Challenges of country-level data availability, data imprecision, surveillance & monitoring

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Emerging Possible Sources of U.S. Data

- Mill – HH food waste collections
- Too Good To Go – and similar dynamic food pricing services
- Winnow & Lean Path – commercial kitchen food waste
- Afresh & other retail food inventory & loss management firms
- Imperfect Foods/Misfit Markets – secondary market sales
- Pacific Coast Collaborative – retail food waste
- Material Recycling Facilities with AI separation of organics
- MITRE National Household Food Waste Survey
- OSU/RECIPEs Household Food Waste Tracking Survey
OSU/RECIPES Tracking of HH Waste

Three times each year
- Self-reported waste
- Add modules by request
  - Frozen foods, time use
- Core Data Public Dashboard
  - kx.osu.edu/landing-page/RECIPES

Feb ‘22 spike
- Dining out spontaneously
- Discarding expired bulk purchases

Only U.S. source of household surveillance

Grant #2115405
Surveys under-report HH food waste levels

• Ongoing FFAR & USDA effort to improve HH measurement
  • Measure same HHs using surveys, curbside audits & diaries
  • Predict more expensive but less biased approaches (e.g., curbside) using surveys
  • Develop user-friendly spreadsheets with calibration factors

![Average Weekly Waste by Household Size](chart.png)

Funding by FFAR (#22-000421 matched by Kroger) & USDA-OCE (#58-0111-23-001)
Policies Impacting Household Food Waste Shift Time Use

Lessons from South Korea & California
South Korean Food Waste Data

- Collected as part of residential food waste tax
- Lee (2023) integrates data from tax program, consumer food purchases and time use studies
- Findings
  - Residents charged 6¢/kg ($15.60/yr on average)
  - Food waste ↓ by 53kg/hh/yr (-20%)
  - Grocery purchases by ↓ 46kg (-5.4% or $172/yr)
  - Time spent on home meals ↑ 1.15 hrs/wk (+7%)
    - valued at $240/yr

Lee (2023). Available at: https://shoonlee.github.io/website/Foodwaste_SL.pdf
California Bill 1383: Organics Recycling

• In 2022 many residents started sorting food waste into separate bins
• Self-reported waste increased by ~20% during first year (still tracking)
  • Analysis of RECIPES/OSU National Household Food Waste Tracking Survey
• Time spent on (from American Time Use Survey)
  • Food cleaning activities increased by 14% (1.2 min/p/day)
  • Food preparing decreased by 9% (2.8 min/p/day)
  • All food activities stayed roughly constant

• Consumer messaging
  • Did not mention benefits of waste reduction

See Li and Roe (2024) for initial results (not peer reviewed)
Metabolic Food Waste

Defined by Serafini & Toti (2016) as the food eaten above physiological needs
Metabolic Food Waste

• Compared to normal weight individuals Serafini & Toti (2016) found
  • Obese consume 127.2 kg more food per person per year
  • Overweight consume 63.1 kg/p/yr additional
• Globally 1.6 billion are overweight + 890 million are obese
• Some policies operate in similar direction for both standard and metabolic waste (e.g., reduce portion sizes)
• Novel anti-obesity medications are proving effective in trials
  • Newest class approaching efficacy of bariatric surgery
  • ~12% of U.S. adults take meds (Kaiser Family Foundation 2024)
  • Sample of 505 U.S. residents taking new meds (Roe 2024, under review)
    • 68% report food savings that exceed med’s production costs
    • 25% wasted more food since starting medications; declines with time on med
    • 84% eat smaller portions
Data Infrastructures are Needed

Expansion of Existing Food Ontologies can Improve Data Interoperability
Ontology (Dooley et al. 2018)

• A well-defined, hierarchical vocabulary connected with logical relationships
• Provides a formal theory for a domain of inquiry that specifies the meaning of terms within a vocabulary
• Consists of a
  • Hierarchical taxonomic structure as well as
  • Statements about how entities within a domain are related
• For the domain of food we seek:
  1. Globally accessible and consistent food descriptions
  2. Multiple hierarchies in the form of taxonomies
Ontologies & Large Language Models (LLMs)

Problem: Ontologies take forever to create

Solution: LLMs can speed up the creation process

- Large Language Models (LLMs) are deep learning algorithms that can recognize, summarize, translate, predict and generate content using large datasets
- E.g., ChatGPT, Google Gemini

Two NSF projects (RECIPES & ICICLE) are collaborating to create this for food waste domain

Image source: https://foodon.org/