Reframing communications that encourage individuals to reduce food waste

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ABSTRACT

The waste of edible food throughout the food chain is recognised as a global issue and academic research focuses on how to encourage reductions in this waste. At the consumer level, governments are investing in communication campaigns that encourage individuals to reduce the amount of edible food discarded in their home-based activities. The specific aims of this paper were to identify causes of food waste and what experts recommend for reducing the problem, to identify gaps between information provided in food waste communication campaigns and the experts recommendations, and finally to empirically identify further gaps between individuals' knowledge of food waste with a framework of the expert recommendations. In terms of findings, the literature review identified a range of causes and nine relevant expert recommendations for reducing this waste. An evaluation of a number of major consumer-focused communication campaigns available in Australia and New Zealand provided evidence that these campaigns were addressing some of the recommendations from experts. A subsequent qualitative investigation of household members' knowledge of the issues of food discard showed that individuals' understandings can be prioritised in terms of the expert recommendations and the communication messages in the campaigns. Further research is identified based on these findings.

Introduction

Globally food waste is a significant environmental, social, and economic issue. Recent estimates suggest that between 1.2 and 2 billion tonnes, or 30–50% of all food produced for human consumption in the world, is either lost or wasted (Food and Agriculture Organization [FAO], 2011; Institute of Mechanical Engineers [IME], 2013). Food loss occurs throughout the supply chain, from the producer through to individual consumers. In low-income countries, most loss occurs during harvesting, storage, transport, and processing. In medium- and high-income countries, as food moves along the distribution chain, the waste mostly occurs at the retail and consumer levels. Food

waste is prevalent with perishable products, such as fresh fruits and vegetables, meats, dairy, and cooked items (FAO, 2011).

This paper focuses on food waste caused by individuals, that is, the behaviours within the control of people in and around where they live (Stancu, Haugaard, & Lähteenmäki, 2016). Food waste is not an isolated behaviour, rather, it emerges from the complex household interactions and activities associated with food purchasing, storage, preparation, and consumption. The multifaceted nature of the food waste challenge is, in part, what has led to suggestions that it is truly a 'wicked' problem (Booth & Whelan, 2014), ever changing and resistant to solutions (Mavrakis, 2014; Parr, 2014).

The overall objective of this research is to contribute to efforts to reduce food waste by highlighting ways to increase the effectiveness of communication campaigns. Consequently, this paper focuses on the practice of communication in society, and in particular that of advertising, and the intersections this has with research and theory (Flew, 2015). The objective is achieved by synthesising recommendations from experts based on a review of academic literature, evaluating current communication campaigns, and reporting on an empirical investigation householders' knowledge of this issue. The specific aims of this paper are threefold, namely: (1) to identify causes of food waste and recommendations provided by experts for reducing it; (2) to identify gaps between information provided in food waste communication campaigns and recommendations from experts, and (3) to identify further gaps between individual knowledge of food waste and recommendations from experts.

Reducing food waste – the view from experts

The body of research, identified in the review of academic literature and Government publications, suggests that individuals' activities in domestic households that result in food waste have, for the most part, been identified. Food waste is not an isolated behaviour, rather it emerges from an interaction of activities associated with food purchasing, storage, preparation, and consumption (e.g. Baker, Fear, & Denniss, 2009; Farr-Wharton, Foth, & Choi, 2014; Pearson, Minehan, & Wakefiled-Rann, 2013). The following schema provides an overview of these findings, as depicted in Figure 1.

The food flows as shown in Figure 1 provide a useful schema that assists in identifying the context in which the choices individuals make can result in food being discarded as waste. The term *discard* is being used in recognition of the fact
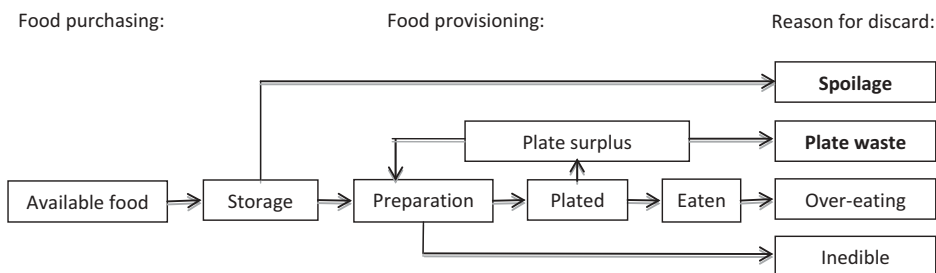
Figure 1. Food flows in household resulting in discard.

that there will always be some waste emerging from components of individual food products that are considered inedible, such as bones or vegetable peelings. While the phrase *food waste* is used by experts, it has been reported that it is not widely recognised, or indeed valued, by many people. Thus, food discard is a more relevant word as it more accurately describes what this phenomenon means to the general population (Evans, 2014).

