

Potential for Ecologic Momentary Assessment in Dietary Intake Research

*Food & Nutrition Board, National Academies Methods Workshop
May 24, 2022*

Katie A. Loth, PhD, MPH, RD, LD



@KlothPhD

DEPARTMENT OF FAMILY MEDICINE
AND COMMUNITY HEALTH

What is Ecological Momentary Assessment (EMA)?

- Tool designed to collect real-time data on dynamic behaviors, psychological states or environmental contexts.
- Designed in response to limitations of traditional assessment methods
 - e.g., Eating disorders, smoking, alcohol use

What is EMA?

- **Ecological:** Subjects studied in their natural environment
- **Momentary:** Data collected in near-immediate state helps to limit/avoid retrospective recall bias
- **Assessment:** Participants completed multiple assessments per day, allowing for understanding of within-, between- person variation in behavior

How is data collected?

1. Researcher Initiated (*'Signal Prompts'*) —

- Random assessments completed multiple times/day
- Assess predictors of interest (mood, context)
- Some protocols include: start/end day prompts

2. Participant Initiated (*'Event Prompts'*) —

- Participants report on an event, behavior
- Assess outcomes of interest (dietary intake, feeding, purging)

Why Choose EMA?

- Study behavior in the natural environment
- Avoid, reduce problems with retrospective recall
- Study temporal patterns
 - Signal prompts → Event prompts
- Test momentary theoretical models.
 - Relationship between mood/context and behavior

EMA Example: Family Matters



- Family Matters seeks to identify how familial factors act as risk or protective factors for predicting childhood obesity.
- Mixed-methods, longitudinal study of children aged 5-7 and their families
- EMA Protocol
 - Researcher initiated: parent mood, stress
 - Participant initiated at family meals: dietary intake, feeding practices, meal context

EMA Example: Family Matters



Researcher Initiated

[← Back](#)

Survey 1

v1.2.3

On a scale from 0-10, with 0 being not sad or depressed at all and 10 being very sad or depressed, how would you rate your level of sadness or depression RIGHT NOW?

Click here to select number 

Next

[← Back](#)

Survey 1

v1.2.3

Since you woke up, have you experienced any of the following (select all that apply)?

Conflicts or arguments with family members or others	☐ No
Demands from my family	☐ No
Traffic/transportation problems	☐ No
Concerns about news events	☐ No
Problems with one's children	☐ No
Concerns about medical treatment or health conditions (your own or other's)	☐ No
Feeling conflicted over what to do	☐ No

Since you woke up this morning, has Calvin SEEN YOU (select all that apply)

☐ Watch TV / movies or play video games
☐ Do any exercise or physical activity
☐ Eat fruits or vegetables (not French fries)
☐ Eat any snack foods such as chips, French fries, candy, or other sweets / baked goods
☐ Eat fast food (e.g., McDonalds, Burger King, Taco Bell)
☐ Drink any soda / pop, fruit drinks, sports drinks (e.g., Gatorade) or energy drinks (e.g., Red Bull)
☐ None of the above

Meal Time Survey

 Home

Shared Meal:

REMEMBER, this meal or snack must have been eaten with at least one adult present. It can be at any location (e.g. at home, at restaurant, in car, at friend or family member's home)

What meal was Calvin eating?

Breakfast

Lunch

Dinner

Snack

Meal at a large gathering (e.g., wedding, funeral, celebration)

Which of the following things were happening during the meal or snack? (Select all that apply)

- ☐ Conversation
- ☐ Watching TV
- ☐ TV on in background
- ☐ Playing a video game
- ☐ Using a cell phone
- ☐ Using a tablet
- ☐ Using a computer
- ☐ Reading / looking at a book
- ☐ Listening to headphones
- ☐ None of the above

← Back

Meal Time Survey

🏠 Home

Were any of the following foods **SERVED**? (Select all that apply). For a dish containing multiple foods (e.g., soups, sandwiches, casseroles) please select the main ingredients in the dish. For example, if you had beef and vegetable soup, mark both: "meat protein" and "vegetables".

☐

Fruit

☐

Vegetables

☐

Whole grains (e.g., whole wheat breads or cereals, brown rice, oatmeal, corn tortillas)

☐

Refined grains (e.g., white bread or cereals, flour tortillas, white rice)

☐

Dairy (e.g., milk, cheese, yogurt, milk alternate such as soy milk, ice cream)

☐

Meat protein (e.g., chicken, beef, seafood / fish)

☐

Beans, eggs, seeds, nuts, tofu

- Beans, eggs, seeds, nuts, tofu
- Sugary drinks (e.g., pop, Kool-Aid, Capri Sun, Sunny Delight, sports drinks)
- Cake / cupcake / cookies or other baked goods
- Candy (e.g., sweets, chocolate, Gushers, fruit snacks)

Next

How well does EMA work?

Concordance of children's intake of selected food groups as reported by parents via 24-h dietary recall and ecological momentary assessment – Loth et al, Public Health Nutrition, 2021

- Concordance between two methods was high – but differed widely by type of food
 - Highest (sweets); Lowest (refined grains)
- Participants more likely to report intake of most foods when reporting via 24-hour dietary recall as compared to EMA
 - Verbal prompts improved recall?
 - Exceptions: Vegetables and Grains (equal); Sugar-sweetened beverages (more in EMA)
- Concordance was highest...
 - at breakfast and snacks (fewer food items eaten?)
 - when foods were prepared, eaten at home (more familiar? easier to remember?)

EMA Pros and Cons

- + Low participant burden
- + Less expensive (\$, staff time)
- + Momentary data collection; time stamped; context specific
- + Enables temporal sequencing of predictors, outcomes
- + Can include questions on specific foods, dietary supplements
- Limited details on food prep, portion size.
- Unable to calculate nutrient intake
- ? Reduced recall bias
- ? Social desirability bias

Take Home Thoughts

- Your research question matters most
- Ask yourself what you are trying to measure?
 - Do the strengths of EMA bolster your ability to answer your research question?
 - Do the weaknesses of EMA take away from your ability to answer your research question?
- EMA can be paired with other methods
 - Digital image capture
 - 24-hour interview led recalls

Selected Readings

1. Loth KA, Fertig A, Trofholz A, et al. Concordance of children's intake of selected food groups as reported by parents via 24-h dietary recall and ecological momentary assessment. *Public Health Nutr.* 2021;24(1):22-33.
2. Bruening M, van Woerden I, Todd M, Brennhof S, Laska MN, Dunton G. A Mobile Ecological Momentary Assessment Tool (devilSPARC) for Nutrition and Physical Activity Behaviors in College Students: A Validation Study. *J Med Internet Res.* 2016;18(7). doi:10.2196/jmir.5969
3. O'Connor SG, Ke W, Dzubur E, Schembre S, Dunton GF. Concordance and predictors of concordance of children's dietary intake as reported via ecological momentary assessment and 24 h recall. *Public Health Nutr.* 2018;21(6):1019-1027. doi:10.1017/S1368980017003780
4. Liao Y, Skelton K, Dunton G, Bruening M. A systematic review of methods and procedures used in ecological momentary assessments of diet and physical activity research in youth: an adapted STROBE checklist for reporting EMA studies (CREMAS). *J Med Internet Res.* 2016;18(6):e151.
5. Maugeri A, Barchitta M. A systematic review of ecological momentary assessment of diet: implications and perspectives for nutritional epidemiology. *Nutrients.* 2019;11(11):2696.