

Considerations When Measuring Exclusive Breastfeeding

Ellen Chetwynd, MPH, BSN, IBCLC, PhD¹ ,
Jill Demirci, RN, IBCLC, PhD² ,
and Jennifer Yourkavitch, MPH, IBCLC, PhD³

Journal of Human Lactation
2025, Vol. 41(1) 22–25
© The Author(s) 2024



Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/08903344241305669
journals.sagepub.com/home/jhl



Abstract

Exclusive breastfeeding, as recommended by the World Health Organization (WHO) for the first 6 months of life, is a critical metric for evaluating maternal and infant feeding practices and health outcomes. Despite its importance, inconsistencies in defining and measuring breastfeeding exclusivity present challenges for research comparability and interpretation. Equally, research design, outcomes of interest, and study resources are necessary considerations when collecting and analyzing exclusive breastfeeding data, and may require the adaption of standardized questions and techniques to individual situations. This paper explores key considerations for researchers when operationalizing and measuring exclusive breastfeeding. We address the nuances of point prevalence and since-birth measures, highlighting their influence on study outcomes and data interpretation. Statistical approaches for analyzing exclusivity data, including logistic regression, survival analysis, and Kaplan-Meier methods, are also discussed. By outlining best practices for precise definitions, tailored data collection, and transparent reporting, this paper aims to provide an overview for precise definition, effective data collection, and clear interpretation.

Keywords

breastfeeding, breastfeeding metrics, breastfeeding prevalence, breastfeeding rates, exclusive breastfeeding, infant feeding practices, lactation surveys, maternal recall

Breastfeeding exclusivity—recommended by the World Health Organization (WHO) for the first 6 months of life (WHO & United Nations Children's Fund [UNICEF], 2021), is a key metric in evaluating infant feeding practices. The WHO defines breastfeeding exclusivity as the proportion of infants who receive only breastmilk (including expressed milk, milk from a wet nurse, or donor human milk) and no other food or drink, not even water. Exceptions are made for prescribed oral rehydration solutions, drops, and syrups such as vitamins, minerals, and medicines, but not herbal fluids or similar traditional medicines (WHO & UNICEF, 2021). Measuring and monitoring breastfeeding exclusivity is vital because the benefits of breastfeeding and human milk intake are dose-dependent and infant age-specific. Higher rates of exclusivity at the population level are associated with enhanced health outcomes in both maternal and child health (Victora et al., 2016). Additionally, introducing commercial infant formula or other foods and liquids in the first 6 months of life can impact the development of the infant's gut microbiome with implications for future immunological function (Ames et al., 2023; Lin et al., 2020).

Despite the ubiquity and importance of breastfeeding exclusivity as an infant feeding outcome or variable in research, there are considerable cross-study distinctions in its definition and measurement. In this paper, we examine the concept of exclusive breastfeeding measurement from multiple perspectives, aiming to provide an overview for

precise definition, effective data collection, and clear interpretation.

Operationalizing the Definition of Breastfeeding Exclusivity in the Research Setting

Breastfeeding, in its simplest sense, involves a child nursing at their mother/parent's breast; however, it can also include direct breastfeeding from a non-birth parent (e.g., wet nursing) or provision of fresh, refrigerated, or thawed expressed human milk from the parent or other individual(s) (e.g., donor human milk) given by vessel (e.g., a bottle, cup, spoon

¹Department of Family Medicine, School of Medicine, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

²Department of Health Promotion and Development, School of Nursing, University of Pittsburgh, Pittsburgh, PA, USA

³Independent, Carrboro, NC, USA

Date submitted: November 22, 2024; Date accepted: November 23, 2024.

Corresponding Author:

Ellen Chetwynd, MPH, BSN, IBCLC, PhD, Department of Family Medicine, School of Medicine, University of North Carolina at Chapel Hill, 321 S Columbia St, Chapel Hill, NC 27599, USA.
Email: chetwynd@med.unc.edu

or other supplemental device). In neonatal intensive care units, premature infants might receive human milk fortified with a human milk-based fortifier, adding another layer of complexity to the definition. When operationalizing breastfeeding exclusivity, given these variations, there are several things to consider.

First, maternal experience might be significant to the outcome of interest. It may be important to determine whether any nursing occurs at the breast (Boone et al., 2016) and, if it does not, whether the milk fed to the infant is fresh or frozen. In studies addressing the impact of breastfeeding exclusivity on maternal health, maternal lactation would be the focus. In these cases, donor or shared human milk would not be included in the definition of exclusivity, as the study focuses on maternal sufficiency rather than infant intake.

