ORDA RESEARCH

Portion Choice, Pay-by-Weight Dining, and Plate Waste

What the evidence says about self-service, waste reduction, and guest satisfaction

INDUSTRY EVIDENCE REVIEW | AUGUST 26, 2026

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EXECUTIVE SUMMARY

The evidence supports the mechanism. The precise effect still needs field validation.

Orda's synthetic study models a simple proposition: if diners choose the amount they actually want, less excess food reaches the plate. Existing human research strongly supports that direction, particularly when self-service is combined with a pay-by-weight incentive.

63.7%
Modeled reduction in plate waste for self-serve pay by weight vs. fixed portion

65.8%
Observed difference in the closest published restaurant comparison

0
Consistent evidence of a meaningful satisfaction penalty in the strongest self-service studies

> **Bottom line.** The pay-by-weight result is plausible relative to published evidence. The flat-price self-service result appears directionally credible but optimistic. The modeled satisfaction lift should be treated as an open empirical question.

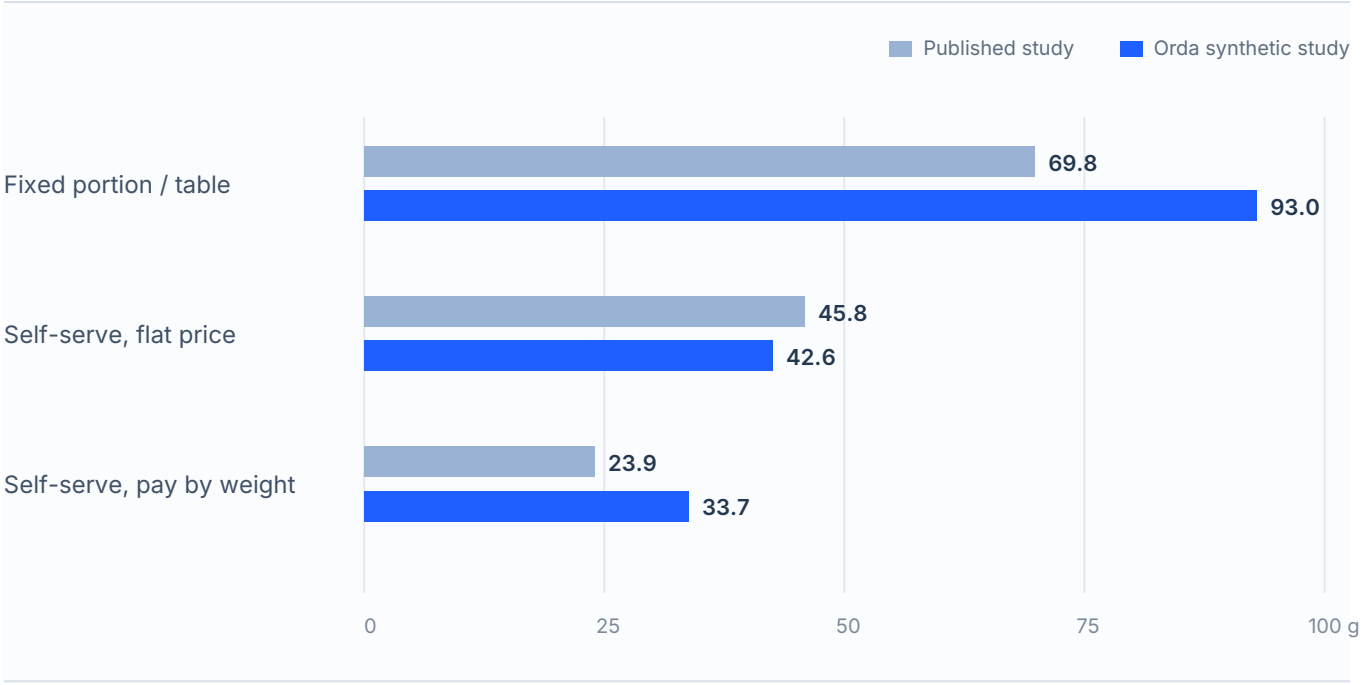
- **Closest direct benchmark:** Matzembacher et al. (2020) measured 69.8 g of plate waste in fixed-price table service, 45.8 g in fixed-price buffet or canteen service, and 23.9 g in pay-by-weight buffet service.
- **Workplace evidence:** reduced-size entree options lowered plate waste by 34.7% in a worksite cafeteria, while workplace canteen users identified excessive portions as the leading reason for waste.
- **Controlled evidence:** self-serving can reduce waste without lowering satisfaction, and smaller physical servings tend to outperform information-only interventions.
- **Systematic reviews:** portion size, service model, autonomy, incentives, food quality, and social context repeatedly emerge as important drivers of plate waste.
- **Research opportunity:** the literature is much thinner on integrated technology that links grams selected, price, transaction data, leftovers, and satisfaction in one field study.

