

Reducing plate waste in hotels: New solutions



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The Low Harm Hedonism Initiative

The Low Harm Hedonism Initiative develops and experimentally tests theory-based solutions to trigger pro-environmental behaviour in hedonic contexts. We do so without causing additional expenses to businesses and without negatively impacting the consumer experience.

We are a multidisciplinary, passionate, and experienced group of researchers working under guidance of Professor Sara Dolnicar at the University of Queensland. Our trusted collaborators are based in other parts of Australia, Austria, China, Germany, Slovenia, and The Netherlands, so that we will always have someone 'local' overseeing the process.



Plate waste is a problem

When we go on holiday, we like to relax, enjoy ourselves, and enjoy the food the destination has to offer. Indulging in new foods means people leave more uneaten food behind when dining out and on holiday (Li et al., 2019). Up to 94% of this type of food waste – plate waste – is preventable (Betz et al., 2015), costing the hotel and hospitality industry money for food purchasing and waste disposal.

Plate waste also burdens the environment substantially. Food waste accounts for 8% of global greenhouse gas emissions (Food and Agriculture Organization of the United Nations, 2013) and 24% of agricultural water use (Kummu et al., 2012). In the hospitality industry, one third of all food waste is plate waste (Sustainable Restaurant Association, 2010). By addressing the problem of plate waste, hotels “kill two birds with one stone”: saving money and improving their environmental footprint, a trademark increasingly valued by guests (Chen, 2015).

Reducing plate waste

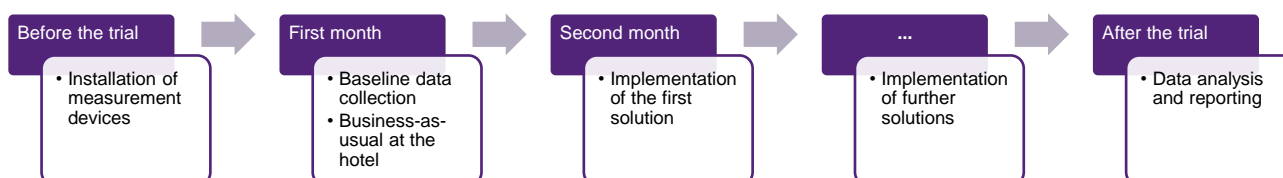
In this information pack, we propose a variety of new solutions targeting tourist behaviour at hotel buffets or restaurants, with the aim to **reduce plate waste while maintaining guest satisfaction**. Finding new, creative ways to encourage better tourist behaviour requires testing in a hotel setting, where tourist behaviour can be measured unobtrusively for a couple of months. We provide engineered measurement devices at no cost to our hotel partners.

All our solutions are based on a thorough review of the literature, follow from theory, and are designed to identify what works and what doesn't.

How does it work?

1. Read through our proposed solutions.
2. 'Click to register your interest' for the ones you are curious about.
3. We will contact you to organise a kick-off meeting.
4. If you would like to test a solution at your hotel, we will provide easy-to-install measurement devices (e.g., weighing scale, people counter) at no cost to you.
5. Using our devices, we will collect baseline data during normal hotel operations for a month.
6. After that, we will trial each of the solutions you have chosen at your hotel for one month at a time, requiring no or only minimal support from the hotel staff.
7. You will provide us with basic socio-demographic data for guests staying at your hotel every day at aggregate level (no personal identification possible). We need this information to exclude differences in the guest mix causing differences in the plate waste.
8. We will analyse all data and share the insight and future recommendations with you. We will also publish the results in academic journals.

How long will it take?



Benefits

All our proposed solutions deliver real benefits to the hotel:

- Reduced cost for food purchasing
- Reduced cost for waste disposal
- Improved environmental sustainability
- Potential to increase guest satisfaction

Examples of successful solutions

If you are interested in successful solutions we have tested in the past, we invite you to take a look at these 2-minute videos.

How to increase the number of families eating up everything on their plate by 34% – <https://youtu.be/kIAQ79DjNII>

How to reduce routine hotel room cleans by 63% – <https://youtu.be/hmpldKoCAG4>

How to reduce routine hotel room cleans by 42% – <https://youtu.be/5ze2qYZIsIM>

How to reduce the use of thick cotton serviettes by 95% – <https://youtu.be/2VJEptxm0r4>

How do we measure plate waste?

