Using qualitative methods to inform a household plastic packaging and food waste simulation model

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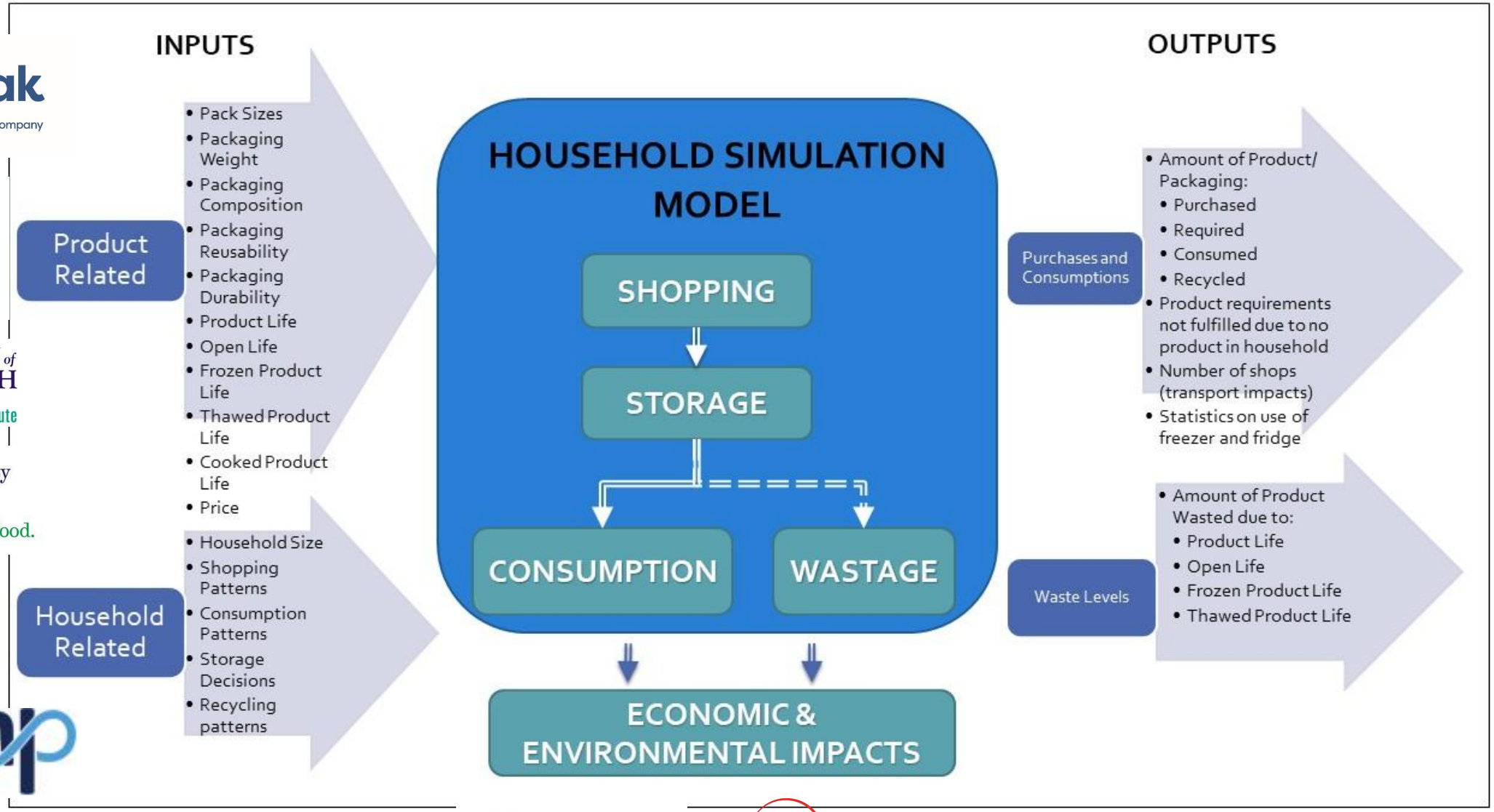
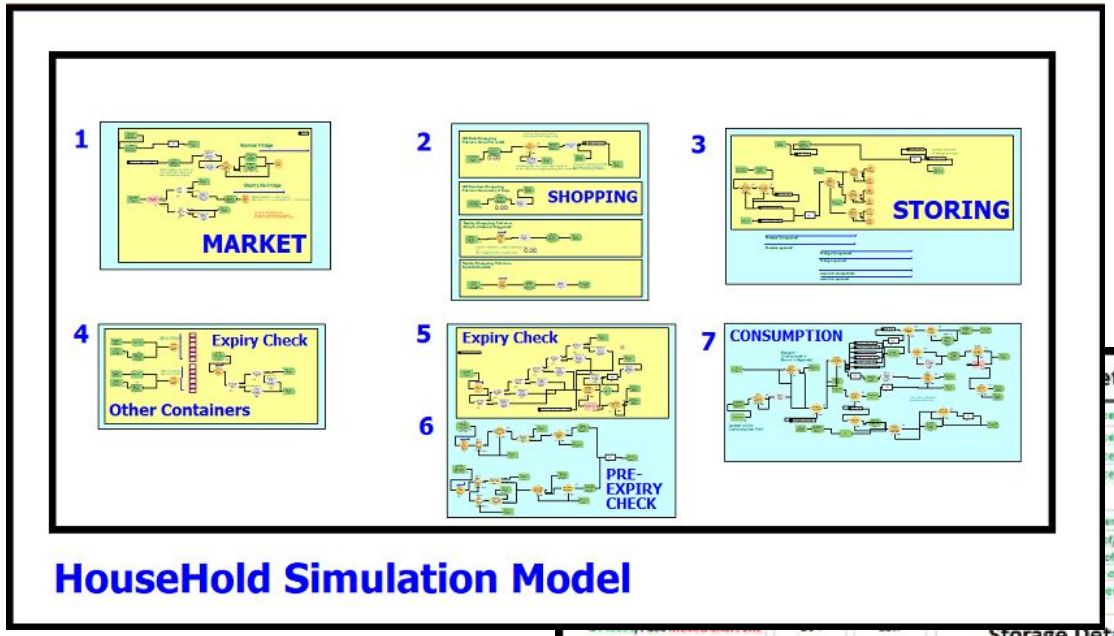
Centre for Food Policy
Shaping an effective food system

Household simulation model



The HHSM can simulate many innovations

HH Food // Plastic Waste Simulation Model



1. Market
2. Shopping
3. Storing
4. Consumption
5. Waste

Storage Details	Average	Half Width
6 Pieces/Pack Moved Short Life	266	9.0
Total Pieces/Pack Moved Short Life	789	18.0
2 Pieces/Pack Thrown Away	259	13.7
No of Days/Small Other Container is Empty	3.00	0.0
Busy Utilisation/Small Other Container	77.07	65.1
Use of/Small Other Container	71.33	54.9
tored/Small Other Container	136.00	85.7
tored/Small Other Container	1.91	1.1
rge Other Container is Empty	26.33	108.7
ation/Large Other Container	19.64	52.1
Use of/Large Other Container	46.67	163.8
tored/Large Other Container	83.67	317.2
tored/Large Other Container	1.77	0.6

tails	Average	Half Width
es/Pack Bought	8.67	13.7
es/Pack Bought	4.33	13.7
es/Pack Bought	2.00	9.0
es/Pack Bought	15.00	18.0
er of/Main Trips	9.67	13.7
f/Random Trips	0.00	0.0
of/Top Ups Trips	0.00	0.0
of/Special Trips	0.00	0.0
er of/Total Trips	9.67	13.7

