

Assessing and Improving Data Entry in Survey Instrument through Card Sorting Behavioral Modeling

Lin Wang, Anthony Schulzetenberg, Alda Rivas, Heather Ridolfo,* Shelley Feuer

U.S. Census Bureau

*National Agricultural Statistics Service

FedCASIC

April 2021

Second National Food Acquisition and Purchase Survey

- Nationally representative survey of American households
- A 7-day diary data collection of household **food acquisition**
- To support evidence-based policymaking
- Leverage technology to achieve effective and efficient data collection with respondent satisfaction – **developing a mobile app for diary data collection**

Information to be collected about food acquisition

1. **Food content** – bread, apple, water, rice, steak, Big Mac, etc
2. **Amount** – pound, ounce, gallon, liter, gram, serving, etc
3. **Cost** – dollar amount, free
4. **Payment method** – cash, credit card, food stamp, etc
5. **Location of acquisition** – physical store, online, friend's home

Question to be addressed for app design

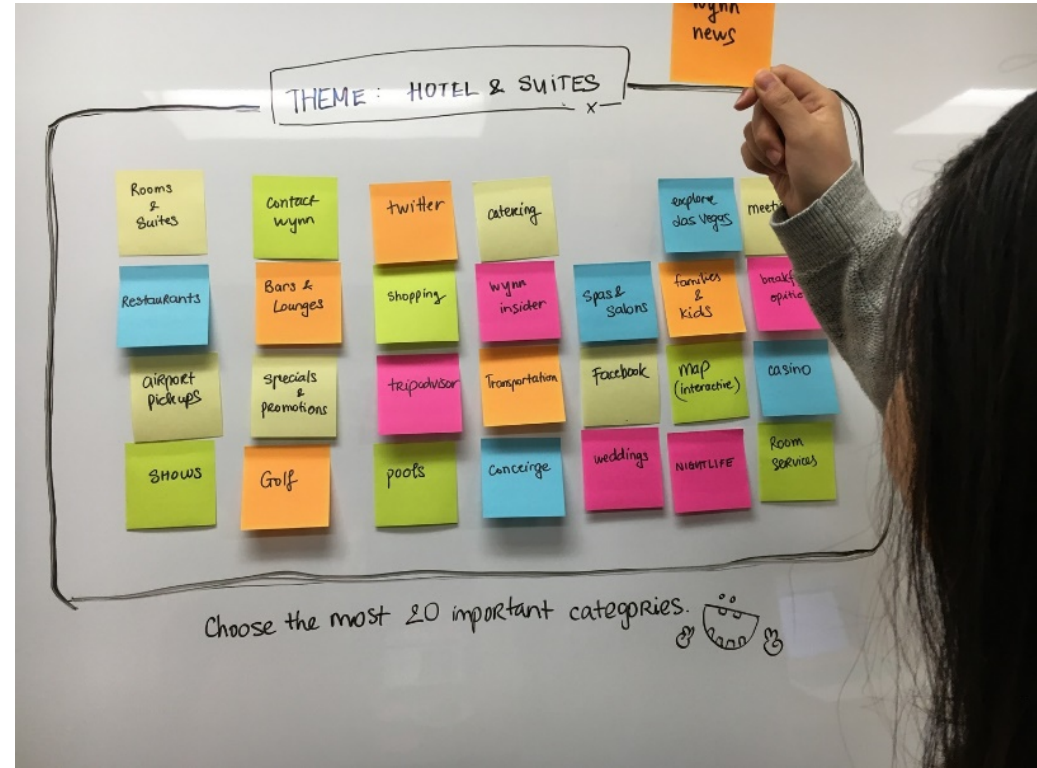
What is the **optimal sequence** of data entry that maximizes **data quality**, minimizes **burden**, and brings respondents to **satisfactory experience**?

User research approach to address the question:

1. Observe potential respondents' behavior
2. Develop a behavioral model of food info entry
3. Design an optimal workflow for the mobile app

Sequential card sorting

- Card sorting 101
- Sequential card sorting
- Study strategy:
 1. A single generic food item
 2. An **actual** food item
 3. **Multiple** food items



Coffee

Starbucks

16
(quantity)

Fl. Oz.