Creating a surplus of *available food* owing to over-purchasing is likely to result in food going 'off' while in *storage* and hence being discarded as *spoilage*. The reasons for this occurring are due to limited planning of purchases and/or the actual meals varying from the planned meal (e.g. Evans, 2014; Quested, Marsh, Stunell, & Parry, 2013). Strategies recommended to reduce this discard include planning shopping by creating written lists that include the ingredients required for planned meals. Another recommendation is to shop regularly, such as every few days rather than a big weekly shopping trip, which allows the content of meals to be more responsive to changing desires. However, it is recognised that even planned meals can be disrupted easily owing to variability in food-related routines, such as spur-of-the moment changes emerging from shifting work demands or spontaneity of social lives (Evans, 2014).

Creating a surplus of food in the *preparation* phase by cooking too much results in *plate surplus*. This may be stored as leftovers and eaten at a later time or discarded as *plate waste*. In a similar manner to the emergence of spoilage, the reasons for plate waste have been reported to be due to limited planning of the amount food prepared and/or actual eaters varying from the plan, social conventions around portions that provide a surplus food, or limited knowledge of the correct amount required from a dietary health perspective (e.g. Evans, 2014; Quested et al., 2013).

Additionally, it is relevant to note that *overeating* is a form of food waste, as it is eating beyond individuals' nutritional requirements. Smil (2004) includes over-nutrition (the gap between the energy value of consumed food per capita and the energy value of food needed per capita) in his definition of food waste. Blair and Sobal (2006) have defined the term 'luxus consumption' meaning food waste and overconsumption leading to storage of body fat, health problems, and excess resource utilisation. Owing to the increasing prevalence of obesity, and associated diseases, the consequences of wasting food through overeating are significant. For example, Blair and Sobal (2006) estimate that 18% of land and ocean hectares used to support the US diet is used to produce this luxus consumption.

And finally, individuals tend to make decisions about whether the particular food item is suitable for eating or not. Thus, it is either edible or *inedible*, with the latter being discarded. Some components of foods are physically impossible for individuals to eat, such as bones. There is also variation in other distinctions between edible and inedible food that are determined by individuals' culturally acquired norms and economic circumstances (Mirosa, Zhang, Lizuka, Aoake, & Pearson, 2015). Further, it is interesting to note that what is considered inedible is also subject to gradual changes, such as emergence of eating skin on potatoes or apples, gradually becoming more acceptable over recent decades. Not surprisingly, individuals apply different standards to the disposal of inedible food as opposed to edible food that they choose not to eat.

In addition to the behaviours related to over-purchasing and cooking too much, as previously discussed, the profile of individuals who discard large amounts of food is

reported to: (a) have limited awareness of the issues; (b) have limited kitchen skills; (c) be immune to the financial cost; and (d) have high-quality standards, which may include acute sensitivity to food safety (Farr-Wharton et al., 2014; Pearson et al., 2013).

From a demographic perspective, identification of who is wasting food is limited to broad profiles. For example, those who tend to discard a lot of food are reported to be combinations of 18–24-year olds, families with young children, and earning more than $100,000 a year (Baker et al., 2009; Mason, Boyle, Fyfe, Smith, & Cordell, 2011; Tucker & Farrelly, 2016; WasteMINZ, 2015a). Other research has identified groups of individuals based on their knowledge and behaviour of food discard. These segments have been labelled as: the *guilty*; those who *don't care*; with the remainder being those who are *in denial* (Hamilton, Denniss, & Baker, 2005).

Figure 2 has been developed from research that identifies what particular food products are discarded and their discard destiny, that is, where they are sent to for disposal.

The food groups in Figure 2 have been listed according to the amount discarded. Not surprisingly, they are all products that are perishable to a greater or lesser degree. Recent research from New Zealand reported that fresh vegetables are the most commonly discarded food, most likely owing to their propensity to go 'off' or spoil. In this context, people's knowledge and their use of *best before/use by* information provided on products is important in understanding food discard (Tsiros & Heilman, 2005), as is encouraging consumption of perishables by making them visible to household members (Quested et al., 2013). Fresh fruits, with a tendency for longer 'shelf life' before they spoil (e.g. apples) than many vegetables (e.g. salad greens), were next most often discarded foods (WasteMINZ, 2015a). This ranking is supported by other research, again from New Zealand, that identified inedible portions of fruits and vegetables (peelings, stems, etc.) as the most often discarded items followed by cooked (i.e. leftovers), uneaten vegetables, meat bones and scraps, and finally uneaten fruit (Tucker & Farrelly, 2016). Further, it would seem reasonable to assume that fresh vegetables and fresh fruits account for the majority of discard occurring owing to spoilage, while the remaining food groups, namely cooked, meat, and bakery, account for majority of discard owing to plate waste.
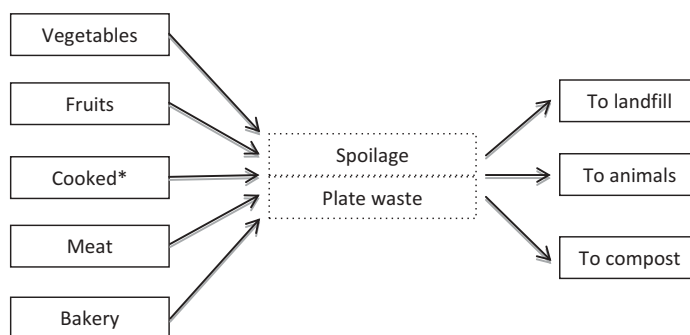
*Excluding cooked meat and food from bakery

