Cognitive Testing of the Brief Breastfeeding and Milk Expression Recall Survey

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Abstract

Background: Major U.S. federal maternal and child health surveys collect an infant feeding history for children under 6 years of age using survey questions that have changed little over decades. Yet, infant feeding and lactation practices have changed with the increasing popularity of milk expression (pumping).

Subjects and Methods: Cognitive interviews were conducted to test the 9-item Brief Breastfeeding and Milk Expression Recall Survey (BaByMERS) with a diverse sample of 15 U.S. mothers of children 1–5 years of age. A 42-item coding scheme was applied to identify interviewer and respondent problems in fielding and answering the questions. Problems were examined in relation to demographics and infant feeding and lactation history.

Results: The extent of problems was modest. Of 42 possible problem codes, only 9 were identified as actual problems for one or more respondents on one or more questions. The most common problems involved uncertainty about the timing of when one started expressing milk, making a mental shift to realize that maternal milk expression and the child's consumption of that milk could be distinct concepts, and difficulty with certain terms or phrases. Problems tended to arise among mothers with more complex infant feeding or lactation histories, who also tended to be those with higher levels of education.

Conclusions: BaByMERS is a promising, brief tool for collecting a recalled infant feeding or lactation history among mothers with young children. Future research can evaluate additional characteristics of the tool to further confirm its utility for large epidemiological studies of maternal and child health.

Keywords: human milk expression, feeding at the breast, breastfeeding, pumping, survey, recall

Introduction

INCREASING THE PROPORTION of infants who are breastfed is a long-standing objective of the U.S. government's Healthy People plan.¹ Evaluation of progress toward that goal is based on data from the federal National Immunization Survey (NIS).² Other national surveys collect an infant feeding history for young participants under 6 years of age or assess women's lifetime lactation histories.^{3–5} Various nonfederal maternal and child health studies use the same federal survey questions or similar questions to ask participants to recall infant feeding practices and maternal lactation histories.

Breastfeeding surveys have not changed much over the decades, despite changes in infant feeding practices. Now at least 85% of mothers who provide human milk for their infant do so using a breast pump at least sometimes, compared with

only 38% in 1993.⁶ Five to 7% of human milk-fed infants are never fed at the breast.^{7,8} Some mothers store expressed milk for their child to continue consuming after lactation has ceased, whereas others continue to lactate after their child has been weaned and discard or donate milk. Consequently, mothers may not report expressed milk feeding because they may not think of providing expressed milk as breastfeeding. This can result in underestimation of total human milk feeding duration for the child and also of respondent duration of lactation, and even the possibility of misclassification if the child was fed exclusively expressed milk or donor milk.

Several major federal surveys ask, "Was [child] ever breastfed or fed breast milk? How old was [child] when he completely stopped...?" which captures both feeding at the breast and expressed milk feeding, but does not allow for separate estimation of each. This is a shortcoming because

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the vast majority of mothers who feed their infant at the breast also feed expressed milk.⁸ Recent evidence also suggests that feeding human milk from a bottle has attenuated benefits compared with feeding at the breast in terms of respiratory, growth, and gastrointestinal outcomes.^{7,9,10}

Many maternal and child health studies, including the federal surveys, require questions designed for an interviewer-administered retrospective recall of infant feeding and lactation and can allot only a few questions.^{11–13} There is, therefore, a need to develop new, succinct questions about infant feeding and lactation practices that can improve data quality and be incorporated efficiently into both federal and nonfederal surveys that require recall of infant feeding and/or lactation practices and are constrained by length. The first step in developing and testing a set of questions to meet these needs is to conduct cognitive interviews. The objective of this study was to identify and address problems with a proposed set of questions as experienced by interviewers and respondents, by conducting cognitive interviews with a diverse group of mothers of children 1–5 years of age.

Materials and Methods

Question set: Brief Breastfeeding and Milk Expression Recall Survey

Questions were adapted from those used in our Moms2Moms Study ($n=491$), where mothers recalled at 12 months postpartum their child's age when the child started and stopped feeding at the breast and consuming expressed milk and when the mother started and stopped expressing milk.⁷ The Moms2Moms questions were based on the suggestions published by Geraghty and Rasmussen.¹⁴ For the present study, question wording was changed based on lessons learned in the Moms2Moms Study.

The format was changed from self-administered to an interviewer-administered format, because the federal surveys fielded by the National Center for Health Statistics (NCHS) of the CDC are interviewer-administered in-person or over the phone. The instructions were refined during pilot testing to provide additional clarity about definitions, especially to ensure that respondents understood the concept of milk expression. Full text of the 9-item question set called the Brief Breastfeeding and Milk Expression Recall Survey (BaByMERS) is presented in Table 1.

