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Household Food Waste Monitoring Through AI-assisted Reporting: Comparing Photo-based and Category-based Approaches

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Abstract

The choice of methodology strongly influences the quality and usability of household food waste data. While self-reporting methods provide important insights into household behaviours and drivers of food waste, high participant burden often limits study duration and data completeness. This study investigated whether AI-assisted reporting through participants preferred social messaging channel can reduce burden, improve user experience, and enable scalable longer-term monitoring. In November 2025, 100 Finnish households participated in a randomized cross-over trial comparing two approaches: photo-based reporting and category-based reporting using predefined food waste categories (Hartikainen et al. 2025). Participants used one method during the first week and switched in the second week. Both approaches were integrated into a familiar messaging platform and required no scales or additional equipment, supporting high scalability. User experience, perceived burden, and willingness for extended participation were assessed through repeated surveys. Both approaches captured household food waste reliably but differed in sensitivity to waste types. Category-based reporting generated more records (575 vs. 371), partly because a single photo often contained multiple food items, while category reporting produced item-level entries. It was particularly effective for liquid and low-visibility waste such as coffee and dairy residues. Photo-based reporting captured plate leftovers and mixed dishes more effectively and was preferred by families with children due to its speed and low effort, whereas older participants favoured the structured category interface. The AI system used for image interpretation demonstrated strong performance, achieving higher food classification accuracy and more precise weight estimation than a general-purpose AI model and a panel of 200 human evaluators, supporting the value of domain-specific training for visual food waste quantification. Importantly, participants reported high engagement and low perceived burden in both approaches, and many indicated willingness to continue reporting beyond one month. Overall, the findings show that the two approaches are complementary: category-based reporting improves capture of small and liquid waste, while photo-based reporting reduces burden and improves documentation of solid waste. Together, they offer a scalable foundation for long-term household food waste monitoring and intervention research.

Keywords: Household, food waste, methodology, diary, user experience, AI

References

Hartikainen, H., Kostensalo, J., & Riipi, I. (2025). Tackling the challenges of food waste diary studies—Testing strategies with Finnish data. Waste Management, 202, 114844.