Figure 2. Food groups, reason for discard, and their destiny.

The discard destiny in Figure 2 has also been listed according to amount of food discarded. Reports show that in the average Australian household, 79% of food discarded is sent to landfill through the municipal rubbish service. Around 12% is composted, and 6% is disposed of into the municipal sewage system via in-sink macerators (food waste disposers which shred food into small pieces). Two percent is fed to animals (Reynolds et al., 2014). Similar rankings of the discard destiny have been identified in New Zealand (e.g. Tucker & Farrelly, 2016; WasteMINZ, 2015a).

It is also worth considering the implications of different discard destinies. The food-waste pyramid (e.g. Eriksson, Strid, & Hansson, 2015) provides a ranking according to environmental impact. From this perspective, 'landfill' is the least attractive option as the product, and its constituent parts are completely lost for any further use. Being fed 'to animals' offers a form of recycling, which may even be seen as 'up-cycling', where the food discarded directly contributes to production of another food product for human consumption (such as when it results in eggs from chickens) or reducing requirements for pet food (such as when used to feed a dog). Finally, composting results in the opportunity for food constituents being discarded to be recycled. In this way, composting, when used as fertilizer for soil, contributes to production of further food products, some of which may be for human consumption. Additionally, individuals tend to apply different standards according to how the food is disposed of. Food that is recycled, such as being put in compost bins or fed to an animal, is seen as a resource or a noble practice, rather than being seen as a waste or a morally inappropriate behaviour. While feeding wasted food to animals or turning it into compost is considered a better alternative than sending it to rot in the landfill, the view from the experts is clear that this still represents an inefficient use of the world's precious resources and ultimately the best thing to do is to not waste food in the first place (Eriksson et al., 2015).

And finally, it has been reported that the motivations for individuals to reduce food discard are, in terms of most relevant to least, the possibility of saving money, feelings of guilt when food that could have been eaten is thrown away, a desire to reduce impact on the natural environment, and finally, food shortages elsewhere in world (Quested et al., 2013). These fall neatly onto a continuum from hedonistic for example what is good for the individual, to altruist motivations, for example what is good for the community and natural environment (Blichfeldt, Mikkelsen, & Gram, 2015). That reducing food discard will save money is self-evident. There is also strong evidence from individuals supporting moral appeals, for example 89% of New Zealanders surveyed stated that food discard is wrong (WasteMINZ, 2015a). The dimensions of this moral appeal include food discard having a negative impact on the natural environment (Pearson, Friel, & Lawrence, 2014), being seen as taking food from those who are hungry (Godfray et al., 2010), and wishing to avoid negative emotions such as guilt, frustration, annoyance, embarrassment, or regret (Graham-Rowe, Jessop, & Sparks, 2014). Further, research shows that the motivation is likely to differ according to who is responsible, such as those responsible for costs are more likely to respond positively to financial incentives (Goonan, Mirosa, & Spence, 2014). For ease of communication, these motivations have been identified as 'save money', 'save the planet', and 'save hungry people'.

In summarising this literature, it is evident that there is no one single, cause of food discard. Food waste emerges as a consequence, which may be unintended, of numerous activities undertaken, and choices made by individuals. Hence, the expert recommendations for individuals to reduce their food discard need to embrace a set of specific situations. For clarity of communication, these have been presented in Tables 1 and 2. As shown in these tables, there are a total of nine expert recommendations, namely, raise awareness, improve cooking literacy, make moral appeal, improve food safety knowledge, plan shopping, plan cooking, use before expiry, reuse as leftovers, and increase amount of unavoidable discard fed to animals and/or composted.

Reducing food discard – information campaigns for individuals

The previous section identified academic literature and Government reports related to the causes of food discard and recommendations provided by such experts for reducing this waste. This section reviews what information is available to the general public to encourage those individuals who wish to reduce their food discard. This discussion incorporates consideration of the extent to which the campaigns are addressing the experts recommendations identified.