Participant recruitment

In 2016 we distributed an e-mail invitation to all employees ($n=8,770$ female) of a healthcare facility to seek volunteer biological mothers of children 1–5 years of age to help to improve national child health surveys. Interested mothers ($n=270$) joined a pool of potential participants for cognitive interviewing by completing a brief online screening questionnaire containing demographics and a question about which of their children they had breastfed.

As is important for cognitive interviewing, we selected participants from the pool based on criteria we theorized would help identify the widest range of potential problems with the question set.¹⁵ Specifically, we chose mothers who represented the extremes in terms of education and age of their children, and diversity in race and ethnicity. Once we invited as many as possible who fit the extremes, we supplemented

the sample with six mothers who had participated in the Moms2Moms Study in 2012 to reach our sample size and demographic goals. Selected mothers were invited for a 30-minute in-person interview. This study was reviewed and approved by the Nationwide Children's Hospital Institutional Review Board.

Cognitive interviews

Cognitive interviewing is a particular survey pretest method that helps identify problems with survey questions and the source of such problems, by helping respondents verbalize their thought processes through a semistructured interview.^{15,16} It is one in a series of validation methods routinely applied in the development of federal surveys.

One, trained female interviewer conducted the cognitive interviews lasting ~20 minutes in a private room at Nationwide Children's Hospital. The interviewer had preselected one of each mother's children 1–5 years of age to be the subject of the interview. First, the interviewer obtained a written informed consent and summarized the study purpose. Then, she administered the 9-item question set from start to finish, just as it would be administered in a typical study. This gathered preliminary responses about the duration of each infant feeding and lactation practice. Next, the interviewer returned to the beginning and posed each question again, but with probes to encourage mothers to think aloud about their thought process, to mention significant life events that were milestones that aided with recall, and to give them opportunities to express certainty, uncertainty, or confusion about each question.

The general approach to the interviews followed the "interpretivist approach" of Miller et al.¹⁵ That is, the interviewer used probes to help the respondent place their responses in the context of their life experience and circumstances (rather than asking them to evaluate the questions). Example standard probes included, "How did you arrive at that answer? Can you restate the question in your own words? What does 'expressed milk' mean to you? Were there any milestones that helped you think of that timeframe?" Spontaneous probes were permitted. Finally, the interviewer posed an open-ended question to seek additional thoughts or feedback.

Interviews were audiorecorded and transcribed by an external service. Interviewer notes reflected her impressions and other details not captured by the transcripts, but the extent of notes was limited to promote focus on conducting the interview. A \$10 incentive was provided.

Interview analysis

To code the interview content of each question for each participant according to the types of problems that arose with that question, we adapted the coding scheme of Lee.¹⁷ The main problem types in this scheme were for respondent behavior (e.g., respondent requests clarification), interviewer behavior (e.g., interviewer did not probe when they should have), instructions (e.g., complicated or conflicting), substance/concepts (e.g., unclear concept), vocabulary/sentence (e.g., awkward or uncommon words), reference points (e.g., time period too short for the behavior), question format (e.g., unclear), task performance (e.g., memory or retrieval problem), and no problem. There were 42 total problem codes.

Two study investigators independently reviewed the recordings and transcripts and assigned codes to each question for each respondent to designate problems that arose. Final

TABLE 1. BRIEF BREASTFEEDING AND MILK EXPRESSION RECALL SURVEY TESTED USING COGNITIVE INTERVIEWS (N=15, OHIO, 2016–2017)

