



Why doorstepping can increase household waste recycling



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ABSTRACT

In this study we report on a doorstepping intervention which produced a 12.5%, statistically significant, increase in the recycling capture rate. More importantly, we investigate *why* doorstepping caused the increase, through focus groups, structured interviews and questionnaires. By analyzing the findings with respect to a pragmatic set of eleven clusters of determinants of behaviour change, we find that social norms and emotion were important, with prompts as a more minor determinant. We can now plan further doorstepping knowing an emphasis on these is useful. Knowledge, skills, belief of consequences, belief of capability, action planning, role clarification, feedback, and motivation were determinant clusters found not to be important in this case.

Recycling behaviour change interventions often do not generally produce transferable learning because they are usually presented as case studies and not broken down into key elements. Our analytical approach of breaking down a poorly defined activity – doorstepping – into elements which influence different clusters of determinants, and then exploring their separate impacts, allows some predictive planning and optimization for other interventions. The specific context here was residential food waste recycling in apartment blocks of communities in Shanghai, China.

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1. Introduction

Municipal solid waste has become an important issue all over the world. The quantity is expected to reach 2.2 billion tons per year by 2025 (Hoornweg and Bhada-Tata, 2012) as cities expand and grow. In countries like Cambodia, Algeria and Morocco, although more than 70% of urban waste are now collected, more than 95% of the waste is dumped without further treatment (Hoornweg and Bhada-Tata, 2012). However, the trend is slowly changing, with some western countries beginning to reach relatively high levels of recycling. During 2012/13, England achieved a 43.2% recycling rate of household waste (DEFRA, 2013), with sorting categories of dry-recyclables, source separated food waste and residual waste. In Germany, the recycling rate was 62% in 2010 (Fischer, 2013). Globally, organic waste (mostly food waste) is the biggest category at 46% by mass, varying from about 28% in high-income countries to 64% in low-income countries (Hoornweg and Bhada-Tata, 2012).

With increasing urbanization, i.e. millions of people in developing countries moving to cities as a strategy to reduce poverty, waste problems are becoming very significant. In the metropolis of Shanghai there are now over 23 million people, and the 60–70% food waste component of residential waste (Tai et al., 2011) is clearly an urgent target for diversion from landfill and conversion into resources such as biogas, fertilizer and/or compost.

For recycling to become successfully established it is necessary to have processing facilities, demand for products, commercial possibilities, collection infrastructure and appropriate legislation and enforcement. However, even the sum of those will not be sufficient if residents do not cooperate and separate their waste. The question of how to facilitate this behaviour change then becomes crucial, and approaches used by local authorities and waste management companies have included the simple provision of information, incentive or disincentive schemes, provision of related items such as kitchen caddies, feedback, involvement of local volunteers and/or community groups, and doorstepping (Barr and Gilg, 2005; DEFRA, 2007; Harder and Woodard, 2007; Read, 1999; Vogt and Nunes, 2014; Yau, 2010). In Shanghai a food waste pilot scheme has been taking place since 2011. The programs were initially piloted in 1000 eligible “role model” communities to identify best practices

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in preparation for the introduction of the program citywide by 2020. The pilot schemes primarily involved the delivery of information, and sometimes involvement of local volunteers (Dai et al., 2015), but almost all with poor results (Huang et al., 2014). Several different alternative approaches are being explored, including involvement of specialist NGOs (Xu et al., 2015), extra prompting (Lin et al., 2015), incentives, and monitoring and feedback systems. In this work we report on explorations of the use of doorstepping to increase recycling as a potentially scalable activity that could overcome current difficulties.

Doorstepping is already considered an effective method for changing recycling behaviour (DEFRA, 2007; Read, 1999) and it is often referred to as a specific strategy which is considered transferable to different contexts (Bernstad et al., 2013; Cotterill et al., 2009). It basically implies that persons involved in the recycling program knock at the doors of residents to deliver information, having a (usually short) interaction at the doorstep. Although in political campaigns and fundraising this is normally done with no pre-notification to the residents, in recycling programs it is common for residents to be informed in advance, and sometimes, as in our case, for a local person to accompany the doorsteppers to effectively make an introduction and give them credibility. Branded tabards are often worn and photo-identification cards on show. However, doorstepping as an intervention activity is not well defined. Different doorstepping campaigns have their own conceptual approach and methods, and because of these it is difficult to be specific about what lessons can be taken forward from them for use in planning any further recycling programs such as in Shanghai.

For example, looking at the four most significant studies of doorstepping in the recycling literature shows that they each have different target goals, component activities and domains of expected impact. Read (1999) presented doorstepping as an educational instrument which delivered recycling knowledge and asked residents to recycle; Timlett and Williams (2008) used it as a tool for persuasion; Cotterill et al. (2009) indicated its main aim is to improve awareness and attitudes and to remove structural barriers, and Bernstad et al. (2013) focused on its use as a variation on information delivery – oral versus written. Although all of these studies suggested that doorstepping as a named strategy was useful for increasing recycling behaviour, their approaches differed considerably, making it difficult to identify any area of learning that could be used in the planning of new programs. It seems that some way of breaking down doorstepping into a set of constituent activities or fundamental elements is needed, alongside a set of potential determinants on behaviour change, before it can be studied more systematically to inform future planning.

Such difficulties are known more generally, outside waste management. Jackson (2005) has written of the tensions in relation to the different kinds of variables which different behaviour change approaches seek to measure, notwithstanding that those approaches have been derived from related systems of knowledge in psychology, sociology and consumer marketing. Waste management does not have a standard way of describing, categorizing or conceptualizing activities or their impacts, but rather draws from different disciplines or, more commonly, creates local, case-study based descriptions. Thus, Read (1999) speaks of doorstepping in educational terms (e.g. interaction, persuasion, social learning), Cotterill et al. (2009) in terms of structural barriers (facilities, skills, action planning), Bernstad et al. (2013) in terms of delivery methods (written or face-to-face information). In order to learn across different doorstepping programs it would be necessary to find determinants leading to behaviour change that have links across all of them. These might be expected to already exist in the literature of waste management, or of behaviour change, or of both. The next step was thus to search for such determinants, and to use a

set of them to break down doorstepping activities and impacts into operational components.

1.1. Breaking down doorstepping into elements

Our exploratory search for cross-linkable determinants for analysing doorstepping started in the waste management literature, where we found dozens of case-study-defined determinants which we managed to cluster into about 40 broad categories (Gordon, 2014). Besides being so numerous, these generally had the disadvantage of not being linked clearly to determinants of behaviour change established in behaviour change literatures, for example as summarized by Jackson, Darnton or Steg (Darnton, 2008; Jackson, 2005; Steg and Vlek, 2009).

