

Parallel Session 7

Scientific insights on out-of-home consumption patterns and impacts on food waste

September 16, 2025

Onsite Moderator: Chantal den Broeder, VLTN
Online Moderator: Paulina Szwed, VLTN

WELCOME!

Welcome to all onsite and online participants!



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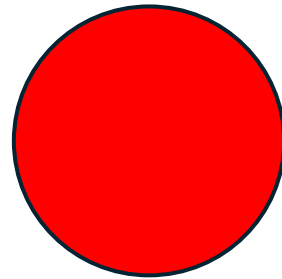
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RECORDING



START RECORDING

AGENDA & OBJECTIVES FOR THE SESSION

1. Provide a **real-life examples** of food waste-related behaviour evident in out-of-home food consumption (e.g., key results from 3 separate case studies within the CHORIZO project).

(25 minutes)

- Case study 2: Caroline Strindmar and Sigve Eliassen, Strawberry
- Case study 3: Tamara Kozic, ITC
- Case study 4: Subash Rana, UCPH

AGENDA & OBJECTIVES FOR THE SESSION (continued)

2. Facilitate a brief discussion about **messages** received during lunchtime.

(10 minutes)

- Paulina Szwed (VLTN)

3. Showcase the results of the **diner model**.

(25 minutes)

- Matteo Vittuari and Caterina Rettore, UNIBO
- Larissa Lopes Lima, NORCE

CORE OBJECTIVE OF THE CHORIZO PROJECT

To deepen our understanding about how social norms -
rules and expectations that are socially enforced -
influence behaviours related to the creation of food waste.

❖ Examples of food-related social norms

Social norms = rules, expectations that are socially enforced.

Suboptimal Food: Not buying, utilizing, consuming food due to “sensory deviations”, primarily unusual shape or colour.

Good Food Provider Identity: Desire to be a good parent, host, and therefore emphasis is placed on amount of food provided, often exceeding what is needed.

Portion Size: Portion size is taken to indicate how much is considered socially acceptable to eat, without being considered excessive (although it might be excessive in reality).

Food Waste Behaviour and Socio-Economic Status: Associations that are made about one's socio-economic status based on their actions regarding food purchase (e.g., if go to a food bank one might be considered economically poor for example), preparation, and consumption.



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CASE STUDY 2

Hospitality sector in Norway (hotels)

Caroline Strindmar & Sigve Eliassen,
Strawberry

The Strawberry Hotel food waste commitment



The journey starts in 2012

*UN SGD 50%
reduction by 2030*

**All hotels measure
food waste daily**

Yearly food waste
reduction targets



Sustainability Linked Loan

A Complex Challenge

We know that food waste is a multifaceted problem with no single solution. It requires a comprehensive approach.

1/3 of total food waste in the company is from guest plate alone.

Our Approach

Guests

Experiment with different types of communication at the breakfast buffet at eight of our hotels. Breakfast as a consistent setting to study how communication and service style influence guest behavior.

Our Focus

This study explores social norms among both our chefs and guests to find effective, sustainable solutions.

Chefs

In-depth interviews with chefs with various backgrounds and experience levels to understand their attitudes and opinions on food waste.

Main findings

- Provocative message increase waste, especially in settings with high proportion of non-business guests.
- Increased food waste during weekends.
- Higher proportions of business guests decrease waste.
- The typical items guests waste the most at breakfast are bread, eggs, and fruit.
- The study show plated lunches generate more waste at plate level. However, there are larger, unseen aspects to consider.
- Chefs with formal training showed stronger understanding of food waste reduction, while those with mainly practical experience could benefit from additional education on best practices.

**Wasting food is
like stealing from
the poor and
hungry.**

**Eat what you
take!**

**Every time you
waste food,
you're wasting
a part of the
planet.**

Enjoy your food!

**We care
for the
enviroment.**

Help us waste less food.

**Please,
don't take
more than
you can
eat**

Strawberry



Do these look familiar?

Impacts in hospitality sector

Breakfast communication

Type of messaging really matters.

We reduced guest plate waste by 20% for leisure guests.

Tailoring conference lunch concepts

What works for different venues and guest demographics.

Other Potential

Attitude campaign

Potential in change of attitudes towards leftover distribution apps.

Facilities and systematisation

Upgrading storage facilities and routines.

Great potential in systematisation in routines and use of leftovers.

Insights implementation in over 200 hotels

Confirm feelings with facts - be more assertive in kind of communication; has a decreasing effect on food waste.

