simple provision of information
- Feedback
  - Provision of items: kitchen caddies
- Local volunteers
- Doorstepping
Pilot scheme in Shanghai (2011)

- Incentives
  - Simple provision of information
  - Local volunteers

- Feedback
  - Provision of items: kitchen caddies
  - Doorstepping

Poor results
Options to facilitate this behavior change

- Incentives
  - Simple provision of information
- Feedback
  - Provision of items: kitchen caddies
- Local volunteers
- Doorstepping

Our focus
Doorstepping

Cited as “effective” (no tests)

But not well defined

• Diverse conceptual approaches used
• Difficult to be specific about lessons for future planning
Waste management

No standard way of describing, categorizing or conceptualizing, Local case-study based descriptions

<table>
<thead>
<tr>
<th>Case studies</th>
<th>Different focus of Doorstepping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read (1999)</td>
<td>educational terms (e.g. interaction, persuasion, social learning)</td>
</tr>
<tr>
<td>Bernstad et al. (2013)</td>
<td>structural barriers (facilities, skills, action planning)</td>
</tr>
<tr>
<td>Corterill et al. (2009)</td>
<td>delivery methods (written or face-to-face information)</td>
</tr>
</tbody>
</table>

necessary to find determinants leading to behavior change that have links across all of them
Cluster dozens of case-study-defined determinants in waste management into 40 broad categories.

Disadvantage: not being linked clearly to determinants of behavior change established in literatures.
Breaking down doorstepping into elements
Behavior Change Terminology

Try to cover all possible parameters and become unmanageable

Focus on their main theoretical constructs at the risk of missing other key determinants
Develop approach of Michie:

**Behavior change**

- 128 constructs
- 17 theories
- 12 domains

This approach would in principle allow us to link doorstepping activities to *determinant clusters* which themselves already had *links to behavior change theoretical constructs*.
<table>
<thead>
<tr>
<th>“Michie” Domains adapted</th>
<th>WM operationalization</th>
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</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>basic information that the scheme existed, and what materials went where</td>
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<tr>
<td>Facilities</td>
<td>vital equipment and staff to make it feasible</td>
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<tr>
<td>Skills</td>
<td>the practical ability to sort</td>
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<tr>
<td>Belief of Capabilities</td>
<td>do residents believe they can do it; that their community can do it</td>
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<tr>
<td>Belief of Consequences</td>
<td>actions make a difference</td>
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<tr>
<td>Norms/Social Influences</td>
<td>recycling is considered ‘normal’ and others may have a view on it</td>
</tr>
<tr>
<td>Prompts</td>
<td>reminders which re-motivate action</td>
</tr>
<tr>
<td>Role Clarification</td>
<td>who should do what?</td>
</tr>
<tr>
<td>Action Planning</td>
<td>exactly how, actually?</td>
</tr>
<tr>
<td>Motivation/persuasion</td>
<td>extra pushes towards the making of a decision to recycle</td>
</tr>
<tr>
<td>Emotion</td>
<td>positive or negative emotions anywhere which might be significant to the behavior change observed</td>
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</table>
Using 11 domains analyze major DS studies

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<td>Facilities</td>
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<td>Emotion</td>
<td>●</td>
<td>●</td>
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Methods

Choose a site for DS which had recycling already ongoing

11 domains

Quantitative data

Qualitative data

• Pre - Questionnaires
• Pre - Measurement

• Doorstepping intervention

• Post-Questionnaires
• Post-Measurement

Extra:
• Focus Groups
• Semi-structured interviews
Site choice: typical community in Shanghai, #13

Live in Gated Communities

- 200-2000 families
- 2-20 buildings

In

23 million
Shanghai

Our site

- Built in 1998
- 75 stairwells up to 6 floor
- 986 households
- 2700 residents

Our site

SBeRG
Reasons for #13

Information we know

- History
- Community Committee
- Local Volunteers

Feasible of measurement

- Stabilized sorting schemes
- Predictable waste collection time
- No leakage of waste

Other candidates are less prepared
### Doorstepping design: 67% interaction rate achieved

<table>
<thead>
<tr>
<th>Details</th>
<th>Target Domains</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information at the door about Environmental Consequences</strong></td>
<td>Belief of Consequences</td>
</tr>
<tr>
<td>Provision of Stickers &amp; magnets</td>
<td>Prompt</td>
</tr>
<tr>
<td></td>
<td>Emotion</td>
</tr>
<tr>
<td>Local &amp; university volunteers Knock at door</td>
<td>Norms</td>
</tr>
<tr>
<td>No particular focus on</td>
<td>Knowledge, Facilities, Feedback, Motivation, Belief of Capability, Action Planning</td>
</tr>
</tbody>
</table>

**Training of volunteers**

- Rehearsals to ensure they are aware of the differences between determinants and did not accidentally emphasize any.
Findings

12.5% increase in Food waste capture rate

(statistically significant)
### Findings

#### Conclusion:

Not reason for success

---

#### Belief about consequences

**Table 3**

<table>
<thead>
<tr>
<th>Answers</th>
<th>Yes</th>
<th>No</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-questionnaire</td>
<td>68.5a</td>
<td>20.7</td>
<td>10.9</td>
</tr>
<tr>
<td>Post-questionnaire</td>
<td>71.2a</td>
<td>11.2</td>
<td>17.6</td>
</tr>
</tbody>
</table>

*a These numbers were already very high in China, compared to normal responses from residents from normal communities.