Individuals and organisations, in Australia and New Zealand along with other developed countries, have access to numerous sources of advice aimed at assisting them to reduce food discard. These are being initiated across the full spectrum of government structures from transnational (e.g. United Nations [UN], 2015) through to local levels.

The most comprehensive and enduring campaigns aiming to reduce food discard running in Australia and New Zealand, and which are Government funded, are all applications of the highly successful Love Food Hate Waste campaign that has been running in the United Kingdom (UK) for sometime (LFHW-UK, 2015). Love Food Hate Waste (LFHW) commenced in two Australian States, New South Wales (NSW) in 2009 (LFHW-NSW, 2015) and Victoria in 2014 (LFHW-Vic, 2015). The New Zealand LFHW campaign commenced in 2015 (WasteMINZ, 2015b).

Table 1. Profile of high food discarders.

Knowledge and situation	Expert recommendation
Have limited awareness	*Raise awareness*
Have limited kitchen skills	*Improve cooking literacy*
Immune to financial cost	*Make moral appeal*
Have high-quality standards	*Improve food safety knowledge*

Table 2. Food discard pathways.

Individual behaviour: (expert recommendation)	Food group	Reason for discard: (expert recommendation)	Expert recommendation
Over-purchase (*plan shopping*)	Fresh fruits & vegetables	Spoilage (*use before expiry*)	*Increase amount of unavoidable discard fed to animals and/or composted*
Cook too much (*plan cooking*)	Cooked items	Plate waste (*reuse as leftovers*)	

LFHW UK is the community engagement programme from the not-for-profit organisation Waste and Resource Action Programme (WRAP) that works with individuals, community groups, and businesses to reduce food discard and is funded by the UK Government (WRAP, 2015). The campaign uses an integrated communications programme that includes digital communication tools, with a website, mobile phone app, television ads shown on YouTube, an active Twitter account, and a Facebook page. Testament to its effectiveness in that country is a claim of a 20% reduction in food waste over an 8-year period (WRAP, 2015).

The LFHW NSW website (LFHW-NSW, 2015) is dominated by static one-way communication to help with food menu planning and shopping, recipes (particularly for use of leftovers), food preparation and storage, and understanding of best before and use by dates. Advice also includes rotating items in the fridge and pantry, composting unavoidable food waste, not shopping when hungry, and cooking appropriate portions. To engage visitors through multimedia, LFHW (NSW) has partnered with a charity (DoSomething) to offer a range of short videos relating to different topic areas of managing food to reduce discard. In terms of embracing the interactivity capabilities for community engagement, visitors can share information available on the site through social media platforms, such as Facebook, Twitter, and LinkedIn. In terms of fully understanding the communications emerging from this programme, it is important to add that the campaign includes a substantial number of grants to partners, such as local councils, to deliver education and behaviour change projects in their community.

In contrast, LFHW (Victoria) engages visitors with a series of rolling banners with eye-catching phrases relating to different aspects of food discard, all of which have the Facebook link sign in the right-hand side (LFHW-Vic, 2015). It offers strong encouragement for visitors to go to the Facebook page to read more about the campaign, although much of the information is still available on the website. Compared to the NSW campaign, this site is more engaging. However, there are no symbols on the website pages to assist visitors to share their findings with others through social media, which the NSW site does offer.

LFHW NZ commenced in 2015 and at the time of writing, it is still under development (WasteMINZ, 2015b). It is located on Facebook (at https://www.facebook.com/lovefoodhatewastenz) and is visible on the websites of a large number of local government Councils across New Zealand which have embraced it. The Facebook page offers a number of topics around aspects of food discard that encourage 'fans' to engage with the conversations.

Saving money is the most commonly used motivator for individuals to reduce food discard in these LFHW communications. The moral appeals of food discard having a negative impact on the natural environment – *save the planet*, and that it may be seen as taking food from those who are hungry – *save hungry people*, are also used, but to a lesser extent.

This review of food waste communication campaigns has identified that they are addressing the issues identified by experts and recommendations for changing behaviour. For example, they provide dramatic evidence of the magnitude of the issue, they provide much information about how to reduce food wastage in the main areas of reducing spoilage and plate waste, as well as information on composting discards that

do occur. However, there are areas where it is unclear how effective they are. The first of these is the feeling that these campaigns are struggling to raise awareness of the magnitude and impact of food discard issues among the majority of the target populations. These individuals are outside the minority who actively engage with the websites and associated social media. Second, no evidence was found as to determine the relative effectiveness of different message framings, namely, 'save money', 'save the planet', and 'save hungry people'. And owing to the fact that food is relatively inexpensive, particularly for those who discard relatively large amounts of food which includes many high-income earners who are somewhat immune to the financial cost, moving to moral appeals of saving hungry people and saving the planet may be more likely to be effective. Finally, there is a sense that current campaigns are missing opportunities to engage with individuals more appropriately. In particular, there are opportunities to increase the reach and impact of messages through ensuring the websites are dynamic with a prominent meaningful logo and through being integrated with a suite of social media technologies to encourage dialogue.