Eliminate fear of displeasing guests with the wrong messaging - be bold but kind.

Accept and find potential in that "one size fits all" doesn't apply, - staff, customer and hotel operations composition play a big part.

Strawberry



WHERE TO FIND US



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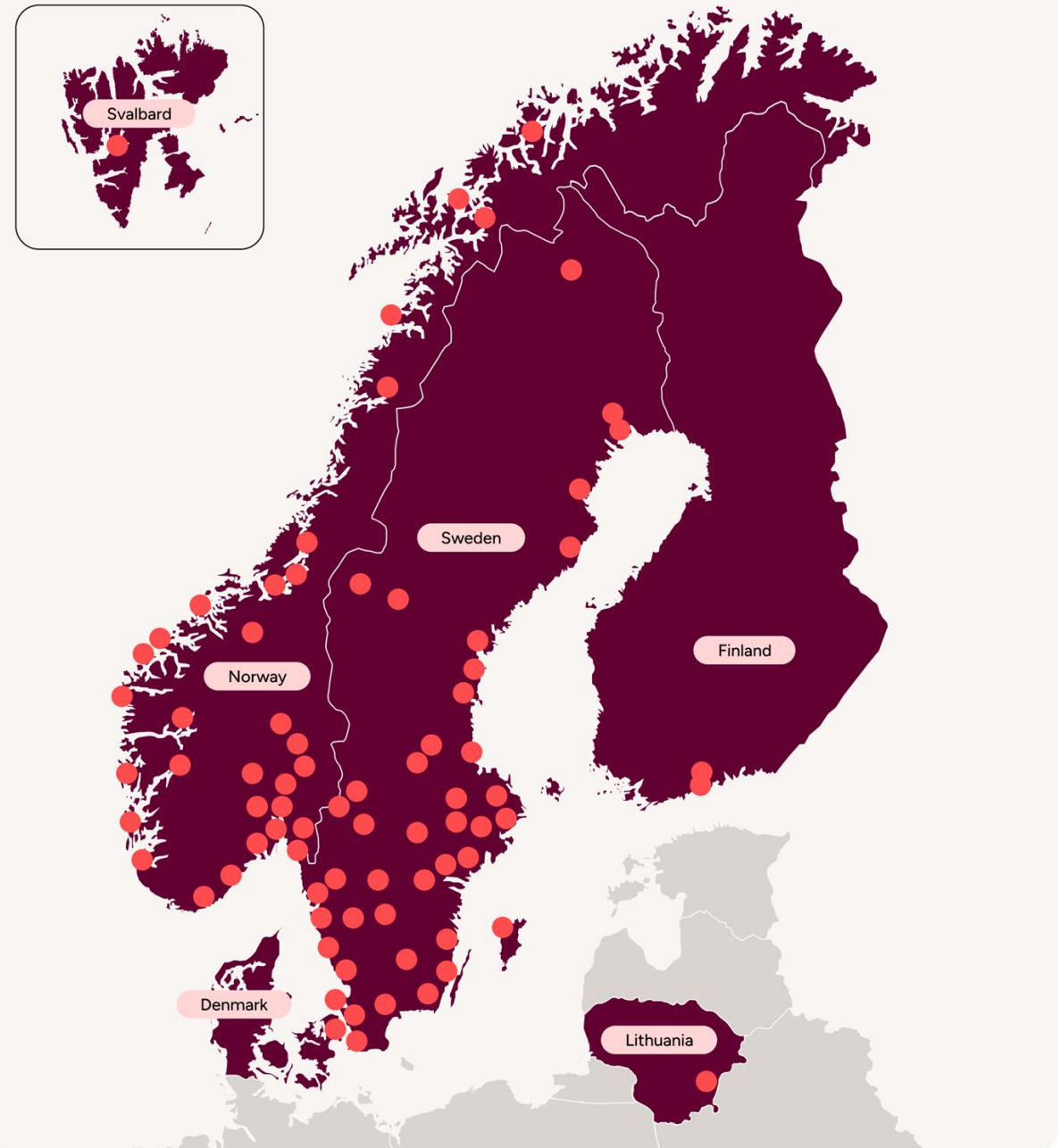
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CASE STUDY 3

Food Services Food Waste

Tamara Kozic, ITC



#QUESTION

Think about the last time you were dining out...
Did you finish everything on your plate?

A) Yes

B) No




Where Does the FW Come From in Food Services?

