Deliverable 3.3

CASE-INDEPENDENT CHANGING SOCIAL NORMS PREDICTIVE MODEL

D3.3

Case-independent changing social norms predictive model

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Glossary of terms and acronyms used

Acronym	Description
ABM	Agent Based Models/Modelling
CS	Case Study
EU	European Union
FLW	Food Loss and Waste
MOA	Motivation Opportunity Ability
N	Normal distribution
μ	Mean
σ	Standard deviation

Executive summary

The CHORIZO project is dedicated to enhancing our understanding of how social norms influence behaviours related to food waste generation. To effectively address food loss and waste (FLW), one of the goals of the project is focused on developing computer simulations to evaluate the impact of interventions designed to reduce FLW behaviours.

The work that underlies the social models directly builds upon the insights presented in Deliverable 3.1, 'Conceptual framework for behavioural change understanding,’ which establishes a theoretical foundation that unifies the MOA and HUMAT frameworks, laying the groundwork for developing computer simulations.

Deliverable 3.3 ‘Case-independent changing social norms predictive model’ comprises of two social norms models that operate in two different contexts. The establishment diner model is an agent-based simulation examining food consumption in a social context. This model is pertinent to both descriptive and injunctive social norms, and social roles such as client, guest, in-group members (e.g., businessperson). Additionally, it also considers gender roles. The model combines insights from Case Studies 2: Hospitality food waste, 3: Food services food waste, and 4: School food waste and relation with obesity and malnutrition.

The second model, the home cook, is a microsimulation that explores food consumption at home. As the behaviour is private, this model is particularly relevant in the context of injunctive social norms, gender roles and social roles of a parent, housewife/househusband and host. The model integrates insights from Case Studies 1: Household food waste in and off crisis periods and 6: Food waste in relation to date marking and sustainable and smart food packaging.

This document accompanies the developed software, providing a technical description of the models to allow for a comprehensive understanding of the assumptions they are based on and how they work, especially among non-expert programmers.

1 INTRODUCTION

The Chorizo Project (“Changing practices and Habits through Open, Responsible, and social Innovation towards ZerO food waste”) is a Horizon Europe project, which aims to improve the understanding about how social norms (rules and expectations that are socially enforced) influence behaviour related to food loss and waste (FLW) generation. Behavioural change is a critical aspect of addressing FLW challenges as it is the result of multiple and interconnected actions taking place in various contexts and at different stages of the food supply chain.

For the purposes of the project, social norms are defined as rules/guides for actions perceived by individuals aspiring/belonging to the norm’s target group as expected by others. Social norms are examples of non-material social facts: manners of acting, thinking and feeling external to the individual, which are invested with a coercive power by virtue of which they exercise control over him (Durkheim 1982, p. 52). The target group of a social norm relates to expectations about social roles: we expect the host, who invited us over, to serve food. In practice, whether individuals belonging to a network of influence (i.e., alters in the ego network, whose opinion matters to the individual at hand) actually hold expectations about one’s actions is irrelevant, as long as the individual thinks they do. For example, you yourself may not necessarily expect that the friend hosting you will serve food. Nonetheless, the host will serve a meal if they think you expect it and they accept this expectation as a part of the host role. CHORIZO investigates two types of social norms: injunctive and descriptive. Injunctive social norms are perceptions about normatively appropriate action in a specific context. Descriptive social norms are prevalent or common behaviours reflecting perceptions about the likelihood that others engage in the normative actions themselves.

To comprehend the intricate interplay between individuals’ social roles, the social norms they adhere to, their actions and the impact on FLW, CHORIZO carried out extensive analyses. Initially the project established a theoretical framework outlining the decision-making processes and behaviours of individuals throughout the supply chain. Additionally, it has integrated the HUMAT and Motivation-Opportunity-Ability (MOA), connecting the fundamental aspects of social norms with these frameworks (D3.1). Subsequently, the project investigated six CS contexts to delineate social norms that influence behaviours related to food waste and summarized the results of the project’s empirical data collection with the broader state-of-the-art analysis (D2.3). Moreover, D3.2 laid out the framework for integrating “what-if” scenarios to the combination of HUMAT and MOA in the computational models.

The software introduced here are the result of work carried out in T3.2: Model development and assessment of behavioural change & social norms impacts. To comprehensively cover a variety of contexts where individuals produce FLW, we propose two case-independent models (**Fout! Verwijzingsbron niet gevonden.**). The establishment diner model is an agent-based simulation examining food consumption in a social context. It is based on a combination of HUMAT and MOA frameworks and is pertinent to both descriptive and injunctive social norms that impact individuals when food consumption is not private. In this model, individuals take on social roles such as client, guest, in-group members (e.g., businessperson). Additionally, it also considers gender roles. The model combines insights from Case Studies 2: Hospitality food waste, 3: Food services food waste, and 4: School food waste and relation with obesity and malnutrition.