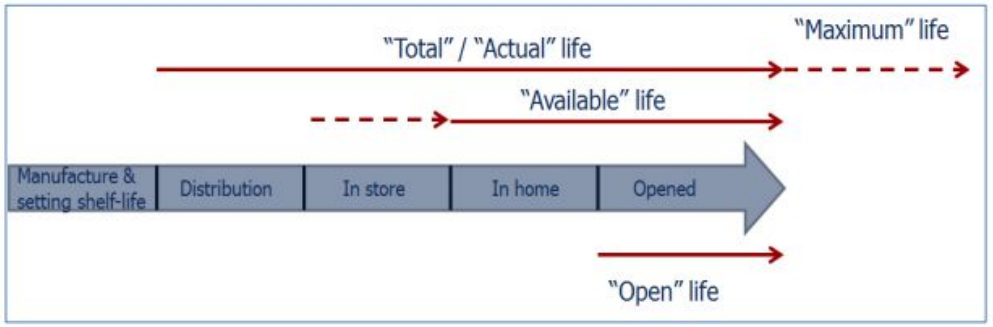
Storage Details	Average	Half Width
1 Piece/Pack Stored in Freezer	4.67	5.2
2 Pieces/Pack Stored in Freezer	1.67	13.7
3 Pieces/Pack Stored in Freezer	0.00	0.0
4 Pieces/Pack Stored in Freezer	2.00	9.0
5 Pieces/Pack Stored in Freezer	0.00	0.0
6 Pieces/Pack Stored in Freezer	0.67	5.2
Total Pieces/Pack Stored in Freezer	9.00	9.0
1 Piece/Pack Stored in Fridge	3.33	20.7
2 Pieces/Pack Stored in Fridge	1.33	20.7
3 Pieces/Pack Stored in Fridge	0.33	5.2
4 Pieces/Pack Stored in Fridge	0.33	5.2
5 Pieces/Pack Stored in Fridge	0.00	0.0
6 Pieces/Pack Stored in Fridge	0.00	0.0
Total Pieces/Pack Stored in Fridge	5.33	51.9
1 Piece/Pack Stored on Counter	5.33	5.2
2 Pieces/Pack Stored on Counter	2.67	10.4
3 Pieces/Pack Stored on Counter	1.00	9.0
4 Pieces/Pack Stored on Counter	0.33	5.2
5 Pieces/Pack Stored on Counter	0.67	5.2
6 Pieces/Pack Stored on Counter	0.00	0.0
Total Pieces/Pack Stored on Counter	10.00	15.6
Number of Days/Freezer is Empty	3.00	0.0
Avg Number Pieces/Stored Freezer	35.36	157.8
Number of Days/Fridge is Empty	67.33	18.7
Avg Number Pieces/Stored Fridge	0.55	0.7
Other Container/Min Storage in Freezer	4.00	0.0
Other Container/Max Storage in Freezer	33.33	145.2
Other Container/Min Storage in Fridge	1.00	0.0
Other Container/Max Storage in Fridge	4.00	0.0
Other Container/Min Storage On Counter	0.00	0.0
Other Container/Max Storage On Counter	0.00	0.0
Orig Container/Min Storage in Freezer	10.00	0.0
Orig Container/Max Storage in Freezer	11.33	13.7
Orig Container/Min Storage in Fridge	5.00	0.0
Orig Container/Max Storage in Fridge	7.00	23.8
Orig Container/Min Storage On Counter	0.00	0.0
Orig Container/Max Storage On Counter	0.00	0.0

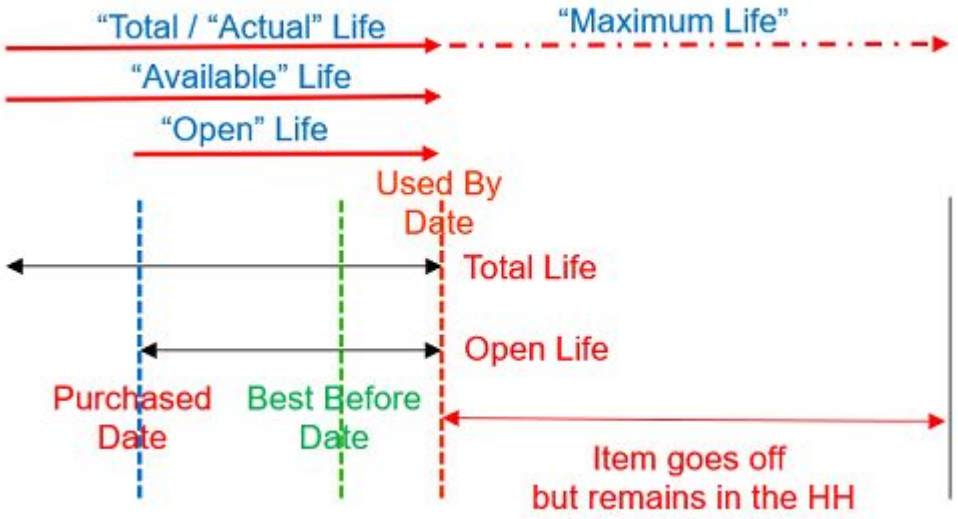
Consumption Details	Average	Half Width
Total No of Pieces/Meal Amount	76.00	0.00
Total No of Pieces/Consumed Amount	33.67	42.46
Total No of Pieces/Unfulfilled Amount	0.00	0.00
Total No of Pieces/Consumed During/ Best Before	33.67	42.46
Total No of Pieces/Consumed During/ Used By	0.00	0.00
Total No of Pieces/Consumed During/ Expired	0.00	0.00

Expired / Thrown Away	Average	Half Width
Total No of Pieces/Thrown Away Expired Wasted	0.67	10.37
Total No of 2 Pieces/Thrown Away Orig Container	8.67	13.72
Total No of 4 Pieces/Thrown Away Orig Container	4.33	13.72
Total No of 6 Pieces/Thrown Away Orig Container	2.00	8.98
Total No /Thrown Away Orig Container	15.00	17.97
Total No /Thrown Away Small Other Container	0.00	0.00
Total No /Thrown Away Large Other Container	0.00	0.00
Food Waste /Ending Up As Home Composite	0.07	1.04
Food Waste /Ending Up Land Fill Residual	0.60	9.34
Plastic Waste /Ending Up As Home Composite	10.50	12.58
Plastic Waste /Ending Up Land Fill Residual	4.50	5.39

The HHSM can simulate many innovations

Packaging type and shelf life





Current Focus:
Trade-offs between small packages and large packages + storage space

