Analysis of the Reversal in Breast Feeding Trends in the Early 1970s

KENNETH W. ECKHARDT PhD
GERRY E. HENDERSHOT, PhD

Dr. Eckhardt is Associate Professor, Department of Sociology, College of Arts and Science, University of Delaware. Dr. Hendershot is Director of Research and Evaluation, Office of Adolescent Pregnancy Programs, Office of the Assistant Secretary for Health, Department of Health and Human Services.

Tearsheet requests to Kenneth W. Eckhardt, PhD, Department of Sociology, College of Arts and Science, University of Delaware, 322 Edward Laurence Smith Hall, Newark, Del. 19716.

Synopsis

The long downward trend in the practice of breast feeding was reversed during the 1972–73 period. Data from the National Survey of Family Growth conducted by the National Center for Health Statistics were used to investigate the social correlates of breast feeding during the periods 1970–72 and 1973–75 to determine if these factors were related to the reversal in the breast feeding trend.

A multivariate log linear modeling technique was used to test hypotheses regarding the direct and indirect effects of education, race, employment status, and source of prenatal care. While education, race, and employment status were directly related to the breast feeding decision, the analysis showed that the trend in breast feeding was unrelated to these correlates.

Two alternate conclusions may be drawn from these findings: first, it is possible that changes in infant feeding practices occur earlier in some groups than in others, but the characteristics that distinguish such groups are not included in conventional social demographic data. Alternately, it is possible that the practice of breast feeding appeals equally to all social groups, and changes in the practice occur in response to broad social forces which affect society as a whole.

A DRAMATIC REVERSAL in breast feeding trends occurred in the early 1970s. The long downward trend in breast feeding, which had begun at least two generations before (*1*), reached its low point in 1972 and then began to climb rapidly upward, reaching levels higher than any previously recorded. The low point was reached in 1972 when only 22 percent of newborn infants in hospitals were breast fed (*2*). By 1980, the last year for which there is a published estimate, that figure had risen to 55 percent (*3*), two and one-half times as high as it had been just 8 years earlier. So quick a national turnaround in health-related personal behavior is rare in American history and perhaps unprecedented in times of peace. An understanding of how and why the change occurred would be helpful to specialists in the field of infant health as well as those in other public health fields who depend on changes in personal health habits for results.

One approach to an investigation of the causes of changes in personal health practices is to identify the special characteristics of the groups who made the changes or those who changed first. That was our approach: the infant feeding practices of women in different socioeconomic groups were compared for two time periods—before and after the breast feeding trend was reversed—1970–72 and 1973–75. Should one group stand out for the rapidity with which it switched to breast feeding in this period, its characteristics could provide clues to the underlying cause of the change.

The data for this study came from the National Survey of Family Growth, Cycle II (NSFG), which was conducted by the National Center for Health Statistics in 1976. Surveyed was a representative national sample of 8,611 women, aged 15–44, who were currently or formerly married or single with children. Interviews were conducted in their homes. For each baby who lived at least 2 months, each mother was asked if she had breast fed "at all." The measure of breast feeding in this report is the percent of babies born in the period 1970 through 1975 whose mothers reported that they were breast fed. There were 5,573 babies born to women in the sample in those 6 years, but they are representative of 19,555,000 babies born in the population because each sample baby represented on the average about 3,500 births in the population. The babies represented by the NSFG sample comprise about 98 percent of the 19,987,000 babies born from 1970 through 1975 in the United States (*4*). The statistics on breast feeding in this report were based on the sample cases, but they were adjusted to project estimates for the population. Because they are estimates based on a sample, the statistics are subject to some sampling error. The details of the sampling plan, the estimating procedure, and sampling error have been described elsewhere (*5*).

