

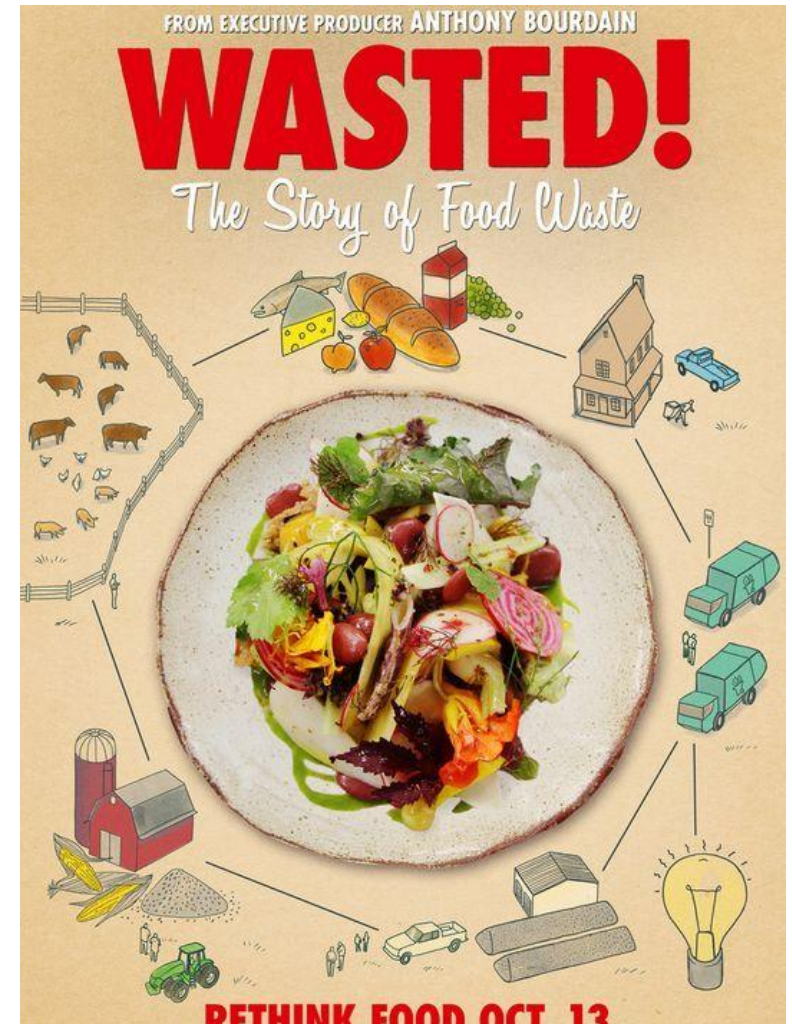


FOOD WASTE: AN INTRODUCTION & OVERVIEW

Danyi Qi & Brian Roe

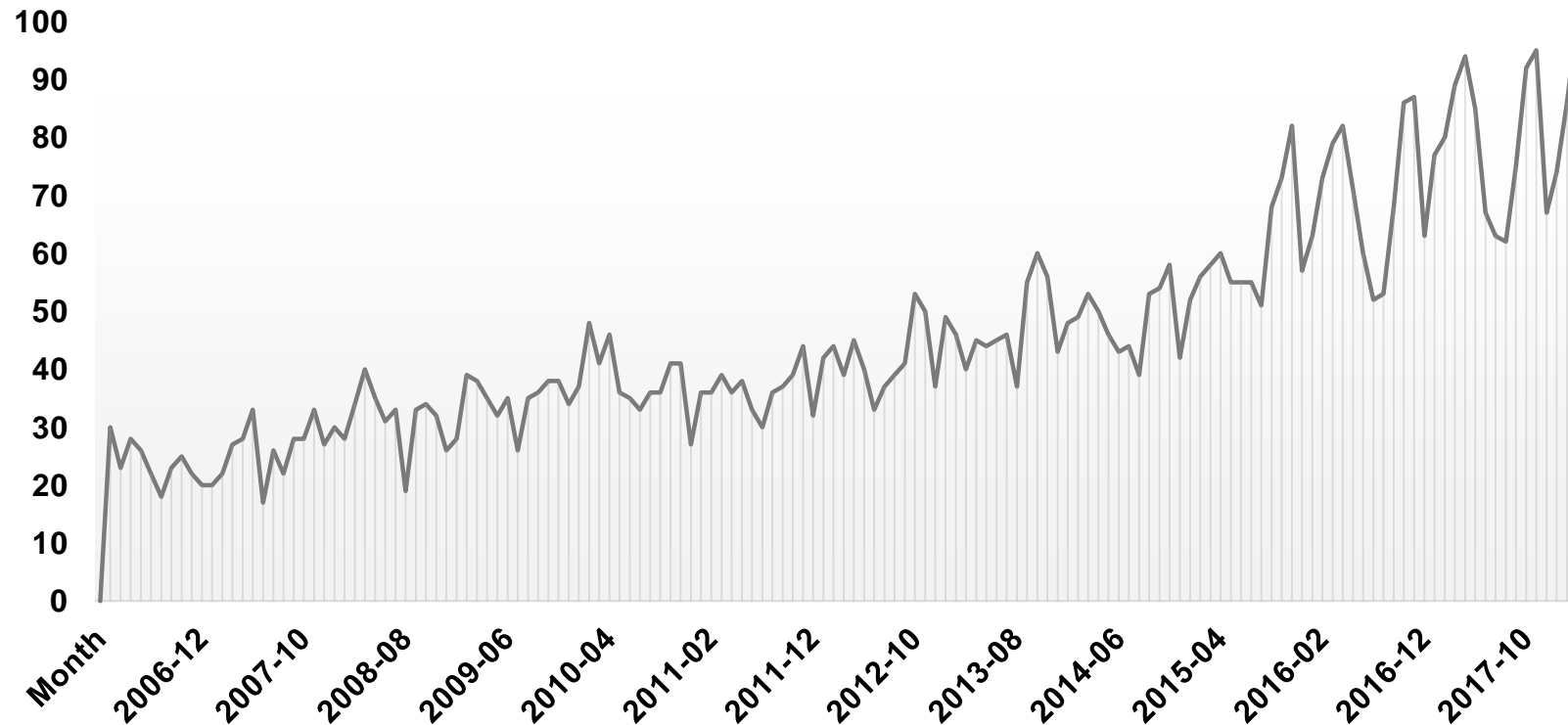
SURVEY BEFORE THE CLASS

In the past 12 months, have you ever read, seen or heard anything about the amount of food that is wasted or about ways to reduce the amount of food that is wasted?



INTERESTS IN FOOD WASTE

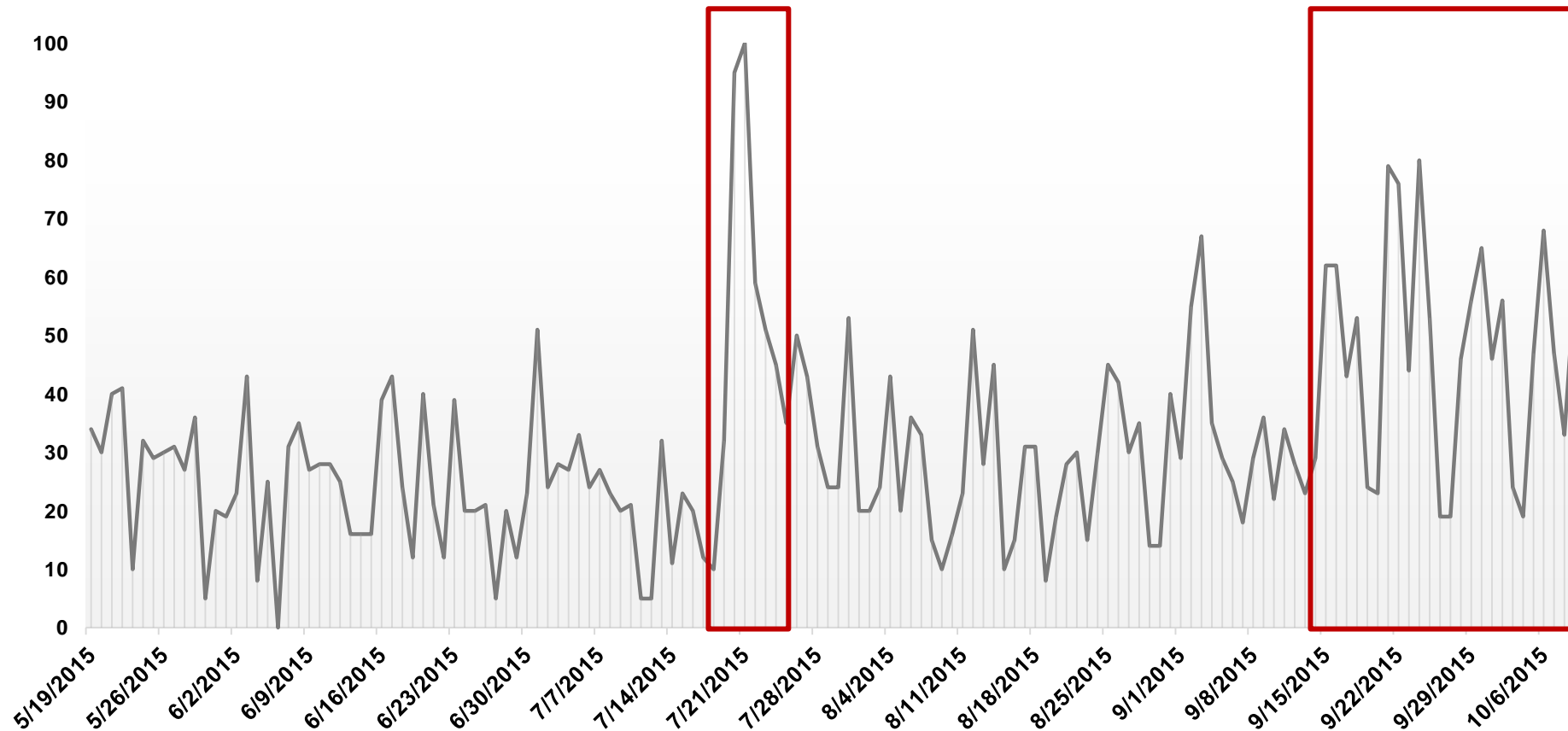
Search Interests in Food Waste (Worldwide)



Data Source: Google Trend

INTERESTS IN FOOD WASTE

Search Interests in Food Waste (United States)



Data Source: Google Trend

FOOD WASTE



► 1:38-5:55 Last Week Tonight on July 19, 2015

WHY FOCUS ON FOOD LOSS AND WASTE?

1. The amounts are staggering



WHY FOCUS ON FOOD LOSS AND WASTE?

1. The amounts are staggering

- The FAO estimates that globally, approximately one-third or 1.3 billion tons of food is wasted annually (Gustavsson et al., 2011)
- USDA estimates that in the United States, food loss and waste at the retail and consumer levels was 31% of the food supply in 2010 (Buzby & Hyman, 2012)
 - 133 billion pounds of food
 - 162 billion dollars



HOW MUCH FOOD WASTE IN THE U.S.?



- Enough to fill the *Rose Bowl* (90,000-seat) every day (vs. *Ohio Stadium*: 104,944-seat)
- 1,249 calories per person per day at the retail and consumer levels
 - Equivalent to the calories in a Big Mac, large fries and a medium Coke
- \$1,350 to \$2,275 worth per year for an average family of 4

WHY FOCUS ON FOOD LOSS AND WASTE?

1. The amounts are staggering

A great waste of the resource used to produce those food

- **Water:** 70% of global freshwater withdrawals are used for irrigation (Postel et al., 1996).
- **Land use:** 37% of the earth's land surface is occupied by agricultural lands, and 70% of the grassland, 50% of savanna, 45% of the temperate deciduous forest, and 27% of the tropical forest biome is cleared or converted by agricultural (Pretty, 2008).
- **Labor, agricultural investment,...**



WHY FOCUS ON FOOD LOSS AND WASTE?

2. People need the wasted food - now



WHY FOCUS ON FOOD LOSS AND WASTE?