We measure plate waste as a daily average per guest, expressed in grams. To achieve this, we use a weighing scale in combination with an automatic people counter. Both connect to a local wireless network gateway that sends the data to the university's server.

Some solutions mention other behaviours that we can target in addition to plate waste (e.g., electricity saving, water use). We have measurement devices for all behaviours that integrate in one easy-to-use system.

Weighing scale

Scales can be used to measure food preparation waste in the kitchen, plate waste generated in the dining room, recycling waste and general waste. To measure plate waste, the scales can be placed under the plate waste disposal bin.



People counter



People counters register how many people move into and out of a specific area without the use of a camera (to protect guest privacy). They recognise moving objects as human or non-human with 95% accuracy. They can be installed above doorways and show the use of the dining room.

Guest satisfaction buttons

It is critically important that our solutions do not reduce guest satisfaction. To ensure this, we use guest satisfaction buttons. These buttons can be located in the hotel lobby or near the dining room exit. The question above the buttons could, for example, read: "How satisfied were you with your breakfast experience today?".



LoRaWAN gateway



The LoRaWAN gateway is a small unit designed to wirelessly connect battery operated devices to the internet. It connects the weighing scale, people counter and guest satisfaction buttons to the internet and sends the data to the university's server.

On the following pages you will find our proposed solutions to reduce plate waste.

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1. Fun and games

Click to register your interest

1.1 The jigsaw puzzle game

Families with children are among the guests who are most wasteful at breakfast and use up most resources. But children can also be a driver for positive behaviour. This solution makes environmentally friendly behaviour fun for the whole family, by turning it into a jigsaw puzzle game!

The reward of the completed puzzle – no matter how big or small – will contribute to the enjoyment and excitement of chasing the puzzle pieces.

The idea

Reward each instance of environmentally friendly behaviour with a jigsaw puzzle piece to encourage guests to complete their own, unique puzzle during their stay



For this experiment

1. The hotel chooses one or more behaviours they want to change.
For example: Eating up at breakfast; reusing towels; waiving a room clean
2. We provide reusable wooden puzzle pieces (customisable), in a different colour for each behaviour.
3. Guests learn about the puzzle game at check-in and with a note in their hotel room.
4. For one month, hotel staff distribute puzzle pieces to guests who display the environmentally friendly behaviours.
For example: Waiters carry a hip bag with puzzle pieces which they can give to guests at the end of their breakfast.
5. At check-out, guests return their completed puzzle. They can take a photo, which they can show off to their friends, and receive a small gift or certificate from the hotel (e.g., an ice cream).

The evidence base

A similar game-based solution (stamp collection game) increased the percentage of people who ate up everything on their plate by 34% in a family hotel with all-you-can-eat buffet (Dolnicar et al., 2020). [See video.](#)

Notes

- This solution can target multiple behaviours at once – it is up to the hotel to choose how many and which ones.
- It is especially suited for family-friendly hotels.

[Click to register your interest](#)

1.2 Make your home proud

It can feel good to be proud of your country and to do your country proud. Having the opportunity to represent our home in a positive way can inspire us to put our best foot forward.

Having a reminder of the world as a whole, including all countries, can also remind us to preserve the environment that makes our world so beautiful.

The idea

Use a world map with light up pins (or flags, etc.) to show where guests who do not waste food are from, using guests' pride in doing good to motivate them



For this experiment

1. We provide a large poster of a world map and light-up pins (or flag pins, or similar) to the hotel.
2. The hotel chooses where to display the poster in the dining hall.
3. Guests are informed at check-in and on table signs about the map and how they can contribute to it.
4. Hotel staff distribute the light-up pins to guests who eat up at the buffet.

For example: Waiters carry a hip bag with light-up pins, which they can give to guests at the end of their meal if they've eaten up everything on their plate.

5. Guests can attach their pins to the map, showing their home and adding to the positive representation of their country/city/region.



The evidence base

When people are reminded that they are part of a group, they often act in a way to represent that group in a positive way (Branscombe et al., 1993). Reminding people of their country and framing their citizenship as is pro-environmental, can motivate them to behave less selfishly and contribute to collective action improving sustainability (Milfont et al., 2020).

Click to register your interest

1.3 Keeping score

Competition can push us to achieve more than we would do by ourselves alone.

Many people are motivated by a touch of competitive spirit, especially when we are part of a team. We feel inspired to pull together with our teammates and achieve something to be proud of, such as helping the Earth.