Scientific status: the 2,100-participant dataset is synthetic. Published human research is used here to calibrate and challenge the model, not to validate synthetic p-values or convert them into human evidence.

EXHIBIT 1

The closest restaurant benchmark lands almost exactly on the same pay-by-weight reduction.

Absolute waste levels differ across settings, but the relative pattern is strikingly similar: self-service lowers waste, and pay by weight lowers it further.



CONFIGURATION	PUBLISHED	ORDA SYNTHETIC	ASSESSMENT
Fixed portion	69.8 g	93.0 g	The synthetic baseline is higher than the closest published comparator.
Self-serve, flat price	45.8 g 34.4% below fixed	42.6 g 54.2% below fixed	Direction is strongly credible; modeled magnitude is optimistic.
Self-serve, pay by weight	23.9 g 65.8% below fixed	33.7 g 63.7% below fixed	Relative effect is remarkably similar, though designs differ.

Source: Matzembacher et al. (2020) and Orda synthetic benchmark. The published study was observational across restaurant configurations, not a randomized trial, so the similarity should be treated as encouraging rather than causal validation.

HUMAN STUDIES

Structural changes to portioning repeatedly cut waste, often by 20 to 42 percent.

Across workplaces, universities, restaurants, hotels, and controlled experiments, the strongest findings favor changing the physical serving decision rather than relying on information alone.

STUDY	DESIGN	MAIN RESULT	EVIDENCE FOR THESIS
Berkowitz et al. (2016)	Worksite cafeteria + restaurant; pre/post intervention	Reduced-size entree choice cut waste 34.7% at the worksite and 41.6% at the restaurant.	Strong
Matzembacher et al. (2020)	Six restaurants; observed service configurations	69.8 g fixed table, 45.8 g fixed-price buffet, 23.9 g pay by weight.	Very strong
Visschers et al. (2020)	Two university canteens; intervention	Smaller servings reduced measured plate waste by 20%; information alone did not.	Strong
Dolnicar et al. (2020)	Hotel buffet; quasi-experimental field study	Game-based incentive reduced family plate waste 34% with no satisfaction impact.	Strong
Richardson et al. (2021)	University dining hall; self-serve field experiment	Smaller dishware reduced waste from 57.0 g to 37.5 g, a 34.2% decline.	Strong
Werkman et al. (2022)	Four controlled experiments	Self-serving in smaller units reduced consumption and waste without lowering satisfaction.	Very strong

> In a workplace canteen, excessive portions were the most frequently reported cause of plate waste, cited by 46.1% of users.

Additional evidence: Chang (2022) found that serving style and inducements interact; Pizzo et al. (2025) found food-waste salience reduced the probability of reported leftovers by 16 percentage points without harming satisfaction; Vader et al. (2025) again identified fullness and large portions among major waste drivers.

SYSTEMATIC REVIEWS

Across reviews, the same levers keep recurring: portion size, service model, autonomy, and incentives.

The literature does not support one universal waste-reduction percentage. It does support a consistent set of mechanisms that shape how much food reaches the plate and how much is left behind.