2. People need the wasted food - now

- Wholesome food that is wasted could help feed people in need



Source: The American Academy of Pediatrics (AAP) and the Food Research & Action Center (FRAC)

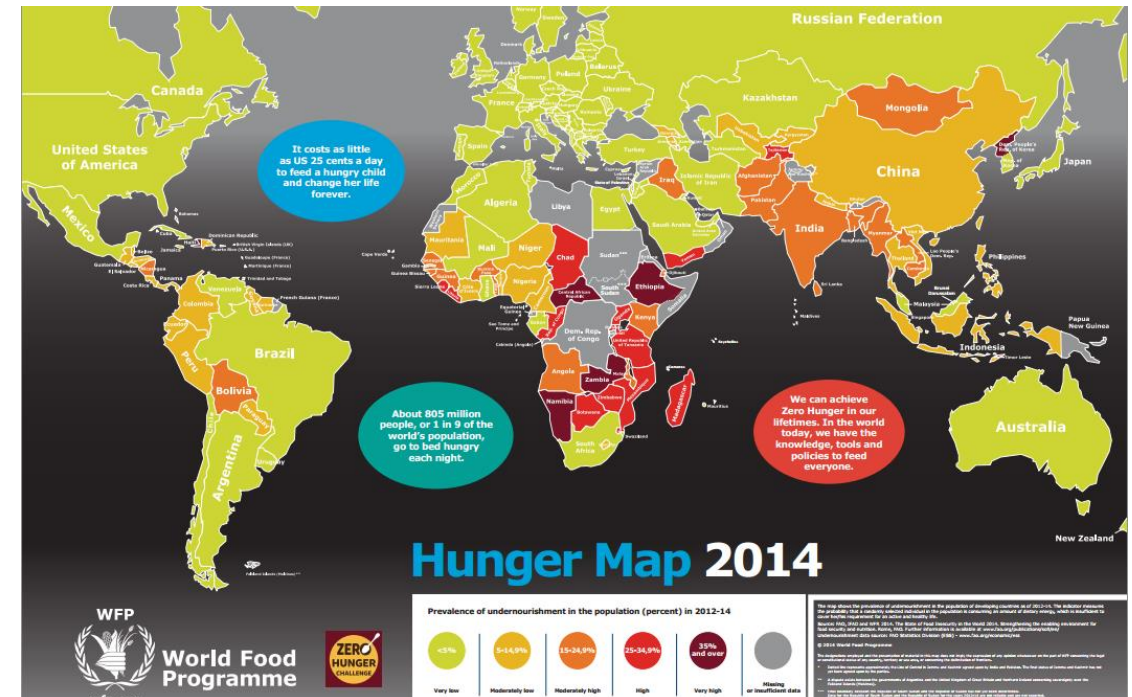
WHY FOCUS ON FOOD LOSS AND WASTE?

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Source: The American Academy of Pediatrics (AAP) and the Food Research & Action Center (FRAC)



Source: United Nation World Food Programme, Hunger Map 2014

WHY FOCUS ON FOOD LOSS AND WASTE?

2. People need the wasted food - now

- Feeding America, a hunger-relief charity, estimates that there are billions of pounds of potentially usable food loss in the U.S. food supply chain
 - 48 billion pounds pre-distribution
 - 22 billion pounds in local markets



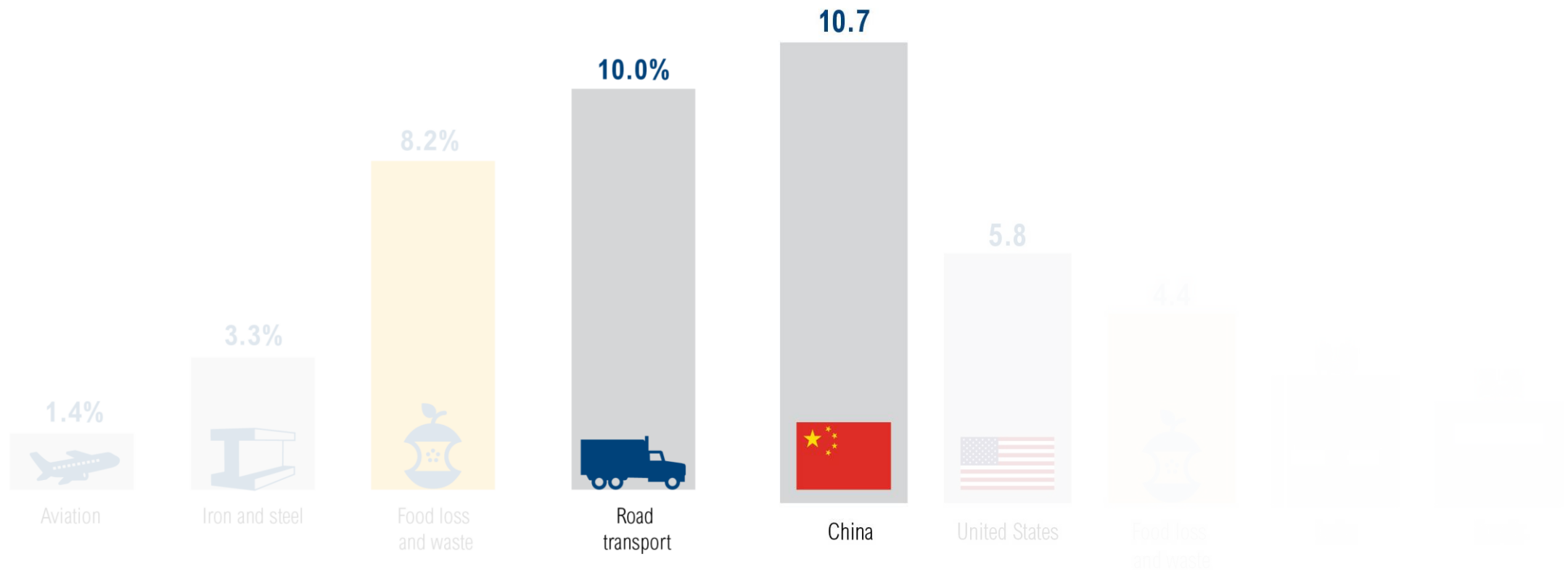
WHY FOCUS ON FOOD LOSS AND WASTE?

3. Environmental Cost



WHY FOCUS ON FOOD LOSS AND WASTE?

3. Environmental Cost

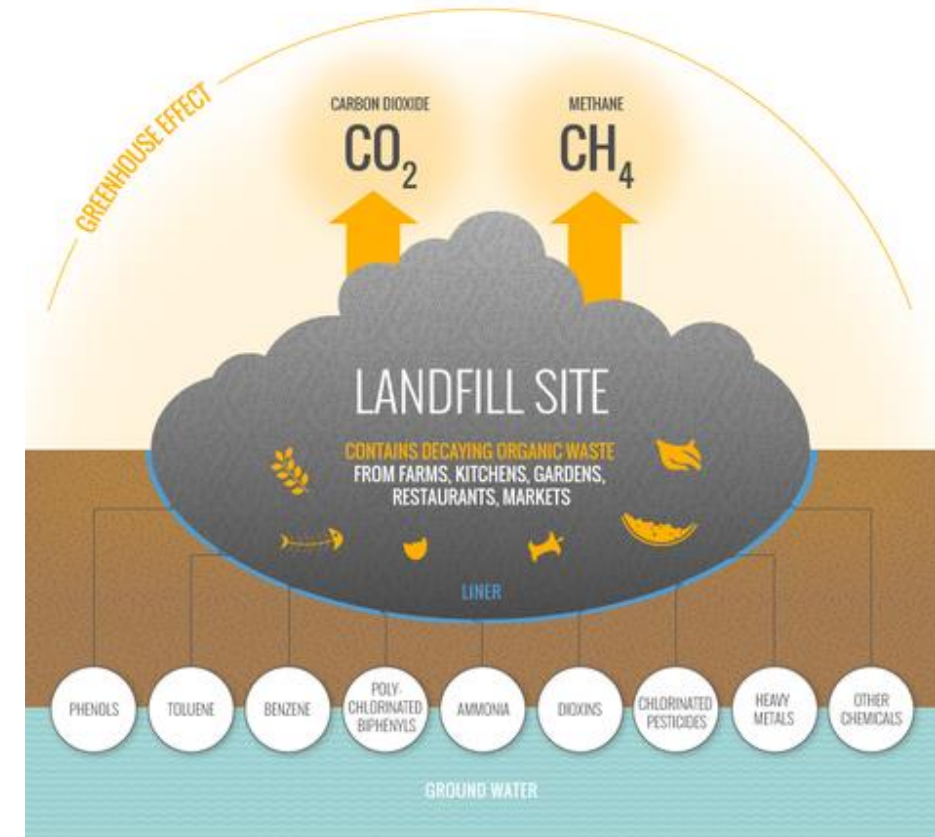


Source: World Resources Institute

WHY FOCUS ON FOOD LOSS AND WASTE?

3. Environmental Cost

- Food is the single **largest component of municipal solid waste going to landfills (~21%)** and the U.S is running out of landfill space
- Landfills generate **20% of the nation's emission of greenhouse gas**
- Bacteria breaks down food waste into more harmful components **that pollute water and soil**



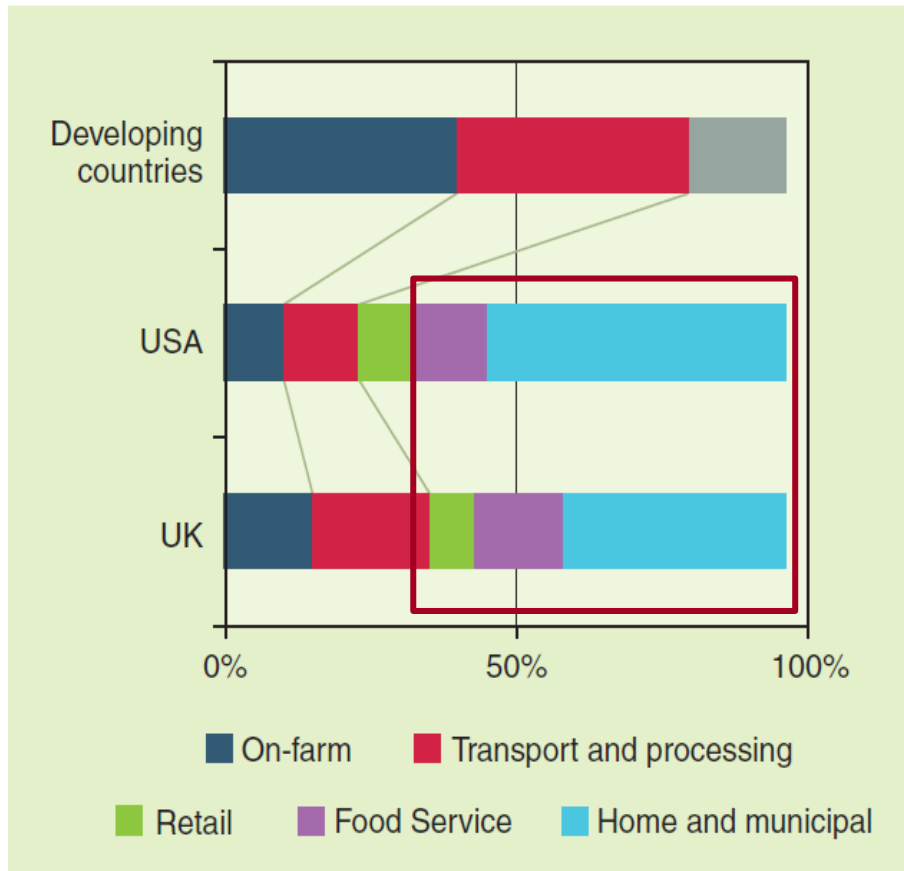
Source: <http://gazasia.com/biogas-source/landfill-sites-2/>

GOAL: CUT FOOD LOSS AND WASTE IN HALF

- U.N. Sustainable Development Goal #12 (Lipinski, O'Connor, and Hanson 2016)
- In September 2015, USDA joined with EPA to announce the United States' first-ever national food waste reduction goal, calling for a 50-percent reduction by 2030



GOAL: CUT FOOD LOSS AND WASTE IN HALF



Source: Godfray et al (2010)

- USDA estimates that in the United States, 21 percent of the food supply is wasted at the consumer level – this represents nearly 2/3 of all wasted food

Consumers and communities are key

DEVELOPED COUNTRIES – CAUSES OF FOOD WASTE

Cost of food waste

- **Consumer:** The replacement cost of uneaten food; Environment cost; Social cost

Benefits of food waste

- **Consumer:** The expected avoided damages, including avoided pain, suffering, time loss and all other health and financial costs from eating aging food; reduced time cost; reduced cost of having insufficient food.