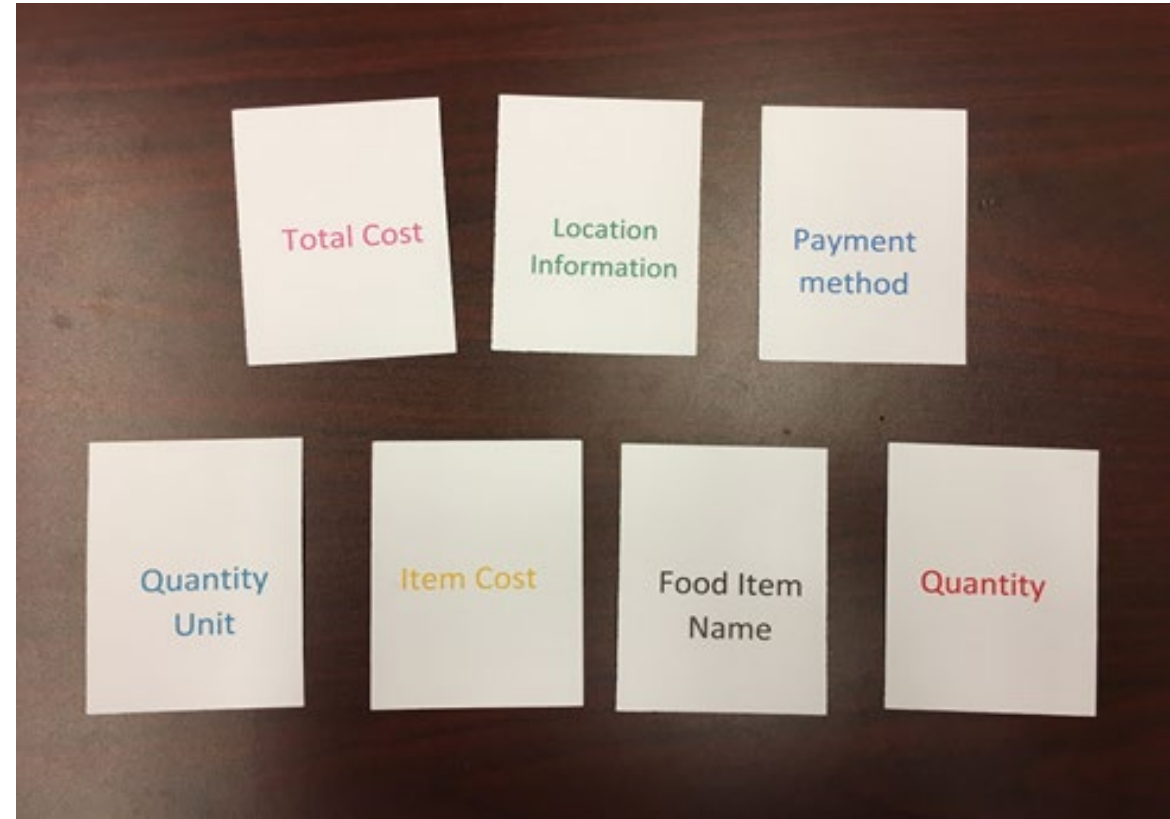
\$5.66

Total cost:
\$6.08

Credit card

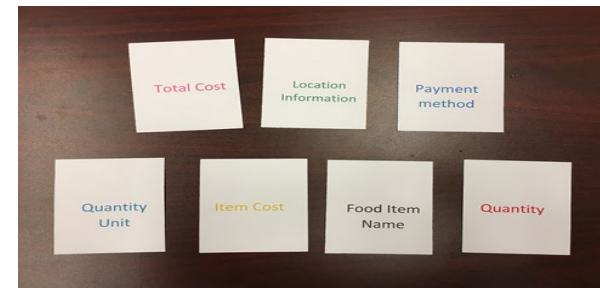
Experiment 1: Generic single food item entry