- **Consumer Plates - Main source of FW in food services**
 - Oversized portions, poor food quality, or dietary goals, over-serving at buffets
- **Buffets - critical hotspots**
 - 36% of respondents admit putting more food on their plates at buffets than usual
 - 34% report overeating at all-you-can-eat buffets
- **Kitchen - smaller, more controllable share of FW**
 - Preparation waste: peels, trimmings, spoilage
 - Planning & calculation errors (overproduction)
 - More predictable and easier to manage than consumer plate waste



#GUESS


What do you think is the strongest social driver for finishing the food in restaurants?

- A) Fear of being judged by others at the table
 - B) Cultural upbringing (*'Finish everything on your plate'*)
 - C) Moral belief (*'Food waste is wrong'*)
- 



#GUESS

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Social Norms & Food Waste Behaviour

- **Moral belief: “Food waste is wrong”** → strongest motivator
 - 19.5% agree, 44.7% partially agree
 - **Women** slightly **more likely** to say this **does not apply** to them
 - **Cultural upbringing: “Finish everything on your plate”**
 - 10.2% agree, 42.8% partially agree
 - No significant gender difference
 - **Group effect (ordering less with friends):**
 - 9.5% agreed they order less food when dining with friends compared to eating alone
 - Women more likely to say this **does apply** to them
 - **Social pressure (fear of judgment):** „*I finish what is on my plate because other at the table may judge me as wasteful otherwise*“
 - Only 4.4% agreed, 15.8% partially agreed
 - **Women** slightly **more likely** to agree
 - **Social judgment (appearance):** „*I don’t eat everything on the plate because I’ll look greedy*“
 - 21.3% agreed, the majority (79%) said it does not apply to them
 - **Women more likely** to agree
- Food waste behaviours are shaped more by **personal values** and **cultural upbringing** than by immediate **social pressure**



#GUESS

What do you think is the #1 reason people take leftovers home?

- A) To save money
 - B) It saves time and is convenient
 - C) Ethical reasons - *'It is good not to waste food'*
- 



#GUESS

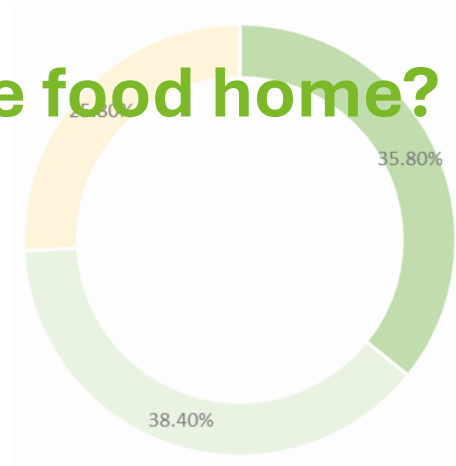
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- 

Leftovers – To Take or Not to Take?