	<i>Original question tested in cognitive interviews</i>	<i>Revised question after cognitive interviews</i>	<i>Answer options</i>
Question 1	Was [child] ever breastfed directly at the breast?	Was [child] ever breastfed directly at the breast?	Yes No Refused Do not know [if No, Refused, Do not know, skip to next Instruction]
Question 2	How old was [child] when [he/she] started feeding at the breast?	How old was [child] when [he/she] started feeding at the breast?	Number in days, weeks, or months Refused Do not know
Question 3	How old was [child] when [he/she] completely stopped feeding at the breast?	How old was [child] when [he/she] completely stopped feeding at the breast?	Number in days, weeks, or months Still feeding at the breast Refused Do not know
Instruction	The next six questions are about expressed breast milk. This includes breast milk expressed using a pump or hand expression.	The next couple of questions are about expressing your breast milk using a breast pump or your hands.	
Question 4	Did you ever use a breast pump or your hands to express milk for [child]?	Did you ever use a breast pump or your hands to express milk for [child]?	Yes No Refused Do not know [if No, Refused, Do not know, skip to No. 7]
Question 5	How old was [child] when you started expressing your breast milk?	How old was [child] when you started using a breast pump or your hands to express your breast milk?	Number in days, weeks, or months Refused Do not know
Question 6	How old was [child] when you stopped expressing your breast milk?	How old was [child] when you stopped using a breast pump or your hands to express your breast milk?	Number in days, weeks, or months Still expressing breast milk Refused Do not know
Question 7	Was [child] ever fed expressed breast milk?	Did [child] ever drink expressed breast milk?	Yes No Refused Do not know [if No, Refused, Do not know, stop]
Question 8	How old was [child] when [he/she] started drinking expressed breast milk?	How old was [child] when [he/she] started drinking expressed breast milk?	Number in days, weeks, or months Refused Do not know
Question 9	How old was [child] when [he/she] completely stopped drinking expressed breast milk?	How old was [child] when [he/she] completely stopped drinking expressed breast milk? Include fresh and frozen breast milk and breast milk mixed in cereal.	Number in days, weeks, or months Still drinking expressed breast milk Refused Do not know

codes were based on discussion to reach consensus. Q-NOTES software was used to store transcripts and codes.¹⁸

The counts and types of problems identified for each question were examined in relation to participant education, parity, race and ethnicity; the duration the subject child was fed at the breast; and whether the mother and her child were asynchronous in the duration of her milk expression and the child's duration of expressed milk feeding.

Results

Interview participants

Fifteen mothers participated in a cognitive interview (Table 2). Their demographics and infant feeding and lactation histories were varied. Mother–infant dyads fed at the breast for as few as 3 days and as many as 419 days. For approximately half of the group, dyads were asynchronous in terms of when they started or stopped producing and consuming expressed milk.

Identified problems: by question order

Of 42 possible problem codes, only 9 (21%) were identified as actual problems for one or more respondents on one or more questions (Table 3). Questions 1–3 (feeding at the breast): Mothers had no difficulty with the first two questions about ever feeding at the breast and when that started. Some mothers (5) expressed some uncertainty about how old their child was when they stopped feeding at the breast (Question 3), but all gave a response.

Questions 4–6 (expressing milk): While relatively few women had difficulty with Question 4, the question that posed the most problems was No. 5 “How old was [child] when you started expressing your breast milk?” and the problems generally involved the participant expressing uncertainty or having difficulty remembering the timing of when she started expressing milk. One participant said, “So um, for all my kids I wanted, I knew I was going back to work so I always start early. I start early in terms of just pumping to

TABLE 2. CHARACTERISTICS OF WOMEN WHO PARTICIPATED IN A COGNITIVE INTERVIEW TO EVALUATE THE BRIEF BREASTFEEDING AND MILK EXPRESSION RECALL SURVEY (N= 15, OHIO, 2016–2017)

Maternal education, <i>n</i> (%)	
High school	1 (7)
Some college or Associate's degree	3 (20)
4-year degree	5 (33)
Postgraduate degree	6 (40)
Parity, <i>n</i> (%)	
1 (0 other children)	5 (33)
2–3	8 (53)
4–6	2 (13)
Race and ethnicity, <i>n</i> (%)	
Non-Hispanic white	10 (67)
Non-Hispanic black or African American	3 (20)
Asian	1 (7)
Biracial	2 (13)
Recruitment source, <i>n</i> (%)	
Healthcare facility	9 (60)
Former participant in Moms2Moms study	6 (40)
Dyad's feeding at the breast duration (mean, median, SD, range, in days)	179, 149, 145, 3–419
Woman's duration of milk expression (mean, median, SD, range, in days)	176, 135, 140, 13–385
Child's duration of expressed milk feeding (mean, median, SD, range, in days)	187, 186, 144, 13–385
Woman's duration of milk expression and child's duration of expressed milk feeding were asynchronous, <i>n</i> (%)	
Yes	8 (53)
No	7 (47)

get extra milk. Um, so I figured I'd probably started early with her as well with my other two... I'm probably 50 percent sure on that." Another mother indicated, "Hmm...um, I'm trying to remember which kid is which. [Laughter] Um, I think with him I started when I got home from the hospital so three, four days maybe? But I am not a hundred percent sure..."

Once they answered Question 5, fewer respondents had the same problem with Question 6 about when they stopped expressing milk.

Despite the interviewer defining the concept of milk expression just before Question 4, at least two mothers were not able to retain the meaning throughout the interview. *Interviewer*: "So what does that question mean to you? 'How old was she when you stopped expressing your breast milk?'" *Participant*: "Um, just, 'when did you stop breast feeding?'" *Interviewer*: "Okay. So...even with that word 'expressing' in there you think it's just when you stopped breast feeding altogether?" *Participant*: "Yeah."