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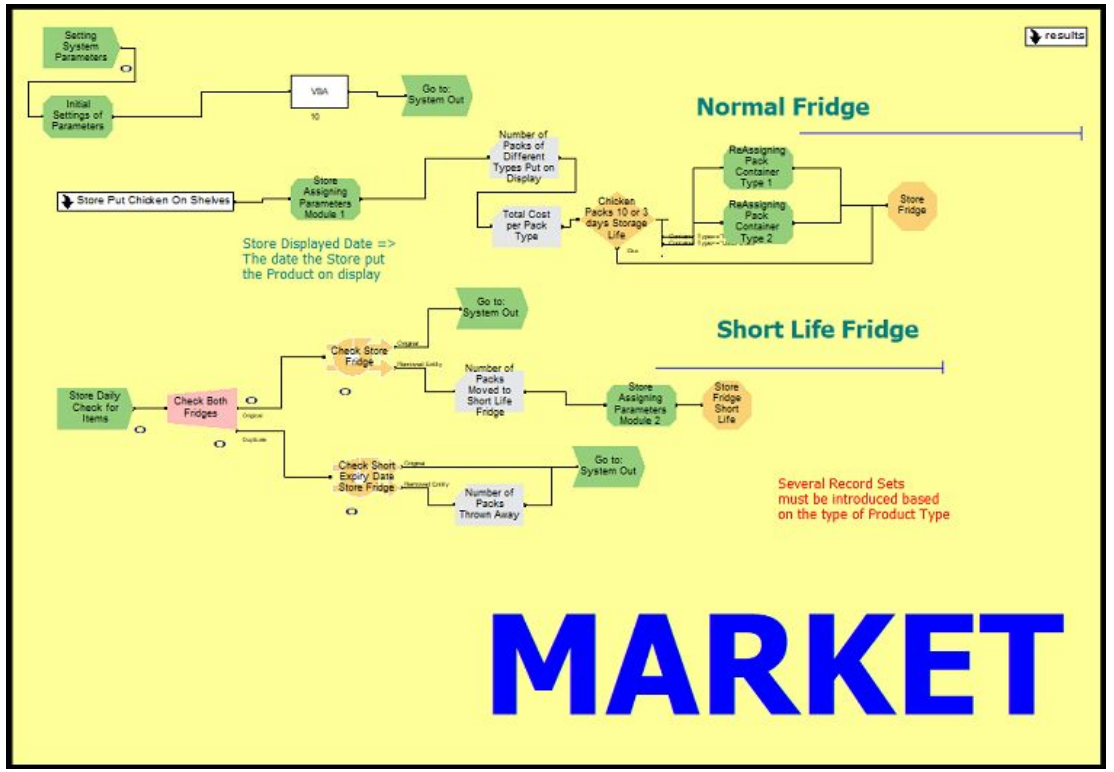
HH Food // Plastic Waste Simulation Model

1.

Market



Market Related Information

Input Parameters	Condition	Value
Products Sizes in Pieces on Display	2 Pieces 4 Pieces 6 Pieces	2 4 6
Products on Display Daily	2 Pieces 4 Pieces 6 Pieces	4 4 4
Cost / Pack	2 Pieces 4 Pieces 6 Pieces	2 2 2
Selling Price £ / Pack	2 Pieces 4 Pieces 6 Pieces	4 6 8
Selling (Reduced Price) £ / Pack	2 Pieces 4 Pieces 6 Pieces	4 6 8
Duration of time to Move Packs to Short Life Fridge	2 Pieces 4 Pieces 6 Pieces	2
Remaining Product Shelf Life to Throw Away Packs	2 Pieces 4 Pieces 6 Pieces	0

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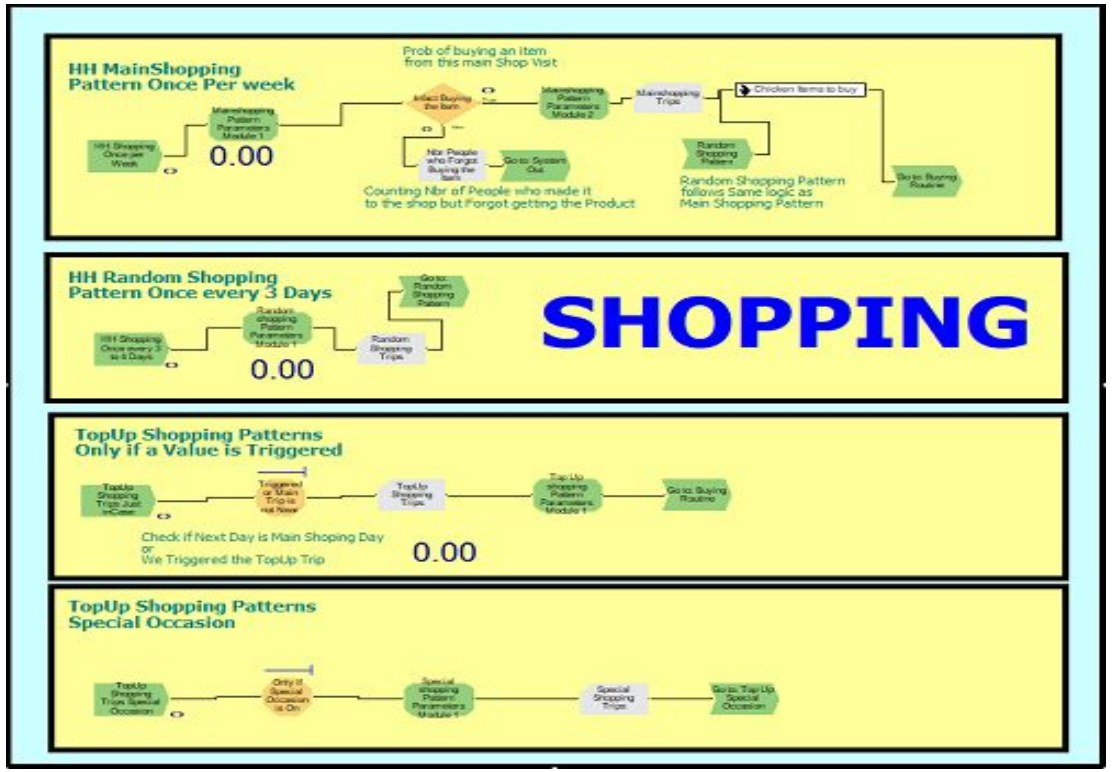
HH Food // Plastic Waste Simulation Model

2.

Shopping



Purchasing Related Information

Input Parameters	Condition	Value
Shopping List / Storage	Checked	100
Main Shopping Trip	Trip Frequency	1
	Switched On	1
	Max No. Trips	100
	Amount to Get	10
	Forgot to Get The Item	0
Random Shopping Trip	Trip Frequency	1
	Switched On	0
	Max No. Trips	100
	Amount to Get	10
TopUp Shopping Trip	Trip Frequency	1
	Switched On	1
	Max No. Trips	100
	Amount to Get	4
TopUp Special Occasion Shopping Trip	Trip Frequency	1
	Switched On	0
	Max No. Trips	100
	Amount to Get	10