About 26.5 percent of the babies born in the 6-year period were breast fed. In the first half of the period, 1970–72, when breast feeding was still declining, about 23.6 percent were breast fed. From 1973–75, the second half of the period, which marked the beginning of the upward trend that has continued to the present, 29.8 percent of the newborns were breast fed. Our particular interest, however, is to compare breast feeding trends in different subgroups of the population. The basic data for

Table 1. Number of infants and percent breast fed at all, by mother's race, employment status, education, source of prenatal care, and baby's year of birth

Race, employment status, education, and source of care	Born 1970–72		Born 1973–75	
	Number of infants	Percent breast fed	Number of infants	Percent breast fed
White, employed				
High school or less:				
Own physician	341	17	238	23
Clinic	74	21	66	16
More than high school:				
Own physician	126	43	103	42
Clinic	25	28	17	50
White, not employed				
High school or less:				
Own physician	663	22	653	26
Clinic	194	14	197	29
More than high school:				
Own physician	246	39	237	58
Clinic	24	62	24	45
Black, employed				
High school or less:				
Own physician	202	12	149	15
Clinic	170	12	125	15
More than high school:				
Own physician	91	11	67	16
Clinic	52	34	31	23
Black, not employed				
High school or less:				
Own physician	246	13	244	19
Clinic	357	10	368	10
More than high school:				
Own physician	38	15	30	35
Clinic	26	28	23	18

such comparisons are given in table 1, which shows the percent of babies breast fed in each period (1970–72 and 1973–75) with the groups classified according to the mother's race, employment status, education, and whether the mother's physician or a clinic provided prenatal care. The numbers of cases on which the estimates were based are also shown in table 1.

Explanatory Factors

The four characteristics of mothers used to classify were selected because of their known or suspected relationship to trends in breast feeding.

Race. During the long decline in breast feeding which ended in 1972, the rate fell more rapidly for black women than for white women (*1*), so much more rapidly that black women, who once were considerably more likely than white women to breast feed, were much less likely to breast feed by the time the decline ended. Since race was a factor in the downward trend, it may also have figured in reversing the trend.

Employment status. Employment is often mentioned as a potential obstacle to breast feeding because job situations may not provide the time or surroundings needed by nursing mothers (*6*). There is some evidence that working women are less likely to breast feed, although the difference between working and nonworking mothers is not large while they are in the hospital (*1,3*). Since 1972 women have won improvements in employment conditions; maternity leaves have been adopted more widely, and they have been lengthened, making breast feeding easier for working mothers. Thus employment may now tend to have a weaker effect on breast feeding. Mothers were counted as employed if they were employed at the time of interview. It would have been preferable to have based that classification on employment status during or soon after the pregnancy. Unfortunately, that information was not available for all mothers, just those who had given birth recently. Since current employment status correlates closely with past employment status, it is a good, though not precise indicator of employment factors which may affect infant feeding decisions.

Education. Changes in behavior tend to be made earlier by well-educated persons. Thus bottle feeding began among better educated mothers and only later spread to the others (*1*). Education presumably makes people more receptive to new ideas and more willing to adopt them. It was to be expected, therefore, that as the benefits of breast feeding became evident in the 1960s and early 1970s, educated women would be the first to breast feed their babies.

Provider of prenatal care. During this period health professionals, especially pediatricians, began to advise mothers to breast feed rather than bottle feed their babies (*7*). Their advice was amplified and reinforced by the mass media, especially women's magazines, and by organizations such as La Leche. It has been suggested that the change in medical opinion on breast feeding played a role in reversing the trend toward bottle feeding (*8*), just as the earlier lack of support for breast feeding by the medical profession was suggested as a cause of its decline (*9*). While the NSFG provides no explicit information about the advice on infant feeding received by mothers from their physicians, it gives the source of prenatal medical care which may have bearing on the kind of advice given. We reasoned that because clinic patients may be seen by a different physician during each prenatal visit, physicians in a clinic are less likely than private physicians to take the time to establish the rapport needed to discuss a "new" idea like breast feeding (*10*). Lacking the support of her prenatal care physician, the clinic patient may be less likely to choose breast feeding. This circumstance may have been true particularly at a

'Among the factors examined in this study, the educational level of the mother appears to have the greatest single effect on the breast feeding decision. Education alone, independent of any association it may have with race, employment status, source of prenatal care, or year of infant's birth, accounts for a large part of the difference in breast feeding among the groups . . .'

time when breast feeding was being practiced by only a few mothers, and it was not being provided for by many maternity wards (*11*). Thus if their prenatal care was provided by clinics, mothers could be expected to lag behind the trend toward breast feeding.