MARGINAL BENEFITS AND COSTS OF FOOD WASTE

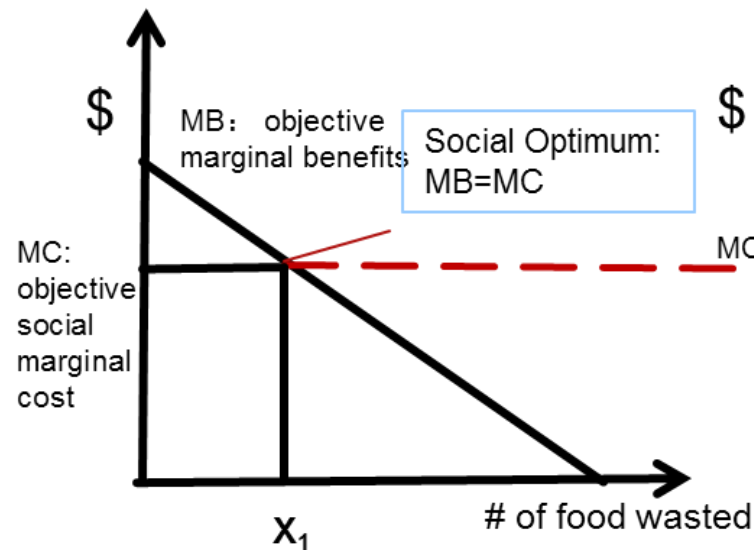


Figure 1.1 Food waste under objective social marginal costs and marginal benefits

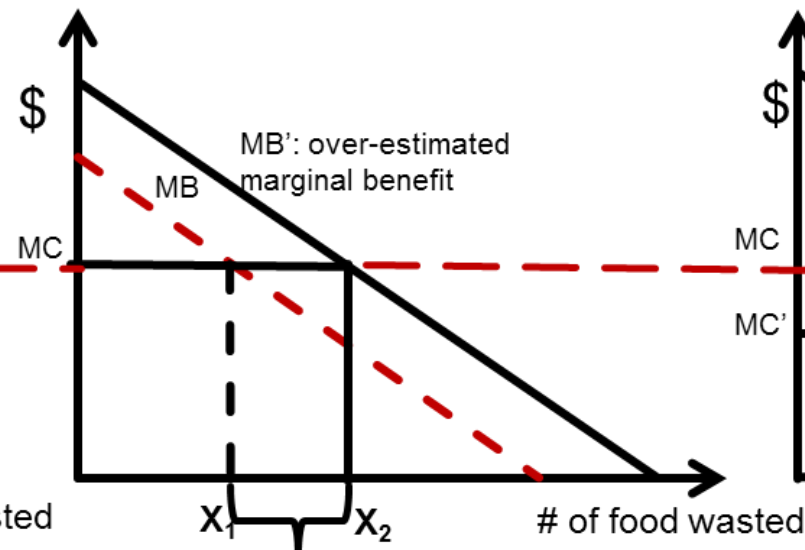


Figure 1.2 Food waste when marginal benefits of waste are over-estimated

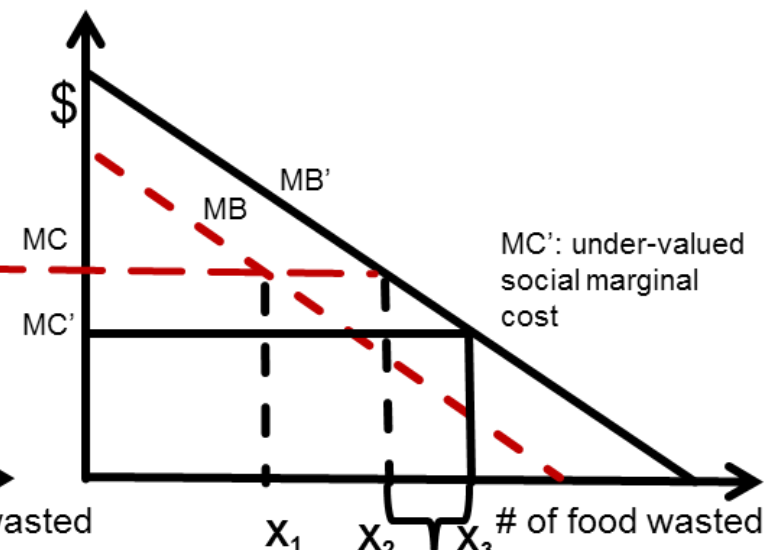
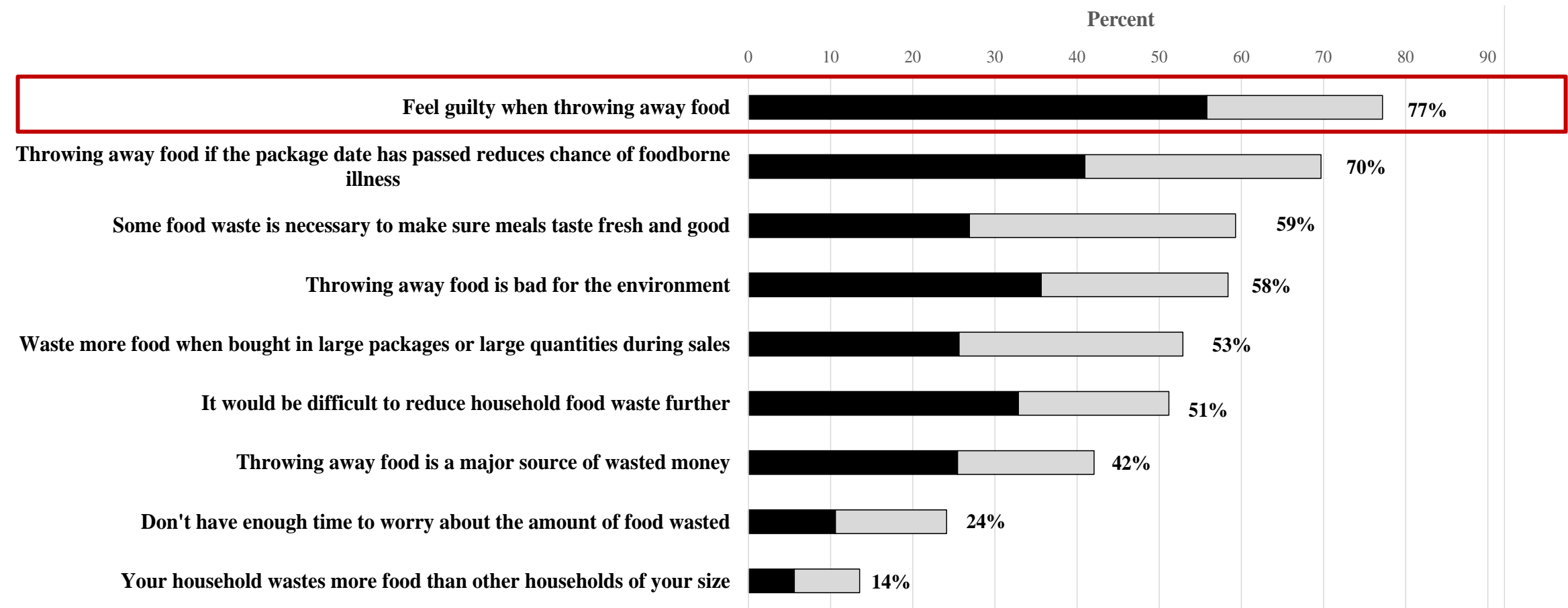


Figure 1.3 Food waste when marginal benefits are over-estimated and social costs don't internalize the externalities by food waste

HOUSEHOLD FOOD WASTE : AWARENESS AND ATTITUDES AMONG U.S. CONSUMERS



Source: Qi and Roe (2016)

INTRODUCTION TO FOOD WASTE

HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION



HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION

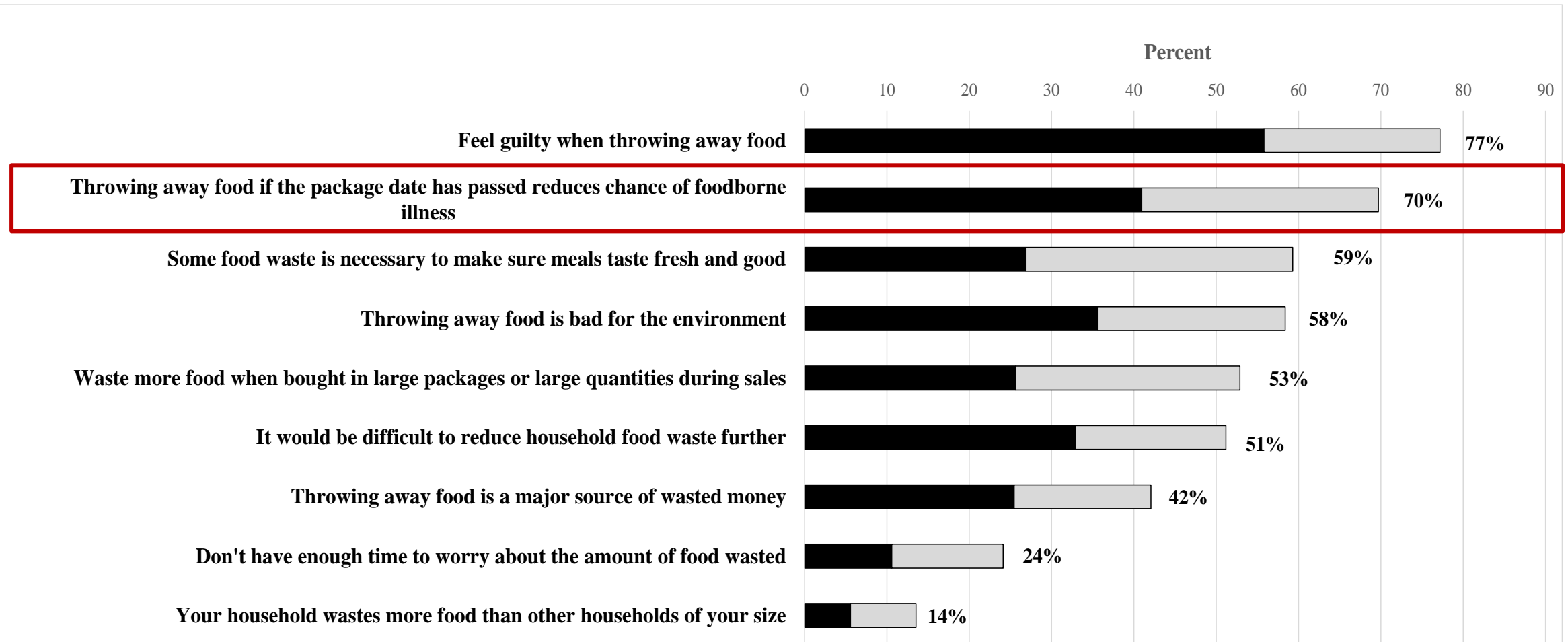
Do you agree with the following statement?

Throwing away food if the package date has passed reduces the chance someone will get sick from eating the food

1. Agree
2. Disagree
3. Not sure



HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION



Source: Qi and Roe (2016)

■ Agree Strongly □ Agree Somewhat

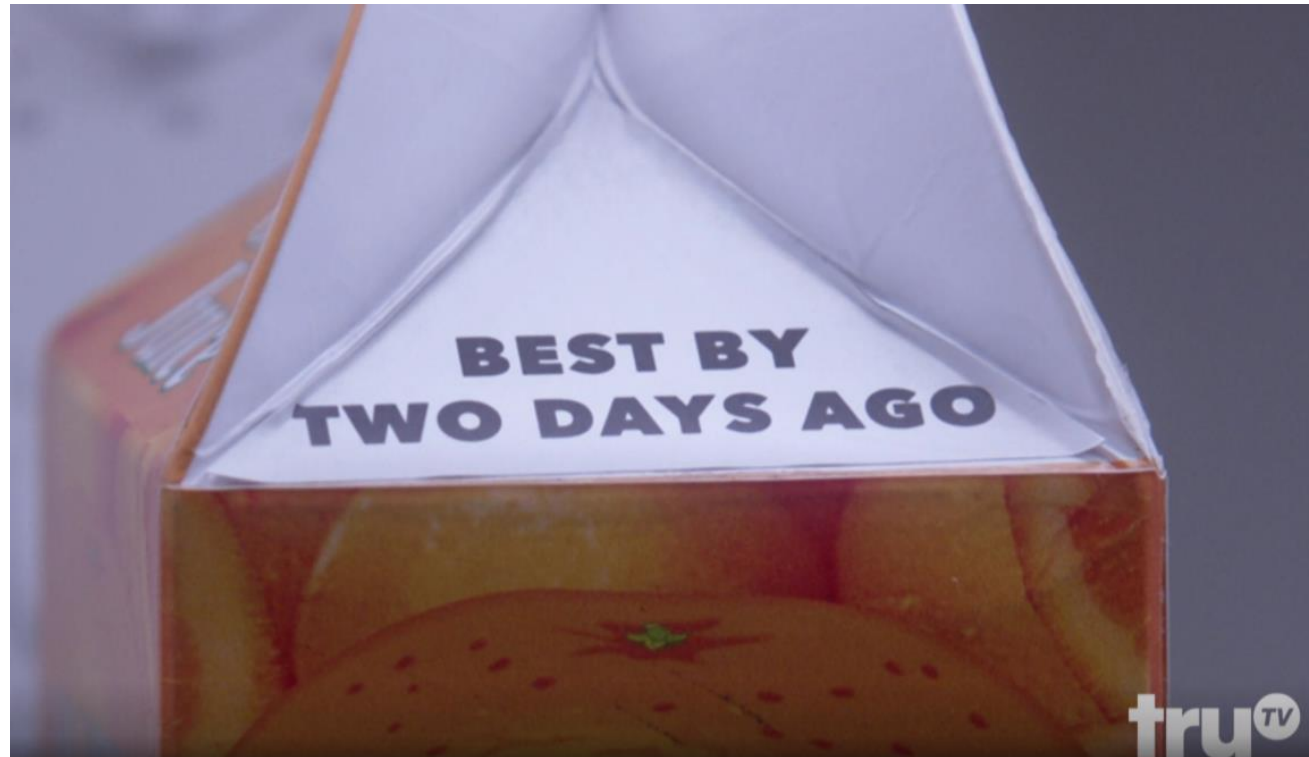
HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION

Consumer Perceptions of Date Labels: National Survey

Authors:
Emily Broad Leib, Christina
Rice, Roni Neff, Marie Spiker,
Ali Schklair, Sally Greenberg



HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION



► 0:00-3:11 ADAM RUINS EVERYTHING:WHAT THE DATE LABELS ON FOOD ACTUALLY MEAN

HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION

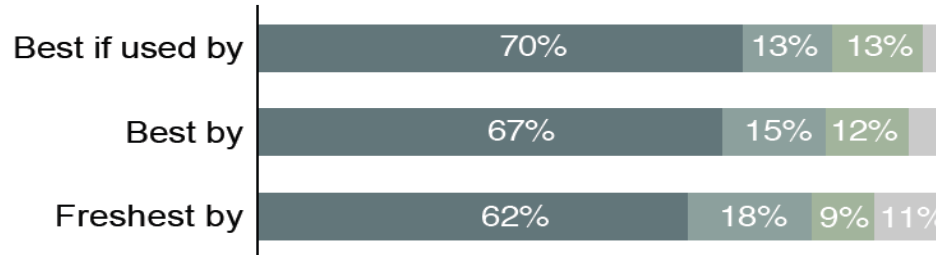
Consumer Perceptions of Date Labels: National Survey

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Consumer confusion over date labels

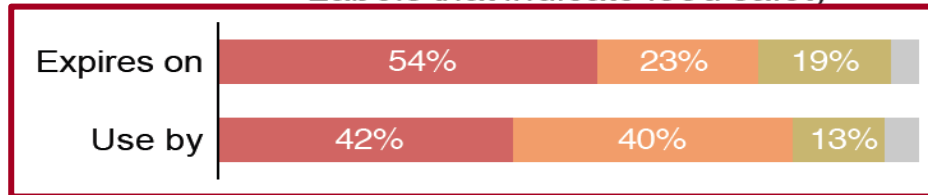
Labels that indicate food quality



Consumer perceptions:

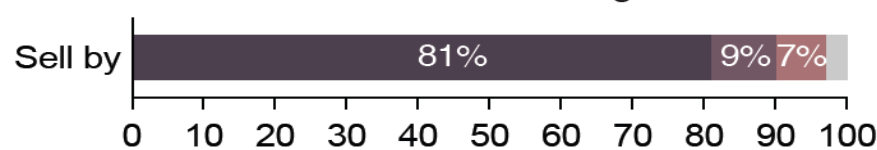
- quality
- message to stores
- safety
- unsure

Labels that indicate food safety



- safety
- quality
- message to stores
- unsure

Labels that send a message to stores



- message to stores
- quality
- safety
- unsure

Food
quality
indicator

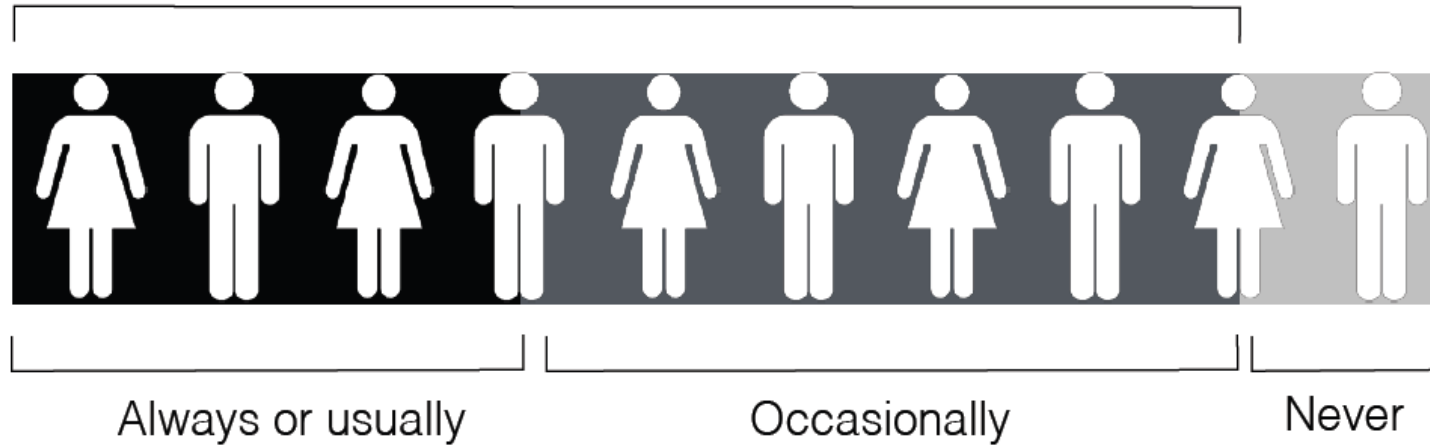
Percentage of consumers

*..., but in fact for most foods the date is a manufacturer's **BEST GUESS** as to how long the product will be at its **PEAK QUALITY**.*



HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION

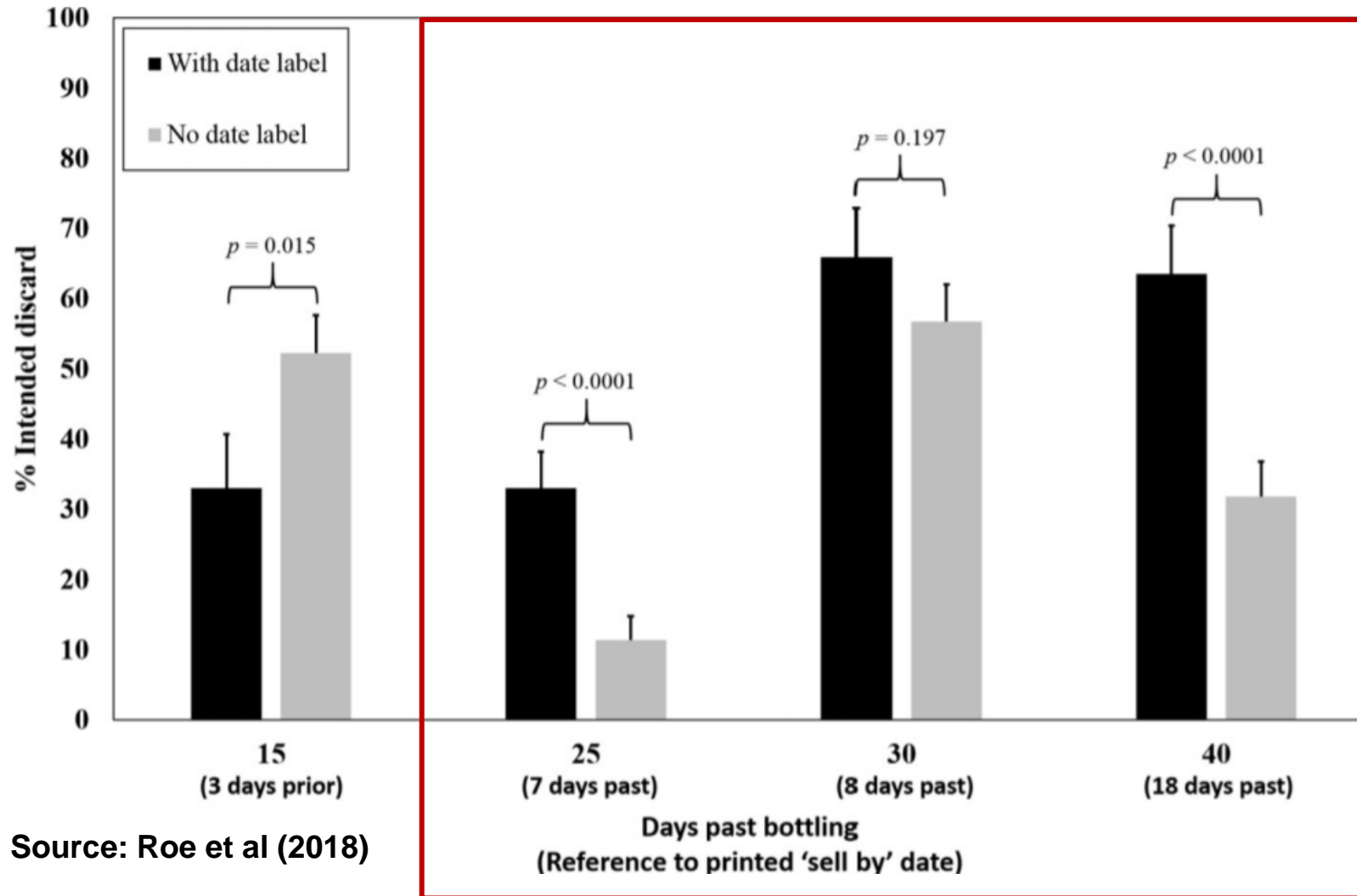
84% of consumers at least occasionally discard food close to or past the date on its package



*A U.K. study found that **20%** of consumer waste occurs because of date label confusion*



HOW DATE LABELS INFLUENCE DISCARDING BEHAVIOR

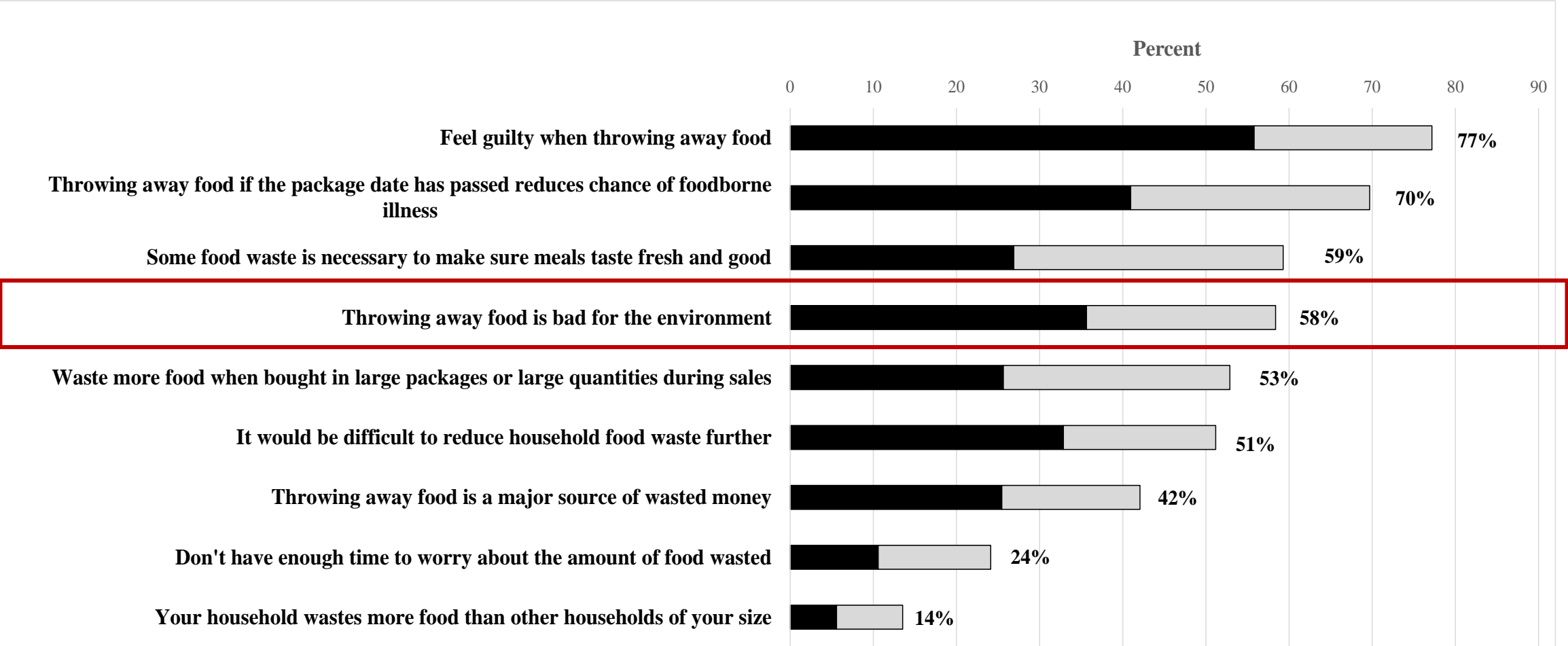


INTRODUCTION TO FOOD WASTE

HOUSEHOLD FOOD WASTE: ENVIRONMENT COST



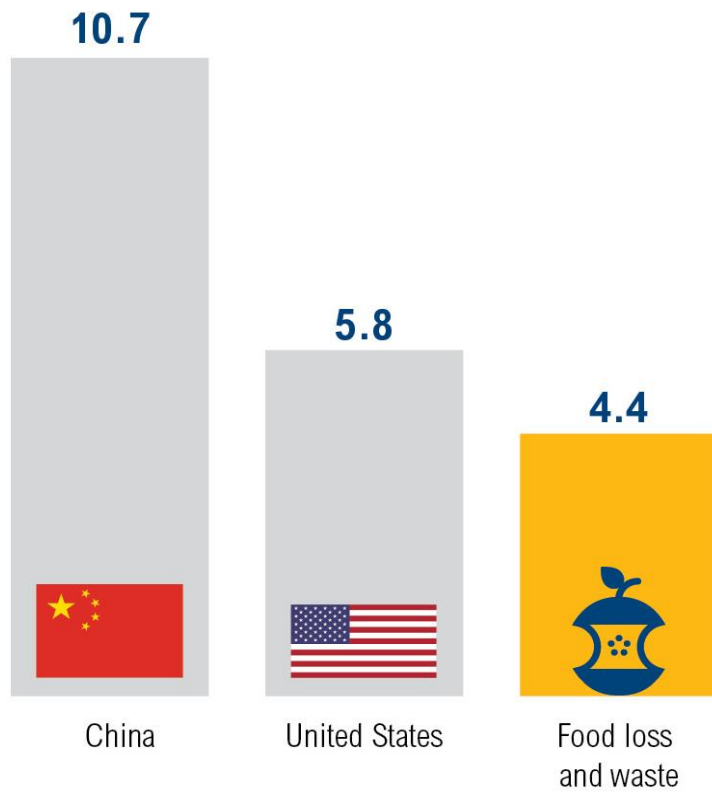
HOUSEHOLD FOOD WASTE: ENVIRONMENT COST



Source: Qi and Roe (2016)

