
Conversion of Wet Waste to Fuel and Value-Added Products using Hydrothermal Carbonization



Qualitative research

Agenda

Time (BST)	Session
09:00-09:15	Welcome
09:15-09:45	<u>Session 1: Surveys</u>
09:45-10:00	Session 1 Q+A
10:00-10:30	<u>Session 2: Interviews and focus groups</u>
10:30-10:45	Session 2 Q+A
10:45-11:00	Break
11:00-11:30	<u>Session 3: Qualitative research case study</u>
11:30-11:45	Session 3 Q+A
11:45-12:00	General Discussion and Close



Session I- Surveys

This session will cover:

- Survey introduction and uses
- Survey components
- Survey example
- Processing data
- How surveys could relate to HTC



Session 2-

Interviews and focus groups

This session will cover:

- Introduction and uses
- Interview components and procedures
- Focus group components and procedures
- Examples
- Processing data
- How focus groups and interviews could relate to HTC



Session 3-

Qualitative research case study

This session will cover:

- Background
- Food waste reduction research
- Food waste recycling research
- Conclusion and implications on HTC



Session I - Surveys



Survey introduction and uses (1)

- A survey is a method of gathering information from a sample of people to make assumptions for a larger population

- Surveys allow quantified results to gain insights on:
 - Specific topics, such as opinions on food waste and HTC
 - Specific groups, such as Indian students

- Surveys can also be used to compare groups
 - Such as food waste attitudes among UK and Indian students
 - Or before and after interventions



Survey introduction and uses (2)

- Surveys can be carried out in the following ways
 - Face-to-face surveys
 - Increased participation and honesty
 - Telephone surveys
 - Self-administered paper and pencil surveys
 - Quicker than face-face
 - Online surveys (JISC, survey monkey etc)
 - Larger reach and less time-consuming
 - But lower response rate and less honesty



Survey components (1): Preparatory consideration

1

- Define the research goal:
-What are you trying to achieve/find out

2

- Define the sample characteristics required

3

- Decide appropriate medium for conducting surveys:
-Face-to-face surveys, Telephone surveys, Self-administered, or Online surveys

4

- Assess number of participants required through a power calculation (G power)



Survey components (2): Specific procedures

1

- Design survey

2

- Design informed consent sheet

3

- Gain approvals (ethical approval, risk assessment etc)

4

- Prepare for conducting surveys

5

- Gain informed consent

6

- Conduct surveys

7

- Analyse surveys

8

- Write up results



Survey Example

Project overview

Vast amounts of food waste (FW) is produced at universities across the UK. This waste has major environmental, social and economic issues associated with its production and end treatment. FW could be greatly reduced at such institutions, in cafeterias and residences. Additionally, large proportions of the FW typically does not get segregated, especially in University residences, and is treated with general waste in a less sustainable way than segregated FW. Little is known as to the best methods to enact behavioural change on

students, in order to substantially reduce FW and increase FW segregation. Further to this, often those in charge of waste contracts and sustainability at universities are not equipped with the requisite information to make the best-informed choice for how their FW is managed, regarding the most environmentally optimal options for them.

The project in Devonshire Hall will aim to answer the key research question is 'To what extent can behavioural change interventions reduce the environmental impact of food waste'. This research will involve conducting this survey, to gain an insight into resident's attitudes and habits regarding food waste and related practices. It will aim to increase understanding of why residents waste food, how important they feel food waste is as a topic, and what the biggest barriers are to increasing food waste segregation and decreasing food waste. Interventions including oral food waste information provision, public pledges for segregating waste, information stickers and email reminders will then be carried out to try and increase food waste segregation at Devonshire Hall.

The information gained will show what greenhouse gas mitigation potential there is with increasing food waste segregation through behavioural change interventions. This will then be considered alongside having different waste treatment practices, such as composting and incineration, in a greenhouse gas assessment that will assess the best methods for universities to reduce the environmental impact of their food waste.

This behavioural change survey is part of my (Nicholas Davison's) PhD project entitled 'Optimising food waste management in the UK university sector'. I am a PhD student in the Bioenergy centre for doctoral training, in the School of Chemical and Process Engineering at the University of Leeds. My course is EPSRC funded. I am asking that you spend around 5 minutes to answer some questions honestly about Shopping Habits and routines, as well as cooking & eating habits in the home and a couple of questions on socio-demographics.

If you wish to withdraw while completing the survey they may simply say at any point during the questionnaire and the questionnaire will be discarded. Participants are not required to answer any of the questions.