- **How often do people take food home?**

- **35.8%** – Consistently
- **38.4%** – Occasionally
- **25.8%** – Never



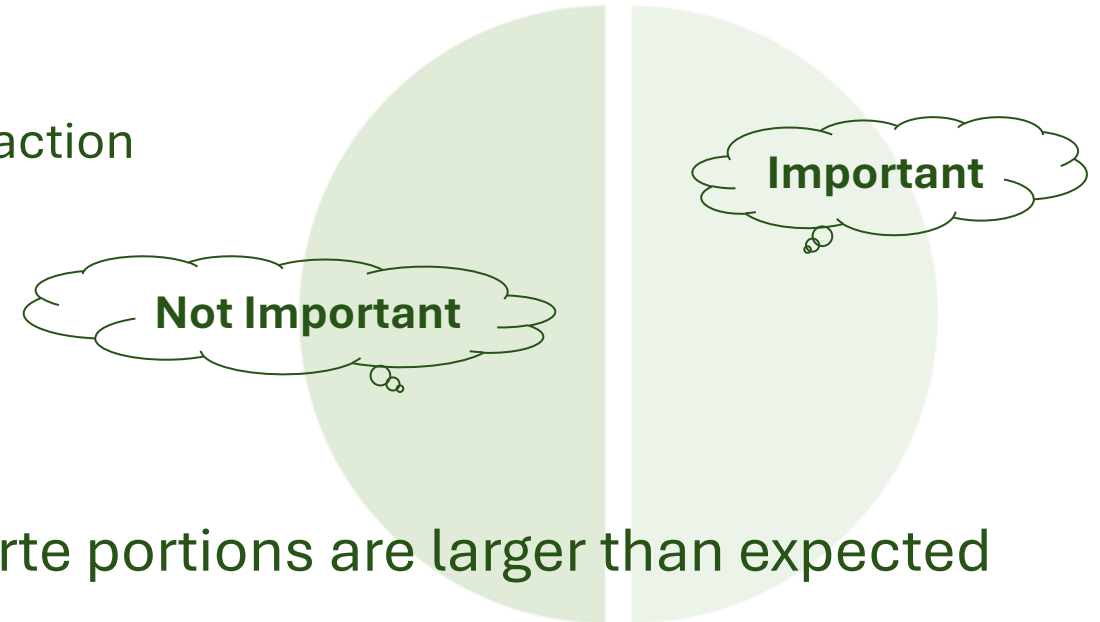
- **Why do they take leftovers?**

- **Ethical value:** “Good not to waste food” – **45.8% most important**
- **Taste:** If food was tasty – **31.6% most important**
- **Practicality:** Saves time, convenient – **26.4% most important**
- **Financial:** Saves money – **16.8% most important**
- **Social pressure:** Very minor (<5%)

Portion Sizes – A Double-Edged Sword

Portion Size as an Enjoyment Factor

- **41%:** portion size is important for meal satisfaction
- **42%:** portion size is not important



- **Mismatch in restaurants:** 9% say a la carte portions are larger than expected or wanted
- **Consumers** who place **high value on** receiving **larger portions** are significantly **less likely to support portion size reductions**
- **Older consumers** are generally **more open to portion size reduction** compared to younger individuals

Pre-Ordering

Yes, if  Cheaper by 10%

Yes, if  Cheaper by 30%

Yes, if  Different dishes available

Yes, if  Requirement to reserve a table

- Strongest driver: **Reservation requirement** (69% would order ahead)
- Moderate drivers: **Menu variety** (51%) and **significant discount** (53%)
- Weak driver: **Small discount** (only 37%)
- Consumers with **stronger concern for FW** are **more likely to support** preordering measures



Thank you!

Tamara Kozic, MA

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Innovation Technology Cluster, Slovenia





CASE STUDY 4

Educational Sector in Denmark (Schools)

Subash Rana, PhD fellow UCPH





#STATEMENT

**Peer pressure influences children's decision
more than taste or hunger.**

- A) Agree
 - B) Neutral
 - C) Disagree
- 



#STATEMENT

Social acceptance is a stronger driver of food waste than food quality in school children.

- A) Agree
 - B) Neutral
 - C) Disagree
- 

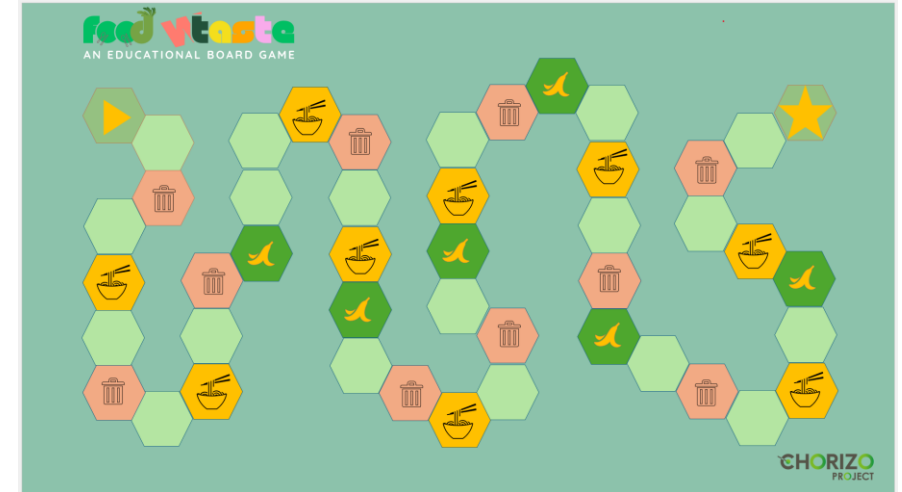
Case Study 4 findings – Educational Sector in Denmark (Schools)

- ❖ Their perception of what food is “right” strongly determined whether it was eaten or discarded. *(suboptimal food / undesirable food quality social norm).*
- ❖ **Fruits and vegetables** were the most wasted food items due to perceived **inferior quality** *(suboptimal food / undesirable food quality social norm).*
- ❖ Food choices were shaped by **peer acceptance** – items liked by individuals were sometimes discarded if deemed “gross” by peers, leading to changes in personal preferences. *(peer influence social norm).*
- ❖ There were examples of parents who knew that the lunch was being thrown out but continued to provide the food because it was seen as the **societal expectation of what a parent should do** *(good food provider social norm).*
- ❖ Many pupils discreetly throw away uneaten lunch items to avoid **upsetting their parents**, often pretending they’ve eaten everything *(discretion social norm).*