Second, the assessment period for breastfeeding exclusivity is also critical. While questions about overall breastfeeding duration often yield reliable recall even years after breastfeeding ends, maternal recall for the timing of exclusive breastfeeding cessation can be limited, as it requires remembering the first instance of any supplemental feeding (Amissah et al., 2017).

Third, researchers should also decide how brief formula use or temporary interruptions of exclusive breastfeeding will be classified when assessing since-birth exclusivity. In some instances, documenting regular supplemental feeding might be more important than the first supplemental feeding.

Finally, the language used in questions to the parents needs to be comprehensible, as clinicians' and researchers' terminology (e.g., milk expression, fortification, donor milk) may not always be clear to respondents. Each scenario requires tailored questions to capture the nuances of the feeding method, the substance provided, and the relevant context and assessment time frame.

Data Collection Considerations

Most commonly, exclusive versus non-exclusive breastfeeding is assessed via a survey with a yes/no question at a single time point, using recall over a short period (e.g., the past 24 hours, past week) for infants under 6 months old. Alternatively, exclusivity can be recalled since birth by asking about breastfeeding directly or by asking about the timing of the introduction of other nutrition or foods. Less frequently, more detailed methods such as journaling or reviewing intake from health records or more objective measures (e.g., deuterium oxide dose-to-the-mother; Slater et al., 2019) are used, although these approaches can be time-consuming and less practical for routine data collection. In other cases, one may be interested in measuring the degree of exclusivity (i.e., the proportion of human milk feeds) over a specified period of time.

Researchers are constrained in their definition and measurement of breastfeeding exclusivity by the availability and quality of data, study-specific outcomes of interest, and

feasibility of data collection in different contexts. At the same time, researchers and research consumers need to be aware that even small modifications to breastfeeding exclusivity definitions and measurements can lead to vastly different findings and limit comparability between studies. For example, Chabé-Ferret (2024) compared strict exclusive breastfeeding (no additional water) to quasi-exclusive breastfeeding (including water supplementation) across 267 Demographic and Health Surveys (DHS) in 87 countries. They found that the mean percentage of exclusively breastfed infants was 20 percentage points higher in the quasi-exclusive breastfeeding analysis. In a study on the collection of exclusive breastfeeding data in a hospital setting, Zakarija-Grković (2012) looked at four different charting methods and found discrepancies that ranged from 3% exclusive breastfeeding to 82% exclusive breastfeeding, depending on the methods used to collect and record the data. These examples highlight the importance of both clear descriptions of exclusive breastfeeding measurement within research reports and the need to exercise caution in comparing exclusivity data across studies.

When researchers are in a position to direct how exclusivity data will be collected, one important but often overlooked consideration involves accounting for the reliability of the respondent. In many cases, multiple individuals share feeding responsibilities, such as when families use daycare or childcare providers. A single caregiver (e.g., mother) may not be aware of all the infant feeding details while apart from their infant. Including questions about the respondent's time spent with the baby, whether they are the primary caregiver responsible for feeding, and then asking that person about feeding practices could enhance the quality of the dataset.

Interpretation of Exclusive Breastfeeding

When researchers use the WHO/UNICEF methodology of 24-hour recall data to estimate the point prevalence of exclusive breastfeeding across a population (Multiple Indicator Cluster Survey 7 [MICS7] & UNICEF, n.d.), it is crucial to understand that it is not the population's since-birth 6-month exclusive breastfeeding prevalence or exclusive breastfeeding *at* 6 months. Instead, it reflects the rate of past-24-hour exclusive breastfeeding *among* infants under 6 months of age, reported as exclusive breastfeeding *up to* 6 months (Hector, 2011). While this method is used in many forums, making the outcome comparable to large datasets, it overestimates the true prevalence of exclusive breastfeeding (Alayón et al., 2022; Andarge et al., 2021; Pullum, 2014). Other sources for standardized questions can be found on the United States Center for Disease Control and Prevention (U.S. CDC, n.d.) website, including the Infant Feeding Practices Survey II (IFPS II; U.S. CDC, 2024a), and the U.S. CDC National Center for Health Statistics National Immunization Survey (U.S. CDC, 2024b). While these

sources provide a bank of standardized questions, their outcomes, like the WHO/UNICEF questions, have limitations in what they measure.

There are modifications that can be used to improve point prevalence data; for example, lengthening the window of recall to a week has produced more accurate results than 24-hour recall (Andarge et al., 2021) but has not been widely implemented. Recall of exclusivity at specific ages can better demonstrate trends in the duration of exclusivity than point prevalence (Greiner, 2014). However, this requires researchers to follow infants over time and to manage complex data including discrepancies in recall at different points among the same respondent.