We thus considered the converse approach, to look at those collections of determinants in behaviour change literatures which we could then relate to the waste management activities. However, we found the range large, and containing overlaps and gaps in the coverage of individual determinants that were difficult to understand without specialist training in many different theories. Jackson speaks of the tension between approaches of theories/models which try to cover all possible parameters and become unmanageable, with those which focus on their main theoretical constructs at the risk of missing other key determinants (Jackson, 2005).

We then considered the work of Michie, where a consensus had been developed from theorists, researchers and practitioners in health of eleven domains or clusters of determinants derived from 128 constructs of 17 theories (Michie et al., 2005). We found that these could be contextualized for waste management in general and recycling in particular, in a way that allowed operationalization of the determinants. This approach would in principle allow us to link doorstepping activities to determinant clusters which themselves already had links to behaviour change theoretical constructs. Such links to theory could be developed later: in this work the focus was the contextual operationalization of such determinants for recycling programs. We thus suspended our previous systematisation of determinants from waste management and continued to work on operationalising from Michie's domains.

The contextualization for our purposes was as follows. The two most obvious and necessary clusters were Knowledge (basic information that the scheme existed, and what materials went where) and Facilities (vital equipment and number of employees to make it feasible). Additional clusters included: Skills (the practical ability to sort); Belief of Capabilities (do residents believe they can do it; that their community can do it); Belief of Consequences (actions make a difference); Norms/Social Influences (recycling is considered 'normal' and others may have an opinion about it); and Prompts (reminders which re-motivate action). Then there were the planning areas: Role Clarification (who should do what?) and Action Planning (what actual, exact, actions would be needed to make this happen, and would the planning needed be ensured? This left the topic of Motivation/persuasion for extra pushes towards the making of a decision to recycle, and the overall topic of Emotion to capture positive or negative emotions anywhere which might be significant to the behaviour change observed.

Work to this point suggested that these eleven clusters would be very useful in the context of recycling, and between them would cover a wide range of impacts of interventions. To pre-explore whether they would be useful for doorstepping in particular, the four major published studies were considered in the light of these clusters, and it was found that they did indeed assist in clarifying and categorising sub-elements, as illustrated generally with the following notes. The study of Bernstad et al. (2013) made use of information on how the waste would be treated and made useful, and the related environmental impacts: these would be covered by the determinant clusters for Knowledge and Belief of Consequence.

Residents were also given a free kitchen caddy and liner bags, which if were determinants would have come within the Facilities and Action Planning clusters. Timlett and Williams (2008) study included basic information on the existence of the recycling scheme (Knowledge) and deliberately used a conversational approach, to engage well and to resolve difficulties, which would likely be covered within Belief of Capability and Skills clusters. Persuasion was purposely designed in, covered by the Motivation determinant and possibly Emotion. Interestingly they had a second parallel program that they did not describe as doorstepping, but which included doorstepping as well as significant feedback and incentives, which our approach could have accommodated with the Prompts, Action Planning and Motivation determinants. Cotterill et al. (2009) provided information and replacement bins which relate to Knowledge and Facilities determinants respectively, and the influence of their promotion of positive attitudes using enthusiasm and encouragement via conversation be covered by the Motivation, Belief of Capability and Emotion determinants. The study of Read (1999) made use of young and colourfully dressed, highly visible doorsteppers to deliver information: all covered by Emotion, Motivation, and thus Belief of Capability as well as basic Knowledge.

All four interventions would have caused a one-off Prompt effect, provided at least basic Knowledge, and would likely have stimulated some aspect of Social Influences, because these are intrinsic elements of doorstepping of any kind simply due to a visitor knocking at the door. In terms of the other determinants, these interventions differed.

In summary, the eleven determinant clusters developed seemed to be suitable for the task required: to provide a lens through which we might categorize, recognize and tease apart – although never completely – various determinants of behaviour change due to doorstepping components, even across very different doorstepping programs. This could allow us to build up learning from different doorstepping programs, and transfer it to planning of new ones. Furthermore, because of their original derivation from theoretical constructs in (Michie et al., 2005), the determinant clusters we were using were likely to provide useful links between practice and theory with some further work.

2. Methods

This study used the ‘complementary’ mixed methods approach (Greene et al., 1989) where the two related by different phenomena were investigated differently. Quantitative data and analysis were designed to determine whether there was a significant change in the fraction of food waste recovered, using representative sampling of waste. Qualitative data and analysis was designed to then explore what the underlying reasons were for the changes, as viewed by the key actors (residents): semi-structured questions allowed rich variety of concepts to emerge.

It was first necessary to choose a suitable site for doorstepping which had recycling already ongoing, and to measure the pre-intervention representative food waste diversion rates via waste tonnages, including a compositional analysis to reveal the amount of food waste not being recycled. Importantly, this pre-intervention situation had to be some time after any other major event, including the initial launch of the waste sorting program which took place over the first two months. In this case, one further month was allowed to elapse before baseline data was taken. An effective doorstepping intervention was designed with the eleven clusters in mind, and then implemented. Two weeks later, post-intervention waste tonnage measurements were taken again in order to quantitatively evaluate any changes in food waste diversion levels. Focus groups were then carried out to qualitatively explore, directly or indirectly as appropriate, which determinants were perceived to

be important by residents, and semi-structured interviews were undertaken to investigate those in more detail. These qualitative methods were designed to provide evidence for the presence or absence of all eleven clusters of determinants, as well as new candidate determinants. Questionnaires were used pre- and post-doorstepping to provide robust triangulation of measurement of one determinant which was predisposed to that form of evaluation: knowledge of the environmental consequences.

2.1. Site choice

This work was undertaken in Shanghai, which although a metropolis of over 23 million people, is primarily composed of thousands of small informally ‘gated’ communities of typically 200–2000 families housed in 2–20 building structures. The community chosen for this work was built in 1988, and has a total of 75 stairwells up 6 floors, 986 households and a total of 2700 residents registered there. It is located in the northern district of Putuo, and is very typical in Shanghai, being of middling age, level of affluence and only slightly under middling size, and having no exceptional dominance of one type of profession or age group in its residents. It was, however, not chosen to be representative of Shanghai but for its potential to meet key criterion to provide rich qualitative data (Marshall and Rossman, 2006: pg 62): (a) access for research; (b) richness mix of people, interactions and structures of interest to our topic; (c) trusting relationships between researchers and relevant residents and gatekeepers; (d) applicable appropriate ethics; (e) our ability to assure data quality and credibility at that site.. The researchers knew its immediate history, and were known to its community committee and local volunteers. Their food waste diversion program had stabilized, and waste was deposited by residents at only three waste stations, and collected at predictable times a day, which made the collection of actual primary data on the weights and contamination levels feasible. There was no ‘leakage’ i.e. residents were not seen to be removing waste from the site for disposal elsewhere (e.g. compared to other communities which might have a public waste facility outside their gates). Other candidate communities with similar characteristics did not have administrators as prepared to put the required efforts into a new recycling intervention, i.e. accompany the doorsteppers and obtain institutional approvals.