1. Purpose: To understand potential respondents' general behavioral pattern of entering a food item
2. Participants: 20 English-speaking adults with at least 8 years of school education
3. Paradigm: Placing the cards of food item information in an order in which the potential respondent would enter the information into a mobile app



Experiment 1: Task instructions

We are in the process of re-designing a mobile app to be used for recording food items that a person either purchased or was given. In order to make the app easy to use, we want to understand how people like you would record food information using a mobile app. In this card sorting exercise, each card represents characteristics of a single food item as well as other information we are interested in collecting. We would like you to place these cards in the order in which you would enter the information into a mobile app.



Results from Experiment 1

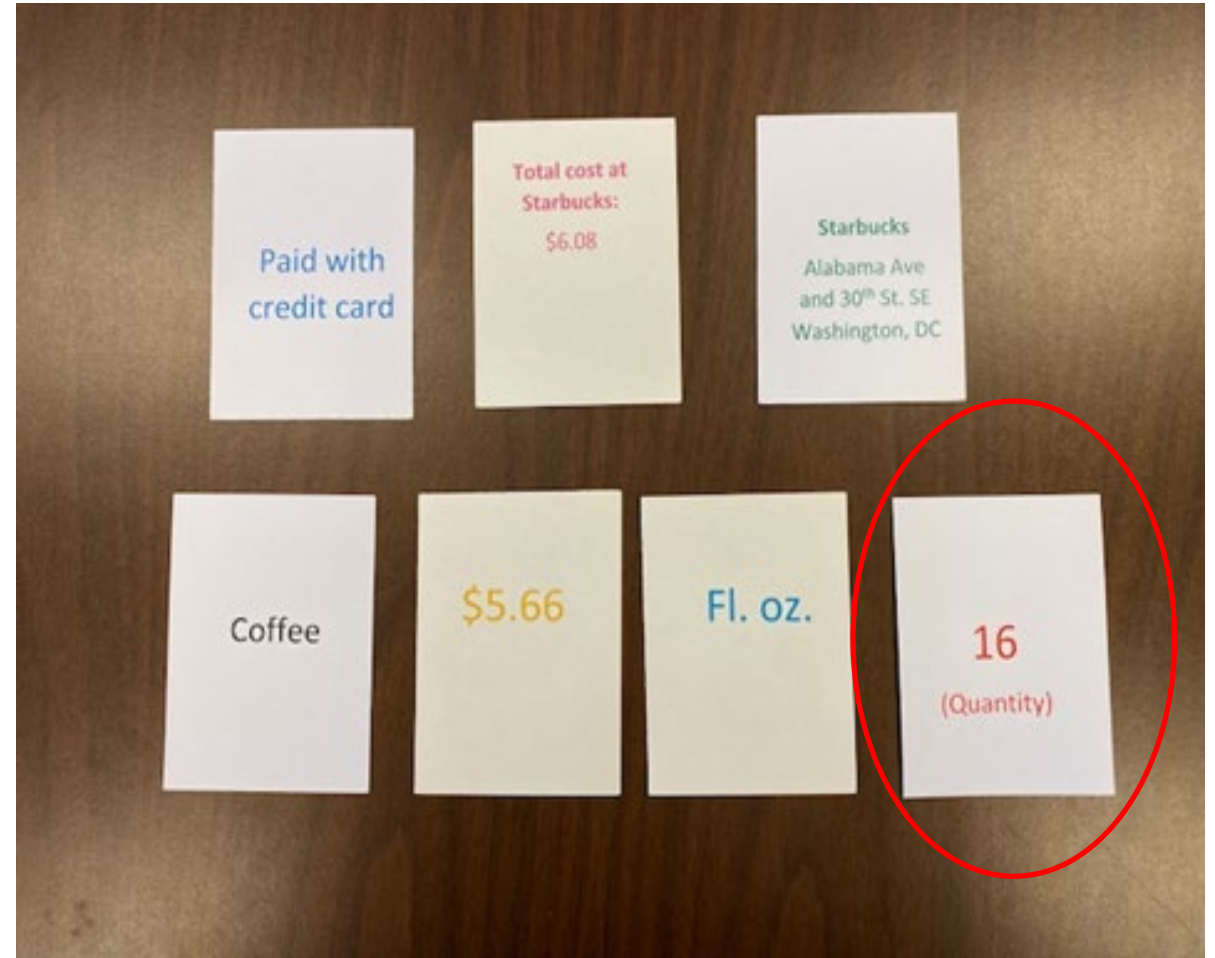
1. Mode, mean, median
2. Notes summary from debriefing