2021 | VIZZOTO, TESTA & IRALDO

107 articles, 180 strategies

Portion-size reduction was among the strategies supported across exploratory, correlational, and causal research. The review also highlighted a shortage of rigorous interventions targeting leftover and serving waste.

2024 | GUIMARÃES ET AL., NUTRIENTS

117,819 meals in meta-analysis evidence

Food-service type and distribution system materially influence plate waste. The authors specifically note that self-service charged by plate weight tends to generate less waste than fixed-price self-service.

2024 | GUIMARÃES ET AL., SUSTAINABILITY

Intervention evidence remains heterogeneous

How food is distributed, managed, and presented matters. The review calls for more rigorous intervention research in self-service settings.

2026 | LIU, WELLS & KAPETANAKI

101 out-of-home plate-waste studies

Waste emerges across decisive moments such as planning, ordering, food evaluation, and leftover handling. The portion-selection step is therefore a legitimate intervention point.

2026 | ASIF, DONATO & ISHAQ

81 hospitality studies

Portion size, buffet layout, feelings of control, and social context are recurring factors. Customizable portions and digital nudges are identified among promising interventions.

2026 | MUTANDA

31 recent hospitality studies

Portion and production control are common strategies, while technology is recommended to improve measurement and tracking of waste sources and volumes.

Portion size

Smaller or better-matched portions repeatedly reduce plate waste.

Service model

How guests obtain food changes selection behavior and waste.

Autonomy

Control over quantity can improve the fit between appetite and serving.

Price incentive

Pay-by-weight links quantity selected to quantity purchased.

Food quality

Taste and perceived quality remain major causes of leftovers.

Context

Social norms, layout, timing, and dining process influence outcomes.

CUSTOMER EXPERIENCE

Satisfaction is the place to be conservative.

> The literature supports "no satisfaction penalty" more strongly than a large satisfaction lift.

WERKMAN ET AL. (2022)

Waste fell without lower satisfaction.

Direct support for non-inferiority of the experience when self-serving and smaller units are used.

DOLNICAR ET AL. (2020)

34% less buffet waste with no satisfaction impact.

Shows that meaningful waste reduction does not require making the dining experience worse.

PIZZO ET AL. (2025)

Fewer reported leftovers with no satisfaction effect.

Supports a no-downside framing, not a large positive satisfaction effect.

How the synthetic satisfaction result should be framed

CONDITION	SYNTHETIC SCORE	EVIDENCE-BASED INTERPRETATION
Fixed portion	5.00 / 7	Baseline only; synthetic.
Self-serve, flat price	5.59 / 7	Plausible direction if autonomy is valued; magnitude is not established.
Self-serve, pay by weight	5.70 / 7	Plausible if fairness, control, and convenience improve; requires direct measurement.

Recommended public language: "Existing research suggests self-service can reduce plate waste without compromising guest satisfaction. Whether a technology-enabled pay-by-weight model increases satisfaction should be tested in the field."

BUSINESS AND ENVIRONMENTAL CONTEXT

The opportunity is bigger than plate waste alone.

1.05B
tonnes of food waste globally in 2022 across households, food service, and retail

290M
tonnes attributed to food service globally, roughly 36 kg per person per year

>6:1
average benefit-cost ratio reported across 86 catering sites for food-waste reduction programs

Illustrative Orda self-service configuration: kiosk, scanner, and scale.

What a technology-enabled model adds

Measured grams
The scale can record quantity selected at the point of purchase.

Continuous choice
Diners choose any quantity, not just a binary small or large portion.

Economic alignment
Pay by weight ties quantity selected to quantity purchased.

Digital feedback
The interface can show weight, price, or light-touch sustainability cues.

Operational analytics
Selection data and leftover weights can distinguish over-serving from dislike or quality issues.

Guest experience
The same trial can measure control, fairness, convenience, value, and satisfaction.