The idea

Use a scoreboard-style competition to motivate guests to eat up everything on their plates



For this experiment

1. The hotel decides for how long the competition will run and whether there will be a prize (such as a small discount for a hotel service).
2. Guests are informed at check-in and on table signs about the ongoing competition and how they contribute.
3. A scoreboard shows the live food waste data (e.g. every ten seconds) and the prior lowest score.
4. When the competition ends, the daily food waste per person for the competition period will be calculated. The day with the lowest food waste per person is the winner!
5. The hotel announces the winning day on their social media platforms or website and distributes any discounts to guests who were present on the winning day (optional).

Example of a simple scoreboard



The evidence base

Being part of a team can make people work harder and achieve better things, compared to when they are alone (DiMenichi & Tricomi, 2015). Competitions for sustainable behaviours such as monetary donations to sustainable causes, recycling and sustainable purchases, are successful at motivating people to behave in more environmentally friendly ways (van Horen et al., 2018).

Click to register your interest

1.4 Clear your plate, win a prize

Hotel guests can be stimulated to eat up everything on their plate by participating in a raffle. The gamification element makes eating up fun for all guests. The expected financial savings of reducing plate waste will outweigh the small cost for the daily prize.

The idea

Use a daily raffle for a small prize (e.g., a bottle of wine) to incentivise guests to eat up at breakfast



For this experiment

1. The hotel decides on a prize they want to give out and when the raffle will be held.
2. Guests are informed about the raffle at check-in and on table signs.
3. For one month, waiters distribute the raffle tickets to guests who eat up at breakfast. Each time the whole table clears their plates, they receive one raffle ticket per person.
4. At the chosen time (e.g., each day at the end of breakfast time), there is a raffle in the dining room.

The evidence base

Guests like it if hotels share their financial savings from sustainable behaviour with them. A similar solution (drinks voucher) reduced the number of room cleans by up to 42% (Dolnicar et al., 2017). [See video.](#)

Notes

- This solution can easily be integrated into an existing raffle (or game night, or similar) at the hotel.

Click to register your interest

1.5 Go viral with your empty plate

Presenting your achievements on social media is popular with the younger generations. We motivate guests to eat up by inviting them to afterwards take a photo through an oversized photo frame, dressing up with accessories and showcasing an empty plate. This makes sustainable behaviour fun and at the same time uses social media to advertise the hotel's brand for free.

The idea

Use a photo frame with food- and nature-related accessories (wig, glasses, hats, masks, etc.) for a photo shoot to motivate people to finish their plate

For this experiment

1. The hotel provides an area near the entrance for a photo shoot with the invitation to "Finish your plates and come here to reward yourself with a photo shoot!".
2. We provide the hotel buffet with the photo shoot frame, customised with the hotel's name, logo, and choice of hashtags.
3. Guests use their phones/cameras to take photos of themselves through the frame.
4. The hotel encourages the guests to upload their photos to social media using the same hashtags.



The evidence base

Additional pleasure engages customers with service providers (Dolnicar, 2020). Social norms (as represented by the sentence on the photo frame "I finished my food") drive behaviour change to reduce food waste (Dolnicar, 2020). Word-of-mouth (photos uploaded by customer on their social media network) is an effective (free) way to advertise the hotel.

Click to register your interest

1.6 Buffet “Three-in-a-row” game

A “Three-in-a-row” game can improve multiple guest behaviours that occur at the buffet, such as not overfilling their plate, showing a better attitude to hotel staff. Guests will be handed a card with nine behaviours they can choose to complete. If they finished any three behaviours in a row, they can get a reward (of the hotel’s choice). This game also helps hotels to promote their services, as for example the signature dish or beverage.

The idea

Use a “Three-in-a-row” game to change multiple guest behaviours at the buffet

An example of a “Three-in-a-row” game

Go back to the buffet table more than 3 times	Use fewer than two plates during the buffet	Try our signature dish
Try one of our beverages	Eat up everything	Smile to our staffs
Try a vegetarian dish	Try one of our desserts	Use our tasting plates

For this experiment

1. The hotel decides what to offer as a reward (e.g. a coupon that can be used for other services in the hotel) and which behaviours they want to change.
2. When guests enter the buffet hall, they will be handed a “Three-in-a-row” card and instructions on how the game works.
3. Guests who finish any three behaviours in a row successfully can hand the card to one of the buffet staff to exchange for a reward.