There are no expected risks to you as the participant.

This research could benefit you by thinking more about the food waste issue, why it's important to you and how you may reduce waste and increase food waste segregation. This could in turn, save you time, money and reduce your carbon footprint.

Your consent to take part in the project

I confirm that I have read and understand the above information sheet/ letter dated 19/03/2020 explaining the above research project and I have had the opportunity to ask questions about the project.

I understand that my participation is voluntary and that I am free to withdraw at any time up until 31/09/2021 (expected completion date of PhD) without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.

Nicholas Davison: Email: pmned@leeds.ac.uk

If you wish to withdraw while completing the survey they may simply say at any point during the questionnaire and the questionnaire will be discarded. Participants are not required to answer any of the questions.

You will be provided with my email address (pmned@leeds.ac.uk) on a group email to all of the residents at Devonshire Hall, stating that I was the person conducting the research at Devonshire Hall and that if you want to contact me to have your data removed, this is the email address to contact me on.

The data will be inputted into an excel spreadsheet in anonymised form, so no one will be able to be identified. You will be allotted a unique code that will correspond to your data. This code will be shown alongside your data on each column of the excel spreadsheet. A separate, locked excel spreadsheet, will also be created linking each code with each participant and this sheet will be shared with no one.

If you want to request that your information/data is to be removed from the research, then you should email me stating this and give me your name, then I will open this locked spreadsheet to find out which code corresponds to you and I will remove your data accordingly.

I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.

I understand that my responses will be kept strictly confidential.

I agree for the data collected from me to be stored and used in relevant future research in an anonymised form. I agree for the data I provide to be archived at Researchfish.

I understand that other genuine researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.

I understand that relevant sections of the data collected during the study, may be looked at by auditors from the University of Leeds where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.

I agree to take part in the above research project and will inform the lead researcher (Nicholas Davison at pmned@leeds.ac.uk) should my contact details change during the project and, if necessary, afterwards.

Add item

1
🔒

I have read the above informed consent information, fully understand it and consent to the above conditions *

✎
⚙️

I consent

Add item

Add item



Survey Example

p.2 Shopping and eating habits Jump ▾

Add item

2 Last week roughly what % of your meals were...? *

	All	75-100%	50-75%	25-50%	0-25%
Catered by the University	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Self-cooked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (such as take-aways, eating out etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Add item

p.3 Cooking and eating habits Jump ▾

Add item

5 Thinking about how you use best-before dates, which of the following statements best describes you? *

I never eat past the date on the label

I occasionally eat past the date on the label

I often eat past the date on the label

Show all (6)

Add item

p.4 The University's role in food waste management Jump ▾

Add item

16 Are you aware of what the University is doing to tackle food waste issues? *

A great deal

A fair amount

A little

Show all (6)

Add item

p.5 Effectiveness of the intervention Jump ▾

Add item

18 Do you recall seeing any of these behavioural change interventions? *

Posters

Table cards (with food waste facts)

Signs (telling people to reduce waste)

Show all (4)

Add item

Add item

19 To what extent did the following interventions impact your behaviour? *

	Quite a lot	A reasonable amount	A little	Hardly at all	Not at all	Don't know
Posters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Table cards (with food waste facts)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Signs (telling people to reduce waste)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

p.6 Socio-Demographics Jump ▾

Add item

20 Gender *

Male

Female

Non-binary

Show all (4)

Add item

p.7 Final page Jump ▾

Add item

Dear participant,

Thank you very much for taking the time to complete this survey.

I greatly appreciate you answering this survey as your answers will help improve understanding of food waste related behaviour at Universities and will help me complete my PhD project.

Please email me at prmed@leeds.ac.uk if you have any questions, or want to request your answers to be withdrawn from my research.

Many thanks, Nick



Processing data

- Simple analysis of total respondents marking each answer, or of % respondents marking each answer
 - Straightforward quick analysis on Excel, or Nvivo
 - <https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home>
 - Effective for straightforward small data sets



Processing data

- Statistical analysis of impact of complex datasets
 - Conduct on SPSS, or other statistical software, requires more consideration
 - <https://www.ibm.com/products/spss-statistics>
 - Effective for categorising impact for large datasets
 - Effective for quantifying differences for multiple groups

- Coding of non-numerical responses
 - Conduct on SPSS, or other statistical software, requires more consideration
 - Effective for scaling impacts, or simplifying non-scalable datasets



How surveys could relate to HTC

- Increase understanding of the following:
 - Public awareness of HTC
 - Through public awareness survey
 - Challenges and opportunities among HTC companies
 - Through surveying staff at HTC companies
 - Different perspectives among HTC stakeholders in different regions
 - Through surveying different HTC stakeholders in different parts of the globe



Question and answer session

- Thank you for listening,
- Any Questions?