Another mother did not consider hand expression when she thought about milk expression, "And I mean I would use my hands but that's breast milk. I guess I don't think that's expression. I thought that was kind of just a part of the milk coming from the breast if you have to use your hands. So when I think 'expressed,' I think of using something to get it out like differently than your hands. So I thought about the pump."

Questions 7–9 (feeding expressed milk): Question 7 "Was [child] ever fed expressed breast milk?" posed problems for three mothers. Respondents needed to make a mental shift from thinking about their own milk expression to thinking about their child's consumption of that milk and realize that those could be distinct concepts. Question 8 was the second most problematic question "How old was [child] when [he/she] started drinking expressed breast milk?" This, again, caused some respondents to express uncertainty or have

difficulty recalling a time frame for their answer. A few respondents had difficulty with the concept or interpretation of expressing milk or feeding, and this arose occasionally across the questions on the topic of milk expression. When asked "Was [child] ever fed expressed breast milk?" one mother said, "I thought when you said he's, like, 'fed'—I'm, like, well he's too young to take it from a spoon."

Despite the problems identified, each respondent arrived at an answer for each question after some thought, even if they were not completely sure about the accuracy of their response. For instance, three mothers expressed uncertainty about their response for Question 9. Sometimes respondents just needed a moment to think or the question repeated or clarified.

As a result of the above findings, the question set was revised for future use (Table 1).

Identified problems by maternal characteristics

Although formal statistical testing for subgroup differences was not possible with our small sample, mothers with high levels of education appeared to be commonly those who expressed uncertainty or had difficulty remembering, while mothers with lower levels of education rarely stated this problem. Many of the mothers who had difficulty with Question 5 tended to be well educated and also those who fed their child at the breast for more than 6 months. Mothers and children who were asynchronous were also commonly represented among those who had problems with Questions 5 and 8.

We did not informally observe any patterns in the type or extent of problems by parity. Race and ethnicity did not appear to predict having particular problems with the question set, with the possible exception of Question 8, where three out of four African American, black, or biracial mothers, had at least one problem with the question.

TABLE 3. COUNTS OF IDENTIFIED PROBLEMS BY PROBLEM CODE AND QUESTION, BRIEF BREASTFEEDING AND MILK EXPRESSION RECALL SURVEY (N=15, OHIO, 2016–2017)

	Number of mothers who had at ≥1 problem with the question	Respondent behavior codes ^a				Substance/concepts		Vocabulary/sentence		Task performance	
		Respondent requires repeat	Respondent requests clarification	Respondent expresses uncertainty	Unclear concept	Multiple interpretations	Awkward or uncommon words	Unclear/ confusing	Memory or retrieval problem		
1. Was [child] ever breastfed directly at the breast?	0	0	0	0	0	0	0	0	0	0	0
2. How old was [child] when [he/she] started feeding at the breast?	0	0	0	0	0	0	0	0	0	0	0
3. How old was [child] when [he/she] completely stopped feeding at the breast?	5	0	1	5	0	0	0	0	0	0	4
4. Did you ever use a breast pump or your hands to express milk for [child]?	2	0	1	0	1	0	0	0	0	0	0
5. How old was [child] when you started expressing your breast milk?	9	0	0	9	0	0	0	1	0	0	8
6. How old was [child] when you stopped expressing your breast milk?	5	1	1	3	2	1	1	0	0	0	3
7. Was [child] ever fed expressed breast milk?	3	2	3	0	2	0	0	0	1	1	0
8. How old was [child] when [he/she] started drinking expressed breast milk?	6	0	1	5	2	1	1	0	1	1	4
9. How old was [child] when [he/she] completely stopped drinking expressed breast milk?	3	0	0	3	0	0	0	0	0	0	3

^aNone of the participants had problems that required use of the other 33 problem codes. A participant could have had multiple problems with a question and be marked more than once.

Discussion

An urgent need exists to better understand the impact of milk expression and expressed milk feeding on maternal and child health because these practices are now extremely common. However, the Infant Feeding Practices Study II (IFPS II) and the Moms2Moms study are among the few studies that included questions to disentangle feeding mode from the substance being fed.^{7,8} This study offers the nine-question BaByMERS to gather a retrospective recall of infant feeding and lactation history with mothers of children 1–5 years of age.