The evidence base

A stamp collection game can reduce the buffet plate waste from family groups by 34% (Dolnicar et al., 2020). [See video](#). Our intervention tackles the issue from a similar angle but targets all guests rather than only family guests.

Notes

- This solution provides a great opportunity to change multiple guest behaviours at once.
- It can be used to promote new dishes or services.
- For behaviours that are hard to check (e.g. going back to the buffet table more than three times), the game is based on guest honesty. Some behaviours can be checked by waiters based on staff availability (e.g. eating up everything; using fewer plates per person).
- Different “Three-in-a-row” cards can be provided everyday to make the game more enjoyable.

2. Incentives

Click to register your interest

2.1 Cross-promotion of under-used hotel services

To make people feel that the motivation for reducing plate waste is not about saving the hotel money, the hotel gives away discount vouchers for a hotel service of their choice. This is a win-win situation: Guests receive “sure money” for simply eating up their plates, and the hotel can boost demand for an under-used hotel service. The increase in demand for the under-used service will generate additional profits, outweighing the cost of offering the discount.

The idea

Use discount vouchers for a different hotel service (e.g., dinner, spa) to stimulate eating up at breakfast and attract new customers to an under-used hotel service

For this experiment

1. The hotel chooses a hotel service they want to promote and how much of a discount they want to give.
2. Guests are informed about the discount voucher at check-in and on a table sign.
3. For one month, waiters distribute discount vouchers to guests who eat up at breakfast.



The evidence base

A similar solution that shared financial savings with guests through a drinks voucher reduced the number of room cleans by 42% (Dolnicar et al., 2017). [See video](#). In all-you-can-eat restaurants, a 20% discount on the cost of the meal reduced plate waste by 45% (Chang, 2022). A small discount on the room rate increased towel reuse by 40% (Morgan & Chompreeda, 2015).

Notes

- The cross-promotion of an under-used hotel service is an opportunity to redirect guests to hotel services they might otherwise never have used.
- The discount can be set to be lower than the profit margin on the promoted service. It may be expressed in relative terms (e.g., 10% off a lunch meal) or absolute terms (e.g., 1€ off an ice cream).

Click to register your interest

2.2 “One-for-one”: Reducing waste & feeding the poor

Tourists waste lots of food on their plates at hotel buffets. At the same time, 12.5% of the Slovenian population are at risk of poverty ([Slovenia Statistical Office](#)). People love to help others and experience a warm glow when they do. We want to use this altruistic pleasure to motivate guests to be less wasteful at breakfast. With the local “one-for-one” connection (saving food feeds someone in need), people will feel more directly involved.

The idea

Leverage the warm glow people feel when they do something good: For every 1kg of food saved, the hotel will make a donation to a local food charity



For this experiment

1. The hotel chooses a local food charity they want to support and a donation/kg saved they can commit to.
2. Guests learn about the “one-for-one” idea and donation at check-in and on table signs.
3. The hotel makes donations to the local food charity in line with their commitment. If desired, the hotel can display the donation receipts in the lobby or breakfast hall, and give out tokens/stickers to guests who eat up.
4. (optional) For the next month, the hotel makes a donation to a different charity of their choice (e.g., an environmental charity). This serves as a comparison to see whether the “one-for-one” connection works better than other donation incentives.

The evidence base

Engaging in green initiatives for public-serving motives increases guest satisfaction (Gao & Mattila, 2014). When hotels linked a towel reuse program with a charity donation, towel reuse rates increased by 30% compared to an environmental appeal message (Goldstein et al., 2011).

Notes

- This solution contributes to Corporate Social Responsibility of the hotel.
- Multiple variations are possible: Guests can have a choice of different charities, receive a token/sticker to symbolise their contribution, place the token in a glass bowl to see how donations are being raised etc.

3. Structural changes

3.1 Smaller serving spoons

Overfilling of dining plates is a big issue in hotel buffets and contributes to plate waste significantly. Our simple solution aims to solve this issue by providing smaller serving spoons.

We expect changing the default setting in the buffet can help to prevent guests from overfilling their plate without harming their buffet experience.

The idea

Use smaller serving spoons to prevent guests from overfilling their plate



For this experiment

1. The hotel decides on the style and size of serving spoons (or other serving utensils).
2. We provide the hotel with normal size and small size serving spoons.
3. For one month, the hotel uses the normal size serving spoons at the buffet.
4. For one month, the hotel uses the small size serving spoons at the buffet.