■ Agree Strongly □ Agree Somewhat

FOOD WASTE VS ENVIRONMENT



Source: World Resource Institute



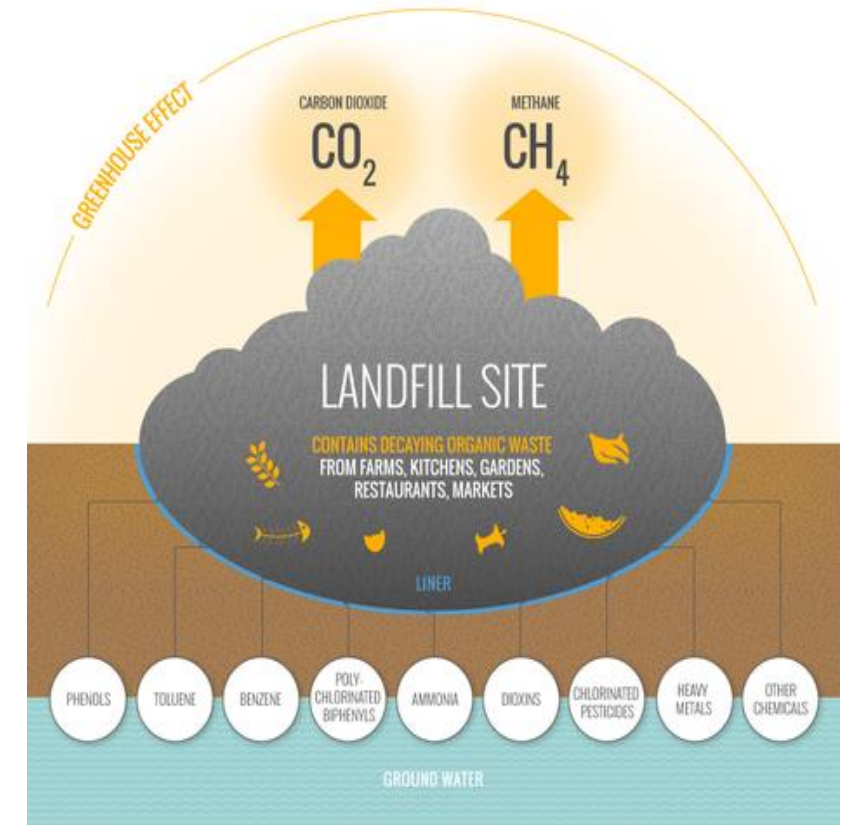
Food Waste in Landfill



Food waste is the **No.1** material sent to landfills and the **U.S is running out of landfill space**

- Landfills generate **20%** of the nation's emissions of **Greenhouse Gas**
- Bacteria breaks down food waste into more **harmful components that pollute water and soil**

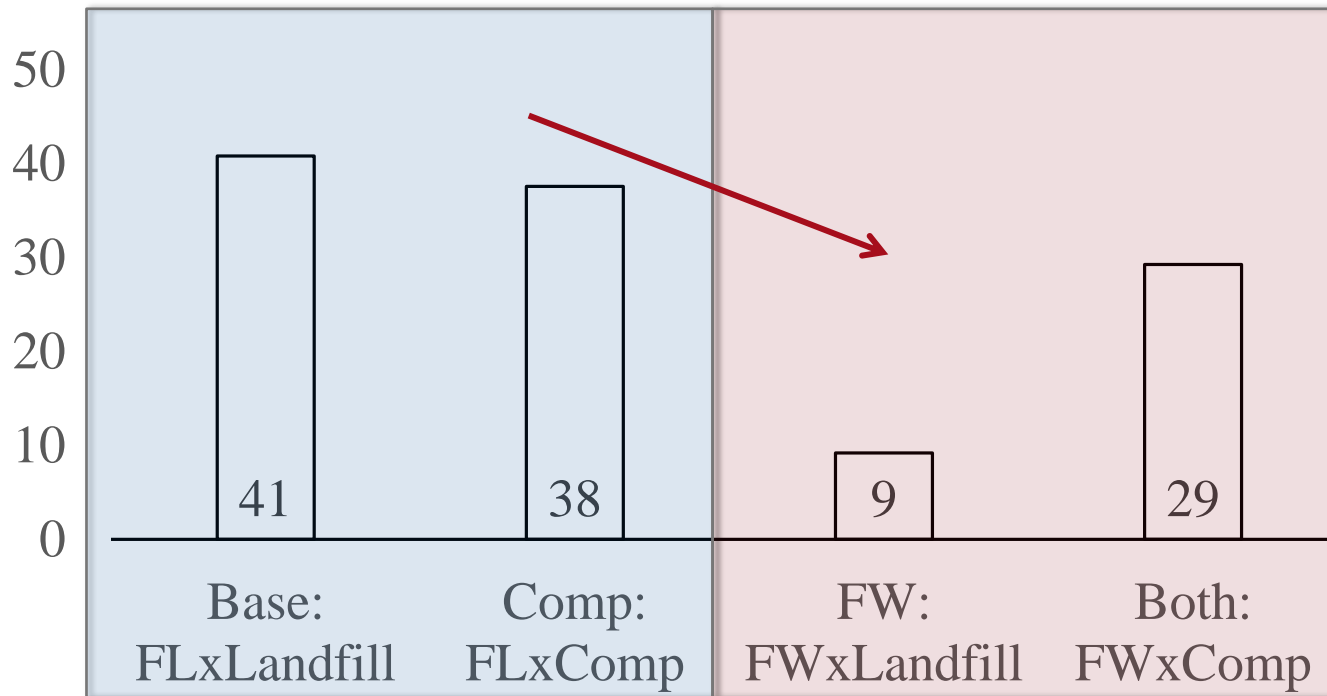
Source: Qi and Roe (2017)



Source: <http://gazasia.com/biogas-source/landfill-sites-2/>

HOW FW MESSAGES INFLUENCE PLATE WASTE BEHAVIOR

Average Grams of Solid Waste Discarded

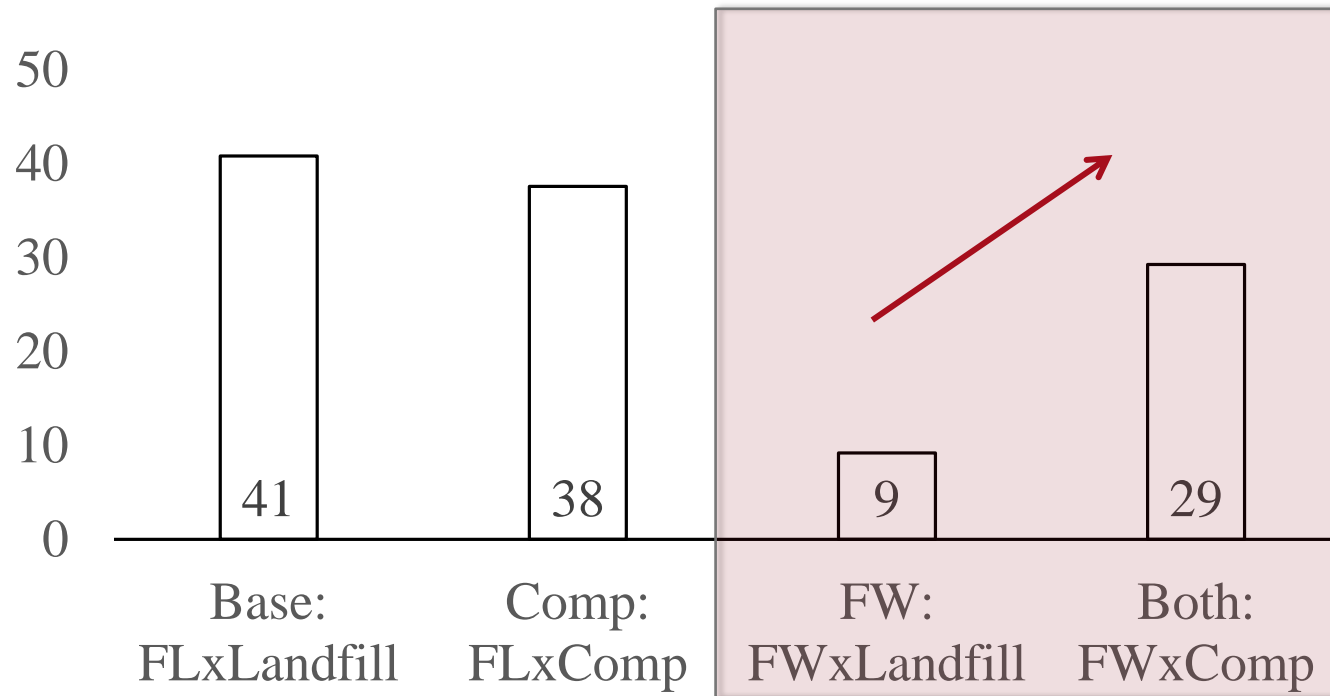


Source: Qi and Roe (2017)



HOW FW MESSAGES INFLUENCE PLATE WASTE BEHAVIOR

Average Grams of Solid Waste Discarded

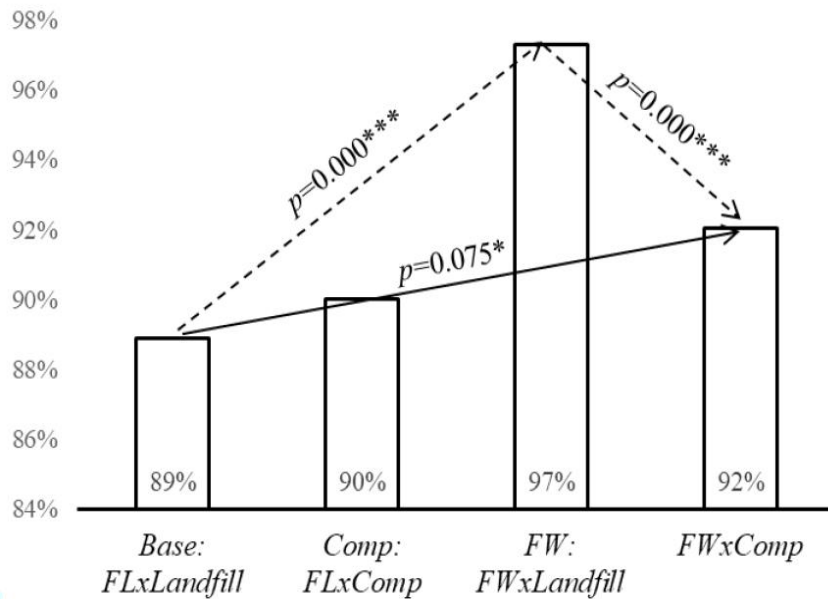


Source: Qi and Roe (2017)

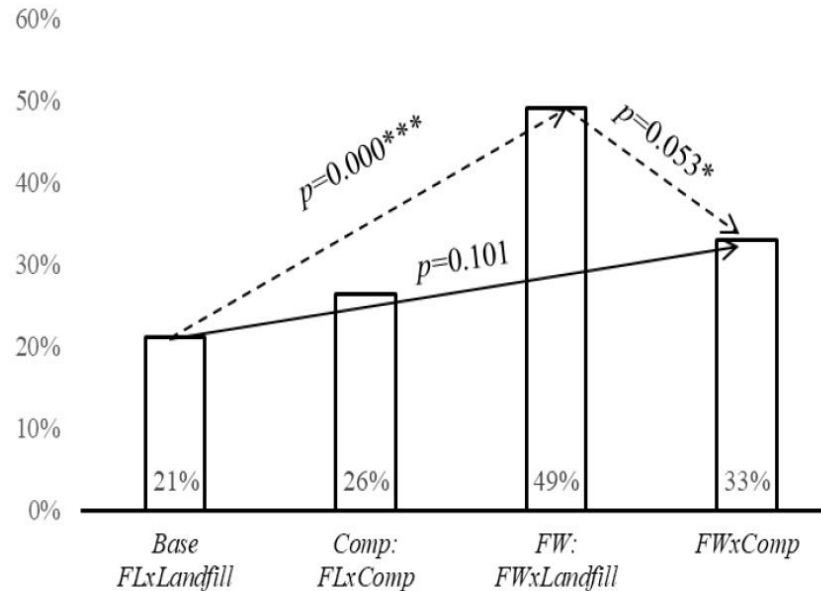


HOW FW MESSAGES INFLUENCE PLATE WASTE BEHAVIOR

Average Percentage of Selected Food Being Consumed



Average Percentage of Subjects Cleaning Plates



Source: Qi and Roe (2017)