Each of these factors—race, employment status, education, and source of prenatal care—has been related to the trend toward breast feeding in one or more published studies singly, but never in combination. It is difficult to interpret these one-to-one comparisons. The association between one factor and infant feeding trends may be spurious because the result may depend on a third factor. Furthermore, two or more of the four factors may interact in their effect on breast feeding because one factor, such as education, may in turn depend for its magnitude and even direction on another, such as race. For instance, education might accelerate the return to breast feeding among white mothers, but retard it among black women. Only by considering several variables simultaneously can we rule out spurious relationships and uncover interactions. Our study is not an exhaustive analysis of all factors that may be relevant to the decision to breast feed or to the observed trends. We have focused only on a few of the more important factors which are discussed in the literature and are accessible in the NSFG II survey.

Statistical Analysis

The data in table 1 were analyzed using a log-linear modeling technique (*12*). We sought to determine which factors, singly or in combination, were essential in accounting for the distribution of breast feeding cases. We set up different combinations of relationships among these variables in order to determine if the observed data could be explained by a population characterized by these relationships.

Table 2 describes six different combinations of relationships. Hypothesis 1 (*H*1) postulates that each factor being investigated has the same likelihood of influencing breast feeding among the subgroups. Hypothesis 2 (*H*2) postulates that breast feeding is a function of the main effects of the source of prenatal care, year of infant's birth, and the educational level, race, and employment status of the mother, but that the breast feeding probability is unaffected by the interaction of these variables.

Table 2. Models fitted to data in table 1, goodness of fit tests, and adjusted coefficient of multiple partial determination for selected log linear analysis

Hypothesis	*Model*[1]	*Chi square (1,000s)*[2]	*df*	R^2_{7} *Hn (23456)*[3]
Breast feeding is equally probable among all subgroups	*H*1 (23456)	5,855	32	. . .
Breast feeding is directly affected by source of care, educational level, race, employment status, and year of birth	*H*2 (12) (13) (14) (15) (16) (23456)	168	26	.96
Breast feeding is directly and indirectly affected by source of care, education, race, employment status, year, and all two-way interactions	*H*3 (123) (124) (125) (126) (134) (135) (136) (145) (146)	123	17	.96
Breast feeding is directly and indirectly affected by source of care, education, race, employment, year, and all two-way and three-way interactions	*H*4 (1234) (1235) (1236) (1345) (1346) (1456) (23456)	85	10	.94
Breast feeding is directly and indirectly affected by source of care, education, race, employment, year, and all two-way, three-way, and four-way interactions	*H*5 (12345) (12346) (13456) (23456)	17	4	.97
Breast feeding is directly and indirectly affected by source of care, education, race, employment status, year, and all two-way, three-way, four-way, and five-way interactions	*H*6 (123456) (234561)	. . .	0	1.00

[1] Model variables were as follows:
1 = breast fed (yes, no)
2 = year of breast feeding (1970–72, 1973–75)
3 = source of care (private, clinic)
4 = educational level (high school, less than high school)
5 = race (white, black)
6 = employment status (employed, not employed)

[2] Since the analysis is based on population estimates, that is, weighted sample data, all likelihood-ratio chi-square are highly significant.

[3] See the statistical analysis section for an explanation of this measure. The terms in each model are represented by numbers. Since the models are hierarchical, only the highest order items are shown. All lower order terms contained in the terms are implied. For instance, H1 (23456) contains all main terms (2) (3) (4) (5) (6), all two-way terms (23) (24) (25) (26), all three-way terms (234) (235) (236) (245) (246), all four-way terms (2345) (2346) (3456) as well as the five-way term (23456).

