

Understanding Response Patterns in a One-Week Diary Survey of Food Purchase and Acquisition Data

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Disclaimer

The findings and conclusions in this presentation are those of the author and should not be construed to represent any official U.S. Department of Agriculture or U.S. Government determination or policy.

General Overview

I will provide a summary of recent **collaborative research** that the University of Michigan Survey Methodology Program (SMP) and Program in Survey and Data Science (PSDS) have conducted in partnership with the USDA-ERS FoodAPS team on short-term diary survey response patterns.

Primary points of interest:

1. What have we learned about response patterns in the FoodAPS (and national short-term diary surveys more generally), and how we might address potential errors that result?
2. What are important future directions for methodological research in this area?

For each of three studies: research question(s), methods, findings, remaining gaps in knowledge

Hu et al. (2017), Journal of Nutrition

Research Question: Can diary survey **paradata** be used to study and understand measurement and nonresponse errors in a seven-day diary survey (such as FoodAPS-1)?

Methods:

1. Use multinomial logistic regression modeling to evaluate patterns of nonresponse (confirmed events, confirmed non-events, refusals, and unconfirmed events) over the seven-day diary period of FoodAPS-1
2. Use binary logistic regression modeling to identify predictors of reporting food acquisition events over the seven-day diary period
3. Use ordinal logistic regression to identify predictors of ease of participation in the seven-day diary survey

Hu et al. (2017), Journal of Nutrition

Findings:

1. Nonresponse increased as the week proceeded, especially for those who started the diary-keeping on **Friday** (odds of refusal increased by 12% each day!)
2. The odds of reporting food acquisition events also decreased by 6% each day, along with the odds of reporting multiple food-away-from-home events
3. Male respondents, larger HHs, non-English speaking HHs, HHs that eat together less often, HHs experiencing tough financial conditions, and HHs that frequently entertain guests all had a harder time getting HH members to participate → **adaptive design implications (tailored strategies?)**

Gaps: Do diet diary surveys show similar patterns? Can GIS data be used (given consent / IRB approval) to verify events? Are there interviewer effects? Would shorter reporting periods (e.g., two three-day periods over multiple weeks) reduce response burden?

Hu et al. (2020), JSSAM

Research Question: Given that the public-use FoodAPS weights only adjust for unit nonresponse at the HH level (i.e., there are no daily weights available), can imputation approaches effectively adjust for nonresponse on later days (as demonstrated by Hu et al., 2017)?

Methods:

1. Impute missing food expenditures for persons that refused on particular days, using a Heckman selection model
2. Use bootstrap replicate sampling to account for the complex sampling features of the FoodAPS in inferences based on the imputed data (create bootstrap replicate, then impute)
3. Estimate item nonresponse error by comparing weighted estimates from respondents on each day to weighted estimates incorporating the imputed values

Hu et al. (2020), JSSAM

Findings:

1. Ignoring the missing data leads to **consistent over-estimation** of mean expenditures and events per person-day, along with under-estimation of total expenditures and events
2. Given the clear underreporting on later days of diary surveys, these types of adjustments (in addition to HH weights) seem necessary to help repair nonresponse bias in estimates

Gaps:

1. How would **day-specific weights** perform compared to this type of imputation method? Would the imputation approach result in more efficient estimates?

Hu et al. (2020), SRM

Research Question: What types of response patterns exist in multi-day diary surveys, and how might these patterns inform future adaptive designs for these types of surveys?

Methods:

1. Use latent class analysis (LCA) to identify different types of response patterns across the seven days
2. Profile each of the derived latent classes in the best-fitting model
3. Compare the classes in terms of covariates known at the onset of the diary period

Hu et al. (2020), SRM

Findings:

1. A model with six classes had the best balance of fit and practical interpretation (see Figure →)
2. Two different types of nonresponse (refusal and unconfirmed events)
3. SNAP status and prior evidence of refusing the HH screening interview was associated with a higher probability of membership in classes that eventually dropped out

Gaps: How can these findings be used to inform adaptive designs based on known information at the onset? Use different strategies for different types of cases predicted to drop out?

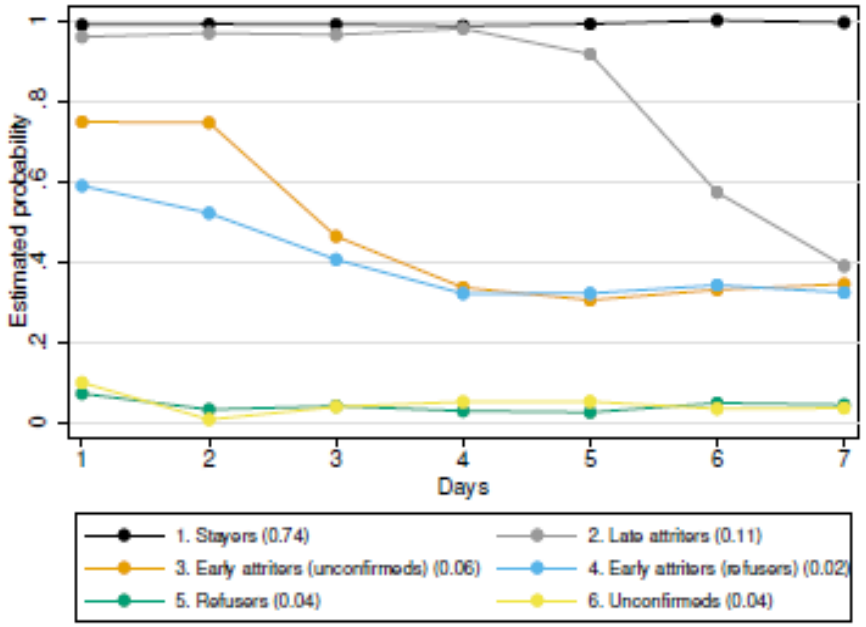

Figure 2. Estimated posterior probabilities of being confirmed on the seven daily response indicators for the six-class solution.

Summary / Next Steps

Nonresponse error will increase across days in diary surveys; we have to **take novel design steps** to address this, or plan to adjust for it when computing daily estimates.

Can we compute better weights for estimation of trajectories and daily prevalence? Or should we rely on well-specified imputation models to address nonresponse across the days?

** And, which approach would be easier for data users?

How can we keep participants engaged in a short-term diary survey? Webinars with study findings? Daily updates? Feedback on their participation? Room for experimentation!

We are currently conducting analyses of a Field Test for FoodAPS-2: this included an incentive experiment to increase participation across the days, adaptive design ideas, and use of novel technology (the “food logger”) to improve the overall respondent experience.

References

Hu, M., Gremel, G., Kirlin, J.A., and West, B.T. (2017). Nonresponse and Underreporting Errors Increase over the Data Collection Week Based on Paradata from the National Household Food Acquisition and Purchase Survey. *Journal of Nutrition*, 147(5), 964-975. Available online at http://jn.nutrition.org/content/early/2017/03/15/jn.116.240697.full.pdf+html.

Hu, M., Kirlin, J.A., West, B.T., Hu, W., Ong, A.R., and Zhang, X. (2020). Estimation of Under-Reporting in Diary Surveys: An Application using the U.S. Food Acquisition and Purchase Survey. *Journal of Survey Statistics and Methodology*, 8(5), 877-902.

Hu, M., Melipillan, R., West, B.T., Kirlin, J.A., and Paniagua, I. (2020). Response patterns in a multi-day diary survey: implications for adaptive survey design. *Survey Research Methods*, 14(3), 289-300.

Thank You!

Please email bwest@umich.edu with any questions about this work.