- Confusion on “quantity” vs. “quantity unit” (3 Ps)
- Confusion on “item cost” vs. “total cost” (2 Ps)
- Uncertain about the meaning of “location” (6 Ps)

Experiment 2: Actual single food item entry

1. Purpose: To verify if the findings of Experiment 1 are generalizable to actual single food item entry
2. Participants: 28 English-speaking adults with at least 8 years of school education
3. Paradigm: Same as Exp 1



Results from Experiment 2

1. Mode, mean, median
2. Notes summary from debriefing

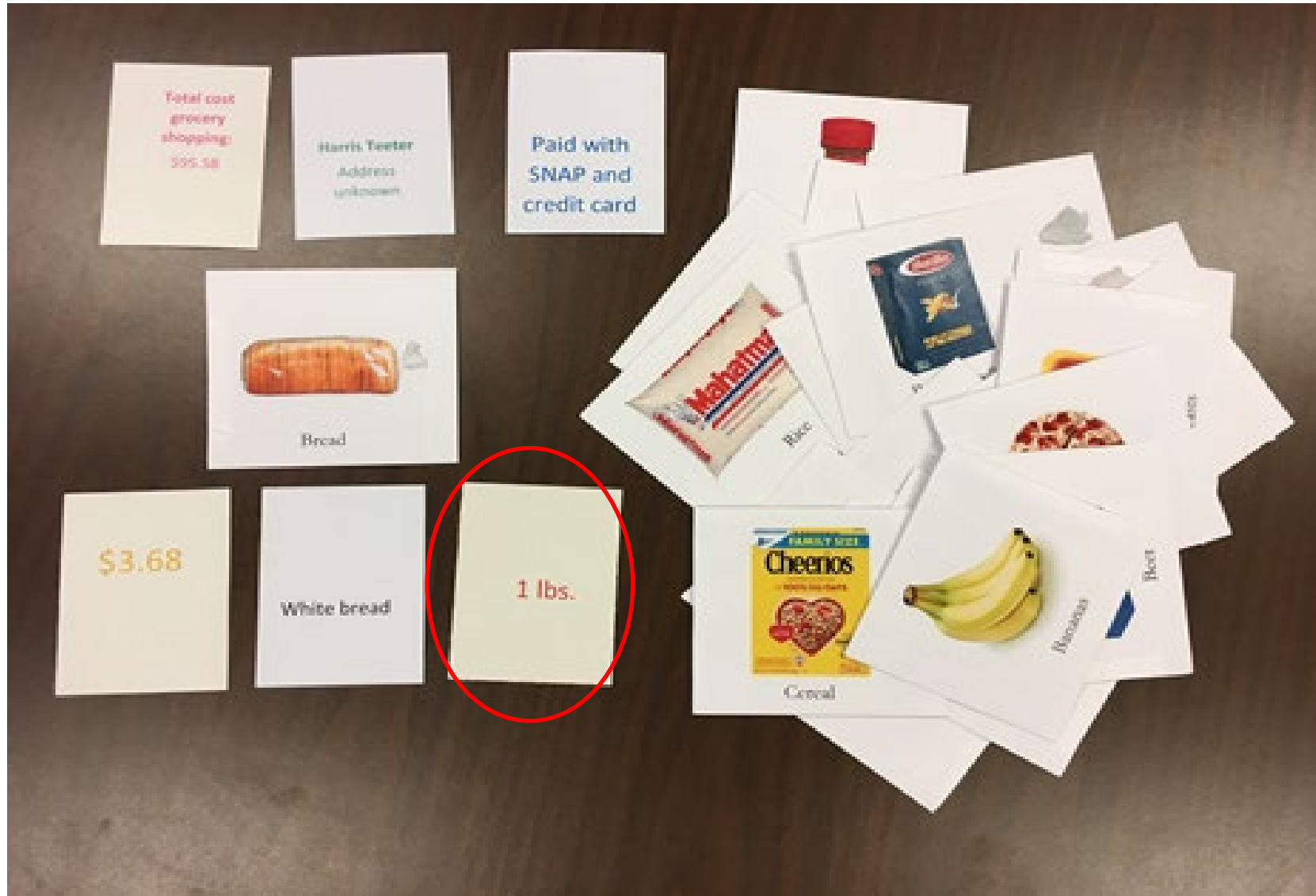


- Confusion caused by placing “quantity” and “quantity unit” in two separate cards (11 Ps)