The home cook model is a microsimulation that explores food consumption at home. As the behaviour is private, the model is particularly relevant in the context of injunctive social norms, gender roles and social roles of a parent, housewife/househusband and host. The model integrates insights from Case Studies 1: Household food waste in and off crisis periods and 6: Food waste in relation to date marking and sustainable and smart food packaging.

This provides a technical description of the predictive models developed in the CHORIZO project and accompanies the software.

	The establishment diner	**The home cook**
Context	Consuming food in an out-of-home, social context	Consuming food in the comfort of your own home
Relevant social roles	• client, • guest, • group member (e.g., professional (corporate representative) vs private individual), • gender	• housewife/househusband, • parent, • host, • gender
Corresponding CHORIZO CS/supply chain types	CS2: dining in a hotel CS3: dining in a restaurant CS4: dining at school	CS1: consuming food at home CS6: purchasing food for home consumption (groceries + take outs)
Normative context	Observability: high (public) Familiarity: medium-low (novel, uncertain) Norms: descriptive, injunctive	Observability: low (private) Familiarity: high (repetitive, habitualized) Norms: injunctive

Table 1 The main differences between the establishment diner and home models with respect to application and normative contexts, social roles and relevant CS

2 THE ESTABLISHMENT DINER MODEL

2.1 The model at a glance

The model is an agent-based simulation that represents the dining behaviour of individuals in a commercial establishment. The model comprises a population (i.e., number of guests in an establishment such as a restaurant, a hotel or a canteen) that have access to a buffet. Individuals follow rules that determine (1) the time at which they go for the meal, (2) the portion size of food they serve themselves in their plates, (3) the number of times they serve themselves food, and (4) the amount of food leftovers on their plates.

2.2 Individuals

Individual guests are represented by agents with the following attributes: gender (male/female) and guest type (business, non-business).

2.3 Hotel

The hotel buffet is open every day for 3 hours (e.g., representing 7-10am operating hours of a breakfast buffet in a hotel). Individuals can start entering the buffet 5 min after opening and can serve themselves till 5 min before the buffet closes. Food is available ad libitum with no restrictions. However, the hotel provides plates that can have three sizes (small, normal, large). The guest can also choose not to eat anything. Food diversity (high vs low) is present in the model.

2.4 Daily routine

The model cycle represents one day. Every day, agents take decisions on:

1) Time of the meal
2) Serving size
3) Time spent eating
4) Food left on the plate
5) Subsequent servings

2.4.1 Time of the meal

Every day agents decide the time they have a meal. Agents that are businesspersons set their mealtime by sampling from a triangular distribution with min = 5, max = 115, and mode = 30 min. We thus assume that businesspersons on average have a meal at 7.30, with the earliest and latest time being 7.05 and 8.55, respectively. Agents that are non-businesspersons set their mealtime by sampling from a triangular distribution with min = 5, max = 175, and mode = 90 min. We thus assume that non-businesspersons on average have meals at 8.30 am, with the earliest and latest times being 7.05 and 9.55, respectively.

Decision 1: Serving size

When agents decide not to eat, their portion size is nothing (0) and they exit the buffet (with an opportunity of having a meal the next day). If the agents decide on portion size (small (S)/normal (N)/large (L)), then they go for another serving and decisions 2-5 (‘Serving size’ - ‘Subsequent servings’) are taken again until either the agents decide not to eat anymore or the buffet closes. When serving food, agents decide whether to opt for nothing (0), a small (S, approx. 200 gr), normal (N, approx. 300 gr), or large (L, approx. 400 gr) food portion, with four decision points, considering various motives, abilities, and opportunities (Fig. 1). Agents initially determine the portion size based on individual motivations: hunger, fullness, desire to be thin, desire to indulge oneself and conformism. Subsequently, the initial decision is adjusted based on time availability (opportunity) and self-control (ability). For example, it may happen that an agent decides to have a large portion but also has limited time to consume the food. If that agent's self-control is high, it will adjust the planned portion size to a one that can actually be consumed. Self-control is therefore implemented at the stage of task execution, rather than planning (Diamond 2013). Agents may further modify their decision about the portion size at the very moment of serving themselves food: individuals with low self-control who are:

- strongly motivated by indulgence (H-IND: importance of indulgence is > 0.7) and weakly motivated by being thin (L-BT) will increase their planned portion size,
- weakly motivated by indulgence (L-IND) but strongly motivated by being thin (H-BT: importance of being thin is > 0.7) will decrease their planned portion size,
- strongly motivated by indulgence (H-IND) and being thin (H-BT) will randomly select one of the two motives as more prevalent. If indulgence is randomly selected, the agent will increase the portion size; if being thin is randomly selected, the agent will decrease the portion size.

Finally, the decision is further limited by plate size (which is an opportunity beyond the agent's control) that limits the maximum portion size.