2.2. Doorstepping design

The main aim in designing a doorstepping intervention is to achieve the target behaviour change – in this case to increase the fraction of food waste actually recycled. The development of an operationalizable set of determinant clusters would allow us to capture some of the pathways of the behaviour change, and in that way to explore underlying assumptions made about the impact of different elements. We thus made a careful note of our own initial assumptions as we designed the intervention, for later comparison.

It was decided that the main message comprising the content of the information given at the door would be about the environmental consequences of food waste sorting, which we would expect to be picked up in measures of the Belief of Consequences determinant cluster. Harris (2006) states that environmental knowledge among Chinese citizens is generally low, and that the Chinese are rarely aware that their actions can have a harmful effect on the environment. A log was kept of related events in the community in preceding and continuing months of the program, and it showed that no information about Environmental Consequences was disseminated, and our work in other communities had shown it was lacking. It was thus decided to focus on it, using highly visual aids to convey the message, with two posters of A2 size: one containing images of current disposal methods to landfill and incineration,

and the second of steps to composting and pig feed. Colour leaflets were also used at the door which contained more details about the alternative disposal pathways, the quantities of waste produced both by Shanghai and the specific community itself, and notes on the consequences of the different pathways. These were designed to be briefly pointed to and then left with the residents where interest was shown. To further emphasize the message of Environmental Consequence, three hand-sized stickers were offered to the residents for a choice of one to keep, nominally to put on their refrigerator, or kitchen caddy if they happened to have one. They portrayed a field of sunflowers, a collection of vegetables and some friendly looking pigs, as compost and pig-feed were potential products from the food waste. It was postulated that the stickers might be considered a mild form of incentive, or act as a prompt if placed in the kitchen, or cause positive emotions and thus might show up in measures of Motivation, Prompt or Emotion determinants.

Having designed the main message, it was necessary to design the remaining aspects of the doorstepping, continuing to be clear about assumptions as to which determinants they might activate.

To restrict the variety of Social Influences that might be activated, it was decided to limit the volunteers to be pairs of university students and local volunteers, i.e. no new international visitors or high ranking persons. A block leader, who generally liaised with residents in allocated blocks, guided the doorsteppers from door to door; their background presence reassured residents that the visit was valid. It is unusual for residents to have unexpected knocks at the door, as most acquaintances would text or phone first, so this step was necessary. The doorsteppers wore branded tabards. The brochure only mentioned Shanghai and local community information – no references to overseas norms, as these had been found to be possibly influential in preliminary work.

To restrict Feedback, residents were simply told that their community was 'doing well but with room for improvement', i.e. no detailed feedback was given or emphasized. Any references to how residents might Plan their Action of recycling, e.g. by discussing caddies or bags was avoided. Roles were not clarified, and although the resident might later feel they should recycle, the doorsteppers did not tell them, "You should be recycling" to thus directly clarify his role. No reward or direct Motivation was intended, beyond the main message of Environmental Consequence. Belief of Capability in the community cleaners, community committees or local authority was avoided by not mentioning them, but statements about "how easy recycling is!" were made verbally and in the leaflets to bolster the individual's Belief of Capability in themselves (self-efficacy).

The volunteers were trained beforehand, and carried out rehearsals, to ensure they were aware of the differences between determinants and did not accidentally emphasize any. They had several discussions about the approach, and the final script was developed with consensus:

"The municipal government of Shanghai is now promoting food waste recycling, and your community began two months ago. Your community is doing very well, but there is still much room for improvement. Here is a brochure that reminds you about the classification details.

Have a look at these two posters: our traditional waste disposal methods are mainly incineration and landfill. However, if we separate the food waste, it can be processed into compost or possibly food for pigs. Here are several types of stickers, you can choose one, perhaps for your kitchen caddy or refrigerator.

It's easy to separate our waste, and if each of us carry out waste separation, then the amount of waste will be reduced from this (hands high) to this (hands low).

Thank you for your time. "

If residents were not home they were doorstepped again later: a 67% interaction rate was achieved overall. Interactions were expected to take 5–8 min each.

2.3. Evaluating the impact of the doorstepping – from residents

2.3.1. Questionnaires

The impact of the doorstepping on the main determinant, Environmental Consequence, was expected to be easily quantitatively evaluated using a questionnaire. Each household had a questionnaire sheet delivered: half of them four days before the doorstepping and half five days afterwards. Two different colours were used to distinguish the two phases, and to prevent duplication. The two halves were chosen to be similar by asking assistance from the local official Community Committee who oversees daily activities in the community and knows the residents very well, including through their local records. They delineated two areas that would have similar residents: although age, income, current job types, family size were all typically spread heterogeneously anyway, the committee told us they needed to take care that the balance of families who moved there from rural versus urban locations many years ago were also evenly distributed. This approach was used rather than giving the same population a pre- and then a post-questionnaire, as the latter approach would itself have been likely to trigger a change in knowledge, or awareness of, environmental consequences.

It is customary in this part of China at this time to provide a small gift as acknowledgement of voluntary effort for activities like questionnaires, and we saw this as a chance to impose a time constraint on returns. The first 100 returned questionnaires were thus advertised to be exchangeable for a small (unidentified) gift, and on being handed in to the community centre office produced a university-branded pen, diary or simple bag.

The questionnaire was designed using guidance from the methodology of Davies (2007) and the doorstepping study by Bernstad et al. (2013). It had three open-ended questions and two relating to the demographics of the respondent. The open-ended questions were used so respondents would not be forced to adopt preconceived answers, and to help mitigate bias (Davies, 2007).