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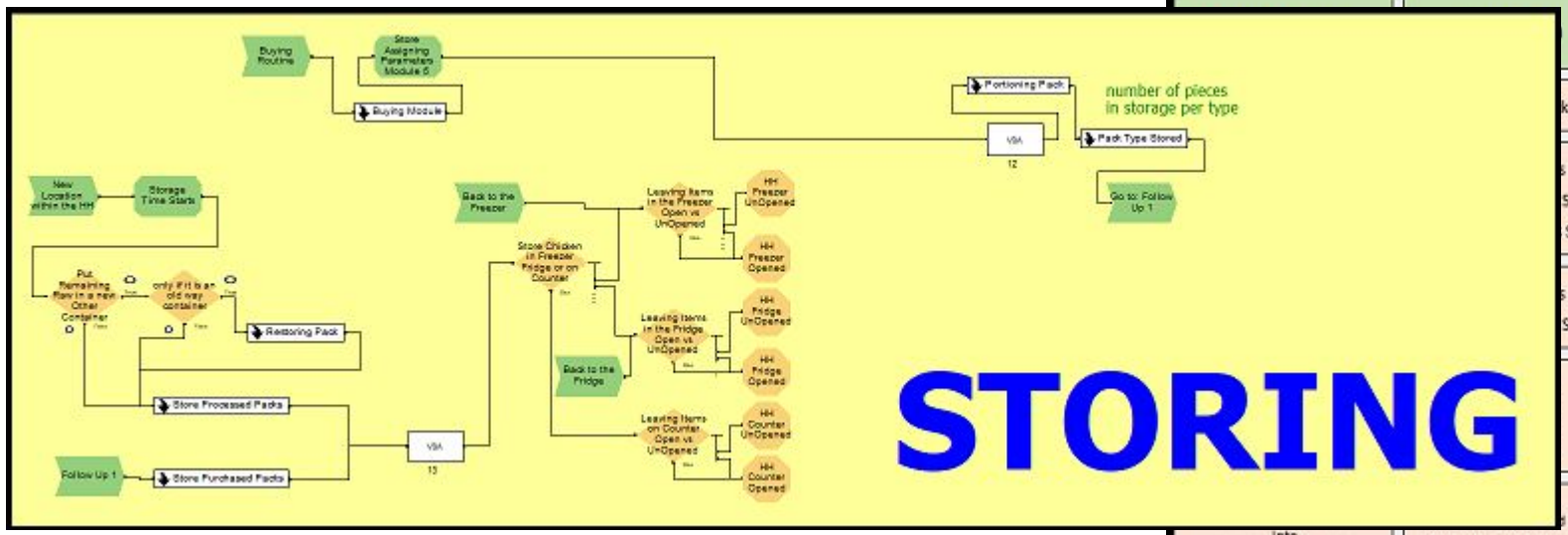
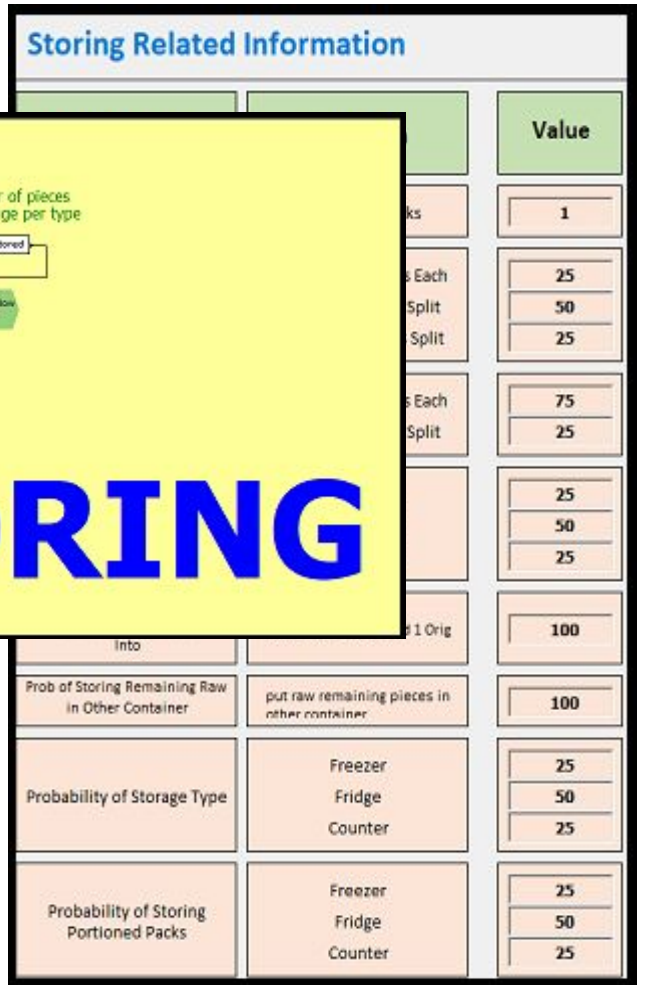
HH Food // Plastic Waste Simulation Model

3.

Storing





Storing Related Information

		Value
		1
	Each	25
	Split	50
	Split	25
	Each	75
	Split	25
		25
		50
		25
	1 Orig	100
Prob of Storing Remaining Raw in Other Container	put raw remaining pieces in other container	100
Probability of Storage Type	Freezer	25
	Fridge	50
	Counter	25
Probability of Storing Portioned Packs	Freezer	25
	Fridge	50
	Counter	25