Session 2-

Interviews and focus groups



Interview introduction and uses

- An Interview is a method of gathering information from a person through having a structured, or semi-structured 1-1 conversation
 - Where 1 person asks questions and 1 answers
- Interviews allow for qualitative in-depth data on specific topics from key stakeholders



Focus group introduction and uses

- A focus group is a method used of gathering information through group interaction.
 - Where 1 person moderates a conversation being held with a small number of carefully selected people with shared characteristics who discuss a given topic.
- Focus groups allow for varied, wide-ranging qualitative in-depth data on specific topics from members with shared characteristics



Interview components (1): Preparation

1

- Define the research goal:
-What are you trying to achieve/find out

2

- Define the sample characteristics required

3

- Decide appropriate medium for conducting surveys:
-Face-to-face, Video calling, Telephone surveys, Written

4

- Decide type of interview
-Structured, or semi-structured



Interview components (2): Specific procedures

1

- Design interview questions

2

- Design informed consent sheet

3

- Gain approvals (ethical approval, risk assessment etc)

4

- Prepare for conducting interviews

5

- Gain informed consent

6

- Conduct interviews (using sound recording, or note taking)

7

- Transcribe data

8

- Analyse results (coding)

9

- Write up results



Focus group components (1): Preparation

1

- Define the research goal:
 - What are you trying to achieve/find out

2

- Define the sample characteristics required:
 - Which group characteristics are required
 - How many individuals in the group (typically 4-8)
 - How many focus groups
 - Gain sample to include diversity within group

3

- Decide appropriate medium for conducting surveys:
 - Face-to-face, Video calling, Telephone surveys, Written

4

- Decide appropriate medium for conducting surveys
 - Typically face-face



Focus group components (2): Specific procedures

1

- Design focus group introduction (ground rules)

2

- Design interview questions

3

- Design informed consent sheet

4

- Gain approvals (ethical approval, risk assessment etc)

5

- Prepare for conducting focus groups (perhaps with incentives)

6

- Gain informed consent

7

- Have introduction with ground rules

8

- Ask questions (using sound recording, or note taking)

9

- Transcribe data

10

- Analyse results (coding)

11

- Write up results



Interview example

- Background
 - Could you briefly explain your organisation and key stakeholders within it?

- Current waste management strategies
 - How much food is wasted (quantity/volume in canteen, campus and university)?

- Opportunities and barriers experienced
 - What are the key barriers and constraints to more sustainable management of food waste at the organisation?
 - Do you have any competing priorities?



Focus group example (1)

Rough script

Hello all and welcome. Thanks for taking the time out of your busy schedules to join our focus group on food waste. My name is Nick Davison and I'm undertaking a PhD in Food Waste.

So, let me give you a brief overview. The focus of my research is to improve food waste management at Universities. Part of the PhD is to look at food waste related behaviour. This includes reducing food waste and increasing food waste recycling in Universities. You were invited because you represent a mixture of those from self-catered backgrounds who did or didn't opt-in to recycle food waste, as well as catered students.

I'd like to listen to your opinions and thoughts on food waste at Devonshire Hall, as this will help me gain better understanding on how different people think about food waste and how that effects related behaviour.

Ground rules. So, before we jump into the conversation, just let me lay out some ground rules to guide us throughout the discussion. First of all, there are no right or wrong answers, and I expect that you will have different points of views. Please feel free to share your point of view even if it differs from what other have said. Just to make you aware, I'm recording this session because I would not want to miss out any of your comments, and it would help me to further analyse the information gathered. It is important for me to say that no names will be included in any reports and everything you say here will be treated as confidential I've taken the liberty of putting name tags here in front you today, they will help you interact with each other, as you don't have to respond only to me all the time. If you want to follow up on anything that someone has said, if you agree or disagree, or want to give examples, please feel free to expand.

Feel free to have a conversation with one another about these questions. I am here to provide some basic information, ask questions, listen, and make sure everyone has a chance to share. I'm really interested in hearing from each of you and I will make sure you all get a chance to share your ideas. Also, we have only limited time, and I would like to cover every aspect of the topic intended for this session, so I've allocated time for each question to keep us on track. However, if you feel like you have more to say or any questions or comments, I will gladly meet you after the discussion.