2.3.2. Focus groups and semi-structured interviews

Focus groups and interviews are well established qualitative methods suited to explore which factors might be important in situations such as this intervention, rather than their quantitative contributions or weightings of the factors (Babbie, 2010; pg. 327) because they allow researchers to better understand complex phenomenon in context without imposing external limitations (William, 2007) e.g. as built into the very structure of survey questions. For this purpose it is not necessary to focus on reliability (quantitatively reproducible results) but on developing deeper validity (learning what the important factors to measure actually are) i.e. to use a sample which contains sufficient diversity to populate possible factors that should be considered in the overall model of the situation. The use of qualitative approaches will improve understanding about how other factors are contributing (such as emotions or norms or prompting) but will not provide measures of their relative contributions nor distributions across the population that they apply to. Sampling for qualitative approaches thus aims to elicit a rich variety of concepts from participants, which in this case would be transcribed and analysed using open and axial coding methods from Grounded Theory (Glaser and Strauss, 1967 pg 101) to reveal candidates. In further studies these might be used to build up theories, and be tested. In this current study the emphasis is on exploration of concepts, not testing of a theory.

Focus groups are a useful way to elicit wide-ranging information, as the participants would trigger each other to think about

even more aspects. By providing a safe space where they had ‘permission’ to speak via a request to give the researchers feedback, residents could open up and prompt each other, and greatly control the direction of the discussion – all leading to a richness of qualitative data. Two focus groups were planned in order to identify the main impacts of the doorstepping in terms of the determinant clusters, and to ‘listen out’ for any unexpected ones. One group was to be mainly community residents who regularly volunteered for activities and knew the community in that light; the other was to have a convenience sample of residents who were available and willing at the time. Both focus groups were carried out on site at the community.

Semi-structured interviews can be useful to obtain more detail on specific topics. In this case they were intended to be used to ask individual residents in a private and safe environment about their responses to the doorstepping in general, as a warm-up, and then to gently prompt them about each of the determinant areas that might have been activated. Potential items which we predicted might arise and thus planned to capture included: different types of social Norms (due to visitors, ‘outsiders’, community members, Shanghai-wide); Emotions (positive about community progress, positivity of doorsteppers, having visitors, provision of stickers, visual aids, negative about visitors interrupting their home, unwelcome block leaders, feeling pressured by neighbours); feedback (from visitors, leaflets); prompts (from visitors, stickers, leaflets); Knowledge (information that scheme existed); environmental consequences; other consequences (chastisement from neighbours, public shame, feelings of guilt for any reason); Belief of capability (community is able since we have doorsteppers helping, committee is competent if it can organize doorstepping, I must be able if you are telling everyone); Motivation (were stickers seen as rewards, was there any specific motivation result); Role clarification (were residents more clear that they should be recycling, or other roles?); Emotion (did the resident mention anything throughout the entire interview that indicated an emotional response to the doorstepping).

The schedule of questions is given in [Appendix A](#).

2.4. Evaluating the impact of the doorstepping – from waste quantities

2.4.1. Choice of indicators and measured quantities

Evaluating whether or not the intervention had a significant impact required a quantitative approach, including representative sampling of valid samples of waste. (This is in contrast to the section above where a qualitative approach was more appropriate.) Previous researchers provide different methodologies and indicators to evaluate household waste recycling ([Berg and Källsortering, 1993](#); [Bernstad et al., 2013](#); [Dahlen, 2005](#); [European Commission, 2004](#)). The most relevant quantity to monitor in this study was the percentage of the food in the waste stream which is diverted into the recycling stream, i.e. the capture rate of the food waste, CR_{FW} . This requires that we determine not only the amount in the recycling food waste bins, but the amount which is not diverted and thus remains mixed in with the ‘residual’ waste. This means that a representative sample of the residual waste must have its composition determined, at least in terms of food and non-food waste.

In summary, two types of waste bins were used, and directly measured:

Residual waste, $RW = \text{Non-Food Waste} + \text{Food Waste not diverted}$

$$= NFW_{\text{notdiv}} + FW_{\text{notdiv}}$$

Recycling (Food Waste) = Food Waste diverted

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

from which the capture rate of the food waste could be calculated, defined by [WRAP \(2010\)](#) as “the quantity of target material ‘captured’ divided by the total quantity of that type of material present”:

$$CR_{FW} = FW_{\text{div}} / (FW_{\text{div}} + FW_{\text{notdiv}})$$

2.4.2. Waste compositional analysis

A representational sample of the residual waste was analysed to determine the proportion of the food waste present, i.e.

$$FW_{\text{notdiv}} / (NFW_{\text{notdiv}} + FW_{\text{notdiv}})$$

There is great variability in the literature regarding sample sizes for compositional analyses and no consensus has yet been reached ([Dahlén and Lagerkvist, 2008](#); [Hoorweg and Bhada-Tata, 2012](#)). [Nordtest \(1995\)](#) suggests waste from no less than 5% of the entire population should be analysed, SWA-tool ([European Commission, 2004](#)) suggest that no less than 45 m³ of waste should be analysed and [Sfeir et al. \(1999\)](#) investigated the effect of sample size on variability and concluded that 91 kg was a sufficient sample size provided that the waste categories under investigation were below ten. The samples used in this investigation all exceeded 91 kg and accounted for greater than 5% of the population assuming householders visited the waste stations at least once over the three day period.

2.4.3. Waste quantity data

The methodology for collecting data on waste quantities was guided and informed by [WRAP \(2010\)](#)’s “Improving the Performance of Waste Diversion Schemes: A Good Practice Guide to Monitoring and Evaluation”. Community #13 has three waste stations each with brown bins for food waste and black bins for residual waste. Although other recycling and specialized waste streams were also collected in very small quantities; none directly overlapped with food waste or residual waste and so were not measured.

Consent for the data collection was obtained in advance from the Community Committee, and plans discussed with the cleaners. The residual waste quantity data were collected over three days during the working week. Weekends were excluded because of potentially inconsistent patterns, known to be possible from previous studies. All of the residual waste bins were weighed before the cleaner emptied the contents into his waste cart. Other information recorded included: time, date, researchers names, weather, approximate volume, bin size and number, bin contents, waste station number, empty bin weight and further comments and observations. This process was repeated for all waste stations three times per day just before the waste collection times (6 am, 9:30 am and 5 pm). The researchers then waited near the bins until the waste had left the community to ensure any extra bags arriving in the meantime were captured.

The food waste data were collected using the same methodology.

3. Findings

3.1. Food waste capture rates

The pre- and post-doorstepping data are shown in [Table 1](#) and [Table 2](#) below. The quantity of diverted food waste showed a statistically significant increase, causing a 12.5% increase in the food waste capture rate (from 45.2% up to 57.7%), illustrated by [Fig. 1](#). (The same primary data was collected one year later and the food waste capture rate was found to be 49.4%: we discuss durability in [Section 4](#)).

Table 1
The amounts of food and non-food waste that were left mixed together by residents (i.e. not sorted or diverted, FW_{not-div}, NFW_{not-div}), taken over three days. The percentages were then used to scale up for the entire mass of waste, and compared to the sorted food waste which could be measured directly in the recycling bins, as in Table 2.