The evidence base

Hotel buffets can reduce 20% of plate waste if they reduce plate size by 12.5% (from 24cm to 21cm) and this will not harm guest satisfaction (Kallbekken & Sælen, 2013). Our solution tackles the issue from a similar angle, but we change the size of serving spoons, which is easier and more economical for the hotel to implement.

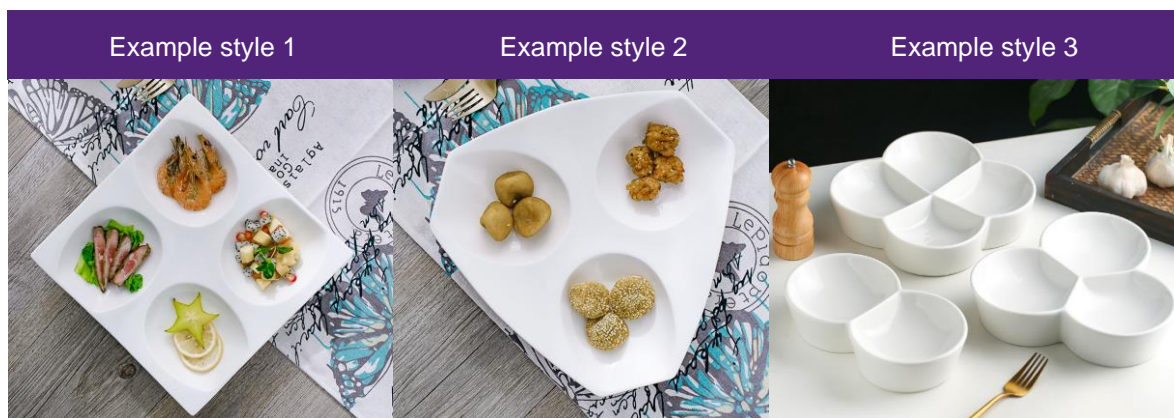
3.2 Tasting plates

Guests are curious to try a variety of foods at buffets. However, taking a large portion of unfamiliar food and mixing flavours that do not work well together are major contributors to buffet plate waste.

Our solution provides tasting plates that allow guests to have a “degustation experience”. This should reduce overfilling and mixing of different flavours and, therefore, reduce plate waste.

The idea

Use tasting plates to enhance guests’ buffet experience and reduce plate waste, which is normally caused by overfilling and mixing of different flavours



For this experiment

1. The hotel can choose to:
 - a. Provide tasting plates to buffet guests in addition to normal plates.
 - b. Replace all existing plates with tasting plates.

In both cases, guests are serving themselves, but will have a choice of plate in option a.
2. Table signs will encourage guests to enjoy a variety of foods and enhance their buffet experience by using the tasting plates.

The evidence base

Hotel buffets can reduce 20% of plate waste if they reduce plate size by 12.5% (from 24cm to 21cm) and this will not harm guest satisfaction (Kallbekken & Sælen, 2013). This solution tackles the issue from a similar angle but the tasting plates are more likely to enhance guests’ buffet experience compared with the previous study.

Notes

- This solution can be marketed as a special degustation experience.

3.3 Messaging on plates

Pre-commitment is a proven strategy to change people's behaviour. We use a slogan printed on plates to signify the guest's pre-commitment to eating up. When they are serving themselves, the slogan will remind them that they have committed to clearing their plate.

Using green coloured plates in addition to the slogan makes the commitment publicly visible, which will further enhance their behaviour and encourage other guests to take a green plate.

The idea

Use pre-commitment strategy and public visibility to reduce plate waste at the buffet



For this experiment

1. The hotel chooses a slogan and plate design with an environmental message.
2. The hotel can choose to:
 - a. Make white plates with slogan and green plates with slogan available to guests in addition to regular plates.
 - b. Replace all existing plates with white plates with slogan and green plates with slogan.
3. A table sign encourages guests to reduce plate waste by using the plates with slogan.

The evidence base

Guests who made a specific commitment (to reuse their bath towel) are 30% more likely to reuse their towel, and this number increased to nearly 40% if their commitment is publicly visible (Baca-Motes et al., 2012). In our solution, we aim to use the white plate with the slogan to stimulate non-publicly visible commitment and use the light green plate with the slogan to stimulate publicly visible commitment.