**Surprise!**

- This is not a statistically significant change
- The level of BOC is already high

**Conclusion:** Not reason for success
Evaluation of impact from residents

- Questionnaires
- Focus groups
- Semi-structured interviews
### Findings

<table>
<thead>
<tr>
<th>Emotion</th>
<th>“It is “xinku” for volunteers to come up and down (the stairs).”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prompts</td>
<td>“It is good to have doorstepping as a reminder; we may forget to sort the waste...long term reminders are not good for a sustainable system.”</td>
</tr>
<tr>
<td>Norms</td>
<td>It (doorstepping) will promote certain pressure. Even though it is only a little stress, it will have an effect over time.</td>
</tr>
<tr>
<td>Norms</td>
<td>It (doorstepping) brings an invisible pressure...It is better to self-regulate, but if not, then pressure from others will be needed.</td>
</tr>
<tr>
<td>Emotion</td>
<td>“It (propaganda) can touch people, especially the doorstepping type. Residents should be touched. If they are not, it will not be effective.”</td>
</tr>
<tr>
<td>Prompts</td>
<td>“Because the doorstepping itself is a reminder...people will regard it as something important if you doorstepped them.”</td>
</tr>
<tr>
<td>Norms</td>
<td>Now I feel there is a social atmosphere building up step by step [with reference to the doorstepping]. Since it is a constant reminder, it will influence our lives over time.</td>
</tr>
<tr>
<td>Norms</td>
<td>“Some pressure from outside cannot come from inside an individual...If a person does want to move forward, they need to be touched...”</td>
</tr>
<tr>
<td>Norms</td>
<td>“...it would be better for the block leaders to pay more attention (e.g. do doorstepping), as they live in the building.”</td>
</tr>
<tr>
<td>Emotion</td>
<td>It (frequent doorstepping) would work, but I think it will bother people too much and they will be negative about it.</td>
</tr>
<tr>
<td>Emotion</td>
<td>“You’re “xinku”.”</td>
</tr>
<tr>
<td>Emotion</td>
<td>“...it (appearing in person at the door) makes them embarrassed.”</td>
</tr>
<tr>
<td>Emotion</td>
<td>“It is difficult and “xinku” to do this job and it takes time.”</td>
</tr>
<tr>
<td>Prompts</td>
<td>“It is OK to remind residents every six months via doorstepping. We will possibly forget it as time goes by.”</td>
</tr>
<tr>
<td>Emotion</td>
<td>“I remember that (the doorstepping) ... you are “xinku”.”</td>
</tr>
</tbody>
</table>
Discussions

Learning useful for improving local design

• Belief of Consequences was not even a minor determinant of the behavior change
• Social Norms and Emotion were significantly activated determinants
• Prompting as a minor contributor
• Many local residents are sensitive to the character and visible behavior of the doorsteppers, it should be possible to enhance the effects already seen.
• The role of Social Norms deserves further exploration, with the data suggesting that some residents are sensitive to community norms
Discussions

Learning useful for doorstepping programs elsewhere

- the usefulness of analyzing and designing doorstepping via consideration of several clusters of determinants of behavior change
- it is operationally not difficult to investigate a large range of determinants, using post-intervention qualitative data collection designed to reveal evidence of them
- These results indicate a much deeper lesson not seen in the literature: that doorstepping should not be considered a generic ‘strategy’ but one with several elements, and that researchers need to be vigilant about concluding and reporting which were key determinants.
Conclusions

Our DS has 12.5% increase based on our design

We find Norms, Emotion are key elements with Prompt a minor effect and BOC no effect

Our specific results are useful for future intervention planning in Shanghai

Our approach has likely usefulness in other recycling programs
Evaluation of impact from waste quantity

$$RW = NFW_{\text{not div}} + FW_{\text{not div}}$$

Recycling = $$FW_{\text{div}}$$

$$CR_{FW} = \frac{FW_{\text{div}}}{(FW_{\text{div}} + FW_{\text{not div}})}$$

Requirements: >91 kg & 5% households

Collection time: 6 am, 9:30 am, 5 pm

Sample: all waste within 3 consecutive days