RW components	2 Weeks pre- doorstepping		2 Weeks post- doorstepping	
	(kg/3-day sample)	(%)	(kg/3-day sample)	(%)
FW _{not-div}	73.96kg	61.30%	63.54kg	54.60%
NFW _{not-div}	46.73kg	38.70%	52.79kg	45.40%
Total	120.69kg	100%	116.33kg	100%

Table 2
Measured, scaled up (*) and derived (**) waste quantities (3-day totals were used: here reported as daily averages i.e. /3, to allow direct comparisons to other work). One year later the capture rate was similarly measured and found to be still significantly higher, at 50%.

	*RW (kg/day)		FW _{div} (kg/day)		*FW _{not-div} (kg/day) ^a		**CR _{FW} ^d	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Average (kg)	567.5	543.8	287.5	405.4	347.7	297	45.3%	57.7%
SD (kg)	41.8	40.3	19.3	15.7	25.6	22		
p-Value	0.122 ^b	0.0052 ^c						

^a Quantities have been scaled up from ratios found in RW compositional analysis samples, as reported in Table 1.

^b Two sample t-test (data normally distributed).

^c Mann–Whitney u-test (before doorstepping food waste diverted data not normally distributed).

^d For researchers wanting to compare recycling rates, these were 33.6% to 42.7% pre- and post- doorstepping, respectively.

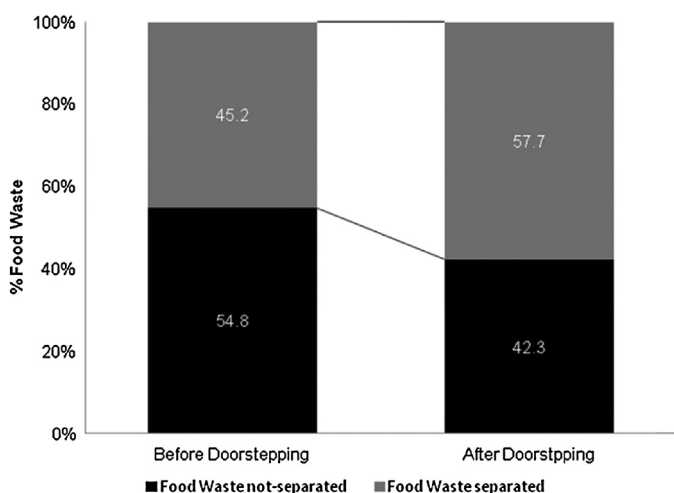


Fig. 1. Food waste not diverted and food waste diverted, two weeks before and two weeks after the doorstepping intervention.

3.2. Questionnaires on Environmental Consequences

Pre-intervention questionnaires were distributed to 439 households on the right side of the community, and 93 valid questionnaires were returned i.e. 21% of them. Post-intervention questionnaires were distributed to 425 households on the left side of the community, and 170 valid responses were returned, a rate of 40%. The division of the community was as suggested by the official local Community Committee, to ensure the two were similar.

The percentage of residents who answered YES to the question “Do you think the current way of waste treatment in Shanghai (incineration or landfills) will have significant impact on the environment?” increased from 68.5% to 71.2%, but this was not a statistically significant change: the data are given in Table 3. There-

Table 3
Answers to “Do you think the current way of waste treatment in Shanghai (incineration or landfills) will have impact on the environment?”

Answers	Yes	No	Not sure
Pre-questionnaire	68.5	20.7	10.9
Post-questionnaire	71.2	11.2	17.6

fore, Belief of Environmental Consequence was not the key element of doorstepping in this case. The unexpectedly high levels of knowledge are discussed in Section 4.2.

The open questions in the same questionnaire were useful to collect types of answers given by the residents, which enriched the quantitative data from the simple question above. All of the answers were consistent with the conclusion of no significant change: in response to the question Q2 (a) “Do you know what happens to the residue waste when it leaves the community”, 53.8% knew it was landfilled or incinerated before the intervention and 45.9% knew after the intervention. Similarly in response to Q2 (b) “Do you know what happens to the food waste when it leaves the community”, 58.1% knew it was composted or processed in the food waste factory, and 55.3% knew after the intervention. The full schedule and analysis of answers is given in Appendix A.

3.3. Focus groups and structured interviews

Two focus groups were conducted after the doorstepping campaign, one with five residents and the other with six. Each one lasted around 1.5 h. The participants were invited to share memories of the doorstepping event, with the interviewer listening out carefully for comments relating to any of the clusters of determinants. Participants were then told that recycling had increased directly after the doorstepping, and asked if they had ideas as to why. They were then asked some short questions to clarify fine points, e.g. did the residents think doorstepping in general was a positive or negative activity. Transcripts were first open coded and then axial coded (Greene et al., 1989) with reference to the 11 determinant clusters of Miche, for analysis.

The responses indicated that the doorstepping did not influence their Knowledge of the program or Belief of Consequences as they were already aware of these. Most remembered the stickers. They did not think the visits themselves were positive or negative, but some thought they caused positive feelings to recycle more, while others thought they caused slightly negative feelings of embarrassment to recycle more. A few thought it served as a reminder or Prompt. However, they spoke a lot about the efforts and diligence of the doorsteppers, often implying that it made them feel positive. Thus, Social Norms and Emotion were by far the most strongly and frequently mentioned, with Prompt much less so. Other clusters of determinants were negated or not mentioned, even with indirect prompts.

In-depth structured interviews were designed to provide opportunities to investigate the three topics elicited in the focus groups in more detail, but were also coded for any comments which related to the other determinants. Five in-depth interviews were conducted, lasting 20–50 min each. The schedule of questions is included in [Appendix B](#). They started with warm-up questions about the program generally, and then asked which activities might have caused the 12.5% increase. Clarification questions then explored whether there was any new knowledge, belief of capability, emotional response to doorstepping elements, a prompt effect, special attitude towards the doorsteppers, or role of stickers as rewards or prompts. Some responses were received which negated some determinants: for example, the residents were already clear they had the role to recycle and the Community Committee had the role to organize the program, and so doorstepping did not influence Roles. The same main three themes as from the focus groups were found to be important: Emotion, Social Norms, and to a lesser degree, Prompts. The fact that the results from the focus-groups were mirrored, and that no new concepts emerged, suggested that our sample size of 5 was sufficient for this variation sampling purposes. Data on these are presented below organized by theme.