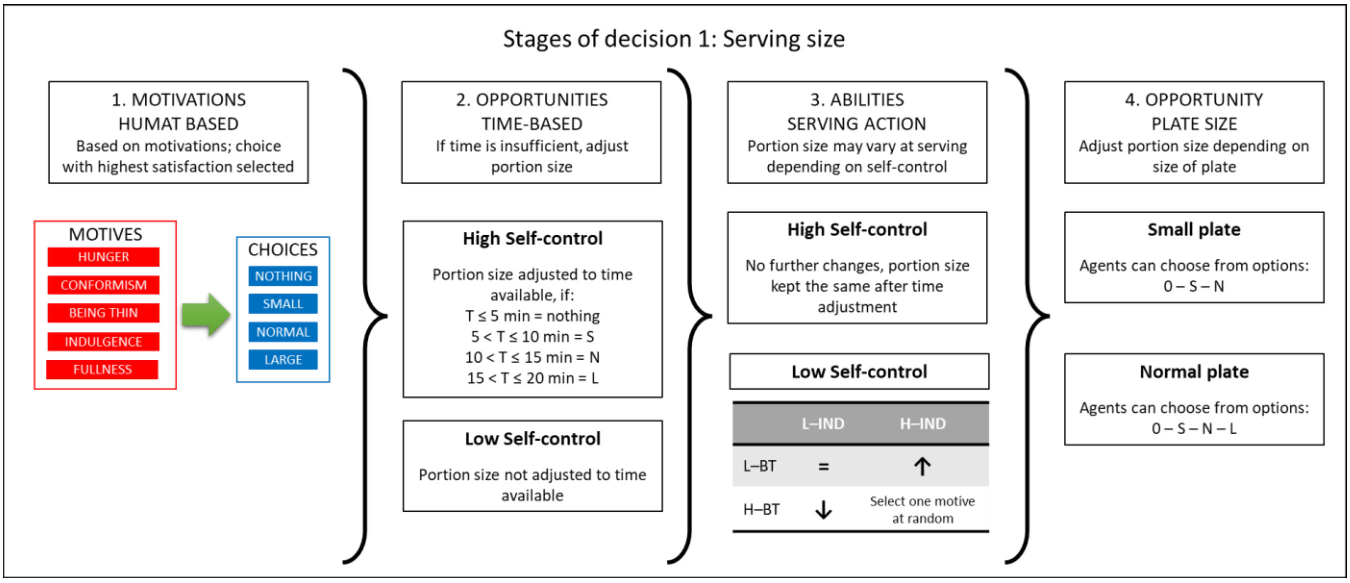

Figure 1 Decision Process for selecting serving size

Stage 1: Motivations and satisfaction of choices

For the first decision agents considered five different motives: hunger, conformism, being thin, indulgence, and fullness. Each motive has a level of importance and for each choice, there is a level of satisfaction attached according to the motive. To make this decision, agents follow the HUMAT approach (Box 1).

BOX 1. HUMAT IN A NUTSHELL

The HUMAT model integrates theoretical concepts on human motives, cognitive dissonances, individual and social decision-making strategies, and the dynamics of influence within social contexts, such as networked communities. It allows for the simulation of decision-making scenarios where individuals must choose among two or multiple choices, such as determining how much food to serve themselves.

Each agent in HUMAT is characterized by a set of motives (e.g., indulgence, conformism) that influence decision-making. Motives are categorized into experiential, social, and values, guiding the process of information diffusion and subsequent choices. Agents vary in the importance they assign to each motive, and they hold beliefs about how the available choices satisfy these motives. While the satisfactions of choices for experiential and values motives are fixed, those related to social motives are dynamic and influenced by the proportions of agents choosing specific choices within the social setting or network. In this case, satisfaction tends to be higher for the choice selected by the majority.

Agents calculate the total satisfaction (TS) derived from each choice according to the following equation:

$$TS_i = \sum_{j=1}^{n} S_{ij} \cdot M_j \text{, } where:$$

TS_i is the total satisfaction of choice *i* (for *i* = 1, 2, …, N),
$S_{i,j}$ is the satisfaction of choice *i* for the j^{th} motive,
M_j is the importance of the j^{th} motive, and
n is the total number of motives

After calculating all total satisfactions, the agent selects the option with the highest satisfaction.

For more information see: (Wander et al. under review)

Hunger. Hunger is represented by a scale from 0 to 1, where 0 indicates no hunger and 1 indicates maximum hunger. This value represents the importance of the motive. At the first serving, hunger is significant, and values are drawn from a truncated normal distribution N (μ = 0.75, σ = 0.15), ranging between 0.01 and 1. There is no distinction between initial hunger levels based on gender or business status. Over time, hunger diminishes linearly, reaching its minimum value (0.01) within 30 minutes of starting to eat (Ghazzawi and Mustafa 2019) signifying satiation within this timeframe. Agents are classified into very hungry (VH), hungry (H), little hungry (LH), and not hungry (NH) based on whether their hunger levels fall within the ranges [1.00-0.75), [0.75-0.50), [0.50-0.25), [0.25-0.01), respectively. The probability density functions of satisfaction for different serving sizes and hunger levels are depicted in Figure 2. When agents are very hungry (VH), satisfaction values are ranked as large > normal > small > none, whereas for not hungry (NH) the order is reversed. For hungry (H) agents, satisfaction values are ranked as normal > large == small > none, and for little hungry (LH) agents, small > none == normal > large (Fig. 2).