- Confusion on “item cost” vs. “total cost” (2 Ps)
- Uncertainty about “location” (1 P)

Experiment 3: Actual multiple food items entry

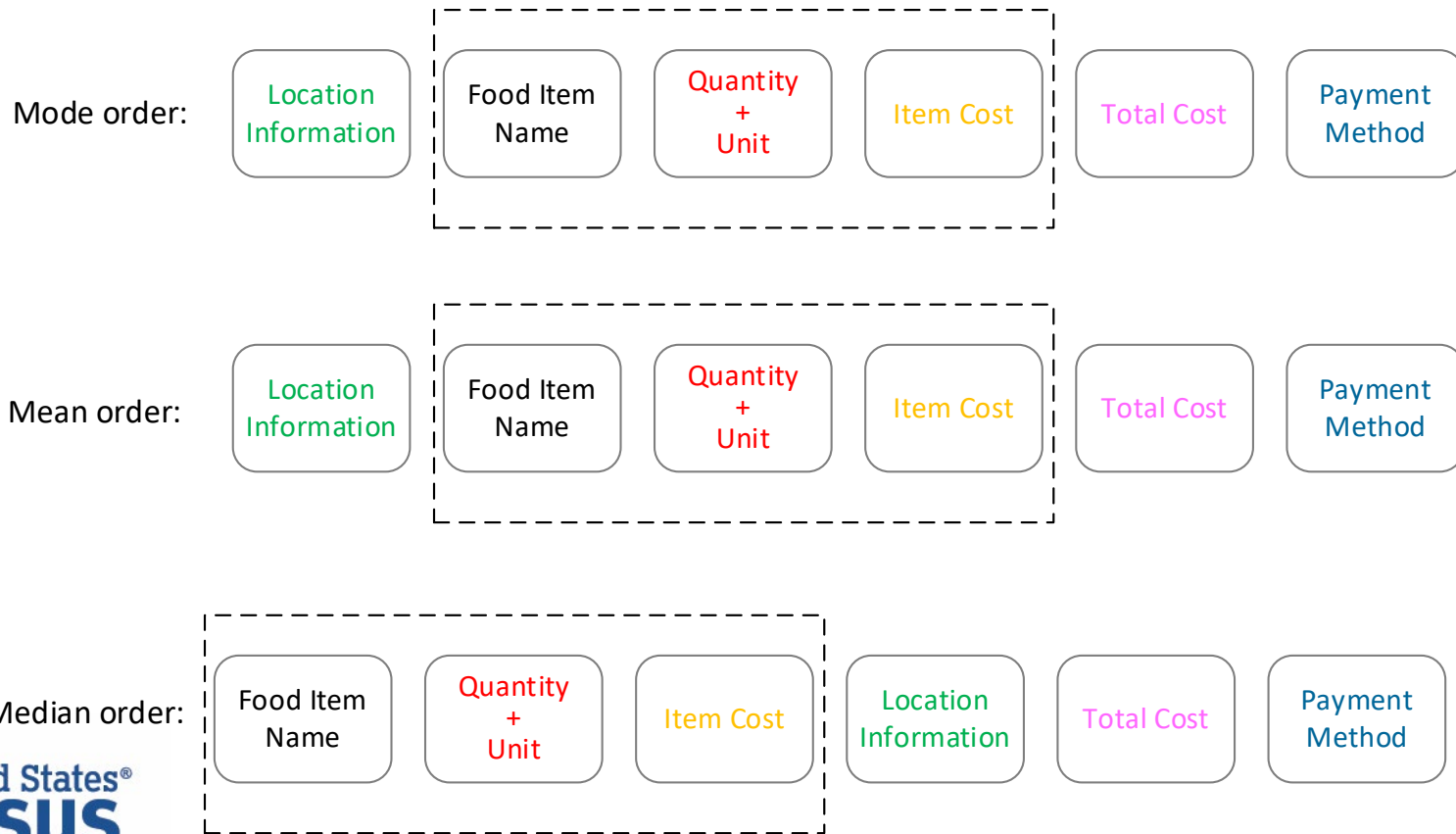
1. Purpose: To investigate if the data entry pattern for a single food item is generalizable to an event of multiple food items acquisition, and if there are any unique behavioral characteristics in recording multiple food items
2. Participants: 14 English-speaking adults with at least 8 years of school education
3. Paradigm: Placing the cards of food item information for 20 food items from a grocery shopping trip in the order in which the potential respondent would enter the information into a mobile app