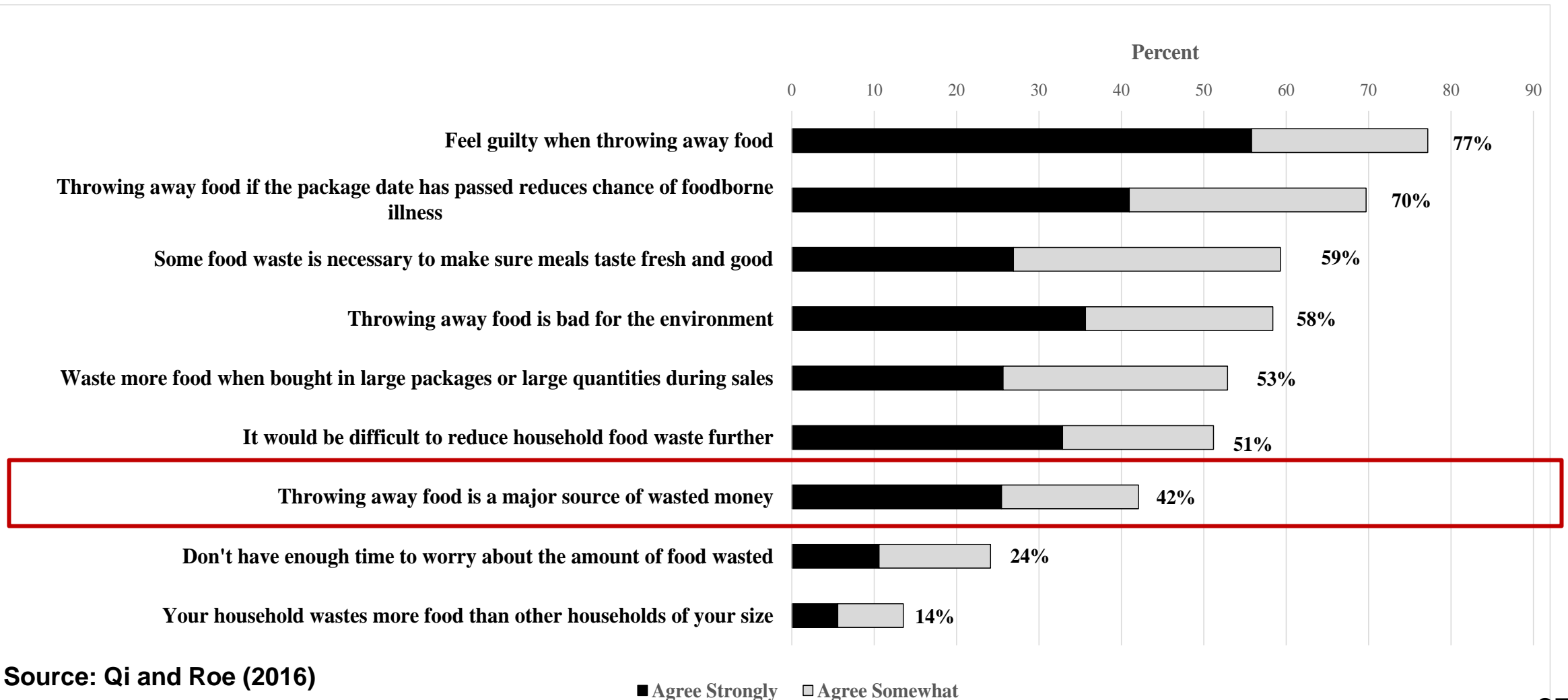


INTRODUCTION TO FOOD WASTE

HOUSEHOLD FOOD WASTE: ECONOMIC COST



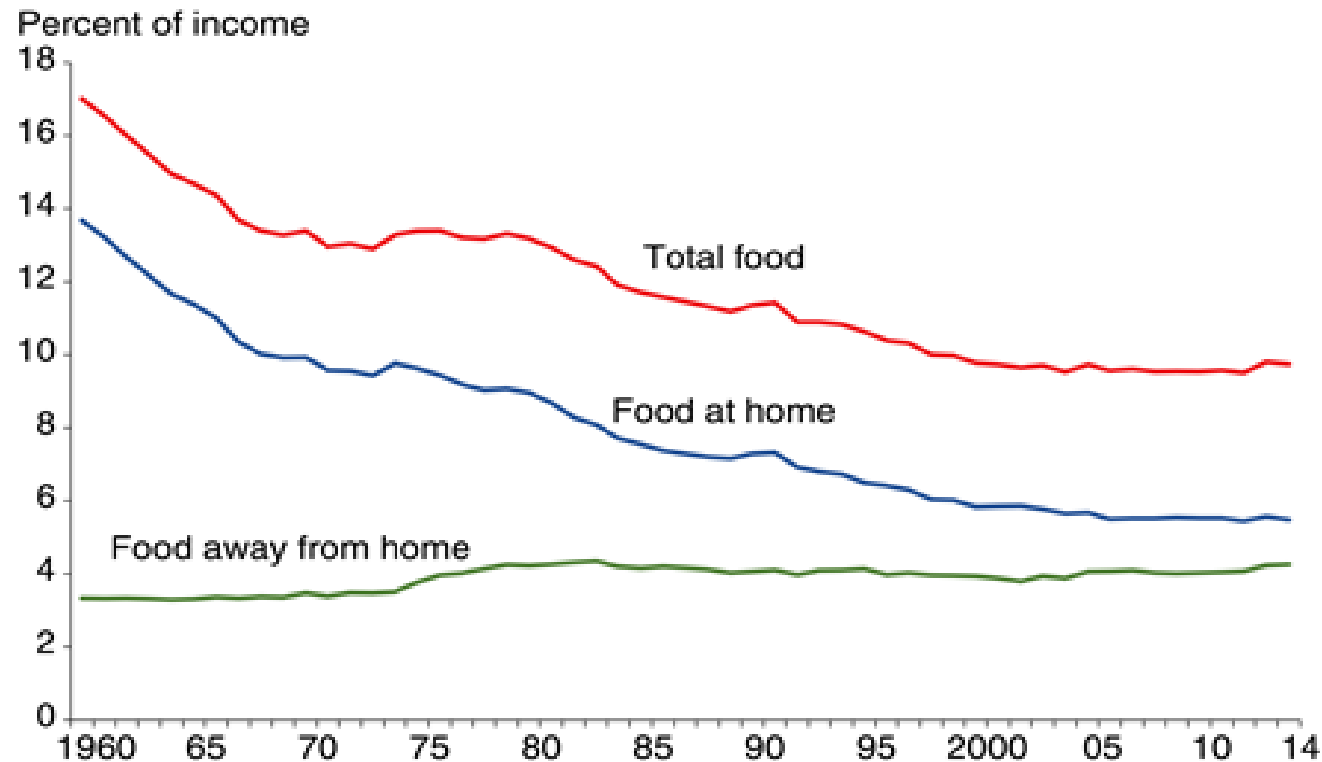
HOUSEHOLD FOOD WASTE : ECONOMIC COST



Source: Qi and Roe (2016)

HOUSEHOLD FOOD WASTE : ECONOMIC COST

Percent of per capita disposable income spent on food in the
United States, 1960-2014



Source: USDA, Economic Research Service, Food Expenditure Series.

FOOD WASTE TAXES AND FEES



South Korea cuts food waste with 'pay as you trash'

South Korean housewife Cho Sung Ja using an RFID food waste disposal system that is able to weigh how much trash each household generates and bill it accordingly. She lives in a three-bedroom apartment with her husband and son in Mapo, a mid-sized district in Seoul.

Source: The Straits Times

FOOD WASTE TAXES AND FEES

FOOD FOR THOUGHT

Tossing Out Food In The Trash? In Seattle, You'll Be Fined For That

January 26, 2015 · 2:54 PM ET

AMY RADIL

FROM KUOW



Source: NPR

CNN politics

45

CONGRESS

SECURITY

THE NINE

TRUMP/ERICA

2018



In Seattle, compost your food scraps -- or else

Sean Kennedy, CNN

Updated 10:20 AM ET, Fri October 3, 2014



FOOD WASTE TAXES AND FEES

FOOD FOR THOUGHT

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January 26, 2015 · 2:54 PM ET

AMY RADIL

FROM KUOW



SOCIAL-OPTIMAL HOUSEHOLD FOOD WASTE: TAXES AND GOVERNMENT INCENTIVES

**BHAGYASHREE KATARE, DMYTRO SEREBRENNIKOV, H. HOLLY WANG, AND
MICHAEL WETZSTEIN**

Source: Katare et al (2017)

FOOD WASTE TAXES AND FEES

FOOD FOR THOUGHT

Tossing Out Food In The Trash? In Seattle, You'll Be Fined For That

January 26, 2015 · 2:54 PM ET

AMY RADIL



Source: NPR

Local News | Local Politics

Judge: Seattle trash-check ordinance 'unconstitutional'

Originally published April 27, 2016 at 4:48 pm | Updated April 28, 2016 at 12:34 pm



Rodney Watkins, a lead driver for Recology CleanScapes, pulls out food waste that should have been thrown into the food/yard-waste bin instead of the garbage bin in December 2014. A judge on Wednesday ruled that trash collectors in Seattle can't examine garbage for food scraps. (Steve Ringman/The Seattle Times)

Source: The Seattle Times

GROUP DISCUSSION: FOOD WASTE TAXES AND FEES

Discussion: Should we have food waste tax/fee to achieve food waste reduction?



Source: The Straits Times

Judge: Seattle trash-check ordinance 'unconstitutional'

Originally published April 27, 2016 at 4:48 pm | Updated April 28, 2016 at 12:34 pm



Source: The Seattle Times

INTRODUCTION TO FOOD WASTE

HOUSEHOLD FOOD WASTE: MEASUREMENT OF FOOD WASTE



HOUSEHOLD FOOD WASTE : MEASUREMENT OF FOOD WASTE

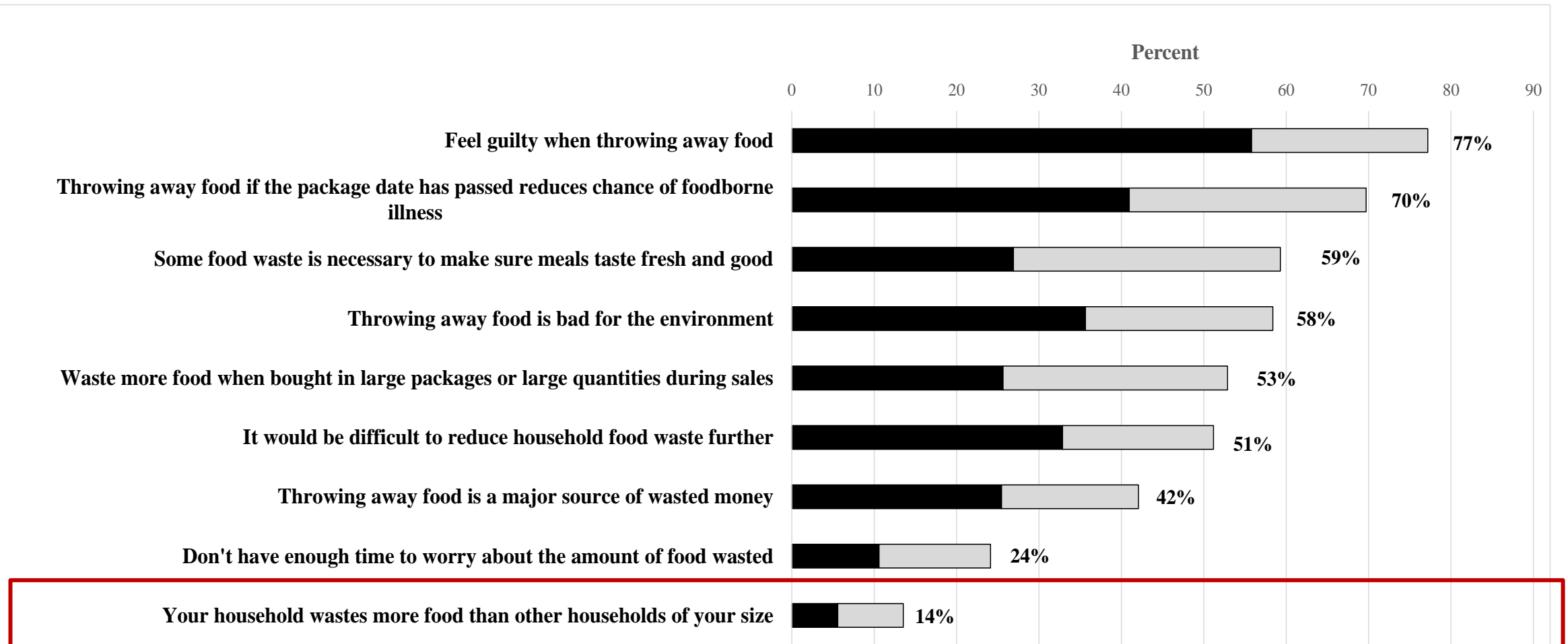
Do you agree with the following statement?