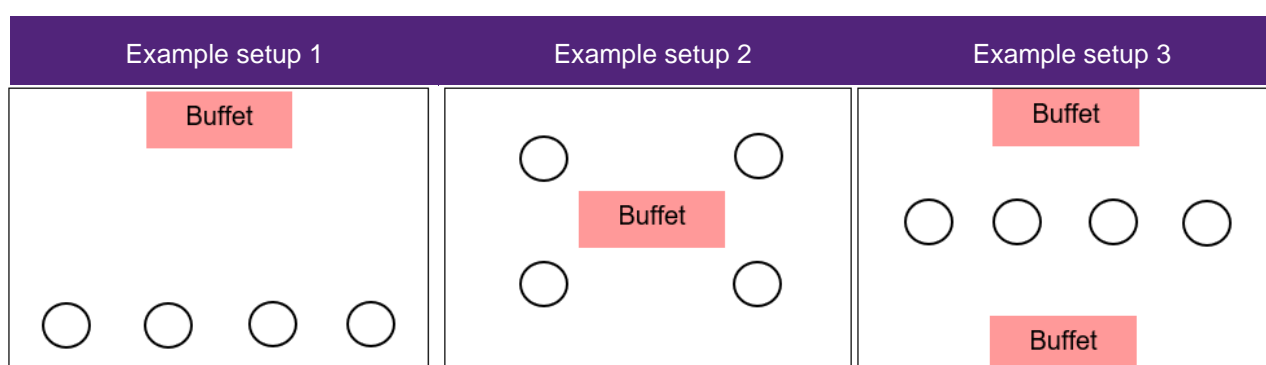
Click to register your interest

3.4 Changing the buffet setup

When the buffet is far away from the dining tables, guests might be reluctant to return multiple times and therefore pile excessive amounts of food onto their plate. Setting up the buffet so it takes less effort for the guests to take multiple trips can encourage people to take less food, as it is easier for them to revisit the buffet.

The idea

Change the setup of the buffet to reduce the effort needed to visit the buffet multiple times



For this experiment

1. The hotel changes the setup of the buffet so that the dining tables are closer to the buffet station.
2. Different setup configurations can be tested from one month to the next.

The evidence base

Making simple changes to the eating environment have been successful in changing individual food choices and diets (Ensaff, 2021). For example, children consumed and wasted less fruit and vegetables when school canteen staff made these foods easily accessible (Nørnberg et al., 2015). Further, prompting guests to return to the buffet multiple times rather than getting all their food at once reduced food waste by almost 20% (Kallbekken & Sælen, 2013).

4. Guiding guests toward better choices

4.1 Meals that work

When guests visit hotel buffets, they often have no guidance as to what foods taste good together and are overwhelmed by choice. This can lead to guests combining foods that do not work or taking too much food, which leads to waste and costs your hotel money. If guests are given a menu which suggests what they can choose to make a tasty meal, this can guide guests away from combining foods that do not taste nice together or taking more food than they can eat.

The idea

Guide guests through meal suggestions as to what food and how much of it to take from the buffet

For this experiment

1. The hotel gives meal suggestions based on what they serve at their buffet and what their chefs think works together.

For example: Healthy option (sweet), healthy option (savory); vegan (see sample menu)

2. We design leaflets based on these suggestions to guide guests to what food to select to create their chosen meal. There is potential to place meal suggestions in QR code format.
3. Leaflets or QR codes should be positioned at the entrance to the buffet or on the buffet table.
4. Hotels clearly label food/dishes so guests can easily identify the items the menu guide suggests.

For example: as per the sample menu, all foods relating to the vegan savoury option have a green sticker next to them.



The evidence base

If you guide guests towards a recommended serving of specific foods (e.g., croissant) this prompts them to avoid wasting food in buffet-style settings (Cozzio et al., 2021). However, our solution is broader and takes the whole meal into account rather than specific food items.

Click to register your interest

4.2 Tips to enjoy the buffet

Coming to an unfamiliar place can be nerve-wracking. We want to improve the comfort and confidence of guests, by providing them with some tips on how to have a good buffet experience. Some of these tips directly aim to reduce food waste in hotel buffets.