Although beyond the scope of research undertaken for this paper, it is likely that individuals will also be exposed to information about food discard from other sources. There has been an ever increasing proliferation of food media across a variety of platforms (Lindenfeld, 2010). These include food in general, such as television (e.g. MasterChef and My Kitchen Rules), globally successful documentary films, for example, Food Inc. in 2008 (Pilgeram & Meeuf, 2015) as well as 'word of mouth' discussions with family, friends, and colleagues.

In summary, the discussion in this section has not only examined how food waste campaigns provide some of the types of information recommended by experts, but also identified gaps between information provided and the expert recommendations. To further inform the research in this paper, an empirical study was conducted to investigate the extent of knowledge held by individuals in terms of food discard and their relationship to the expert recommendations. The following section describes the method for this study.

Research method

Qualitative interviews were undertaken to provide a deep understanding of the subjective experiences and perceptions of individuals regarding food behaviours. Interviews were completed in an online mode using a professional web-based interview tool (GroupQuality®) that included webcam, audio, and chat functions. As respondents were sought from different regions across Australia, online interviewing reduced costs and provided the additional benefit of having respondents talk conveniently in their own home environment, which has been reported to result in greater disclosure than offline methods (Wilkerson, Iantaffi, Grey, Bockting, & Rosser, 2014).

Twenty-nine individuals were recruited via a professional market research agency to participate in the online interviews. All participants needed to have responsibility (or shared responsibility) for their household grocery shopping. People with a certain diet or lifestyle due to medical reasons or food allergies were excluded from the study. They also needed to speak English as the first language in their home and have a webcam and high-speed internet connection so that they could participate in the online interview.

To reduce selection bias, the aim of the study was described in a general way: 'we are interested in how, what and why you buy the foods you do'. Additionally, the questionnaire included a wide range of different food-related questions (e.g. on taste, price, convenience, health, and environment). Quota sampling was used to obtain participants from demographically diverse backgrounds. They received a financial compensation of $A50 after finishing the interview. Table 3 shows the participants' profiles.

Interviews were completed in June 2014, by the same interviewer and lasted around 60 min each. All interviews were audio-recorded and transcribed verbatim. The interview started with an introduction and further explanation of the interview tool. The interview was structured to first tap into the personal food world of the participant and then gradually transition towards specific food behaviours including 'Don't waste food'. Results from all aspects of the interview have been published (Hoek, Pearson, James, Lawrence, & Friel, under review) while the following findings present a more detailed analysis from only the food waste component. The term food waste is used in description of research method, and presentation of the findings, as it was the term used in collection of these empirical data.

Findings

The following findings are presented in terms of the nine expert recommendations previously identified. The order represents an approximation by the authors of their perceived importance from participants when they were confronted with advice 'Don't waste food'. This being awareness, make moral appeal, planning shopping, plan

Table 3. Profile of participants.

		N = 29
Gender	Females/Males	18/11
Age	Mean (range)	38 (18–64)
Household	Single person	6
	With partner	11
	With partner and children <18 at home	7
	With partner and children ≥18 at home	2
	Lone parent with children <18 at home	2
	Other adult household composition	1
State	New South Wales	10
	Victoria	9
	Western Australia	2
	Queensland	2
	South Australia	4
	Tasmania	2
Education	Secondary school	3
	Certificate level	6
	Diploma	1
	Bachelor degree	14
	Postgraduate degree	6
Household income	<30,000	2
($A per annum)	30,001–50,000	3
	50,001–75,000	9
	75,001–100,000	7
	100,001–200,000	8
	>200,000	0

Table 4. Summary of thematically derived food waste knowledge held by participants.

Expert recommendation	Situation for respondents
High priority	
Raise awareness	Required for majority of population
Make moral appeal	More effective than monetary appeal for majority
Medium priority	
Plan shopping	Reminder required for many
Plan cooking	Reminder required for many
Use before expiry	Information required for some
Reuse of leftovers	Recipes required for some
Fed to animals/composted	To be seen as form of food waste required for some
Low priority	
Improve food safety knowledge	Not mentioned
Improve cooking literacy	Not mentioned

cooking, re-use leftovers, use before expiry, fed to animals and/or composted, improve cooking literacy, and finally improve food safety knowledge.

In general, there was a low level of awareness of the amount of food waste, either at the global level or more locally, including some participants claiming that there was no waste of food in their household.