In order to measure the full 6 months of exclusivity (matching global recommendations) rather than exclusive breastfeeding during the first 6 months requires data collection after the 6-month window has passed, once the infant is over 6 months of age. Using this measure, the day or month when the first substance other than human milk was given would indicate the cessation of exclusive breastfeeding, even if this occurrence was transient. While this method introduces recall bias, it estimates the population prevalence of exclusive breastfeeding to the full recommended 6 months and the total duration of exclusive breastfeeding during this time. This method would clearly provide a different estimate than point prevalence techniques (Isiguzo et al., 2023), and one approach to managing the difference is to provide data on both point prevalence and since-birth measures (Abdel-Hady & El-Gilany, 2016). As an alternative, it can be common to have interval data that measures exclusivity at 4 to 5.9 and 6 to 7.9 months. When this is the case, Alayón and colleagues' (2022) suggest a method for estimating exclusive breastfeeding at 6 months which calculates the midpoint between these two intervals.

Considerations for Statistical Analysis

Statistical analysis will necessarily vary depending on the measurement of breastfeeding exclusivity. If the outcome is exclusive breastfeeding at a single point in time, the outcome variable would be binary (yes/no), and logistic regression would be a good choice for comparing populations or groups of respondents. Survival analysis can be used if the data allows for when infants “drop out” of exclusive breastfeeding or exclusive human milk feeding. If exclusivity is measured in intervals, for example, if the data came from standardized pediatric visits or survey data at distinct ages, a life table would allow comparison across intervals of time. However, if the data being analyzed provides continuous data about breastfeeding duration, a Kaplan-Meier test might be more appropriate (Fink & Brown, 2006; see, for example, Yourkavitch et al., 2018). Both life tables and Kaplan-Meier tests can account for censored data—participants who are still exclusively breastfeeding at the end of the study window or 6 months of age—although they censor

in different ways. Kaplan Meier calculates censored data when it occurs, whereas life tables make the assumption that censoring occurs at random intervals (Fink & Brown, 2006; Greiner, 2014).

Conclusion

The incorporation of breastfeeding exclusivity as an outcome or variable in clinical and research settings requires a clear definition and measurement, considering study or clinical objectives, data sources, and comparability/generalizability. Researchers must balance the need for precise, standardized measures—like the WHO definition of breastfeeding exclusivity—with practical constraints when considering their study design and clearly and transparently document how they defined the terms and obtained the measures they reported.

Acknowledgments

The authors would like to acknowledge the use of ChatGPT, a language model by OpenAI, for assistance only in refining the clarity and flow of the manuscript. The content, ideas, and conclusions presented are those of the authors and remain the sole responsibility of the authors.

Author Contributions

All authors participated in the conceptualization of the paper as well as writing of the original draft and the final reviewing and editing.

Disclosures and Conflicts of Interest

The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Authors disclose that Dr. Chetwynd was Editor in Chief and Dr. Demirci was the Deputy Editor in Chief of the *Journal of Human Lactation* at the time this paper was written.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

ORCID iDs

Ellen Chetwynd  <https://orcid.org/0000-0001-5611-8778>

Jill Demirci  <https://orcid.org/0000-0002-4802-7849>

Jennifer Yourkavitch  <https://orcid.org/0000-0002-7701-1918>

References

- Abdel-Hady, D. M., & El-Gilany, A. H. (2016). Calculating exclusive breastfeeding rates: Comparing dietary “24-hour recall” with recall “since birth” methods. *Breastfeeding Medicine*, 11(10), 514–518. <https://doi.org/10.1089/bfm.2016.0032>
- Alayón, S., Varela, V., Mukuria-Ashe, A., Alvey, J., Milner, E., Pedersen, S., & Yourkavitch, J. (2022). Exclusive breastfeeding: Measurement to match the global recommendation. *Maternal & Child Nutrition*, 18(4), Article e13409. <https://doi.org/10.1111/mcn.13409>