The BaByMERS appears to offer several advantages over questions commonly used in federal child health surveys and other nonfederal studies. In particular, when mother's lactation and the child's human milk consumption are asynchronous, as was the case for about half of the mothers and children in the present study, or when infants are fed exclusively expressed milk, the questions used in the National Survey of Family Growth (NSFG) pose the potential for misclassification of some children as "not breastfed" or for under/overestimation of duration. Additionally, none of the major federal surveys can accurately separately estimate the duration fed at the breast and duration fed on expressed milk, nor can they accurately estimate the mother's lactation duration (only NSFG can accurately measure this for dyads who were synchronous or only fed at the breast).

The questions used in the IFPS II and the published FeedCat Tool distinguish feeding modes, but were designed for repeated prospective administration, so the questions are not well suited for a retrospective history.^{11,12} The FeedCat Tool also relies on open-ended responses to be coded, making it resource intensive. The recently proposed Questionnaire on Infant Feeding was designed for retrospective studies, but it is lengthy and was tested in a self-administered format with mothers of children 19–35 months of age, rather than the wider age group of children included in most federal surveys.¹³

In using the BaByMERS, some respondents expressed at least a bit of uncertainty or needed to think carefully, but all were able to respond to all questions. Uncertainty and memory problems were the main problems identified, but these are common to all studies asking mothers to recall these past events. Less common concerns were related to ensuring a clear understanding of the distinction between feeding at the breast and milk expression or feeding expressed milk. The interviewer guide contained specific language just before the questions about milk expression to ensure respondents were clear about this term, and it seemed to limit confusion to what we observed in this sample (it likely would have been greater without this).

The BaByMERS was designed and tested to be interviewer administered, and it seems to be important to administer it in this way so the interviewer can clarify confusion. This is consistent with the methods of most federal surveys. We are concerned that a self-administered format would reduce accuracy. We revised the question wording and some instructions to reduce the modest problems we identified even further, for when the questions are used in future studies. Future research will test modifications made to the BaByMERS based on the cognitive interviews and will measure recall accuracy.

Contrary to expectations, it was the more highly educated mothers who experienced problems, particularly related to uncertainty and memory. Upon deeper inspection, they also tended to be those with the most complex histories: longer

durations and asynchronicity with their infants' feeding. Mothers who provided milk for less than a few weeks had less difficulty.

While we did not observe clear differences based on parity, a few mothers conveyed in thinking aloud how they were trying to mentally separate their experiences among their children. Thus, in a larger sample, we might expect that mothers with more children will have more difficulty. Still, one could expect this to be a problem for all studies asking multiparous women to recall experiences specific to one of their children, not only studies that would use the BaByMERS. Our efforts to select mothers reflecting extremes of demographic and other characteristics enabled us to draw these conclusions, and this approach reflects best practice in cognitive interviewing and survey design.¹⁵ To our knowledge, prior studies to develop similar surveys have not explored these same associations.

This study had several limitations. First, we did not include questions specifically about donor milk, either through a milk bank or peer to peer sharing. None of the participants mentioned receiving or giving donor milk, so we are unable to generalize our findings to this small subgroup of mothers and children. Second, our question set is longer than the ones currently in use in the NCHS federal surveys, and the surveys are under significant pressure to remain succinct. We endeavored to keep our question set as short as possible while still gathering the detail we felt was essential to separately evaluate feeding modes. Studies such as the NSFG that are focused only on women's lactation histories might omit Questions 7–9, whereas child-focused studies might omit Questions 5–6. However, we did not test these variations. Nevertheless, BaByMERS is shorter than other available surveys that separate feeding modes.

Third, we did not evaluate our question set using a self-administered format, so its utility in that setting is uncertain. Future studies could evaluate a Spanish version of the question set as well. Finally, our sample of 15 mothers was small. However, cognitive interviewing studies tend to be small, in line with the objective to uncover problematic features of survey questions rather than to provide statistically robust estimates of problem prevalence. We are confident that most of the problems in our question set were uncovered because fewer and fewer new problems surfaced as the sample was filled and the same problems began to repeat.

Despite these limitations, the strengths of this study include the use of a consistent interviewer using pilot-tested probes and a set of questions that had been used in a prior study of almost 500 women. The participants were diverse based on maternal and child characteristics and their experiences, and this enabled a thorough test of the BaByMERS. Also, we included mothers of children 1–5 years of age, which is the typical age group for which infant feeding is assessed in most NCHS surveys. Finally, we adapted a set of published codes for analysis.

Conclusion

This study offers a set of interviewer-administered questions, BaByMERS, to improve the quality of data collected about infant feeding and lactation in both federal and non-federal studies. Further field testing of the question set and application to other populations and contexts will help confirm its applicability for future research.

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