When told that around one third of all food produced was wasted, many participants appeared to be shocked and surprised. Comments included: 'That's terrible. …That's unbelievable. …I didn't realise there's so much waste. …Wow! That's a lot of waste. … Crazy when you think of it.' It was rare to find a participant who was aware of this, such as 'And I know that people, especially in Australia, waste a lot of food.'

In contrast to the extremely low level of awareness of the extent of food waste, there was strong agreement that not wasting food is a good thing. By far, the most commonly mentioned theme was that of guilt:

> 'It bothers me a lot, I feel quite guilty actually. I don't think we waste much food, very little….' (Respondent 2)
> 'I waste a lot of food. I always cook more than we need. Sometimes I'll freeze it, but I must admit, at the end of the week, I do put quite a lot of things in the bin. I'm a little bit guilty about wasting food.' (Respondent 21)

Comments were also made about 'this little voice of my mother in the back of my mind' or of vivid TV images of hungry children in Africa. These comments highlighted that it was seen as simply not appropriate to waste food while some people do not have enough to eat. This is an example of the 'save hungry people' appeal. The following quote illustrates some thoughts and feelings when food is wasted:

> 'So, I really do make sure that I do not waste any food… And I think that is something, looking at how in other countries and so on, where people are actually not having enough food to eat and then us sitting here and then just throwing food out… ' (Respondent 16)

The second most commonly mentioned potential motivator was that of 'saving money'. This was almost always referred to as avoiding waste of money, which was sometimes described literally:

> 'I don't want to buy food and then throw it out at the end of week. That's just like I might as well put the money in the bin.' (Respondent 5)

There was minimal recognition of 'saving the planet' as a motivator. In general, respondents were not aware of the environmental impact of food wasted. The following comments summarise this view:

> 'I just don't see how food affects the environment, really. I guess I think that it all decomposes itself after a certain period of time, depending what the food item is. So I don't see how it could be that bad for the environment.' (Respondent 26)
> 'I don't think it's [food waste] environmentally harmful because a lot of our organic stuff, I dig into the garden anyway…' (Respondent 21)

Upon reflection, some realised that 'it's being disposed of…It's going somewhere' and 'it could affect the environment because there's more rubbish being put out there.' Product packaging was mentioned as part of the potential impact on environment as in some instances it could go to 'landfill' rather than the less damaging option of being recycled. Only one respondent was aware of food waste's environmental impact:

> 'It definitely has a huge impact on the environment, because every time we waste food, more has to be produced. That's more chemicals and fuels and water.' (Respondent 2)

The potential for positive feelings when food is not wasted, for example, feeling proud or good about oneself, was also mentioned, as illustrated by the following:

> 'I was really conscious the other day. I had a bag of apples as well, and my son wouldn't eat the apples, and they didn't get eaten. But, instead of throwing them out, I puréed them all …. So, again, I was quite proud of myself that I didn't throw those out and I didn't buy another bag of apples later…' (Respondent 9)

Another theme that emerged was a sense of conflict, with some mentioning that reducing food waste would imply that people would actually eat more by finishing all the food provided on their plate:

> '…instead of throwing it in the dustbin, you're throwing it in your stomach. So, it's equally bad.' (Respondent 6)

Another respondent mentioned the potential conflict with health messages that encourage increasing purchases of food products that are prone to waste:

> 'Sort of almost a trade-off against the health aspects. If you want to be healthy, you gotta get more fresh fruit and veg, and then you risk having more wastage.' (Respondent 11)

Many respondents mentioned the planned shopping and cooking, including the reuse of leftovers, was an effective approach to reducing food waste. One respondent mentioned all three:

> 'I think planning is a really is a good thing. Like planning your meals and not just buying whatever and hoping that you use it up. And being aware of not cooking too much of something or making sure you eat the leftovers instead of just throwing that away. But, I think being organised is really a big thing when it comes to wasting food. And knowing what you've got and knowing what you need and stuff like that.' (Respondent 29)

While others focussed on planning the shopping:

> "Just careful shopping, so you don't splurge buy … and then you end up with too much, and then you're gonna end up throwing it out 'cause it's gone off by the end of the week." (Respondent 5)

And linking shopping to planned meals:

> 'When I do the food shopping, I do a meal plan for the week so that I'm only buying what we actually need to eat. And I try to stick to that meal plan every night so that at the end of the week we don't have food to throw out, hopefully. Usually, it works but not all the time but most of the time.' (Respondent 5)

And the reuse of leftovers:

> 'Even if there are leftovers, I'll put them in the fridge and I'll make them up into something else for another meal. Nothing gets wasted. The only waste is just from trimmings and that sort of thing.' (Respondent 14)

One respondent mentioned the challenge of knowing when a product has 'spoiled':