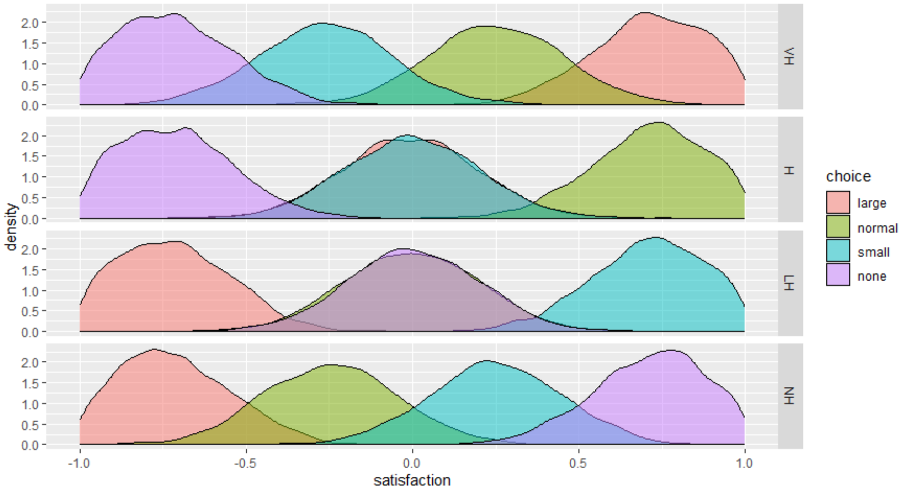

Figure 2 Probability Density Functions of Satisfaction Levels Based on Choice and Hunger Levels.
VN= very hungry, H= hungry, LH= little hungry, NH= no hungry.

Conformism. Conformism determines how much the serving size choice is influenced by ego's network of influence. We assigned equal importance levels to Male/Female agents. For guest types, conformism is higher for business guests, sampled from N (μ = 0.75 and σ = 0.15), than for non-business guests, sampled from N (μ=0.5 and σ=0.15). The network of influence consists of agents who served themselves food within the ten minutes prior of ego's arrival to the buffet. Satisfaction levels for each serving size choice are dynamically adjusted based on the proportion of agents in ego's network selecting a specific serving size. Therefore, satisfaction tends to be higher for the option chosen by the majority within the network. However, ego's perception of others' persuasiveness varies depending on their similarity to itself, as detailed in Table 1. Ego assigns the highest weight (1) to agents matching its gender and guest type, and the lowest weight (0.1) to those differing in both. Hence, agents' choices carry ten times more influence when observed in similar agents compared to dissimilar ones.

		Business		**Non-business**	
		Fem	Mal	Fem	Mal
Business	Fem	1.0	0.5	0.5	0.1
	Mal	0.5	1.0	0.1	0.5
Non-business	Fem	0.5	0.1	1.0	0.5
	Mal	0.1	0.5	0.5	1.0

Table 2 Persuasiveness Matrix based on Agent Identity

Being thin. Being thin determines how much the serving size choice is influenced by the adherence to this social norm. We assigned equal importance levels to business/non-business agents. For gender, being thin is more important for females, sampled from N (μ = 0.75 and σ = 0.15), than for males, sample from N (μ=0.5 and σ=0.15). The level of satisfaction per choice decreases as serving size increases: large < normal < small < none. The probability density functions of satisfactions per serving size are illustrated in figure 3.

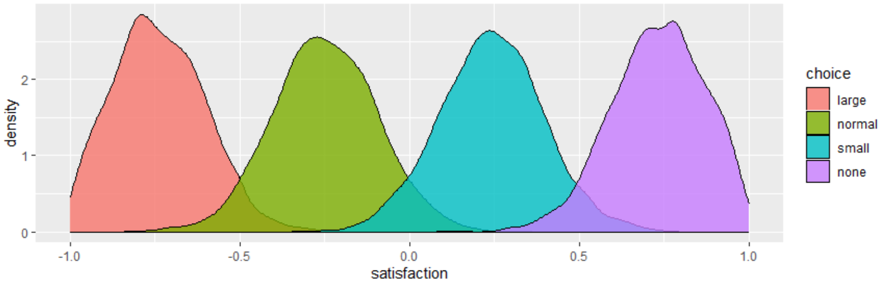

Figure 3 Probability Density Functions of Satisfaction Levels Based on Choice for the Motive of Being Thin

Indulgence. Indulgence refers to the act of enjoying rich, luxurious, or extravagant foods without strict regard for dietary restrictions or health concerns. We assigned equal importance levels to Male/Female agents. For guest types, indulgence is assigned differently, it is higher for non-business guests, sampled from a N (μ = 0.75 and σ = 0.15), and lower for business guests, sampled from N (μ=0.5 and σ=0.15). The level of satisfaction per choice increases with serving size: none < small < normal < large. The probability density functions of satisfaction levels per serving size are illustrated in figure 4.