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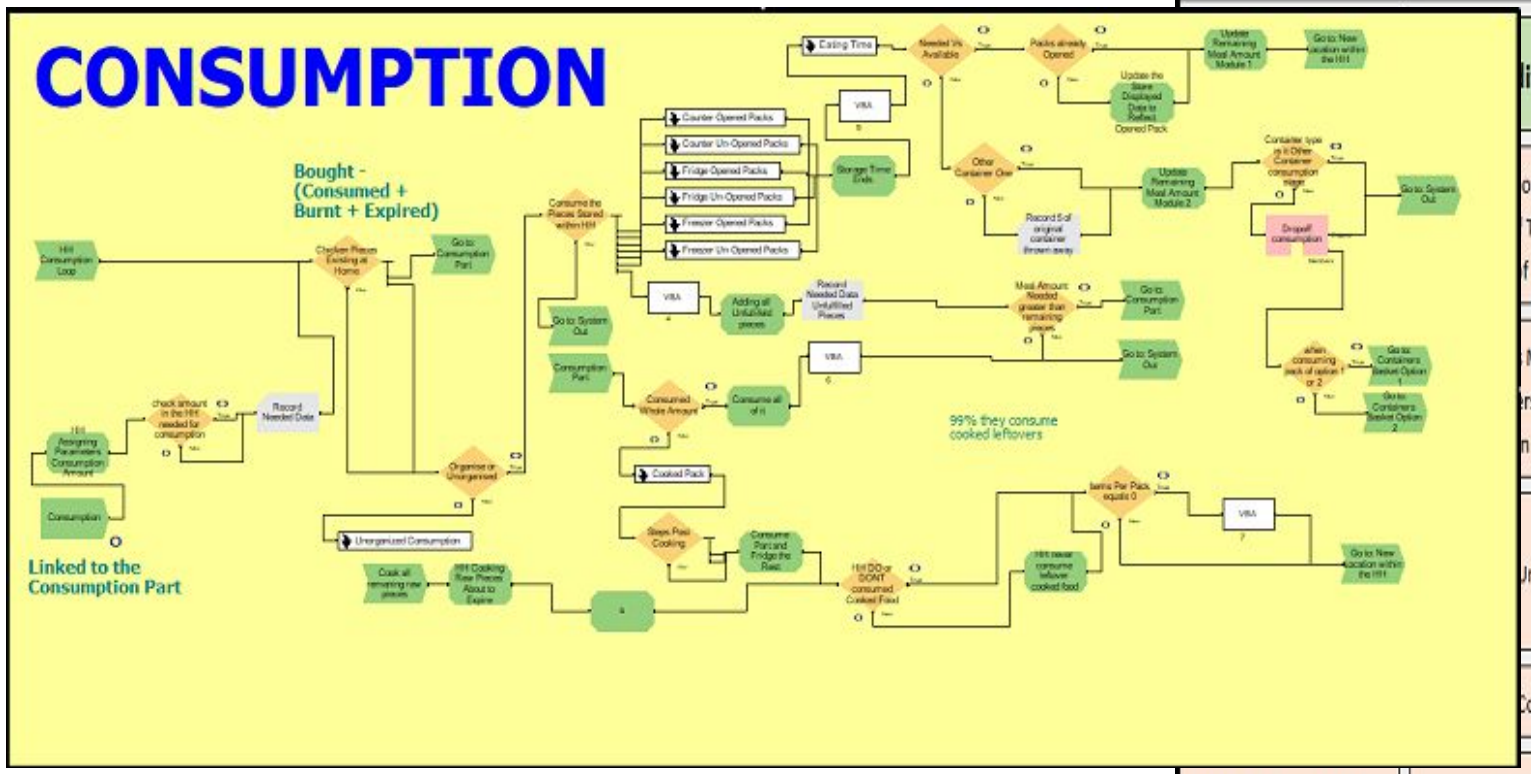
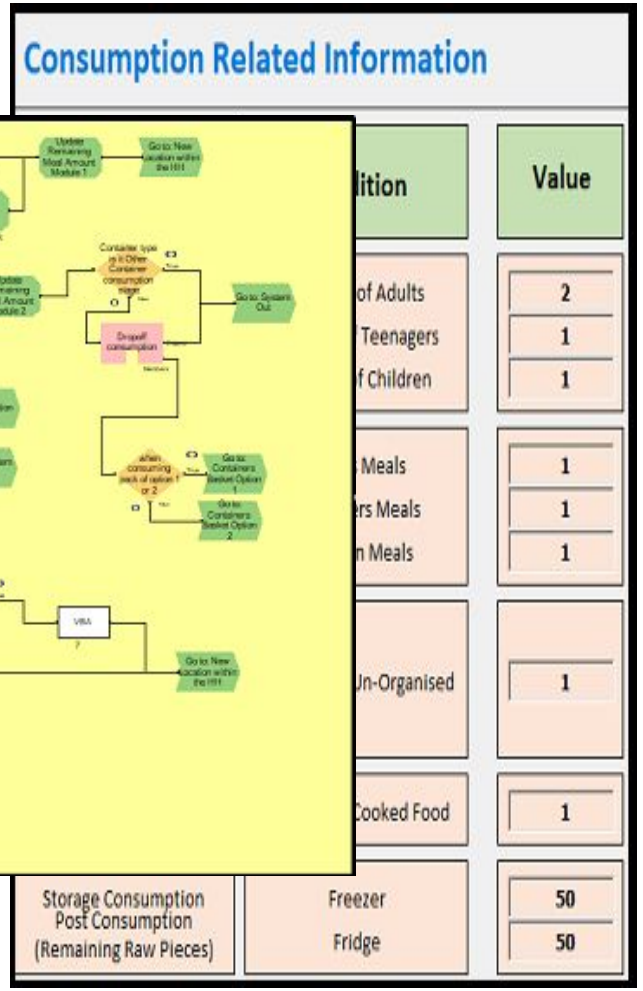
HH Food // Plastic Waste Simulation Model

4.

Consumption





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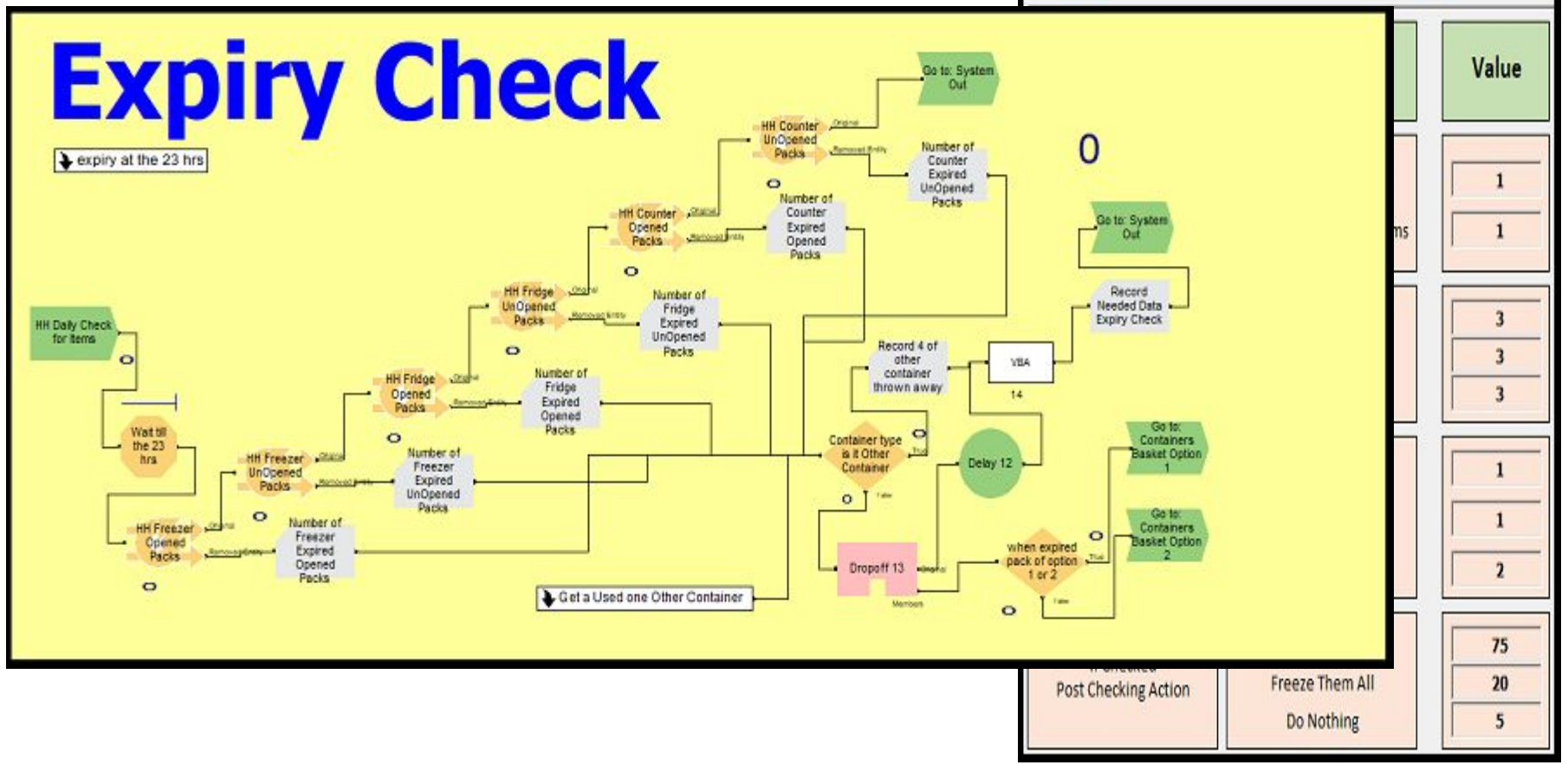
5.