Hypothesis 3 (*H*3) postulates that breast feeding is a function of the main effects of the source of prenatal care, year of infant's birth, educational level, race, and employment status of mother as well as the interaction of these factors taken two at a time. Hypotheses 4, 5, and 6 (*H*4, *H*5, *H*6) go further by postulating that, in addition to the individual and two-way effects, three-way, four-way, and possibly five-way interactions may account for distribution of breast feeding as presented in table 1.

Chi square analysis was used to gauge the likelihood that the observed distribution was drawn from a population having the characteristics specified by hypotheses 1, 2, 3, 4, 5, or 6. Population models that produced high chi squares were less probable candidates than population models that produced low chi squares. In addition to searching for population models that produced "low" chi squares, we sought a population model that was theoretically parsimonious. In this analysis we followed the recommendations of Slesinger and Travis (*13*) supplemented by Goodman's search strategy (*14*). Goodman notes that the fit of population models can be evaluated by determining the reduction in chi square that results as one moves from simple to more complex models.

The strategy was as follows. First, model *H*1, using the assumption that the cell percents observed in table 1 were simply random variations from the mean, was fitted to the data. A chi square "goodness of fit" test was used to measure the success of this assumption. Then an attempt was made to provide a "better fit" by using models incorporating different assumptions. These models increased in complexity. With the random variations model as a baseline, an improvement of fit measure was obtained for each model according to the following formula.

$$R^2_f\, Hn = \left((\chi^2(H1) \div df_1) - (\chi^2(Hn) \div df_n)\right) \div (\chi^2(H1) \div df_1)$$

χ^2 ($H1$) = chi square obtained from fitting model $H1$.
χ^2 (Hn) = chi square obtained from fitting model Hn where n varies from 2 to 3.
df = degrees of freedom appropriate to model being tested.

In this equation, each chi square is adjusted by its degree of freedom to produce an unbiased goodness of fit. Each coefficient can be interpreted as the decrease in "unexplained" variance which results from including terms in each model which were absent in the baseline model, *H*1. The resulting measure is analogous to an adjusted proportional decrease in chi square to the model's better fit and serves as a useful guide for selecting the best fitting model.

Table 2 reports both the initial chi square and the chi square reduction associated with each population model.

Table 3. Effects included in the main effects model, the change in chi square resulting from deleting each main effect independently, and the change in chi square resulting from the independent addition of two-way terms

Effect	Change in chi square associated with effect (1,000s)	Percent change in chi square
Main effects:		
Year	110	65
Source of care	6	3
Education	839	500
Employment status	36	21
Race	196	116
Two-way effects:		
Year and source of care		
Year and education	3	2
Year and employment status	12	7
Year and race	1	. . .
Source of care and education	3	2
Source of care and employment status	2	1
Source of care and race		
Education and employment status	2	2
Education and race	18	11
Employment status and race		

Low chi squares were obtained with population models *H*2, *H*3, *H*4, *H*5, and *H*6. The greatest reduction in chi square occurred as one moved from a population model in which none of the factors were postulated as important (*H*1) to a population model in which source of prenatal care, and educational level, race, and labor force status of the mother were postulated as important (*H*2). However, some of the terms present in model *H*2 may be unnecessary, for it may be desirable to incorporate some of the two-way terms present in model *H*3.

The analysis presented in table 3 is based on two independent stepwise procedures. First, model *H*2 was examined to determine if any of the main effects included in the model could be eliminated without impairing the fit of the predicted to the observed values of table 1. Next, two-way terms, one at a time, were added to model *H*2 to determine if the addition of selected terms had a beneficial effect in reducing chi square.