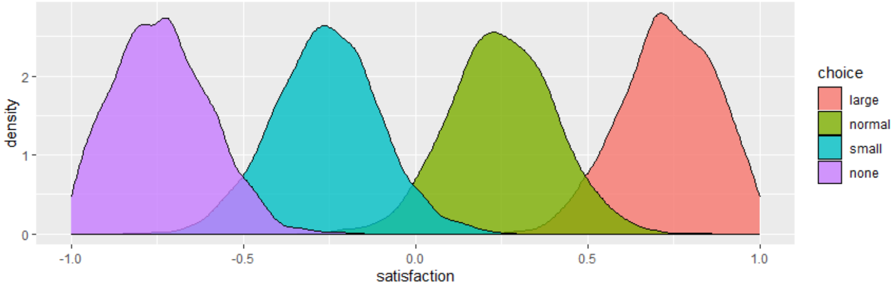

Figure 4 Probability Density Functions of Satisfaction Levels Based on Choice for the Indulgence Motive

The importance of indulgence is modulated by food diversity. Food diversity represents the breadth of food options available such as fruits, cereals, bread, pastries, dairy products, proteins, and beverages, and it is quantified on a scale of 0 to 1. At 0, indicating low diversity, and at 1, indicating high diversity. Food diversity modulates the importance of indulgence among agents in a linear function. Specifically, when food diversity is 0, indulgence decreases by 10 %; when it is 0.5, indulgence remains the same; and when it is 1, indulgence increases by 10%.

Fullness. We define fullness as the sensation experienced when consuming food beyond the body's need for nourishment, often resulting in discomfort. It ranges from 0.01, not full, to 1, completely full. The importance is equal to the feeling value. There's no gender or business-based distinction in initial fullness levels. At initialization, fullness is 0.01 and remains at its minimum until hunger decreases to 0.5. Afterwards, as hunger continues to decline, fullness starts to increase linearly, reaching its peak 30 minutes later, or 15 minutes after hunger hits its lowest point. Agents are classified into very full (VF), full (F), little full (LF), and not full (NF) based on whether their fullness levels fall within the ranges [1.00-0.75), [0.75-0.50), [0.50-0.25), [0.25-0.01), respectively. The probability density functions of satisfaction for different serving sizes and fullness levels are depicted in Figure 5. When agents are very full (VF), satisfaction values are ranked as 0 > small > normal > L, whereas for not full (NF) the order is reversed. For full (F) agents, satisfaction values are ranked as small > 0 == normal > large and for little full (LF) normal > large == small > none, (Fig. 5).