Waste



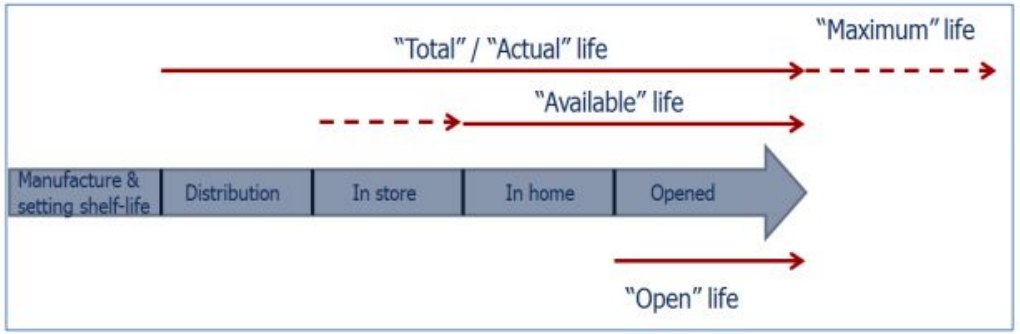
Work packages

A *discrete event simulation model* for 30 food products/packaging combinations

(10-15 of the products will be fresh fruit and vegetables due to the large packaging and food waste reduction potential)

WP 1 Development, enhancement, and expansion of HHSM **WP 2** Knowledge Exchange **WP 3** Academic impact

WP 4 Quantifying food quality and packaging trade-offs - additional data collection (Kent/Greenwich)



WP 5 Household-packaging interaction, behaviour and practice - additional data collection *(the rest of this talk)*

Qualitative Data Collection - Intentions & Design

- Qualitative Research can validate and provide insights for Quantitative modelling.
- Practice Theory can provide a sociological approach to the different models within the HHSM, due to understandings of eating and food waste as compound practices.

- What considerations are taken into account before the food enters the home?
- What happens to the food and its packaging once it enters the home?
- How do food and plastic packaging become waste differently?

- 28 people recruited for online interviews, 25 completed food and plastic waste diary after screening questionnaire.
- Semi-structured interviews with photo-elicitation elements. Interview guide focussed on different aspects of food waste as compound practice, e.g. food provisioning, meal organisation, and judgement/tastes.
- Diaries based on remote ethnographic methods. Ethnographic/observational methods ideal for this kind of project, but present own challenges.

Qualitative Data Collection - Findings

- Specific information about how different products and package types are treated and talked about.
- Detailed breakdown of these findings by the archetype each participant is in.
- Additional information about how meal planning may be affected by the flexibility of meals.
- Aspects of consumer behaviour and opinion about packaging which are counter-intuitive to packaging experts and against “best practice”; including removing produce from packaging as soon as it is brought into the home.
- Insight into how households store fresh items once they have been removed from packaging.

Previous Results **Change packaging size –**

Results 25% waste decrease

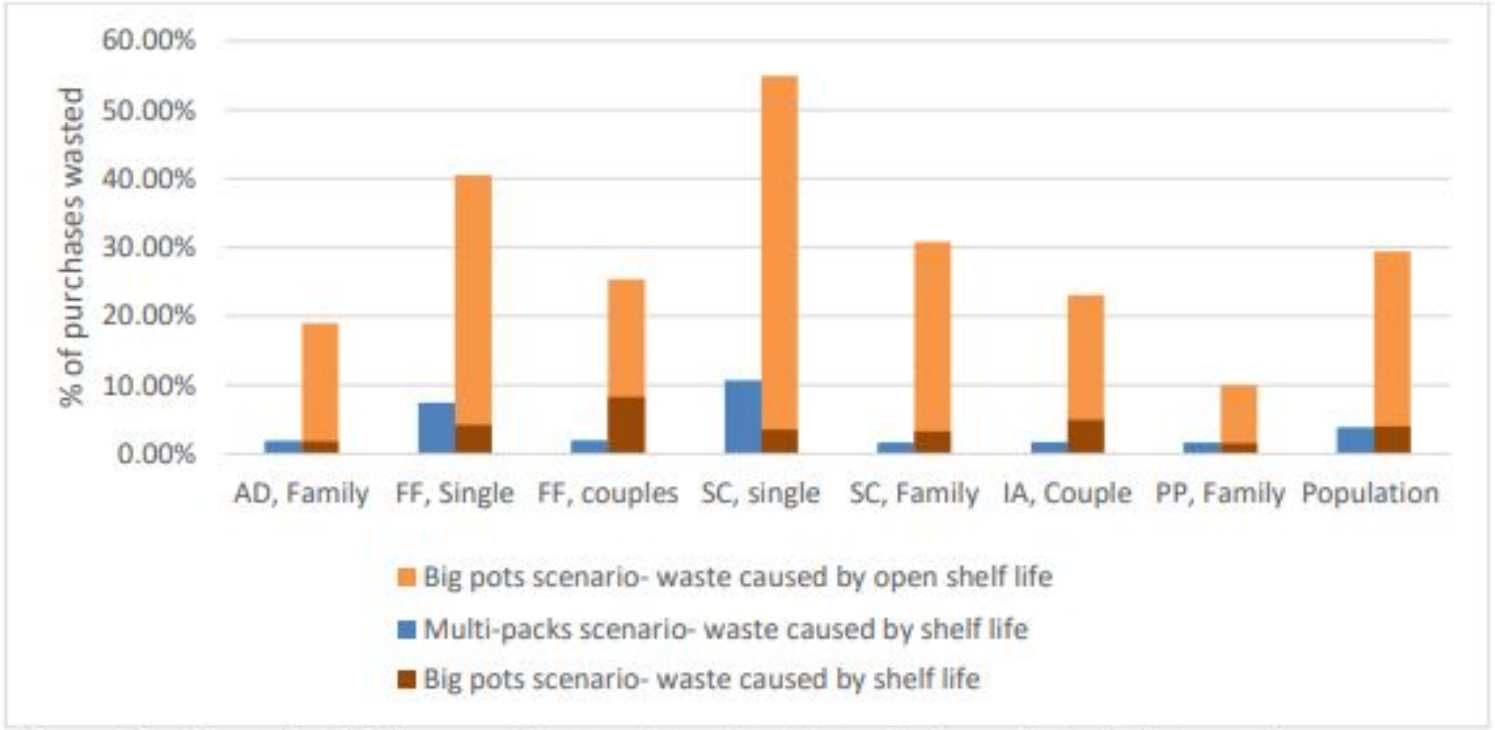
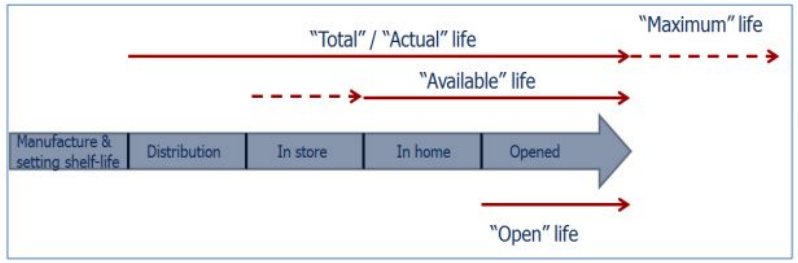


Figure 3 - Waste levels from purchasing "small multi-packs" vs. "single big pots"