Case Study 4 – Educational Sector in Denmark (Schools)

Promotive findings

- ❖ Pupils are well aware of environmental impact of food waste, and they think towards climate change and resource depletion **(Environmental awareness/ Planetary health)**.
- ❖ Pupils are aware of world hunger and feel that more should be done beyond just being aware **(Sense of responsibility)**.
- ❖ There is economic incentive to reduce food waste as the pupil relates “throwing food” equal to “throwing money” **(Financial gain)**.



Case Study 4 – Educational Sector in Denmark (Schools)

Recommendations

- ❖ Parents should do better **communication with pupils** about their **likes and dislikes** and maintaining the **feedback** loop and **developing trust** is crucial.
- ❖ Parents should shift the **focus from providing big portion sizes** to providing **high quality lunch-packs** that are balanced with regards to nutritional value.
- ❖ Teachers should **integrate hands-on activities & gamification** into the learning process.
- ❖ Teachers should **contextualize activities** to reflect local food cultures, school food systems, and age-specific capacity.
- ❖ SEP developed in the project should be **integrated to the European Commission ongoing work** on food literacy training for kids at school.

BRIEF DISCUSSION ON THE LUNCH BUFFET MESSAGES





THE ESTABLISHMENT DINER MODEL

What drives food waste in buffet environments?



#1 INTRODUCTION

What did we do in CHORIZO?

What is an agent-based model?

What are OFLW impact scenarios?

INTRODUCTION

We developed two models to understand and predict the relation between social norms, business practices, consumer behaviour and food waste.

The Establishment Diner model

- Agent-based model
- Simulates the behaviour of guests in an hotel buffet (out-of-home setting)

The Home Cook model

- Micro-simulation
- Simulates the FW generated at the household level as a consequence of purchasing and storing behaviours

WHAT IS AN AGENT-BASED MODEL?

An **agent-based model** (ABM) is a computational model for simulating the actions and interactions of autonomous agents (both individual or groups) within a specified environment in order to understand the behaviour of a system and what governs its outcomes.

AGENTS have various **characteristics**...
(sex, age, education, employment, etc.)



...**goals** and follow **rules and behaviours** driving their decisions

AGENTS make **decisions** based on rules and behaviours



AGENTS can make decisions **independently**



AGENTS **interact** with each other and the environment



WHAT IS THE ADDED VALUE?

Capturing emergent behaviours

- Complex systems exhibit emergent macro-level patterns emerging from individual components' interactions
- ABMs simulate the behaviour of individual agents and interactions

Account for heterogeneity

- Complex systems are characterized by heterogeneity
- ABMs can represent agents with diverse characteristics and decision-making processes

Exploring scenarios

- ABMs can explore «what-ifs» questions by manipulating parameters to simulate different scenarios and observe their effect in the system

0FLW IMPACT SCENARIOS

We developed scenarios to:

- 1 Explore various normatively focused communication strategies
- 2 Simulate the implementation of social innovations in additional contexts or on different population groups
- 3 Consider different combinations of FLW reduction actions and social innovations and analyse their combined effect

0FLW IMPACT SCENARIOS

What-if scenarios are hypothetical situations used to explore the potential outcomes of different decisions or events.



Simulated in models by altering variables and parameters to:

Anticipate future scenarios:

by altering key parameters or variables within a simulation, we can examine how various factors might interact and affect outcomes

Evaluating decision alternatives:

by running simulations with different scenarios, decision-makers can assess the potential consequences of their choices and make more informed decisions



#QUESTION

What's the main reason you might leave food uneaten at a hotel buffet?



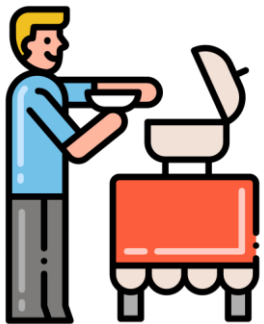
#2 THE ESTABLISHMENT DINER MODEL

THE ESTABLISHMENT DINER MODEL

Aim is to develop a model to understand and predict the relation between social norms, business practices, consumer behaviour and food waste.