Your household wastes more food than other households of your size

1. Agree
2. Disagree



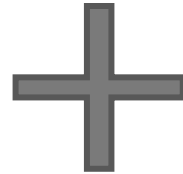
HOUSEHOLD FOOD WASTE : MEASUREMENT OF FOOD WASTE



Source: Qi and Roe (2016)

HOUSEHOLD FOOD WASTE : MEASUREMENT OF FOOD WASTE

➤ Household Food Waste diaries



Volume (litre, pint, oz)



Weight (g, oz)

HOUSEHOLD FOOD WASTE : MEASUREMENT OF FOOD WASTE

Example of completed entries

If no food or drink waste, please say why: All food consumed ☒ Meal not eaten at home ☒ Other (write in)

What? Please give a full description of the food or drink waste including brand. (If you run out of space you can use the overflow pages at the back of the diary)	Type? How was it originally purchased?						Pack Size? What was the original pack size when purchased?	State? Was it cooked, prepared or served before being thrown away?		How Much Was Wasted? What was the weight, volume, number or amount?	Where? Please tick where it was thrown away					Why? Please give the reason for disposal Some possible answers may be: Bought too much, pack too big, went off it, passed use-by date, cooked/served too much, didn't taste nice, didn't fancy it, other (write in)
	Frozen	Tinned	Chilled/fresh	Takeaway	Homemade and for grown	Other		Original state	Cooked/prepared/served		General waste bin	Council food waste bin	Sink	Home compost	Fed to animal	
Tesco finest pork sausages	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Pack of 10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2 sausages	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	These were too burnt to eat
Birds Eye quarter pounder beef burgers with onion	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4 pack at 450g	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	One burger	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Not cooked on BBQ; didn't want to risk refreezing it
Mash made from 5 large Tesco desiree potatoes and Cravendale whole milk and Anchor butter	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1kg potatoes, 1 litre milk, 200g butter block	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	About 2 tablespoons	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	I put my food down to answer the phone and the dog ate it
McDonalds chicken nuggets	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Box of 6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3 nuggets	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Husband bought these on way home for the kids and they didn't get eaten
ASDA chosen by you microwave vegetable curry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	500g	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3 tablespoons	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Did not want as much as was in the portion size
Cauliflower cheese made with fresh cauliflower, Tesco semi-skimmed milk, Cathedral City cheddar cheese	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1x lg cauli, 500g cheese, 4 pints milk	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Half of a 24cm casserole dish	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Didn't all get eaten - don't fancy saving it for another meal as it didn't taste that great
Coca cola and Smirnoff vodka made up as a glass	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2ltr bottle Coke, 1 ltr bottle vodka	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100ml	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Went flat before it was finished
Potato peelings (for the mash above)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	As above	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	From 5 potatoes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Potatoes were too old to cook with skins on

Need help? Call our diary support team on 0800 077 8427

Evening Meal



Volume (litre, pint, oz)



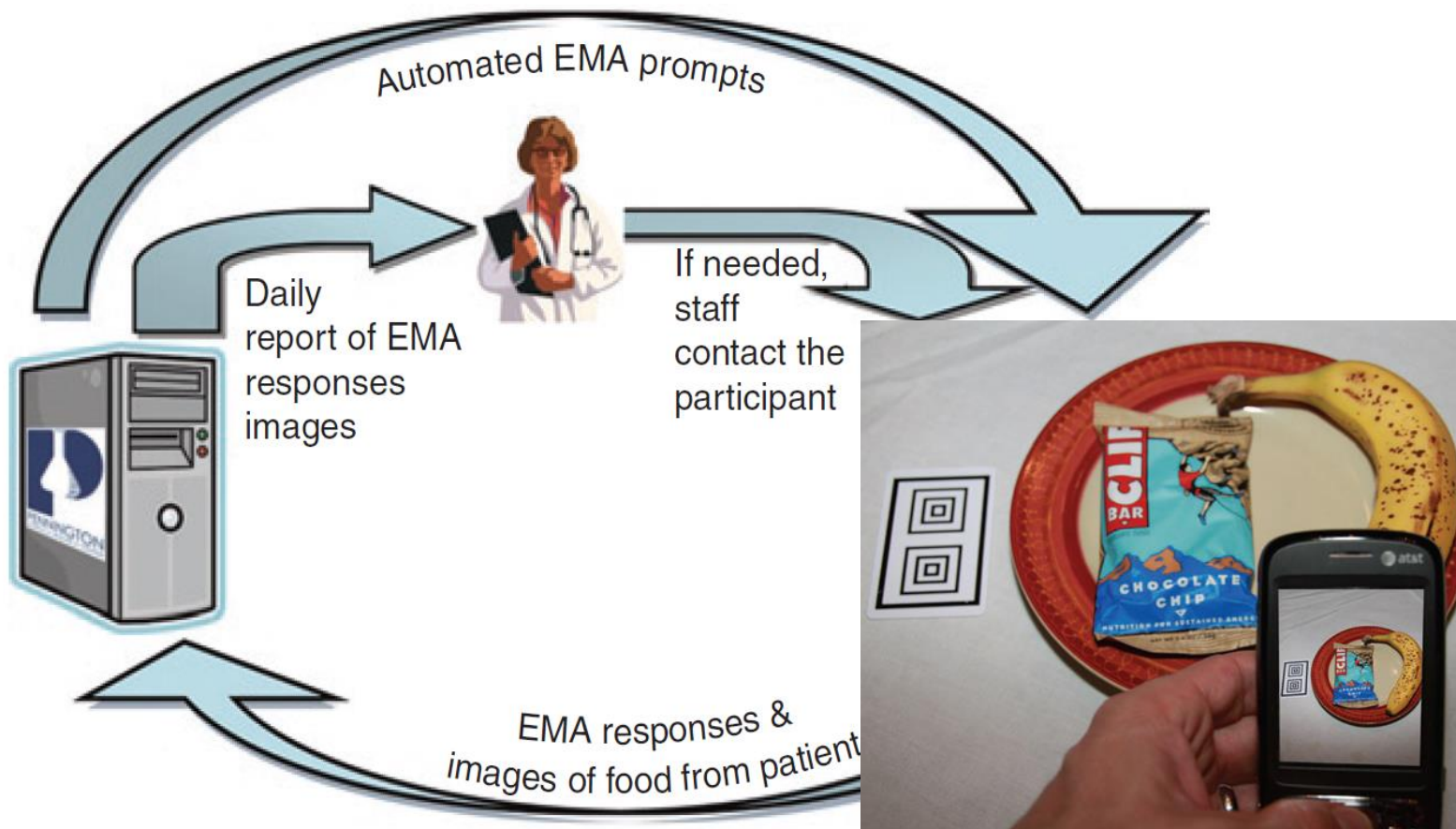
Weight (g, oz)

HOUSEHOLD FOOD WASTE : MEASUREMENT OF FOOD WASTE

- Household Food Waste diaries
- Household Waste Stream Composition Analysis



FOODIMAGE APP



< Eat

Eat - After Photo

User-dq

Dinner



Take After Photo
(1 photos)



Served Too Much

Tossing details?



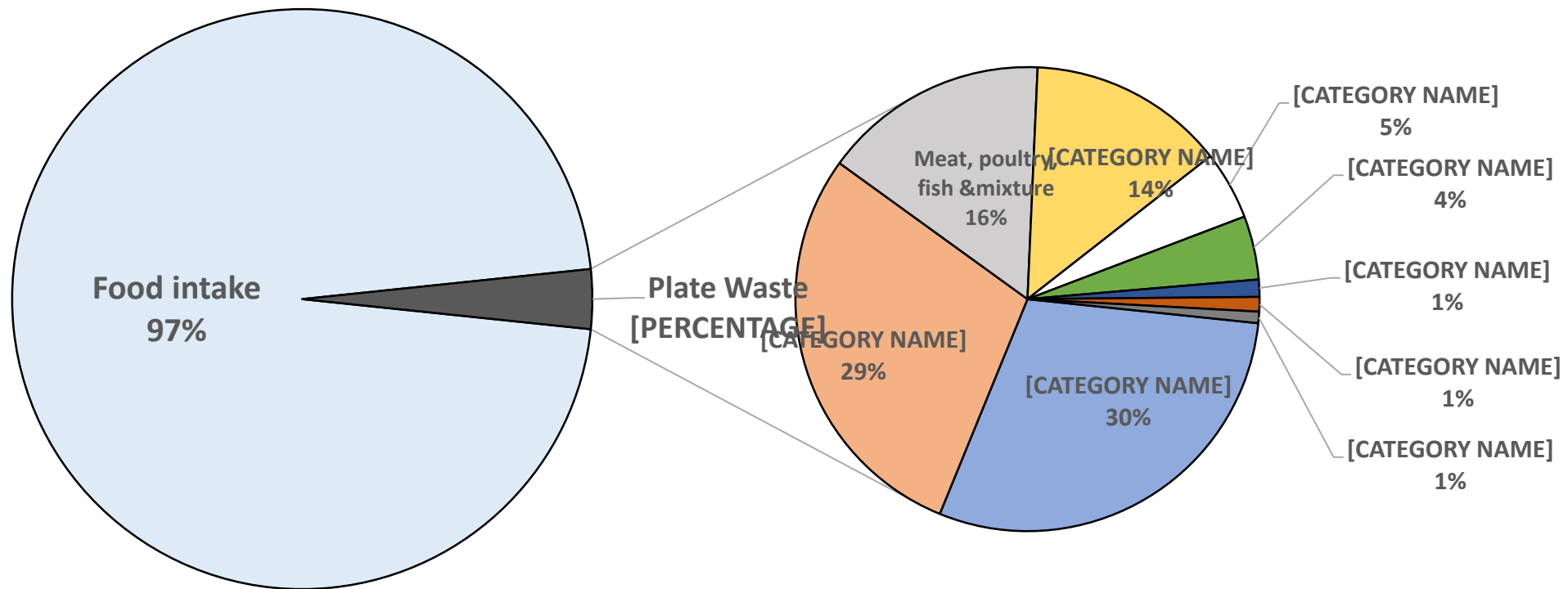
Add Receipt Photo



View Receipt Text

FOODIMAGE APP

Plate Waste Composition (average per item)

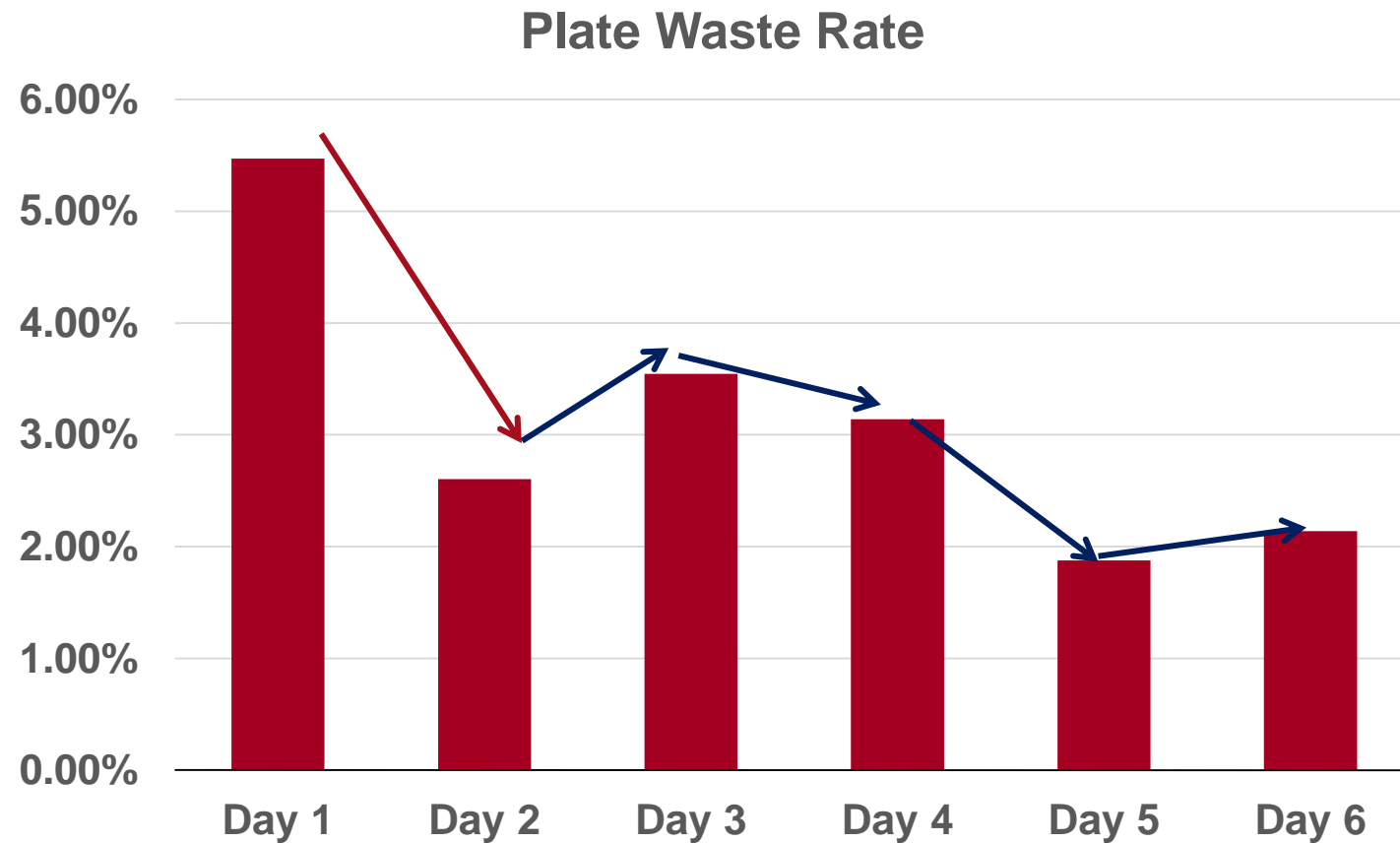


**Food Selected (average
per item): 169.96g**

**Plate Waste (average
per item): 5.63g**

Source: Roe et al (2018)