Previous Results - Evidence Matrix

Table 1: Summary of progress against priority action areas for a selection of key products

KEY ACTION AREAS	*Estimated potential* food waste savings *	Bread	Milk	Yogurt	Hard cheese	Fresh chicken	Bacon/ sausages/ ham	Potatoes & other uncut fresh produce
Remove the date label where not needed *(fresh produce only)*	>150,000 tonnes/year	n/a	n/a	n/a	n/a	n/a	n/a	c.75% with date labels
Use a Best Before where Use By is not needed. Don't use Display Until	>150,000 tonnes/year	100% Best Before	0% Best Before (but recent change in advice to risk assess for BB)	16% Best Before	100% Best Before	n/a (no Display Until)	n/a (no Display Until)	13% Display Until to be removed
Maximise available product life		No change (average 3.6 days)	Increase since last survey	No change	Increase since last survey	No change (average 5.2 days)	No change	Decrease in life on potatoes since last survey (ave 3.9 days)
Remove open life statements where not needed, or change to 'best within'.		None present	All Use Within	All Use Within	All Use Within	Extended since last survey	Some removal on bacon / sausages	None present
Clear storage advice – where to store, how to store, numerical fridge temperature, etc.	>100,000 tonnes/year (underestimate)	Consistent advice not to store in fridge	27% with temperature advice 10% with fridge logo			48% with temp advice 17% with fridge logo		10% with temp advice 17% with fridge logo
Clear freezing/defrosting /cook from frozen advice	>200,000 tonnes/year	Big increase in snowflake More Cook from Frozen needed; 26% FODOP to remove	Very low prevalence	n/a	Very low prevalence	Some increase in snowflake 35% FODOP to remove. More CFF needed	Some increase in snowflake 30% FODOP to remove. More CFF needed	n/a
Small packs available at the right price point	>200,000 tonnes/year	Low availability and 74% more expensive /kg for small packs	Widely available at range of price points	Widely available at range of price points	Widely available Some price difference	Widely available at range of price points	Widely available at range of price points	For most – loose more expensive per kg than pre-packed
On-pack recipe ideas, hints and tips (as well as in-store, other channels)	*No firm estimate (>300,000 across all food types)*	Positive trend towards adopting	Low prevalence	Low prevalence	Positive trend to adopting	Low prevalence	Low prevalence	Positive trend towards adopting

KEY

FODOP – Freeze on Day of Purchase. CFF – Cook from frozen **** NOT ADDITIVE. See Appendix 2 for method and assumptions.***

- Good practice adopted or positive trend seen - high impact area [≥10,000t savings potential]
- Good practice adopted or positive trend seen - lower impact area
- Shortfall or no change seen - high impact area [≥10,000t savings potential].
- Shortfall or no change seen - lower impact area

https://www.wrap.org.uk/sites/files/wrap/Retail_Survey_2019.pdf


wrap

RETAIL SURVEY 2019

HELPING CONSUMERS REDUCE FOOD WASTE THROUGH BETTER LABELLING AND PRODUCT CHANGES

In 2019, WRAP undertook a survey of UK retailers following on from previous surveys conducted in 2009, 2011 and 2015. A range of own-brand and branded food products was assessed to understand changes in packaged products since the previous surveys and how these could influence household food waste.

Research date: February 2019- July 2019
Publication Date: November 2019

Project code: BCP003-002

Previous Results - Evidence Matrix

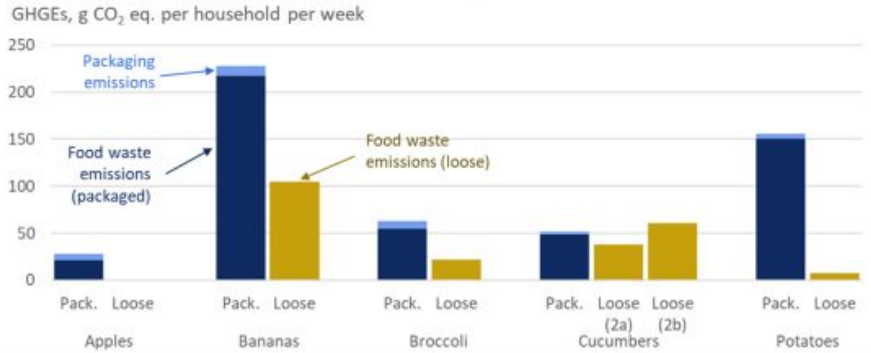
Table ES1: Predicted impact on 'not used in time' HHFW of selling loose (final row), and effects of individual changes (first three rows), percentage point difference

Change:	Difference in HHFW compared to packaged, expressed as percentage-point difference				
	Apples	**Bananas**	**Broccoli**	**Cucumber**	**Potatoes**
Change in shelf-life from packaging removal	0.0 pp	+3.3 pp	+1.9 pp	0.0 pp	0.0 pp
Removal of BB date	-0.8 pp	0.0 pp	-7.1 pp	-3.5 pp	-4.5 pp
Change in pack-size options	-2.7 pp	-9.9 pp	0.0 pp	0.0 pp (or +7.2 pp)*	-8.8 pp
Selling loose (All three changes combined)**	**-3.1 pp**	**-7.5 pp**	**-4.7 pp**	**-3.5 pp (or +4.0 pp)***	**-13.0 pp**

*0 pp / -3.5 pp if smaller (half-sized) cucumbers available loose; +7 pp / +4.0 pp if no smaller cucumbers available

**This is not simply the sum of the three changes above: this scenario includes interactions between all three changes

Figure ES2: Estimated Greenhouse Gas (GHG) emissions for packaged and loose scenarios, splitting emissions relating to packaging and HHFW

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Final Report

Helping people to reduce fresh-produce waste: **Modelling the impact of selling products loose or in packaging**

Investigation into the impacts on food waste in the home from selling fresh fruit and vegetables loose or in packaging

Project code: POS102-002

Research date: April 2020 - July 2021 **Date:** 24th February 2022

https://wrap.org.uk/sites/default/files/2022-02/Modelling-the-impact-of-selling-products-loose-or-in-packaging.pdf

Please do get in touch

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https://www.city.ac.uk/prospective-students/courses/postgraduate/food-policy