If you have a mobile phone, I please ask you to put it on silent, and if you need to answer a call, could you please step out to do so.



Focus group example (2)

- Focus meeting plan
 - Duration ~1hour
 - Order
 - - Consent forms, Introduction/Overview/Ground rules (10 minutes)
 - - Questions (45 minutes)
 - - Sum up session and thank participants (5 minutes)
- Proposed questions and prompts
 - Initial questions- General food waste issues
 - 1) Do you consider food waste to be an issue?
- FW reduction
 - 2) What do you do to try to reduce your food waste and why?
 - 3) Did you notice any of the materials designed to reduce food waste located in the canteen (posters, table cards, or signs)? (Which did you find most effective?)
- University food waste management
 - 4) Are you aware of strategies and policies that the University of Leeds is doing to tackle food waste issues and what else do you think the University could do to improve food waste management?
 - Is there anything else anyone else would like to add about anything that we discussed, or that didn't come up, but you think may be relevant?



Processing data

1

- Transcribe to written form

2

- Typically transfer to qualitative analysis software

3

- Code data (code into categories)

4

- Use codes to create key themes

5

- Write up into key themes

6

- Use illustrative quotes to support findings



How focus groups and interviews could relate to HTC

- Understand public feeling towards HTC
 - Through focus group with HTC overview
- Understand challenges and opportunities among HTC companies
 - Through interviews with staff at HTC companies
- Understand different perspectives among HTC stakeholders in different regions
 - Through interviews, or focus groups with different HTC stakeholders in different parts of the globe
- Understand policy and business opportunities for HTC
 - Through interviews and focus groups with politicians and food companies



Question and answer session

- Thank you for listening,
- Any Questions?



Session 3- Qualitative research case study



School of Chemical and Process Engineering

CDT Bioenergy

opportunities for food waste reduction in UK and Indian

Nicholas Davison

[\(pmned@leeds.ac.uk\)](mailto:pmned@leeds.ac.uk)

Supervisors: Professor Timothy Cockerill, Dr. Andrew Ross
and Professor William Young



Previous studies: Food waste reduction

Food waste reduction options	Reduction achieved	Studies
Behavioural change		
• Educational prompts	4-20% total food waste reduction	Ellison et al., 2019 Whitehair et al., 2013 Manomaivbool et al., 2016
• Salient signs	20% total food waste reduction	Kallbekken and Saelen, 2013
Infrastructural changes		
• Menu changes	Up to 28% reduction on specific food types	Cohen et al., 2014 Schwartz et al., 2015
• Improved food demand estimation	Up to 65% reduction in surplus food	Laveranz et al., 2020
• Reduced plate sizes	20-60% total food waste reduction	Kallbekken and Saelen, 2013 Wansak and Van Ittersum, 2013
• Trayless canteens	25-30% total food waste reduction	Arramark, 2008



Previous studies: Covid-19 and food waste

Covid-19 impacts	Impacts observed	Studies
Food waste generation		
<ul style="list-style-type: none"> Increased food waste awareness 	Increased awareness of food waste issues and increased effort to minimise food waste	Matzembacher, et al., 2020
<ul style="list-style-type: none"> Reduced food waste generation 	Self-reported reduced household food waste generation during Covid-19 lockdown	Principato et al., 2020
Adaptability		
<ul style="list-style-type: none"> Changing attitudes in business 	Increased adaptability of businesses to changes due to Covid-19	Alonso et al., 2020
<ul style="list-style-type: none"> Changing consumer attitudes 	Increased adaptability of consumers to changes due to Covid-19	Besser et al., 2020



Research background

UoL and many Indian universities

- Produce lots of food waste
- Want to find ways to reduce this waste
- Unaware of the impact of Covid-19 on food waste



General

- Many educational institutions could reduce food waste generation
- Key knowledge gaps with behavioural change, Covid-19 and food waste management
- What are the best methods to make improvements?