3.3.1. Norms

The doorstepping intervention was not designed to particularly emphasize social norms, as the script shows. However, both focus groups and almost all interviewees mentioned some form of Social Norm effect:

“Now I feel there is a social atmosphere building up step by step [with reference to the doorstepping]. Since most of the residents are participating in recycling, the rest will feel external pressure. As a result, they will change gradually until they form habits.” [INTV4]

“It (doorstepping) will promote certain pressure. Even though it is only a little stress, it will have an effect of promoting (a change of behaviour)”. [INTV3]

In some cases the emphasis was on the extrinsic nature created by someone coming to the door:

“It (doorstepping) brings an invisible pressure. . . It is better to self-regulate, but if not, then pressure from others can cause progress and motivation.” [INTV3]

“Some pressure from outside cannot come from inside an individual. . . If a person does want to move forward, then the pressure from outside can motivate him.” [INTV4]

It was implied that external doorsteppers were probably best for people who were not well integrated into the community:

“Those who rent houses here don’t know us. They don’t have sense of belonging. So it is hard for the (local) volunteers to persuade or supervise them to do waste sorting (Therefore, doorstepping is effective.)” [FG1]

But others commented that the doorsteppers should include familiar people:

“Familiar people work better, because it is the older people who will be at home. . . they will not recognize you.” [FG2]

“ . . . it would be better for the block leaders to pay more attention (i.e. do doorstepping), as they live in the buildings.” [INTV5]

In summary, social influence was clearly implicated as an important determinant in doorstepping.

3.3.2. Emotion

The doorstepping intervention was not specifically designed to elicit emotions, for example in the way [Tonglet et al. \(2004\)](#) designed their program, but many references were made to slight emotions arising, which seemed in fact to be influential in the behaviour change.

The interview and focus group questions distinguished between feelings of social pressure that would be better described as Social

Norms, and actual Emotions. Only one mention was made of negative emotions:

“ . . . it (appearing in person at the door) makes them embarrassed.” [INTV7]

However, having any visitors knock on doors is atypical in this area, and on being asked, several residents implied they would feel negative if doorstepping happened frequently:

“It (frequent doorstepping) would work, but I think it will bother people too much and they will be negative about it”. [INTV6]

The possibility that the doorstepping could have caused negativity was explicitly broached to elicit comments, but it seemed not to be the case:

“We feel happier than before, after the doorstepping campaign.” [FG1]

“We don’t feel any pressure or feel troubled.” [FG1]

“People like you are welcome to come to our doors.” [FG2]

A positivity brought by the doorsteppers was mentioned several times:

“It (publicity) can touch people, especially the doorstepping type. Residents should be touched. If they didn’t participate in sorting yet, it would be a motivation for them.” [INTV3]

Part of the positivity came from knowing the doorsteppers were university students, with a clear implication in this case that they had a higher knowledge that should not be rejected lightly.

“It (doorstepping) definitely works! How could it not? We consider that you are university students and you are young. You have devoted yourselves to this work and (therefore) it must be important. How can doorstepping not work well?” [FG1]

Interestingly, many comments used the Chinese expression, “xinku, which has no exact translation into English but which can imply an acknowledgement, or sometimes a respect, for hard or possibly unnecessarily volunteered work. It is not typically an indication of emotion, but the way it was used in this work sometimes implied a response akin to a relatively deep, slightly positive feeling of satisfaction with or approval of the doorsteppers as people. The way it was used also implied that when residents considered doorsteppers as ‘xinku’ they were more likely to try harder at recycling:

“It is “xinku” for volunteers to come up and down (the stairs).” [INTV1]

“You’re “xinku”.” [INTV6]

“I remember that (the doorstepping) . . . you are “xinku”.” [INTV8]

“It is difficult and “xinku” to do this job and it takes time.” [INTV7]

“ . . . you are already very “xinku”, and we don’t have negative emotion about you.” [FG2]

It was certainly true that the general behaviour of the doorsteppers even when away from a door was noticed and influential:

“They (doorsteppers) were very kind and nice. Sometimes they come across unreasonable residents who would close the door or ignore them.” [FG1]

“You are really patient. . . One resident was carrying a bag of rice upstairs and you (a doorstepper) offered to help carry the bag.” [FG1]

In summary, the data clearly implicates Emotion as a significant determinant which influenced the residents, notwithstanding that the emotions mentioned were not necessarily strong ones.

3.3.3. Prompts

The qualitative analysis showed that doorstepping could also play the role of Prompt. Some said that it did serve as a reminder and might be appropriate and useful now and again.

“Because the doorstepping itself is a reminder. . . people will regard it as something important if you doorstep. . . otherwise they will just ignore it.” [INTV3]

“It is good to have doorstepping as a reminder; we may forget to sort the waste. . . long term reminders are much better to foster such

sorting. In this way, after a long time, say one or two years, it will become a habit.” [INTV1]

“It is OK to remind residents every six months via doorstepping. We will possibly forget it as time goes by.” [INTV7]

“Well, if so (you come bimonthly) then we will think why do you knock on our door since we do quite well.” “Doorstepping should not have a high frequency.” [FG2]

This lesser impact of doorstepping on Prompting seems consistent with the fact that this community had an abundance of prompting in other ways, e.g. notices on the blackboards in the public areas, near the communal bins, and by public loudspeaker announcements every few days. In the first months during its initiation stages which pre-dated our baseline period, local volunteers also stood by the bins to ‘help’ residents understand how to recycle.

4. Discussion

This study broke down the general operation of doorstepping into eleven clusters of determinants of behaviour change deemed relevant to the context, and used them to analyse and understand the impacts of an intervention. In commonly reported terms, the intervention consisted of a doorstepping by student or young volunteers accompanied by a local resident, with brief mentions about environmental impacts with the use of visual aids, and the provision of an informative leaflet and a colourful sticker. In the language of the determinants, the intervention was designed to have a main ‘message’ about the environmental consequences of recycling food waste intended to increase Belief of Consequences, and the intrinsic nature of the act of doorstepping, i.e. knocking on a resident’s door and engaging in conversation, was kept simple but expected to activate Prompting and some aspect of Social Norms.

4.1. Learning useful for improving local design

The intervention was successful in increasing the food waste captured, but the focus groups and in-depth interviews showed clearly that main message regarding Belief of Consequences was not even a minor determinant of the behaviour change, and questionnaires showed that the level of knowledge of environmental consequences was already high before the intervention, and unchanged by it. The researchers had kept a detailed log of all activities taking place in the community to ensure no complexities arose, but it relied on information from other groups also, and after the entire research work a late report was received which indicated that the residents had been given overview information about Environmental Consequences. The ‘main message’ delivered in the doorstepping was not, therefore, the cause of the impact in this case, which implied that the delivery approach was. Building on this result, a further study is being carried out to determine the average results from a large sample of communities which used information only versus another sample which used interpersonal approaches including some forms of doorstepping (Dai, 2015).