Change product life– Results 15% waste decrease

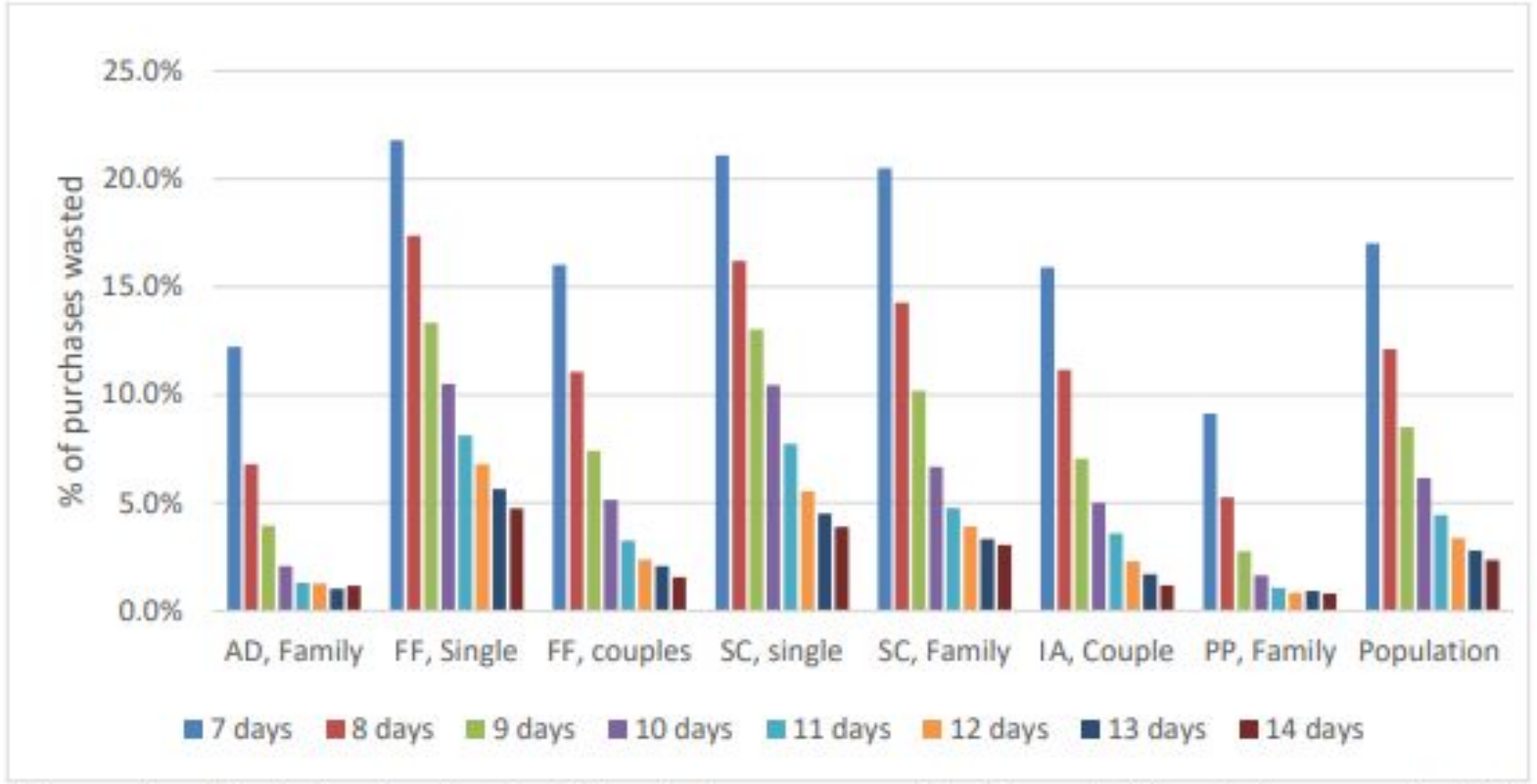
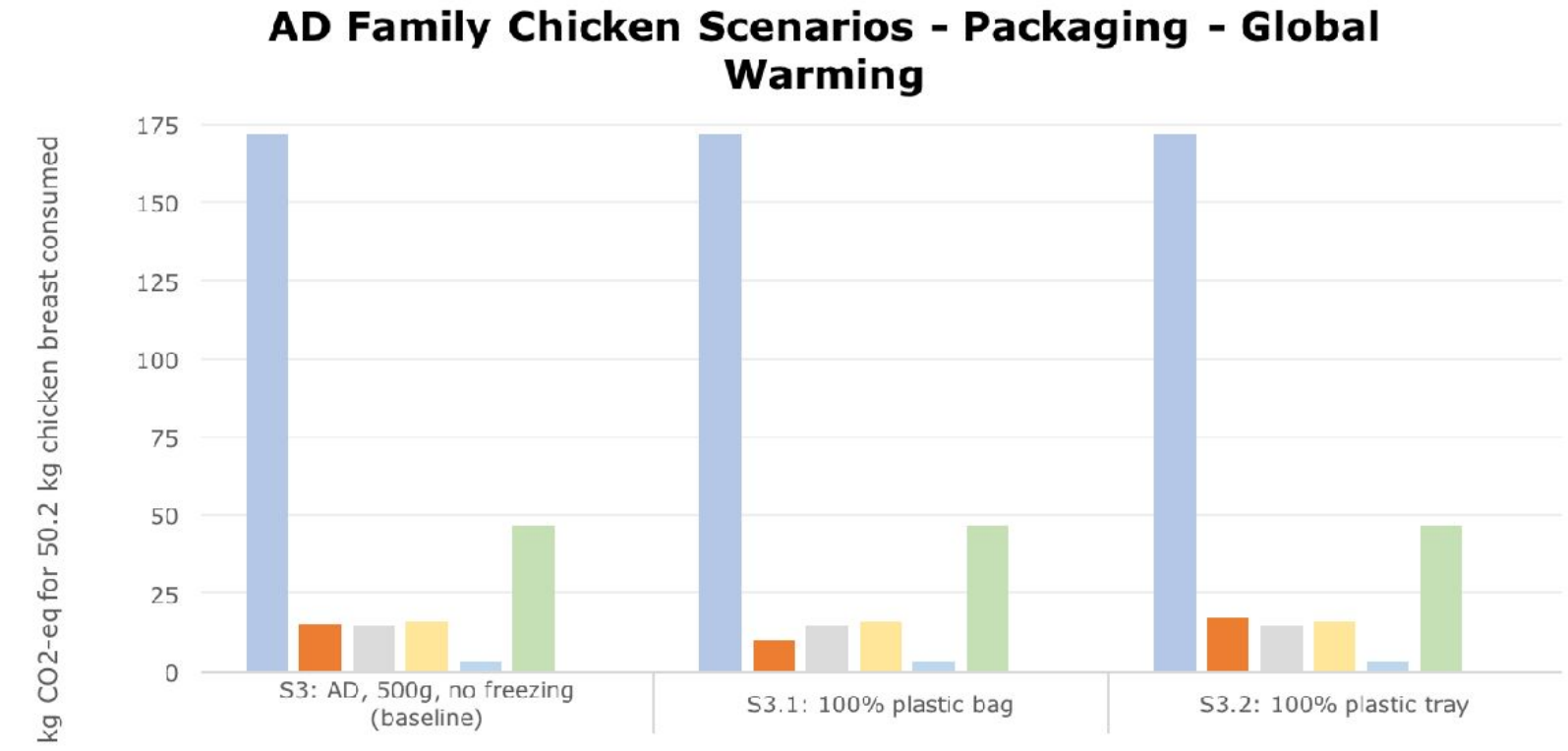


Figure 1 - Waste level outputs of hard cheese across the household archetypes and whole population as the open shelf life varies from 7 to 14 days

HHSM evidence – from Masters student project



	S3: AD, 500g, no freezing (baseline)	S3.1: 100% plastic bag	S3.2: 100% plastic tray
Product	172.0	172.0	172.0
Packaging	15.0	9.9	17.1
Food waste	14.7	14.7	14.7
Transportation	16.0	16.1	16.0
Storage	3.1	3.1	3.1
Preparation	46.7	46.7	46.7
Total	267.6	262.5	269.7

Normalised (per year) results for Global warming in the Aspirational Discoverers family chicken breast scenarios, for two packaging trade-off scenarios in the AD family buying 100% plastic bag or 100% plastic tray packaging for 500g.