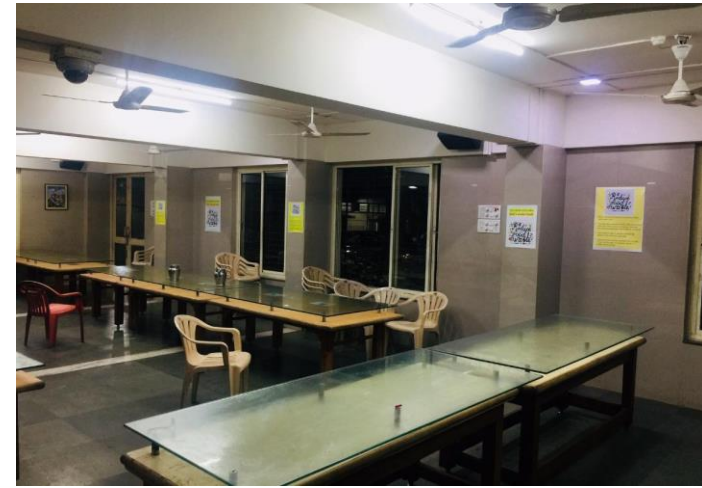


Food waste reduction case studies



UK

- University canteen
- Serving set meals and self-service salad bar
- 260 students



India

- University canteen
- Self-service buffet
- 375 students



Research goals

Aims

- Assess food waste reduction from interventions
- Compare food waste reduction in UK and Indian canteens
- Identify most effective food waste reduction intervention from:
 - ❖ Posters
 - ❖ Table cards
 - ❖ Food waste signs



Research methodology

Methods

- Gain baseline for food waste generation
- Introduce food waste reduction interventions:
 - ❖ Posters
 - ❖ Table cards
 - ❖ Food waste signs
- Gain post-intervention food waste data
- Conduct pre and post intervention surveys
- Conduct interviews and focus groups

Posters



Signs

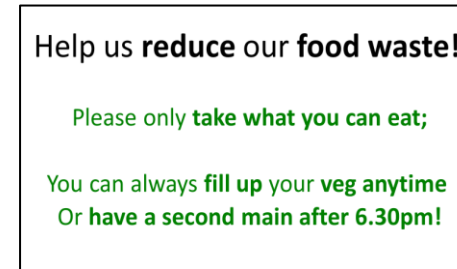


Table cards



Key findings from surveys, interviews and focus groups

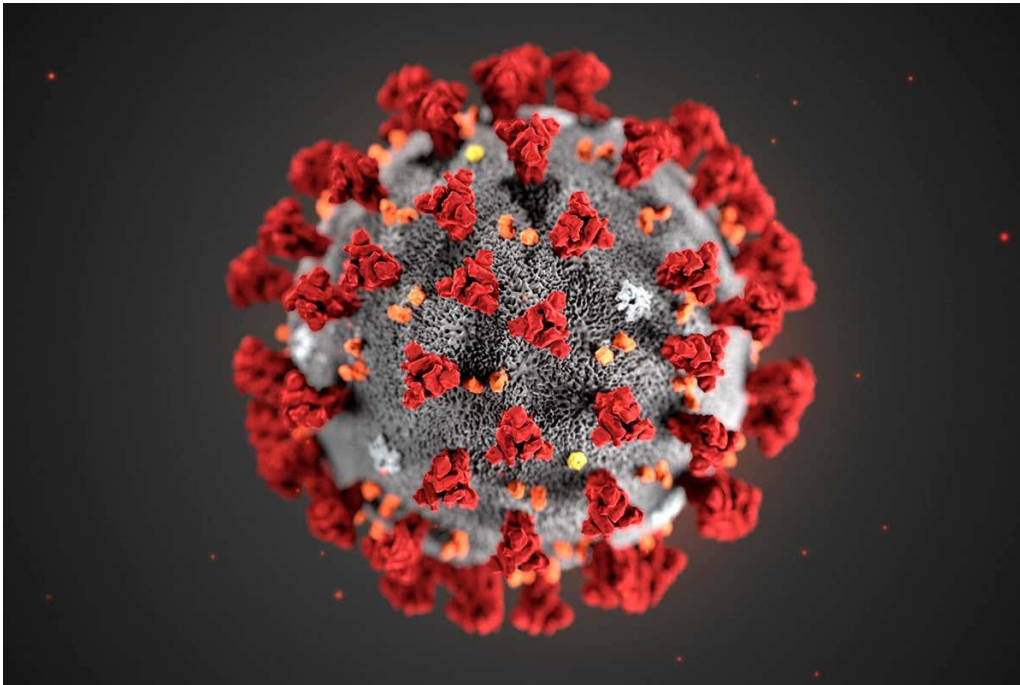
Surveys

- Improvements in food waste attitudes after interventions
- Greater improvements among Indian students
- Table cards considered most important intervention
- UK students more concerned about environmental and economic issues with food waste
- Indian students more concerned about social issues and food insecurity with food waste