The Establishment Diner model

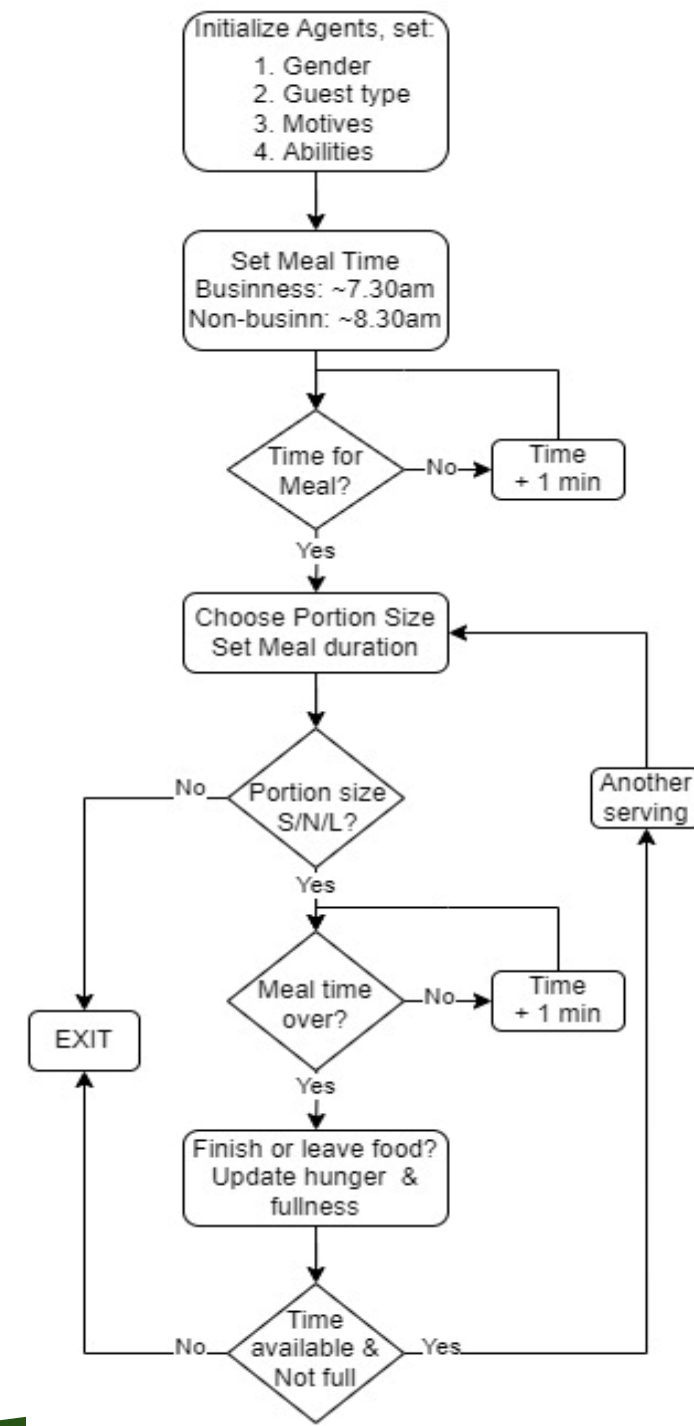


Agent-based simulation that represents the **dining behaviour** of individuals in a commercial establishment.

The model studies the interaction of a **population** that have access to a buffet.

THE ESTABLISHMENT DINER MODEL

- Individual guests:
 - Male or female
 - Business or non-business
- Hotel:
 - The hotel buffet is open every day for 3 hours
 - Food without restrictions
 - Plate sizes: normal or large
 - Food diversity (low or high)
 - Guests can also opt for no eating
- Individuals follow rules that determine:
 - the time at which they go for the meal;
 - the portion size of food they serve themselves in their plates
 - the number of times they serve themselves food
 - the amount of food leftovers on their plates.