The focus groups and interviews revealed that Social Norms and Emotion were significantly activated determinants, with Prompting a minor contributor. These determinants were not purposely designed in, and are thus interesting to note as results of a rather neutral approach, for example compared to the enthusiastic approach used by Read (1999). For future local campaigns using a similar approach it is possible that a similar 12.5% increased recycling could be obtained, above and beyond any that could be generated by an alternative main message, e.g. focusing on Roles (it is the duty of the resident’s to sort at home!) or Action Planning (how do you plan to get your food waste from your kitchen to the recycling bin?) or Motivation (if we see you recycling you could win a prize...).

Furthermore, now that it is known from the qualitative data that many local residents are sensitive to the character and visible behaviour of the doorsteppers, it should be possible to enhance the effects already seen. For example, planners should not hesitate to accept doorsteppers that naturally evoke positive emotions and ‘xinku’, such as students and older people, and not minimize visible extra efforts that they make in the community – possibly even to increase these e.g. by having the same doorsteppers previously do other voluntary work which is valued and (appropriately) visible. Using the findings of this work, another study is being carried out to determine whether the Prompt and Emotion aspects of the volunteers can be in part induced by brightly coloured bins instead (Lin, 2015), and a further, extended study of the ‘Xinku’ effect is being carried out (Johnson, 2015).

The role of Social Norms deserves further exploration, with the data suggesting that some residents are sensitive to community norms, which could be enhanced e.g. with more emphasis on collective participation and achievements in this particular scheme, or of efforts made by various people so far, or making reference to aspects of identity of the community e.g. as a ‘responsible’ or ‘caring’ or ‘green’ community. The data further suggests that a variation in approach might be useful for those residents who are not so involved in the community, e.g. who work long hours away from home, or are new. Having block leaders accompany doorsteppers seemed important to longer-term residents, and ‘outsiders’ as doorsteppers were considered better for residents who were not embedded or thus influenced by the local community. Another aspect of social influences is their subjectivity: different stakeholders have been found to consider different social influences to be key to success from the same intervention (Xu, 2015). For clarification, we also note here that residents were not ‘supervised’ or ‘observed’ when depositing their waste at the communal bins any time after the initial launch of the program, i.e. which finished one month before our intervention, and thus that aspect of social influence was not an element of our intervention.

4.2. Learning useful for doorstepping programs elsewhere

This study has shown the usefulness of analysing and designing doorstepping via consideration of several clusters of determinants of behaviour change. Rather than use determinants implied from only one theory or experimental approach and risk missing key information, we have shown that it is operationally not difficult to investigate a large range of determinants, using post-intervention qualitative data collection designed to reveal evidence of them. This may be less useful in the narrow investigation of a particular theory, but it has worked well to provide space for key determinants to emerge from the data in a general grounded theory manner. Many intervention studies in waste have limited funding, and so simply try out an intervention and then assume that any measured change is a result of the intended effect, without having time to check other possibilities. In our case we had designed-in a “Belief of Environmental Consequence” element that we thought would cause the effect, but by spending more time collecting post-intervention data we showed that the effect was in fact due to something else: Social Norms and Emotions. Knowing that will make a great difference to planning of further programs.

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. It seems unlikely that this is possible without post-event qualitative data collection to obtain rich and detailed information.

We do not claim in this work that the clusters of determinants which we used are special, and they are not precisely derived or

Table 4
Cost breakdown of the doorstepping intervention (time and materials).

People			
	Participants	Time/hours	Comments
University volunteers	15	2 + 2	9:30–11:30am 2:00–4:00pm
Local volunteers	15	2 + 2	9:30–11:30am 2:00–4:00pm
Training (volunteer time) ^a	30	2	Before the intervention
NGO specialist time	3	10	Before the intervention
Total		210 Person-hours (of which 180 was volunteers)	
Materials			
	Number	Comments	
A2 size poster	30	2 for each team ^b	
Color leaflet	1000	1 for each household	
Hand size sticker	1000	1 for each household	
Branded tabard	30	1 for each doorstepper	

^a All volunteers were trained before the intervention, by experienced, specialist NGO/university members.

^b Each team consisted of one university volunteer and one local volunteer to 'introduce' the doorsteppers to the residents.

defined either individually or as a set. We do believe that the ones chosen cover a great range of those reported in various works, contextualized for recycling. It is likely that this set will be equally useful for a large variety of recycling studies. The usefulness of the general approach also suggests that more efforts would be worthwhile in developing further sets that specialized operationally for other commonly studied areas of behaviour change, such as energy reduction, use of public transportation, and water use reduction. A non-contextualised reference set from which those could be derived should ideally be developed by going again through the process covered in the work by [Michie et al. \(2005\)](#) but without the step which brings in specialism for public health.

The costs associated with this program are important to record. They were not excessive: 210 person hours (of which 180 were volunteers) for 986 households (see [Table 4](#) for details). In addition, leaflets and stickers were prepared and purchased for each household. The overall associated costs are not very different to other types of recycling programs, e.g. based on written information only. Although the experience of the NGO and/or university staff was key, there are nowadays many similar organisations around the world that can provide such expertise.

It is important to know what the longevity or durability of interventions is, both in terms of their cost-effectiveness for policy-making and in understanding the nature of the behaviour change which has occurred. In this work the community was visited again one year later and primary data collected using the same methodology: a food waste capture rate of 49.4% was found. This is a very respectable maintenance of the figure of 57.7% only 2 weeks after the doorstepping. However, we are generally very cautious about the data sometimes reported by researchers taken some time later in non-laboratory studies i.e. in real-world, complex situations, because we are aware that there are many factors which can influence waste and recycling practices and believe it is virtually impossible to draw any valid conclusions about durability without regular data collection which can account for seasonal and other fluctuations such as special mass media campaigns, events in schools with local children, etc. – a detailed log would need to be kept. In addition, turnover rates would need to be monitored accurately, and it would need to be known exactly how well any newcomers were inducted into the program. In this community we are confident that the turnover rate was quite low and that no major events affecting recycling had occurred in the community itself, but general city publicity and increasing public awareness were changing factors. In addition, durability is more likely associated with elements relating to the changing and embedding of habits, which

is not analysed in this work. We thus are not confident to conclude any durability effects from the doorstepping intervention in isolation, but can say that the particular program in addition to the doorstepping in the context of increasing public awareness seems to have produced an excellent level of durability.