Research gap worth claiming: the literature is rich on portion size and food waste, but much thinner on an integrated transaction-level system that combines diner autonomy, weighed quantity, pricing, and digital measurement in one experience.

RECOMMENDED VALIDATION STUDY

A field trial can separate the effect of autonomy from the effect of price.

To turn the synthetic benchmark into defensible human evidence, the study should preserve the same menu and dining context while changing the portioning and pricing mechanics.

A

Fixed portion

Standard portion served to the diner. Target: 700 completed meals.

B

Self-serve, flat price

Diner controls quantity but price does not change with weight. Target: 700 completed meals.

C

Self-serve, pay by weight

Diner controls quantity and price scales with weight. Target: 700 completed meals.

Primary waste outcome

Edible plate waste in grams per diner, weighed after eating.

Primary experience outcome

Overall satisfaction on a pre-specified 1-7 scale, including a non-inferiority test vs. fixed portions.

Mechanism measures

Grams selected, grams consumed, hunger, taste, perceived control, perceived value, and willingness to use again.

Operational outcomes

Checkout time, queue time, food cost per meal, price paid, refills, and prepared but unsold food.

Analysis

Intention-to-treat; report effect sizes and 95% confidence intervals; adjust for menu, day, and site as pre-specified.

Study governance

Pre-register the protocol and seek appropriate ethics or IRB/REB review if the work is intended as generalizable research.

> **Important design principle:** do not use the synthetic effect sizes as evidence that the field result will be large. Use them to define the hypothesis and measurement plan.

CLAIMS LADDER

What is defensible now, and what requires field validation.

CLAIM	STATUS TODAY	AFTER SUCCESSFUL FIELD VALIDATION
Portion autonomy can reduce plate waste	**Supported** by multiple human studies.	Can quantify the effect in Orda's exact workplace technology context.
Pay by weight can produce very low plate waste	**Supported** by strong observational restaurant evidence.	Can make a causal estimate if randomized or cluster-randomized.
Waste can fall without hurting satisfaction	**Supported** by experiments and field interventions.	Can establish non-inferiority in the target population.
Self-service increases satisfaction by about 0.6 to 0.7 points	**Not established.** Synthetic only.	Can be claimed only if measured effect is statistically and practically meaningful.
Orda's system cuts waste by 64%	**Not established.** Synthetic only.	Can be claimed for studied settings if replicated with transparent methodology and confidence intervals.

> The strongest story today is not that the question has been proven. It is that the mechanism is credible, the modeled result is grounded in real evidence, and the next experiment is feasible and worth running.

The proposed self-serve, weighed-portion model is not built on a fringe behavioral assumption. Human research repeatedly shows that mismatched portions contribute to waste, that structural portion interventions often reduce waste, and that self-service or incentive mechanisms can do so without necessarily compromising satisfaction. The closest restaurant comparison found a pay-by-weight difference almost identical to the central synthetic estimate.

Recommended external framing: "A 2,100-participant digital-twin simulation produced a 64% reduction in modeled plate waste with pay-by-weight self-service. The direction and magnitude are consistent with the closest published restaurant evidence, and the next step is prospective validation in workplace dining."

SCOPE AND METHODOLOGY

This review prioritizes the evidence most relevant to the workplace dining decision.

Scope

Self-service portioning, pay-by-weight models, plate waste, portion size, autonomy, incentives, and customer satisfaction.

Evidence prioritized

Peer-reviewed field experiments, controlled experiments, workplace and cafeteria studies, restaurant studies, systematic reviews, meta-analyses, and high-quality sector reports.

Comparability rule

Grams-per-plate evidence is treated as the closest quantitative benchmark. Self-reported leftover rates and other metrics are kept separate rather than pooled.

Currency

Evidence included through August 26, 2026, including recent systematic reviews of hospitality and out-of-home plate waste.

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Use of this document: this evidence review is intended as a companion to Orda's synthetic research package, a background document for prospective field-study partners, and a source document for public communications. Synthetic results should always be labeled as modeled data, not human-subject findings.