Experiment 3: Actual multiple food items entry



Results from Experiment 3

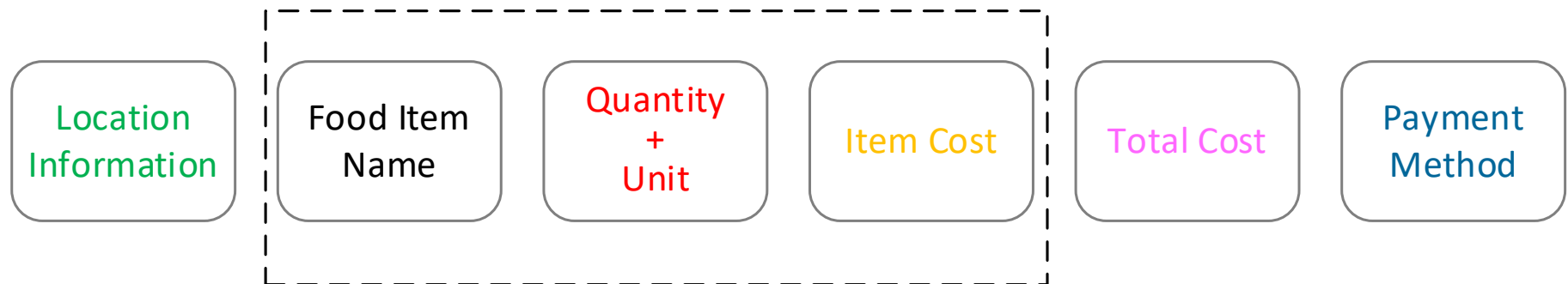
1. Mode, mean, median
2. Notes summary from debriefing



- Most participants followed the **same order** of entering item characteristics, usually enter all characteristics together
- Almost all participants enter “total cost” and “payment methods” **at the end.**
- Placement of “location” information is a mix, some at the beginning, some after items.
- **No particular order pattern** among the food items.

Summary

1. The “**Sequential Card Sorting**” method can help identify optimal order of entering multiple data elements that are associated.
2. Data collection instrument design should be **based on user research** and accommodate respondents’ natural data entry behavior
3. A common **pattern of food information entry** emerged from this study, and was **incorporated in the design** of FoodLogger – the mobile app for FoodAPS-2 data collection:



Acknowledgement

USDA Economic Research Service
National Agricultural Statistics Service

Dawn Nelson

Elizabeth Nichols

Jennifer Childs

Joanne Pascale

Paul Beatty

Contact

lin.wang@census.gov