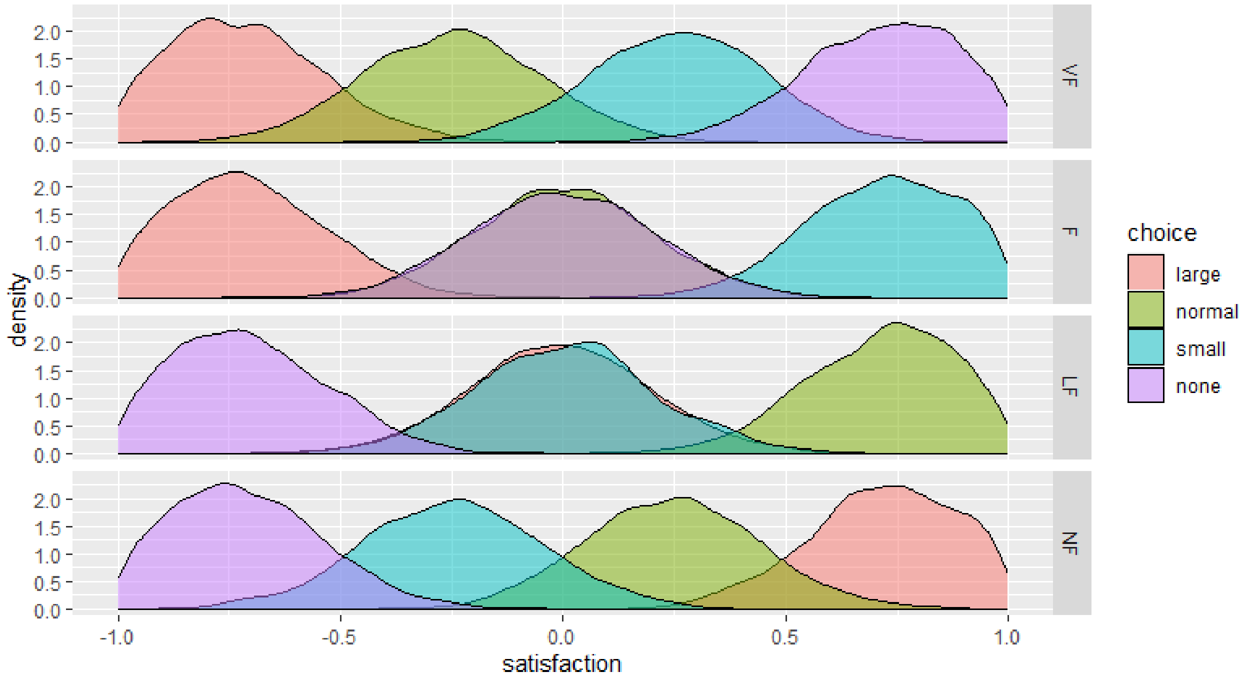

Figure 5 Probability Density Functions of Satisfaction Levels Based on Choice and Fullness Levels. VF= very full, F= full, LF= little full, NF= not full.

After considering all motives' importance and respective satisfaction of choices, the agent selects the choice that gives the maximum satisfaction, following the HUMAT deliberative process (Box 1, also see: Wander et al. under review).

Stage 2: Available time

The second decision agents make is based on their available eating time, specifically for business persons, whom we assume they need to leave by 9:00 am. Assuming agents need at least 10, 15, or 20 minutes to eat small (S), normal (N), or large (L) portion sizes respectively, they adjust their portion size only if they have high self-control (> 0.75), reflecting their ability to exert control over their actions. Values of self-control are set by drawing from a normal distribution (μ = 0.75, σ = 0.15) without gender or business distinctions. If their available time is less than what is needed to eat the portion size previously chosen, agents with high self-control adjust their portion size based on their available time: ‘none’ if less than 5 minutes, ‘small’ if between 5 and 10 minutes, ‘normal’ if between 10 and 15 minutes, and ‘large’ otherwise. Non-businesspersons do not need to adjust for time, as we assume they have sufficient time available, and the buffet restaurant will not close before they finish eating (Fig 1).

Stage 3: Self-control at serving

Self-control is the ability to control actions like serving food portions. Values of self-control are set by drawing from a normal distribution (μ = 0.75, σ = 0.15) without gender or business distinctions. High self-control (> 0.75) agents maintain the portion size chosen previously. Low self-control agents may adjust size based on importance of indulgence and being thin. Those valuing indulgence (> 0.75) increase portion size if thinness importance is low (< 0.75). Conversely, those valuing thinness (> 0.75) decrease portion size if indulgence importance is low (< 0.75). When both importance scores are high, agents experience dissonance decide randomly to increase or decrease portion size. To reduce dissonance, they increase the importance of the motive that won the random decision (Fig 1).

Stage 4: Plate size

Plate size dictates the amount of food served: small plates allow for small or normal portions, as individuals can stack food; meanwhile, normal-sized plates also allow for larger portions, for the same reason.

2.4.2 Time required for eating the served portion

We assume that the duration of eating is influenced by the portion size served, with small portions requiring an average of 10 minutes (μ = 10 min, σ = 1 min), normal portions 15 minutes (μ = 15 min, σ = 1 min), and large portions 20 minutes (μ = 20 min, σ = 1 min).

Decision 2: Plate food waste

The amount of uneaten food left by the agent on the plate depends on abilities, opportunities, and motivations (Fig 6). Stages 3 and 4 in fig. 6 follow the HUMAT socio-cognitive architecture (Box 1).