Focus groups and interviews

- Cultural diversity and food preference key reason for waste in India
- Menu changes key opportunity in India
- Food demand estimation key issue in Indian canteen
- Overfilling plates key issue in UK and Indian canteen
- Key opportunities for surplus food redistribution in UK and India
- Key opportunities for more student engagement projects in UK and India

Covid-19 impacts and changes in Indian canteen

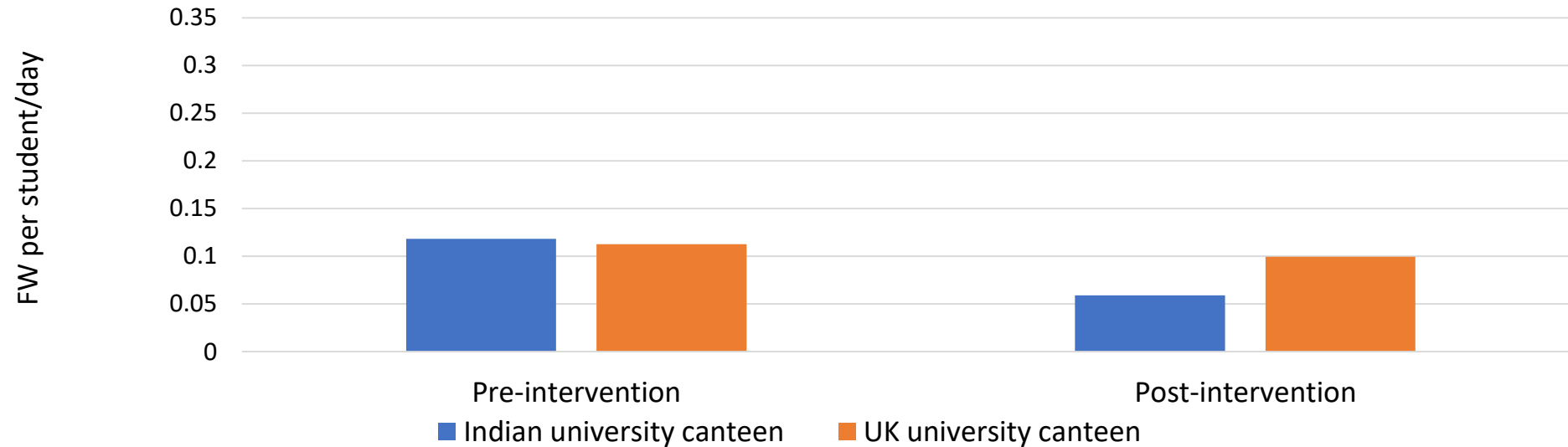


Impacts

- Reduction of students from 375 to 150
- Covid-19 and attitude change
- Change to table service
- Improved student number estimation
- Lack of outside eating options
- Menu refinement

Food waste reduction results

Per student pre and post-intervention food waste generation in UK and Indian University canteens



- **UK University canteen:** Per capita food waste reduction of around 15% at post-intervention.
- **Indian University canteen:** Per capita food waste reduction of around 50% post-interventions and post-Covid-19.

Discussion of food waste reduction results

Food waste reduction study results	Literature comparisons	Results supported by literature	Studies
Behavioural change			
~15% reduction	4-20% total food waste reduction from information prompts	Yes	Ellison et al., 2019 Whitehair et al., 2013 Manomaivbool et al., 2016
Improved food waste awareness and attitudes	Improved attitudes and awareness after interventions as shown in surveys and interviews and focus groups	Yes	Whitehair et al., 2013 Geislar, 2017 Luecke, 2015;
Infrastructural changes			
~35% reduction	~28% reduction by standardising menus	Yes	Cohen et al., 2014 Schwartz et al., 2015
	~65% less surplus food by improved food demand estimation	Yes	Laveranz et al., 2020
	Up to 65% less per capita food waste with table service	Yes	Papargyropoulou et al., 2019
	Improved efforts to reduce food after Covid-19	Yes	Matzembacher, et al., 2020 Principato et al., 2020



Key recommendations for food waste reduction

- Introduce similar food waste interventions wherever possible
- Use the pandemic as an opportunity to make infrastructural changes such as:
 - ❖ Table service
 - ❖ Improved estimation
 - ❖ Refined menus
- Consider adopting other changes
 - ❖ Going trayless
 - ❖ Reduced plate sizes