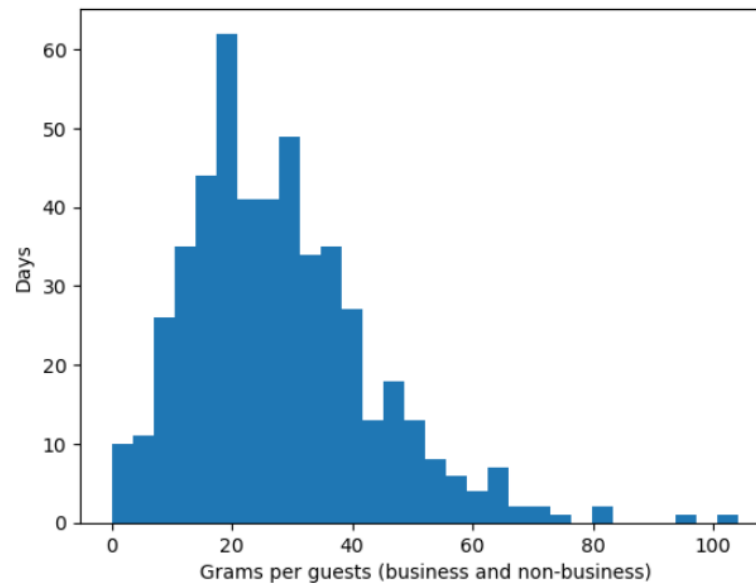


THE ESTABLISHMENT DINER MODEL

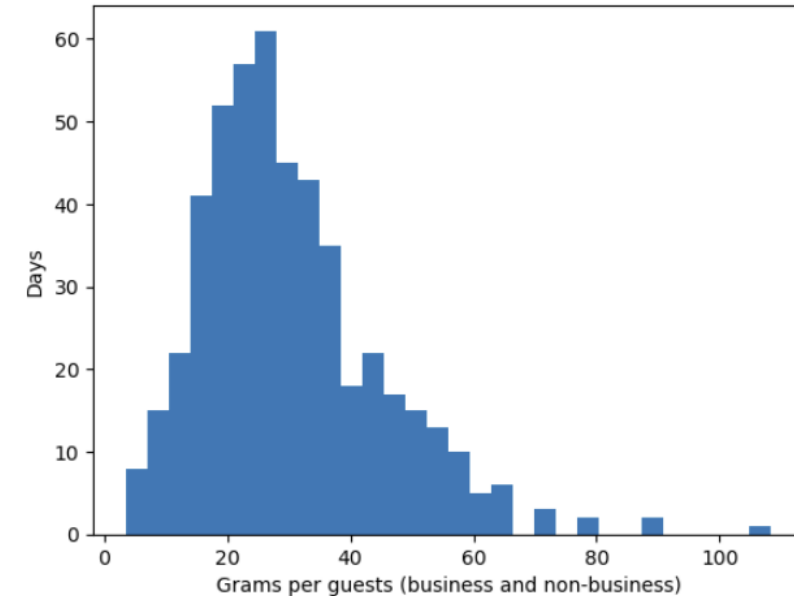
Calibration

- We used data collected across eight different Norwegian hotels involved in case study 2 activities.
- This data consists of records of the number of business and non-business guests and the total amount of food waste generated each day at the end of breakfast time.
- The data was collected on days when the hotel displayed messages to raise awareness about food waste (positive or provocative messages) and days without messages (control days). For the first calibration, we considered only the control days.

Experimental data



Simulation results



SCENARIO DEVELOPMENT AND SIMULATION



Plate size (N/L)



Guest composition
(share of business
and non-business
guests)



Sustainability
awareness



Communication
strategy



#GUESS

Which parameter do you think has the biggest impact on food waste at buffets?

- A) Changing the plate size offered to customers
- B) Having mostly business guests in the restaurant
- C) Having guests with a high level of sustainability awareness
- D) Using provocative messages to push guests not to waste food