> "…is a shocker…. As soon as it hits that date [Use-By-Date] she will throw something out, when I will actually use it, check to make sure it's fine first, but she's just one of these that as soon as it hits that Use-By date or Best-By date, out it goes. And I can't abide by that, 'cause I always think there's a few more days that we could have used it." (Respondent 8)

In addition to 'putting it in the bin' respondents mentioned, feeding unavoidable food waste to animals or organising for it to be composted. Interestingly, generally, these respondents felt that such actions were not wasting food:

> '[food waste] peeling potatoes and carrots or any other sort of veggies, we've got chickens. So, we give the scraps to them. I would say that's not wasting.' (Respondent 4)
> 'If there's some left over, the cheese, we give them to one of the dogs. I wouldn't count that as wasting food, I guess.' (Respondent 26)
> 'We don't waste food here. … Most of any scraps and that goes into the compost bin or in some cases go to the rabbit hutch.' (Respondent 29)

Only one respondent recognised that such actions were relatively low down on the food waste pyramid:

> 'I definitely could do better there by utilising the food instead of digging it into a garden, I could actually make it something else.' (Respondent 21)

There was no explicit mention during the interviews of the desirability of improving cooking literacy, or that of inadequate food safety knowledge, contributing to the amount of food discard.

While it was seen as being 'quite hard to make sure there was absolutely no wastage', not wasting large amounts of food was described as relatively easy to perform, as demonstrated in the following:

> 'I wouldn't say easy, but it's not particularly hard. I think just being organised and being organised is the hard part, I would say. Yeah, being aware of what food you're buying and what food you're eating and not letting things go off. Knowing when things are off and not just throwing things out just in case. So I think organization, and I suppose like knowledge about it, about when something's good to eat and when something's not good to eat…' (Respondent 29)

In summary, the findings tend to support the notion that there are gaps between individual knowledge of food waste and recommendations from experts. The findings from the thematic analysis are listed in terms of level of priority, according to their relationship with the expert recommendations that framed the analysis. Additionally, the findings are also classified regarding the extent to which the participants are likely to respond positively to new knowledge about reducing food waste, given their responses during the interviews. Based on this analysis, there is evidence to suggest that communication campaigns should be focusing on raising awareness about food waste while emphasising the moral appeals of 'saving hungry people' and 'saving the planet'.

Discussion

Current food discard reduction communication campaigns, such as LFHW, are addressing the issues identified by experts and recommendations for changing behaviours. However, evidence from the empirical study, although only a small sample size ($N = 29$), suggests that most individuals, while thinking food discard is highly undesirable, are not aware of its magnitude in terms of the amount they discard or on a global scale. Nor are they knowledgeable on the impact of food discard. The low level of awareness is supported by other studies (e.g. Jörissen, Priefer, & Bräutigam, 2015; Quested et al., 2013; WasteMINZ, 2015a). Research has also identified that individuals tend to underestimate the amount of food they discard (Evans, 2014) and lack social practices that enable them to easily reduce it (Stoddart, 2013). For example, in New Zealand, over half of 'high food wasters' perceive that they waste 'little' or very 'little food' (WasteMINZ, 2015a). Hence, further research is required to quantify the extent of this lack of awareness.

Although evidence from the empirical study supports the diversity of motives for reducing food discard, namely, 'save money', 'save the planet', and 'save hungry people', no evidence was found as to the relative effectiveness of such motivations in changing behaviour. Additionally, many individuals are likely to be forced to make tradeoffs at times, and food discard may be an unfortunate consequence of these competing priorities (Aschemann-Witzel, de Hooge, Amani, Bech-Larsen, & Oostindjer, 2015). Further, it is likely that there is some misalignment between language and message framing in the information campaigns. For example, 'food waste' is morally loaded with negative connotations. It is also inconsistent with the view held by individuals about inedible food. This leads to recommendations that the potentially more relevant term of food discard is used in communications. In relation to the framing of communications about issues relating to environmental sustainability, it has been suggested that it is preferable to talk about values – not just facts, to use simple language – not technical terms, and to appeal to emotions (Lakoff, 2010). Arguably, the same principles apply to food discard communication campaigns. Hence, further research is required to identify the language, message framing, and underpinning motivational appeal that would be most relevant in terms of having a positive influence on the target audience.

Frames, or schemas, are the structures of an individual's thinking and typically these are unconscious. They contribute to how an individual organises and creates meaning. It has been suggested that the impact of any communication is enhanced when the message is linked to audience member's values and other familiar issues (Weathers &

Kendall, 2015). The news media is a major channel for transmission of information to the public as it helps to determine the importance of an issue, as well as shaping their thoughts about it. However, there is a complex relationship between news media content and audience reception. Audience research recognises that news media is only one of the many possible sources of information used by individuals to create meaning. In this area, social representation theory provides a framework for how information is moulded and transformed into meaning (Olausson, 2011). Hence, further research is required to identify information sources and their integration into meanings created by individuals that direct their behaviours towards both food discard and the reduction of this discard through communication campaigns.