Food waste reduction conclusions

- Indian students more impacted by interventions
- Culture specific attitudes and challenges
- Informative interventions can reduce food waste by around 15%
- Infrastructural changes can bring about food waste reductions by around 35%
- A combination of both can lead to ~50% reductions
- Covid-19 can make it easier to adopt changes and aid behavioural change



Food waste recycling: Research setting

Setting

- UK
- University Halls of residence
- Opt-in food waste recycling
- ~350 students

Aims

- Assess food waste recycling increase from interventions
- Compare food waste attitudes between self-catered and catered residents
- Identify most effective food waste recycling intervention from:
 - ❖ Oral information
 - ❖ Public pledges
 - ❖ Fridge magnets
 - ❖ Feedback emails
- Assess the major opportunities and barriers to improving food waste recycling

Methods

- Gain baseline for opt-in food waste recycling
- Introduce food waste recycling interventions:
 - ❖ Oral information
 - ❖ Public pledges
 - ❖ Fridge magnets
 - ❖ Feedback emails
- Gain post-intervention food waste recycling data
- Conduct pre and post intervention surveys
- Conduct interviews and focus groups



Key findings from surveys, interviews and focus groups

Surveys

- Improvements in food waste attitudes after interventions
- Public pledges considered most important intervention
- Self-catered students considered personal economic impacts of food waste more important than catered students
- Self-catered students believed they wasted more food

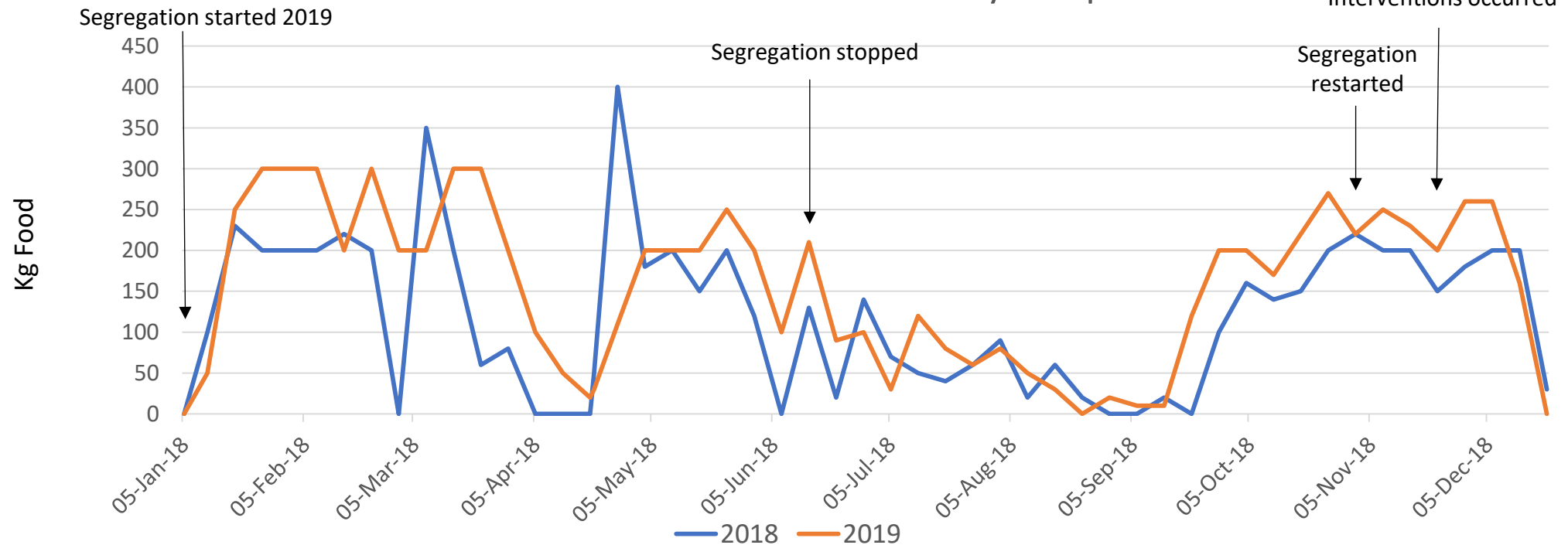
Focus groups and interviews

- Issues of economic costs and setting up food waste recycling
- Concerns of food waste recycling and hygiene if bins aren't regularly emptied
- Issues of lack of policy to support food waste recycling
- Issues of convenience and food waste recycling
- Issues of awareness of the benefits of food waste recycling
- Opportunities in student engagement activities and making food waste recycling more convenient