Findings

Among the factors examined in this study, the educational level of the mother appears to have the greatest single effect on the breast feeding decision. Education alone, independent of any association it may have with race, employment status, source of prenatal care, or year of infant's birth, accounts for a large part of the differences in breast feeding among the groups presented in table 1. Race was the second most important factor. White women were more likely to breast feed than black women. The third most important factor, and one of great

Table 4. Comparison of three models: Model *H*1—the model of no effect, Model *H*2—the model of main effects, and Model *H*3—the model of selected main and two-way effects

Model and assumption	Chi square (1,000s)	df	R^2Hn f (23456)
*H*1 No direct or indirect effects	5,855	32	. . .
*H*2 Each independent variable has direct but no indirect effects	168	26	.96
*H*3 Race, education, employment status, year; year and employment status; and education and race have effects on breast feeding	144	25	.97

interest to the purpose of this paper, was the year of the infant's birth. We have already noted that the downtrend in breast feeding in the period 1970–72 was reversed in 1973–75, but this analysis further indicates that the upward trend was not the spurious result of some change in the characteristics of mothers with respect to race, employment status, education, or source of prenatal care. Finally, it should be noted that employment status has a small but direct effect on breast feeding. The source of prenatal care appears to play only a small role in the decision to breast feed.

An examination of the addition of two-way interactions explained little. Only the interactions of race and education, and employment status and year of infant's birth appeared to have minor statistical importance and possibly some theoretical relevance. It is possible that education has slightly different effects for blacks and whites, and the interaction of employment status and year of infant's birth provides a hint of a suggestion that changes in the work environment and maternity leave policy have influenced working mothers who wish to breast feed their babies.

Table 4 shows the effect of deleting source of prenatal care from model *H*2 and adding the two-way interactions of education and race, and employment status and year of infant birth.

Summary and Conclusion

The sudden reversal in the breast feeding trend from down to up in the 1970s had important implications for infant nutrition and for how other personal health habits may be changed. In seeking to understand the reversal, we tried to identify groups who were first affected by it. Previous research and observation raised the possibility that early participation in the new trend toward breast feeding was affected by factors such as a mother's race, employment, education, and the source of her prenatal care. We used retrospective survey data about infant feeding for babies born in the periods 1970–72 and 1973–75 to examine the relevant factors, applying a multivariate statistical technique that allowed us to test for various interactions among the explanatory factors and trends in breast feeding. We found that there were extremely large differences in breast feeding with respect to both education and race: well-educated women and white women were more likely than their black and less-educated counterparts to breast feed. The differences existed independently of each other and of employment, source of prenatal care, and time period. Also, we found that the reversal from 1970–72 to the 1973–75 period was not the spurious result of a change in the composition of the population of women who gave birth in the two periods, at least with respect to race, education, employment, and source of prenatal care. In other words, there was a real upward trend. However, and this is important for the purpose of our study, we found that the reversal in breast feeding trends was no more likely to occur in any one group whether it be in respect to race, education, or source of prenatal care. It was only marginally more likely to occur among employed women than among nonemployed women.

This failure to find factors associated with the new trend toward breast feeding is similar to the failure of earlier researchers to find factors associated with the decline in breast feeding (*9*). Two inferences may be drawn from these failures. The first is that changes in infant feeding practices occur earlier in groups of women with certain characteristics, but they are not broad social characteristics, such as race and education, but subtler, perhaps psychological factors, which cannot be measured by a multipurpose, cross-sectional survey. The second inference is that no particular factors predispose some groups to the early adoption of a new infant feeding practice. Instead there are general and pervasive social influences, such as the mass media, public opinion, and "fashion," which affect all major segments of a society. Since all groups are influenced to the same extent, they adopt a new infant feeding practice at equal rates; the time of adoption by particular women in these groups is largely a matter of chance.