- Ames, S. R., Lotoski, L. C., & Azad, M. B. (2023). Comparing early life nutritional sources and human milk feeding practices: Personalized and dynamic nutrition supports infant gut microbiome development and immune system maturation. *Gut Microbes*, 15(1), Article 2190305. <https://doi.org/10.1080/19490976.2023.2190305>
- Amissah, E. A., Kancherla, V., Ko, Y.-A., & Li, R. (2017). Validation study of maternal recall on breastfeeding duration 6 years after childbirth. *Journal of Human Lactation*, 33(2), 390–400. <https://doi.org/10.1177/0890334417691506>
- Andarge, S. D., Fenta, E. H., Gebreyesus, S. H., & Belachew, R. Y. (2021). One-week recall period gives a more accurate estimate of exclusive breastfeeding practice than 24-h recall among infants younger than six months of age. *International Breastfeeding Journal*, 16(1), 65. <https://doi.org/10.1186/s13006-021-00411-2>
- Boone, K. M., Geraghty, S. R., & Keim, S. A. (2016). Feeding at the breast and expressed milk feeding: Associations with otitis media and diarrhea in infants. *The Journal of Pediatrics*, 174, 118–125. <https://doi.org/10.1016/j.jpeds.2016.04.006>
- Chabé-Ferret, B. (2024). Measuring breastfeeding prevalence using demographic and health surveys. *BMC Public Health*, 24(1), Article 2366. <https://doi.org/10.1186/s12889-024-19821-y>
- Fink, S. A., & Brown, R. S., Jr. (2006). Survival analysis. *Gastroenterology & Hepatology*, 2(5), 380–383.
- Greiner, T. (2014). Exclusive breastfeeding: Measurement and indicators. *International Breastfeeding Journal*, 9(1), 18. <https://doi.org/10.1186/1746-4358-9-18>
- Hector, D. J. (2011). Complexities and subtleties in the measurement and reporting of breastfeeding practices. *International Breastfeeding Journal*, 6, 5. <https://doi.org/10.1186/1746-4358-6-5>
- Isiguzo, C., Documet, P., Demirci, J. R., Youk, A., Mendez, G., Davis, E. M., & Mendez, D. D. (2023). Comparative assessment of exclusive breastfeeding rates from 24-hour recall and since birth methods in Southwestern Pennsylvania using ecological momentary assessment. *Journal of Human Lactation*, 39(4), 584–594. <https://doi.org/10.1177/08903344231193734>
- Lin, B., Dai, R., Lu, L., Fan, X., & Yu, Y. (2020). Breastfeeding and atopic dermatitis risk: A systematic review and meta-analysis of prospective cohort studies. *Dermatology*, 236(4), 345–360. <https://doi.org/10.1159/000503781>
- Multiple Indicator Cluster Survey 7, & United Nations Children's Fund. (n.d.). *Tools: MICS7 complementary questionnaire topics—Infant and young child feeding*. <https://mics.unicef.org/tools#survey-design>
- Pullum, T. W. (2014). Exclusive breastfeeding: Aligning the indicator with the goal. *Global Health: Science and Practice*, 2(3), 355–356. <https://doi.org/10.9745/GHSP-D-14-00119>
- Slater, C., Kaestel, P., & Houghton, L. (2019). Assessing breastfeeding practices objectively using stable isotope techniques. *Annals of Nutrition and Metabolism*, 75(2), 109–113. <https://doi.org/10.1159/000503667>
- United States Center for Disease Control and Prevention. (2024a). *Breastfeeding data: Infant Feeding Practices Study (IFPS) II—Questionnaires and modules*. <https://www.cdc.gov/breastfeeding-data/studies/questionnaires.html>
- United States Center for Disease Control and Prevention. (2024b). *Breastfeeding data: Breastfeeding rates: Survey questions—Wording of the breastfeeding questions*. <https://www.cdc.gov/breastfeeding-data/survey/questions.html>
- United States Center for Disease Control and Prevention, National Center for Health Statistics. (n.d.). *National Health and Nutrition Examination Survey—2019–2020 questionnaire variable list*. <https://www.cdc.gov/nchs/nhanes/Search/variablelist.aspx?Component=Questionnaire&Cycle=2019-2020>
- Victora, C. G., Bahl, R., Barros, A. J. D., França, G. V. A., Horton, S., Krasevec, J., Murch, S., Sankar, M. J., Walker, N., & Rollins, N. C. (2016). Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. *The Lancet*, 387(10017), 475–490. [https://doi.org/10.1016/S0140-6736\(15\)01024-7](https://doi.org/10.1016/S0140-6736(15)01024-7)
- World Health Organization, & United Nations Children's Fund. (2021). *Indicators for assessing infant and young child feeding practices: Definitions and measurement methods*. <https://apps.who.int/iris/handle/10665/340706>
- Yourkavitch, J., Rasmussen, K. M., Pence, B. W., Aiello, A., Ennett, S., Bengtson, A. M., Chetwynd, E., & Robinson, W. (2018). Early, regular breast-milk pumping may lead to early breast-milk feeding cessation. *Public Health Nutrition*, 21(9), 1726–1736. <https://doi.org/10.1017/S1368980017004281>
- Zakarija-Grković, I. (2012). Exclusive breastfeeding in the hospital: How accurate are the data? *Journal of Human Lactation*, 28(2), 139–144. <https://doi.org/10.1177/0890334412437764>