Food waste recycling intervention data

Devonshire Hall 2018 and 2019 weekly comparison



Key recommendations for food waste recycling

- Introduce food waste recycling when feasible
- Introduce similar food waste recycling interventions wherever possible
- Consider adopting other interventions
 - ❖ Incentives
 - ❖ Appealing bin design
 - ❖ Engagement volunteers



Food waste recycling conclusions

- Informative interventions can increase food waste recycling by around 70%
- Engagement and reducing effort key to increasing food waste recycling rates
- Economics, feasibility and policy key barriers to food waste recycling
- Student satisfaction and hygiene key risks with food waste recycling
- Major opportunity to bring about significant benefits



Implications for HTC

- Understand FW attitudes and behaviours
- Understand drivers
- FW reduction and implications on HTC
 - Reduced feedstock available
- FW recycling and implications on HTC
 - Increased feedstock available

Conclusion



Question and answer session

- Thank you for listening,
- Any Questions?





References

- Alonso, A.D., Kok, S.K., Bressan, A., O'Shea, M., Sakellarios, N., Koresis, A., Solis, M.A.B. and Santoni, L.J., 2020. COVID-19, aftermath, impacts, and hospitality firms: An international perspective. *International journal of hospitality management*, 91, p.102654.
- Besser, A., Flett, G.L. and Zeigler-Hill, V., 2020. Adaptability to a sudden transition to online learning during the COVID-19 pandemic: Understanding the challenges for students. *Scholarship of Teaching and Learning in Psychology*.
- Cohen, J.F., Richardson, S., Parker, E., Catalano, P.J. and Rimm, E.B., 2014. Impact of the new US Department of Agriculture school meal standards on food selection, consumption, and waste. *American journal of preventive medicine*, 46(4), pp.388-394.
- Ellison, B., Savchenko, O., Nikolaus, C.J. and Duff, B.R., 2019. Every plate counts: Evaluation of a food waste reduction campaign in a university dining hall. *Resources, Conservation and Recycling*, 144, pp.276-284.
- Geislar, S., 2017. The new norms of food waste at the curb: Evidence-based policy tools to address benefits and barriers. *Waste Management*, 68, pp.571-580.
- Kallbekken, S. and Sælen, H., 2013. 'Nudging' hotel guests to reduce FW as a win-win environmental measure. *Economics Letters*, 119(3), pp.325-327.
- Leverenz, D., Hafner, G., Moussawel, S., Kranert, M., Goossens, Y. and Schmidt, T., 2020. Reducing food waste in hotel kitchens based on self-reported data. *Industrial Marketing Management*.
- Luecke, L., 2015. Haste to no waste: A multi-component food waste study in a university dining facility.
- Manomaivibool, P., Chart-asa, C. and Unroj, P., 2016. Measuring the Impacts of a Save Food Campaign to Reduce FW on Campus in Thailand. *Appl. Environ. Res.*, 38, pp.13-22.
- Matzembacher, D.E., Brancoli, P., Maia, L.M. and Eriksson, M., 2020. Consumer's food waste in different restaurants configuration: A comparison between different levels of incentive and interaction. *Waste Management*, 114, pp.263-273.
- Papargyropoulou, E., Steinberger, J.K., Wright, N., Lozano, R., Padfield, R. and Ujang, Z., 2019. Patterns and causes of food waste in the hospitality and food service sector: food waste prevention insights from Malaysia. *Sustainability*, 11(21), p.6016.
- Principato, L., Secondi, L., Cicatiello, C. and Mattia, G., 2020. Caring more about food: The unexpected positive effect of the Covid-19 lockdown on household food management and waste. *Socio-Economic Planning Sciences*, p.100953.
- Schwartz, M.B., Henderson, K.E., Read, M., Danna, N. and Ickovics, J.R., 2015. New school meal regulations increase fruit consumption and do not increase total plate waste. *Childhood Obesity*, 11(3), pp.242-247.
- Whitehair, K.J., Shanklin, C.W. and Brannon, L.A., 2013. Written messages improve edible FW behaviors in a university dining facility. *Journal of the Academy of Nutrition and Dietetics*, 113(1), pp.63-69.
- WRAP, 2018a. Why take action: legal/policy case. [Online]. [Accessed on 15th July 2018]. Available from: [Link to website](#)