#GUESS

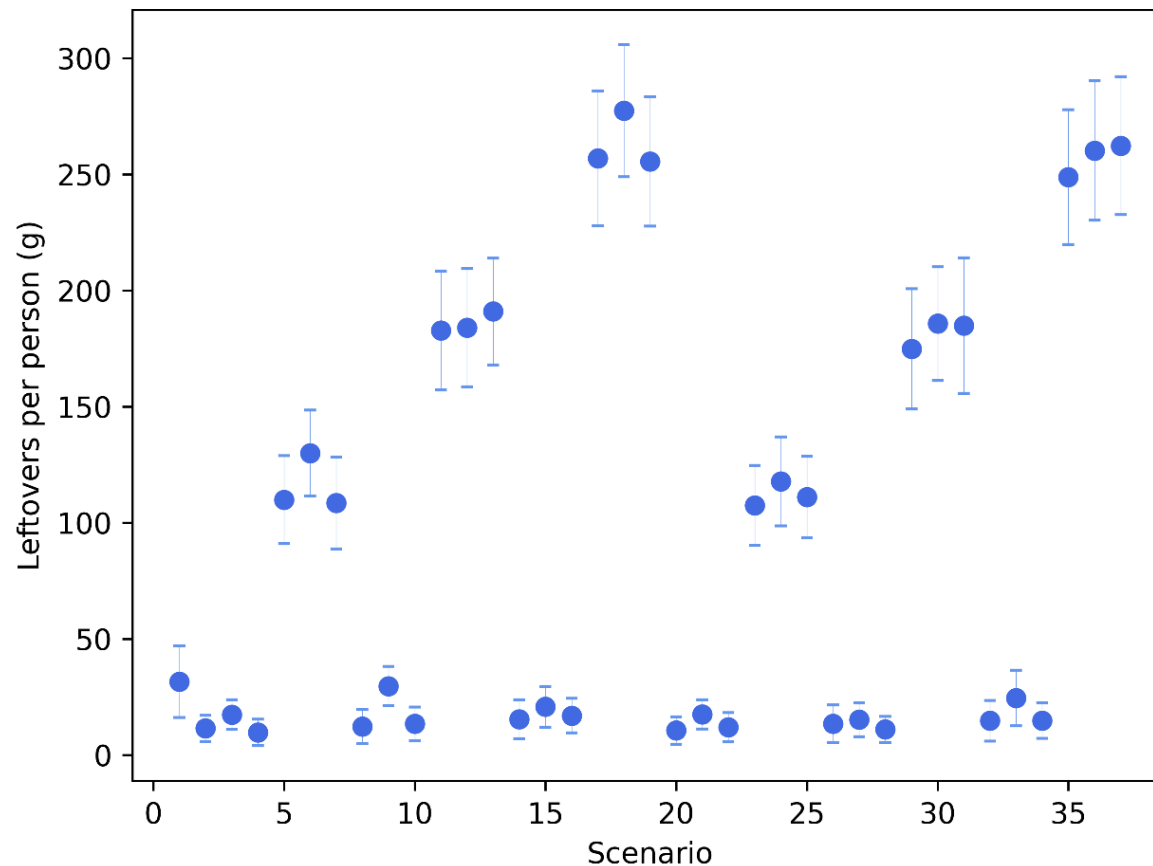
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SCENARIOS RESULTS



The level of guests' **sustainability awareness** has a paramount influence on FW



FW amounts of scenarios with low sustainability awareness are higher and more diverse

All scenarios with high sustainability awareness produce less FW

SCENARIOS RESULTS



Guest composition

(share of business and non-business guests)

Business guests have an higher level of conformism =
they tend to be influenced more by others (social norm)

Comparing scenarios with different share of business and non-business guests
shows that when business guests are predominant there is less FW.



FW reduction interventions should target «leisure» travelers,
characterized by a more relaxed an «individualistic» behaviour.

SCENARIOS RESULTS



Plate size

Scenarios with Normal plates (smaller than Larger plates) yields a slightly higher amount of leftovers



Surprising result, perhaps related to the number of servings:

- Smaller plates may nudge towards multiple servings, leading to overserving.
 - When combined, smaller servings might lead to larger total portions.

SCENARIOS RESULTS



Communication strategy

Provocative messages negatively influence FW, while positive messages slightly reduce it compared to no communication



Careful consideration of message framing:

- Provocative messages can be interpreted as a constraint of personal freedom.
- No message is better than a wrongly framed one.



#3 FINAL MESSAGES

KEY TAKEAWAYS



FW is the result of complex drivers and interactions

It results from the interaction between individual behaviours, context, and operational design.



Small changes matter

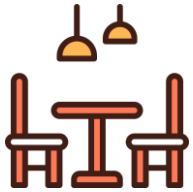
Simple interventions like plate size, tone of message, or settings characterized by diverse guest composition can significantly affect waste levels.



No one-size-fits-all – Context is key

The same message or layout can work in one setting and backfire in another.

WHAT'S NEXT



Expanding to new social dining contexts:

- By adapting the model, it is possible to investigate FW behaviours in settings such as schools, other institutional catering environments, and hotels, to understand the specificities of different settings in a participatory way.
- Responsible research and innovation and community engagement have become fundamental pillars for scientific research.



Adapting to different geographical contexts:

The goal is to understand how cultural, operational, and policy differences influence waste patterns and the effectiveness of interventions.

Any Final Questions?





Thank you

Please visit the CHORIZO project website
and Datahub at:

<https://chorizoproject.eu>



<https://data.chorizoproject.eu>