The idea

Provide simple tips on how to enjoy the buffet, to help guests feel comfortable and confident while also reducing food waste



For this experiment

1. We will work with you on some simple instructions or tips on how best to enjoy your buffet.
2. These tips will be provided on an A-frame sign in the dining room, as well as on table signs.
3. The provided tips will include behaviours which reduce buffet food waste:
 - a. We will suggest for guests to take small servings of food at first, so they can discover what they like.
 - b. We will also suggest that guests go back many times to take small servings, rather than overloading their plate and getting full.



The evidence base

It is normal to feel nervous in new places, especially when we don't know what to do and feel uncertain (Gu et al., 2020). This nervousness can lead people to act impulsively, because the brain requires excessive amounts of energy when it is anxious (Hitze et al., 2010) such as overloading their plate at the buffet or taking large servings of food that they later realise they do not like. By providing tips on how to use the buffet, we can help reduce uncertainty and guide guests to waste less food.

[Click to register your interest](#)

4.3 If people like me can do it, I can too.

You can save money across a range of services by showing guests that people similar to them behave in environmentally friendly ways. People are more likely to behave in a specific way (e.g., clearing their plate at the buffet) when they see people who are similar to themselves (e.g., other families) behaving in that way compared to when they see people different to themselves (e.g., businessmen and women) behaving in the same way.

The idea

Display posters that show your hotel's main demographic(s) behaving in the ideal way

For this experiment

1. The hotel chooses one or more behaviours they want to change.
For example: Eating up at breakfast; reusing towels; waiving a room clean.

2. The hotel provides us with demographic information about the typical hotel guests.

For example: Your hotel might attract guests from specific countries, or specific groups such as families.

3. We provide you with posters (see example) that target the chosen behaviour and are representative of the hotel's demographic.

4. Posters should be displayed in areas that are relevant to the behaviour (e.g., dining room if the goal is to reduce plate waste).



The evidence base

When knowing that students similar to themselves behaved in environmentally friendly ways (e.g., taking public transport instead of driving, conserving energy and water) students were more motivated to behave in the same way compared to when knowing students different to themselves behaved in environmentally friendly ways (Ferguson et al., 2011).

Notes

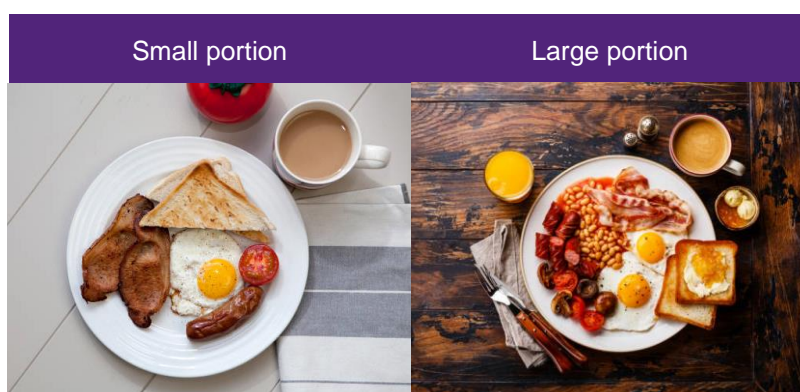
- This solution can target multiple behaviours at once – it is up to the hotel to choose how many and which ones.
- If your hotel attracts a wide demographic, we can provide multiple variations of the poster.

4.4 Visually representing serving sizes

When eating at a buffet, guests have no reference to standard portion sizes, often taking more food than necessary. The more food that is on a plate or bowl increases intake and food waste. In this solution we aim to use visual cues to provide reference to standard portion sizes. If guests can see a standard portion, this should decrease the amount of food individuals take from the buffet, therefore reducing food waste.

The idea

Use photos of standard portion sizes to guide guests towards the recommended amount of food



For this experiment

1. The hotel takes photos of meals that shows standard portions of foods they typically serve at the buffet (see examples of small (recommended) and large portions).
2. Photos should show foods that your chefs know go well together
3. We provide hotels with posters and table tents of the photos of the chosen meal(s) so that the hotel can display these at the buffet and at tables.
4. The hotel displays photos of portion sizes.

The evidence base

Visual cues can nudge consumers towards choosing specific target foods. Including seaside pictures as opposed to unrelated images on a menu increases fish meal selections (Guéguen et al., 2012). In a study by Wansink et al. (2005) individuals presented with accurate visual representations of a normal portion of soup consumed less soup than individuals presented with a larger portion.

Notes

- The hotel can display photos on screens, so that images can be easily changed to match the food available on that day. This is a simpler option for hotels with regularly changing menus.

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