5. Conclusion

This study aimed to design and understand a successful doorstepping intervention by finding a way to break down doorstepping into analysable elements, to thus facilitate progressive learning for future programs.

The intervention designed produced a statistically significant increase in food waste diverted, with the capture rate increasing impressively from 45.2% to 57.7%.

More importantly, qualitative studies showed that the elements which made the main impression were Social Norms, Emotion and, to a lesser extent, the Prompting effect, and this learning guides local planning to focus on higher visibility of the doorsteppers, knowledge that student and possibly older volunteers had special effectiveness, and increased emphasis on a 'message' of local community change of behaviour, with decrease emphasis or removal of the 'message' about environmental consequences.

Elements that did not impact significantly included Knowledge, Skills, Belief of (Environmental) Consequences, Belief of Capability, Action Planning, Role Clarification, Feedback, and Motivation. Programs which assume that flooding residents with information and emphasis on environmental consequences might especially be interested in this result.

The approach of using an elemental analysis has proven very useful, allowing much richer and more transferable and potentially generalizable learning to take place than other studies labelled as 'doorstepping'. This approach generally shows potentially great usefulness in pragmatic analysis of various recycling activities for planning purposes, such as recycling services, collection methods and multi-faceted recycling programs. The particular clusters of determinants used are worthy of further development in order to check their level of 'completeness', and to provide a stronger link to behaviour change theories.

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Appendix A. Schedule of questions used in the written questionnaires, distributed by block leaders and submitted to a central collection point

Schedule of questions used in the written questionnaires, distributed by block leaders and submitted to a central collection point

Questions and results of questionnaires.

Q1: If you recycle your food waste at the moment what are the main reasons?			
Response	Respondents mentioning (%)		
	Pre/%	Post/%	
Environmental protection/reduce pollution	41.9	44.7	
For a cleaner community, city, country or living environment	23.7	19.4	
Better air quality	6.5	1.8	
Waste sorted becomes a resource	12.9	11.8	
To reduce waste	11.8	4.1	
Human health	8.6	8.8	
Publicity	6.5	3.5	
Motivated by work of the community committee/volunteers	2.2	1.2	
It is our responsibility	2.2	7.6	
For the next generation	21.5	21.2	
For the society/world	0	10.0	
For myself	0	3.5	
Learned from foreigner/foreign countries	0	2.4	
Others	7.5	7.6	
Unanswered	3.2	1.2	

Q2 (a): Do you know what happens to the residue waste when it leaves the community?			
Response	Respondents mentioning (%)		
	Pre/%	Post/%	
Landfill or incineration	36.6	15.3	
Landfill	8.6	9.4	
Incineration	8.6	21.2	
Composted/waste factory	4.3	3.5	
Recycled/sorted	15.0	17.6	
Not sure	30.1	35.3	
Unanswered	2.2	4.1	

Q2 (b): Do you know what happens to the food waste when it leaves the community?			
Response	Respondents mentioning (%)		
	Pre/%	Post/%	
Composted/food waste factory	58.1	56.3	
Pig-feed	3.2	4.7	
Bio-gas	1.1	0.0	
Recycle/sorted	7.5	6.5	
Incineration/landfill	2.2	5.9	
Others	5.4	0.6	
Not sure	25.8	31.2	
Unanswered	2.2	1.8	

Q3 (a): Do current ways of waste disposal (incineration and landfill) have any effects on the environment?			
Response	Respondents mentioning (%)		
	Pre/%	Post/%	
Yes	68.5	71.2	
No	20.7	11.2	
Not sure	10.9	17.6	

Q3 (b): If you answered YES what are they?

Response	Respondents mentioning (%)	
	Pre/%	Post/%
Landfill takes up space	19.4	5.9
Air pollution	44.1	37.1
Soil pollution	15.1	8.2
Water pollution	4.3	10.6
Heavy metals	2.2	0.0
Unsorted waste is a waste of resources	4.3	0.0
Will have an effect on the environment (unspecified)	18.3	17.6
Human health	9.7	11.8
Global warming greenhouse effect	1.1	5.3
Other	1.1	7.1
Unanswered	2.2	8.2

The pre- and post- questionnaires were analysed using the same methodology. The questionnaires were translated from Chinese and coded using an open coding approach to categorize the respondent's answers (Davies, 2007). The responses followed similar patterns and answers which made coding easy and every time a category was mentioned it was recorded in a spreadsheet. No category was mentioned twice in the same questionnaire. It should be noted that more than one category could be coded in one response so the total number of categories mentioned exceeds the response sample size. And the results of open questions are given in percentages in the tables, the sum of which exceeds 100%.

The results demonstrate little change before and after the intervention contrary to the hypothesis. In response to the question Q2 (a) "Do you know what happens to the residue waste when it leaves the community", 53.8% knew it was landfilled or incinerated before the intervention and 45.9% knew after the intervention. Similarly in response to Q2 (b) "Do you know what happens to the food waste when it leaves the community", 58.1% knew it was composted or processed in the food waste factory, and 55.3% knew after the intervention.

In response to Q3 "does waste disposal have any effects on the environment", 68.5% replied yes before and 71.2% replied yes after.

To study the residents' belief of environmental consequences, the answers of Q3 were used for direct comparison and the answers of Q2 were used for supplementary understanding. Results of both Q2 and Q3 have shown little change between pre- and post-questionnaires. And the unexpected high belief of the consequences was discussed in Section 4.2.

Appendix B. Interview Questions

1. Interview Questions

(translated from the Chinese)

Gender: Age: Occupation:

- Do you have any memories about what happened when the food waste program was set up in your community? Specifically what?
- Do you remember our doorstepping visit?
- Do you think it was useful to help people recycle more?
- After we did the doorstepping, do you think that you and the people you know participated more? Or almost as before?
- After we did the doorstepping, the food waste recovery rate increased by 12%. What do you think was the reason?
- What do you think of the information given to you, in terms of its helping to increase recycling?
- Do you think that the doorstepping provided you with information you did not have before?

8. Do you think all residents are happy with doorstepping: do you think it is a popular way to promote recycling?
9. If you were reminded, you might recycle more. Do you think the doorstepping acted as a reminder to you?
10. Some people say they do not like doorstepping, and others say they do. What do you think? Why?
11. What do you think about having (Fudan) university students as doorsteppers?
12. Do you think doorstepping causes any kind of pressure or stress, or other special feeling?
13. Do you remember receiving a sticker? Did it end up acting as a reminder for you, or do you think of it as a kind of reward?
14. Did other things happen around the same time as the doorstepping that might have caused more residents to participate better?
15. Do you have any suggestions for us? Do you think we should proceed in a different way to doorstepping in future communities?

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