FOODIMAGE APP – LEARNING AT HOME



Source: Qi et al (2018)



FOOD RECOVERY HIERARCHY



Environmental Topics

Laws & Regulations

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Related Topics: [Reduce, Reuse, Recycle](#)

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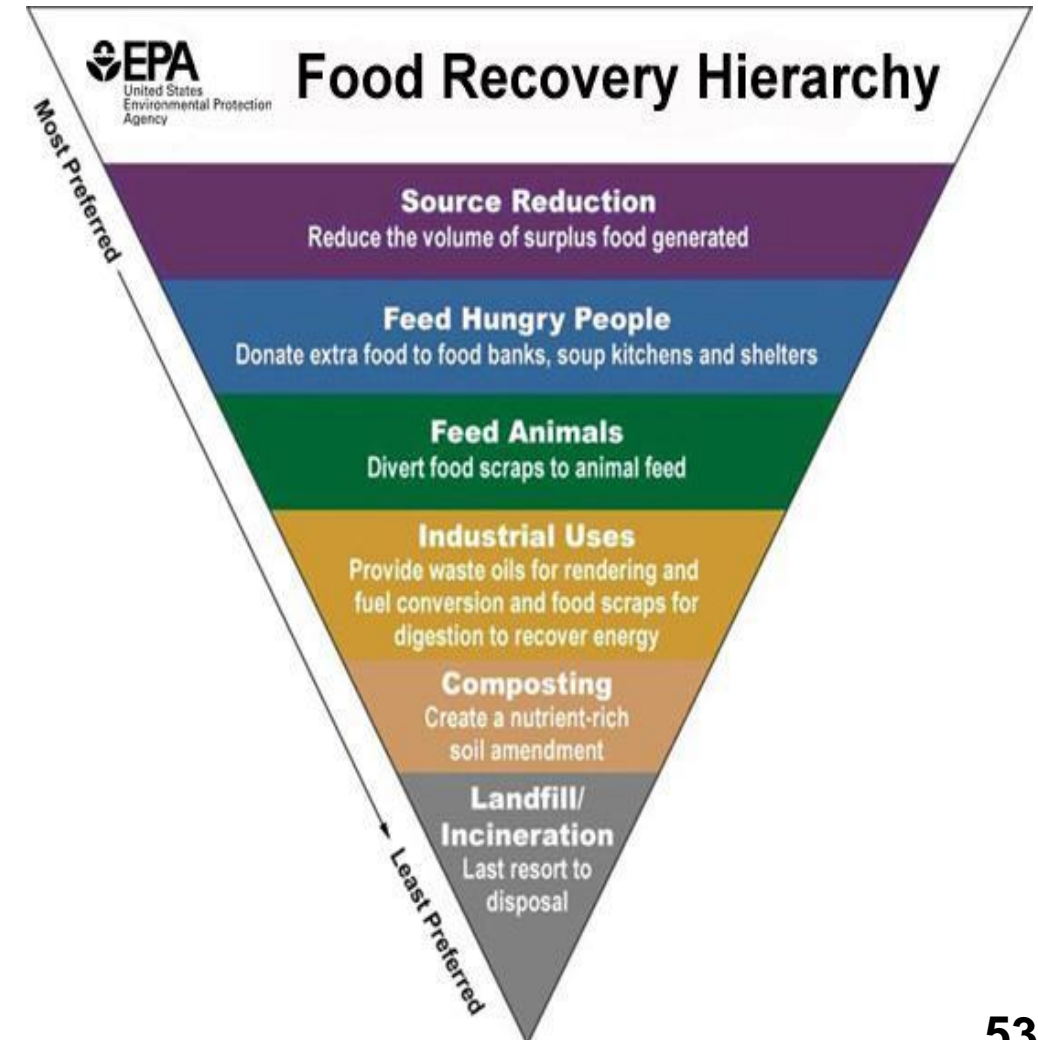


Reducing Wasted Food At Home

Most people don't realize how much food they throw away every day — from uneaten leftovers to spoiled produce. About 95 percent of the food we throw away ends up in landfills or combustion facilities. In 2014, we disposed of more than 38 million tons of food waste. By managing food sustainably and reducing waste, we can help businesses and consumers save money, provide a bridge in our communities for those who do not have enough to eat, and conserve resources for future generations.

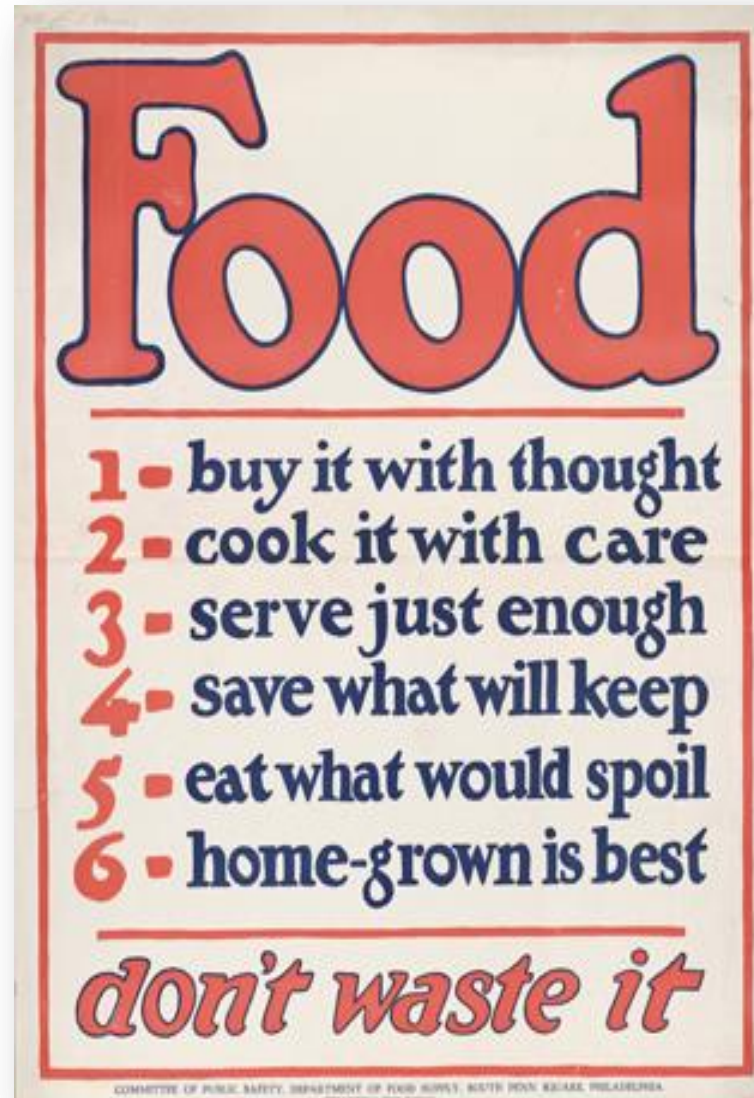
On this page:

- [Benefits of Reducing Wasted Food](#)
- [Ways to Reduce Wasted Food](#)
 - [Planning Tips](#)
 - [Storage Tips](#)
 - [Prep Tips](#)
 - [Thriftness Tips](#)
- [Toolkit for Your Home and Your Community](#)
- [If You Can't Reduce Wasted Food, Divert It From Landfills](#)

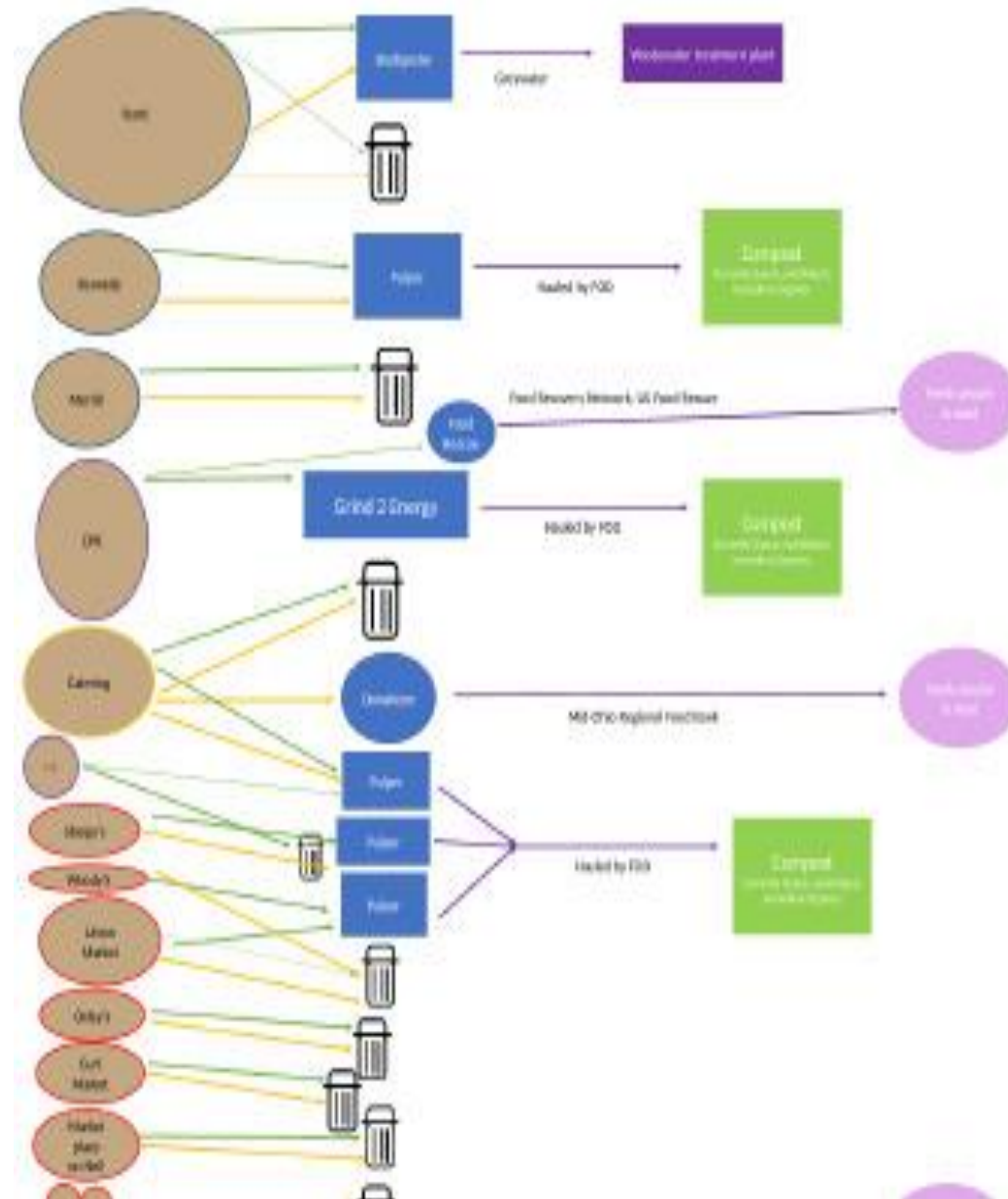
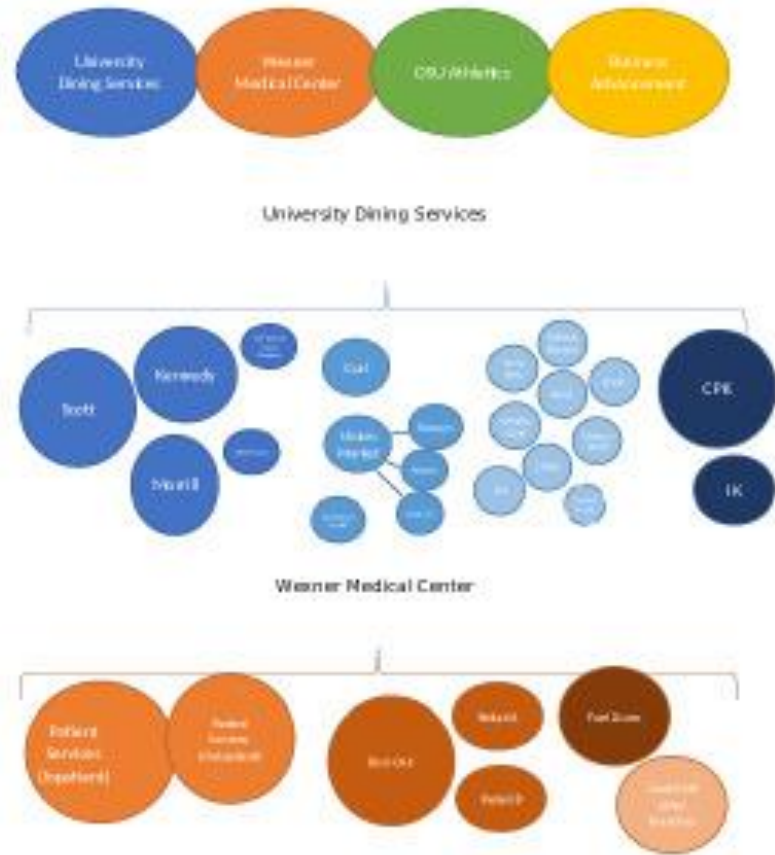


<https://www.epa.gov/recycle/reducing-wasted-food-home>

HOW CAN WE REDUCE FOOD WASTE?



Food Flows Mapping



Inventory of Food Flows on Campus