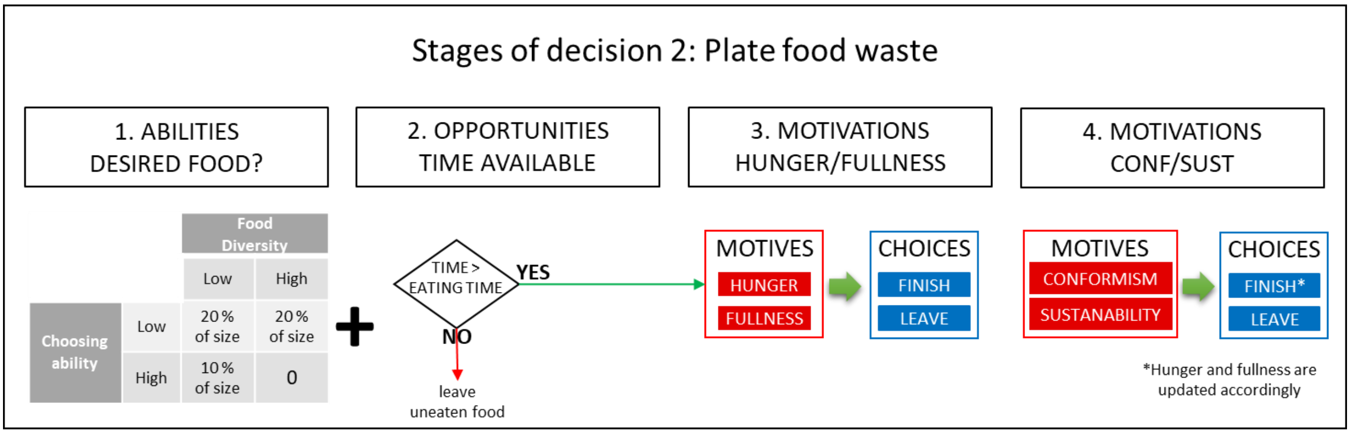

Figure 6 Decision Process for Finishing Food on Plate

Stage 1: Choosing what one likes

The degree to which agents choose what they like to eat depends on two factors: food diversity and their ability to choose what they like. Businesspersons are assumed to have better choosing ability than non-business individuals. At initialization, businesspersons' ability's values follow N (μ = 0.75, σ = 0.15), and non-business individuals' follow N (μ = 0.5, σ = 0.15), with no gender distinction. The combination of food diversity and choosing ability directly affects the amount of disliked food and thus leftovers: if both are low (<0.75), the amount of disliked food and leftovers (up to now) equal to 20% of the serving size; if both are high, there is no disliked food; if food diversity is high and choosing ability is low, disliked food and leftovers equal 20% of the serving size; if choosing ability is high and food diversity is low, disliked food and leftovers equal to 10% of the serving size (Table 2). Our rationale is as follows. When choosing ability is low, agents inevitably end up with options they dislike, regardless of food diversity, resulting in a medium-large amount of leftovers. Conversely, when choosing ability is high, agents with low food diversity may not find their preferred choices, leading to dislike food and leftovers, but to a lesser degree. However, when both factors are high, agents select precisely what they like, leaving no leftovers.

		Food Diversity	
		Low	**High**
Ability to choose what you like	**Low**	**↑ 20%**	**↑ 20%**
	High	**↑ 10%**	**0%**

Table 3 Percentage of leftover food based on choosing ability and food diversity levels

Stage 2: Available time

The amount of leftovers resulting from disliked food is added to the amount left due to time constraints. When agents are time-constrained, agents do not have enough time to finish their plate. The amount left is calculated as the amount of liked food (i.e., served food minus disliked food) minus food eaten given time available (we assume that agents eat 20 gr of food per minute). Agents then leave the buffet. Conversely, if agents are not time-constrained, two additional decisions are made based on motivations.

Stage 3: Motives of hunger and fullness

If agents have sufficient time available to complete their meal, their decision to finish the food portion is based on hunger and fullness. They can choose either to finish or leave the food on the plate. The satisfaction derived from these choices varies based on the motivations: finishing the plate yields positive satisfaction for hunger but negative satisfaction for fullness (see Fig 7). It is important to note that the feeling of hunger and its importance decrease over time, while the opposite is true for fullness. Therefore, initially hungry agents are motivated to finish their meal, but as time passes, their hunger diminishes while their feeling of fullness increases, prompting them to leave food on their plates.

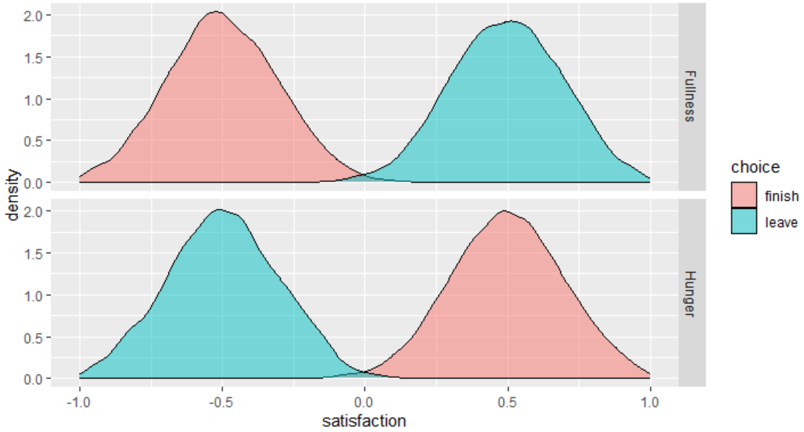

Figure 7 Probability Density Functions of Satisfaction Levels Based on Choice and Motivation Type (Fullness or Hunger).