References

1. Hirschman, C., and Hendershot, G. E.: Trends in breast feeding among American mothers. Vital Health Stat [23]

No. 3. DHEW Publication No. (PHS) 79–1979. Hyattsville, Md., 1979.
2. Hendershot, G.: Trends and differentials in breast feeding in the United States, 1970–75. Working Paper No. 5. National Center for Health Statistics, Hyattsville, Md., June 1981.
3. Martinez, G. A., Dodd, D. A., and Samartgedes, J. A.: Milk feeding in the United States during the first 12 months of life. Pediatrics 68: 863–868 (1981).
4. National Center for Health Statistics: Vital statistics of the United States, 1975. Vol. 1. Natality. DHEW Publication No. (PHS) 78–1113. Hyattsville, Md., 1978.
5. Grady, W.R.: National Survey of Family Growth, Cycle II: sample design, estimation procedures, and variance estimation. Vital Health Stat [2] No. 87. DHHS Publication No. (PHS) 81–1361. Hyattsville, Md., 1981.
6. McCann, M. F., Liskin, L. S., Piotrow, P. T., and Rinehart, W.: Breast-feeding, fertility, and family planning. Population Reports, Series J, No. 24. Baltimore, Md., November–December 1981.
7. American Academy of Pediatrics: Commentary on breastfeeding, including proposed standards for formulas. Pediatrics 57: 278–285 (1976).
8. Butz, W. P.: Infant feeding: three questions and a caveat. Rand Paper Series, No. P-6673. Santa Monica, Calif., June 1981.
9. Hirschman, C., and Butler, M.: Trends and differentials in breast feeding: an update. Demography 18: 39–54 (1981).
10. Burne, S. R.: Breast feeding. Lancet No. 7979: 261, (1976).
11. Knafl, K.: Conflicting perspectives on breast feeding. Am J Nurs 74: 1848–1851, October 1974.
12. Swafford, M.: Three parametric techniques for contingency table analysis: a nontechnical commentary. Am Sociol Rev 45: 664–690 (1980).
13. Slesinger, D. P., and Travis, H. P.: A study of infant mortality in Wisconsin, 1969. From linked birth and death records: an application of log linear models. Paper presented at the annual meetings of the Population Association of America, Seattle, Wash., 1975.
14. Goodman, L. A.: A modified multiple regression approach to the analysis of dichotanous variables. Am Sociol Rev 37: 28–46 (1972).

Marital Status and Its Relation to the Use of Short-Stay Hospitals and Nursing Homes

W. FRANK LEWIS, MA

Tearsheet requests to Mr. W. Frank Lewis, Special Assistant to the Director, Division of Health Care Statistics, National Center for Health Care Statistics, Center Bldg., 3700 East-West Highway, Rm. 2–43, Hyattsville, Md. 20782.

Synopsis

Marital status has been associated with a wide variety of health indices and health practices. To better understand the relation of marital status to use of health facilities, discharge data from two surveys conducted by the National Center for Health Statistics—the 1979 National Hospital Discharge Survey and the 1976 National Nursing Home Survey—were examined by marital status, sex, age, diagnosed condition, and, for nursing home data, source of payment.

For the four marital status categories considered in this analysis (married, never married, separated and divorced, and widowed), married and never married persons had the lowest overall discharge rates and widowed persons had the highest. Among men in each of the categories, those less than 45 years of age had the lowest rates, while never married and widowed men 45 and older generally had the highest rates. Among persons 45 years of age and older, the married—especially women—had the lowest rates and the never married—especially men—had the highest rates. A consistent finding was that, for never married persons, rates of use for both short-stay hospitals and nursing homes, as measured by discharge rates, increased to a greater degree with age than they did for the other marital groups.

The possible reasons for the difference in use of health facilities by the different marital groups are discussed and the importance of marital status as a determinant of such use is stressed.

THE RELATION BETWEEN MARITAL STATUS and health has been the subject of a number of population-based studies in the United States. Evidence has been found that links marital status to such diverse health indices as general mortality, automobile-related fatalities, depressive symptomatology, and alcoholism. The differences in the indices for people in different marital status categories have generally been explained as resulting from varying lifestyles associated with marital status and the effect of these lifestyles on health.

It is generally recognized that marriage offers security and social support and that married people are often happier than unmarried ones (*1–3*). Also, the married are believed to enjoy better nutrition and to get more sleep