There is also the issue of how to communicate the appeal to the target audience. It has been suggested that to mobilise broad-based support for social change, which arguably is required to make substantial reductions in food discard, individuals should not be treated as objects of manipulation, rather facilitating public dialogue will allow the emergence of powerful engagement across the community (Brulle, 2010). In terms of facilitating such dialogue, findings in the current study suggest that existing food discard communication campaigns often constitute one-way communications emanating from websites. As such, they are very cost-effective channels for providing access to a lot of content. However, proactive integration of the website with social media platforms, such as Facebook and Twitter, offers the opportunity to more actively engage visitors (as fans or followers) through sharing content, through user-generated content (Flew & Wildman, 2015), and spreading messages (Mulhern, 2009). Such multidirectional and at times informal communication allows for discussion and debate (Picard, 2015), which in turn may lead to behaviour change.

While websites and extensions to social media were identified in this study as the channel of choice in the LFHW campaigns, a New Zealand-based study by Tucker and Farrelly (2016) captured information about what individuals think are the best communication channels to use. Although only a small sample of respondents (147) they ranked leaflets provided in mailboxes, word of mouth and television shows as being the most effective way, while Internet, email, and public talks ranked least effective. Such equivocal findings may suggest that there is further need for organisations involved with creating campaigns of this nature need to develop a stronger understanding about appropriate channels to use. Integrated Marketing Communication (IMC) is ideally suited as a way to strategically address issues around communication channels, as it offers a coordinated and systematised approach that integrates advertising and public relations for delivery via multiple media channels (Kerr & Patti, 2015; Kerr, Schultz, Patti, & Kim, 2008).

In addition to understanding channel efficiencies, people are living in an era of rapidly changing information communication technologies that includes digitisation of content and the convergence of platforms and services (Flew & Wildman, 2015). Hence, there is a need to understand which devices individuals prefer to use to access information, for example, the so-called conventional channels such as newspapers or television as well as digital media such as the Internet or social media and whether it is accessed from wired or mobile devices. Evidence suggests that they are not all equal in terms of an individual's engagement with the information that firms provide for them (Andrews, Gajanayake, & Sahama, 2013). Hence, further research is also required to

determine the most appropriate channels for communication campaigns, and which devices the target audiences are likely to use, to ensure appropriately enabled content.

And finally, recommendations from experts have provided only very limited market segmentation of food discarders, such as those based on knowledge: guilty, don't care, and in-denial, or demographics: those young affluent people with families who are likely to discard large amounts of food. Identification of segments of high food discarders, and those who are willing to change, based on the food discard pathway (Table 2) will allow for communicating the most relevant appeal to a specific target audience. For example, it may be that those who over-purchase respond to messages of feeling guilty when fresh fruits and vegetable spoil and are put in the rubbish bin. Further, they may respond positively to improvements in their food literacy around cooking with 'apps' accessed via mobile devices such as 'Big oven' where a recipe is provided based on the ingredients typed in. Hence, further research is required to provide a more sophisticated profile of individuals that will allow customisation of communications to identify segments in the population.

Conclusion

The synthesis of a review of literature to determine causes of and expert recommendations on food discard, together with an evaluation of the major food waste communication campaigns, and an empirical study into the knowledge held by individuals in relation to reducing food discard emerging in households, has identified significant requirements for further research.

If worthwhile reductions in food discard are to be achieved, it is first necessary to address the low level of awareness amongst individuals about the significance of the problem and its negative consequences on the environment and society as a whole.

The challenge then moves to encouraging positive changes in behaviour amongst these individuals. It is argued that the impact of communication campaigns will be increased if more targeted approaches are used. Further consumer science research is required to identify groups of similar individuals along each food discard pathway, and those behaviours that individuals are willing to change. This will allow identification of those groups, or target segments of the population, who discard large amounts of food. They will then be prioritised in future communication campaigns.

The implementation of IMCs will engage more individuals in meaningful dialogue around reducing food discard in their home. Such an approach will benefit from selective use of traditional media, interactive communication channels, and social media applications. The content of communications will be built on identifying information sources used and applying appropriate framing and appeals for each target segment.

Finally, much of the existing food discard research focuses on individual choices alone. Whilst this is of vital importance, it is also necessary to incorporate broader contexts such as the systemic and structural issues that exist as both barriers and opportunities for individuals to make positive changes in their behaviour (Tucker & Farrelly, 2016). The ultimate aim is to have informed individuals making considered choices where the 'preferred choice' is an easy option. Consideration of these contextual factors leads to the requirement for continuing engagement with local, state, and federal government policies that support food discard reduction initiatives.

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