Stage 4: Motives of conformism and sustainability

Finally, before agents actually finish or leave their food, they deliberate once more, considering conformism and sustainability. Conformism influences their decision by dynamically adjusting satisfaction levels based on the proportion of agents in ego's network choosing each option, with higher satisfaction typically aligning with the majority choice within the network. Note that ego's perception of others' persuasiveness varies based on their similarity to itself, as outlined in Table 1. Sustainability, on the other hand, entails the responsible management of food resources to minimize waste and maximize efficiency. At initialization, values of importance are drawn from a normal distribution ($\mu = 0.75$, $\sigma = 0.15$), regardless of guess type or gender. The level of satisfaction is negative for leaving food (with $\mu = -0.5$ and $\sigma = 0.2$) and positive for finishing (with $\mu = 0.5$ and $\sigma = 0.2$).

2.4.3 Subsequent servings

If after finishing or leaving food on their plate agents have time for another serving, they proceed to decide on subsequent servings. This involves repeating the decision-making processes for serving size, time spent eating, food left on the plate, and subsequent servings. This loop continues as long as there is available time or until the serving size option selected is 'nothing'. Agents then leave the buffet.

3 THE HOME COOK MODEL

3.1 The model at a glance

The home cook model operates as a micro-simulation that represents eating behaviour of individuals in a private context. The goal of the model is to assess the amount and type of food waste generated in households. In the model, a household makes grocery purchasing decisions based on the household composition, consumption routines and dietary preferences. Effectively, individuals cooking at home take on the role of pantry managers, who mitigate uncertainty about the exact number of meals consumed at home until the next shopping trip.

3.2 Households

Household composition is a model parameter that sets the numbers of adult (1 to 5) and children (0 to 5), who consume respectively 1800g and 1050 grams per day. A maximum of three meals per day can be consumed at home (baseline). To account for diverse preferences with respect to eating out, the probability of each meal to be prepared and consumed at home is a model parameter (e.g., 66% probability results in two meals prepared from the household's own pantry, and one meal consumed outside). Notably, this model exclusively concentrates on meals prepared at home and therefore only tracks food waste generated at a household level.

3.3 Grocery runs

To account for diverse shopping habits, the frequency of grocery shopping trips is a model parameter. Households typically restock their pantry once a week (baseline), aiming to maintain a stable inventory level. Purchasing decisions take into account what stock is already in the pantry, and the household member(s) only buy what is lacking from the desired pantry, which is expressed as:

$$\text{Desired-Pantry-Size} = \mu + \delta * \sigma$$

Where:

- μ - the average expected weekly consumption (i.e., the consumption between grocery shopping runs),
- σ - the weekly standard deviation from the expected average weekly consumption, and
- δ - the size preference of the food pantry.

The δ model parameter accounts for individual household preferences of keeping a small/large food supply available at home at all times. Ultimately, it is a critical value determining risk aversion. Higher δ values characterize consumers that are more risk-averse of running out of food supplies between grocery runs. These consumers hold onto larger safety food stocks. If a household unexpectedly runs out of food between shopping trips, the member(s) will have to order emergency takeout meals.

Preference for small/large food stock level forms the basic form of adaptation/learning of the simulation. If perishables keep spoiling before they are consumed, households shift their strategy, leaning more on non-perishables. They learn from their pantry patterns.

3.4 Pantry composition

While the size of the pantry is primarily determined by the average household consumption (given the number of household members and their eating out preferences) and risk aversion to running out of food supplies at home, the composition of the pantry is determined by individual dietary preferences. Each pantry contains two categories of food: perishables and non-perishables. Perishables are characterized by a best before date (drawn from a normal distribution N (μ = 3, σ = 1); so, it typically falls around 3 days), and a spoilage date (drawn from a normal distribution N (μ = 5, σ = 2). Importantly, actual spoilage takes place at least 1 day after the best before. To account for diverse food discard habits (model parameter), individuals may either be guided by the best before (baseline) or spoilage dates. After a food item reaches one of those dates, a household member will throw it out.

Households may adopt one of two approaches to consuming fresh foods that correspond to their dietary preferences (model parameter): either (1) prioritizing the consumption of perishables before non-perishables, or (2) aiming for a balanced mix, such that meals consist of 50% perishables and 50% non-perishables.

3.5 Model outputs and simulation scenarios

The simulation outputs include:

- the perishables rate – fraction of perishable foods in a household's home diet,
- the discard rate – the amount of discarded foods divided by total foods consumed.

The home cook simulation is capable of tracking how do preferences for eating out and eating fresh foods influence:

- the amount of food you buy,
- the size and composition of your pantry,
- the fraction of fresh foods in your diet,
- discard rate?

The what-if scenarios implemented in the next step of the simulation can answer the following questions:

- How does the discard rate change when you have a habit of throwing food out only when it is actually spoiled (compared to past best before)?
- How does the discard rate change when you are a prepper (have high risk aversion for running out of food)?
- How does the discard rate change when you go shopping at a different frequency? (baseline once a week vs every 3 days or every 14 days)
- How does the discard rate change if a new preservation technology is available? (current average life of perishables vs increasing the average life of perishables by 1 day vs 2 days)

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