

# Association of Health Profession and Direct-to-Consumer Marketing with Infant Formula Choice and Switching

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**ABSTRACT: Background:** Infant formula is marketed by health professionals and directly to consumers. Formula marketing has been shown to reduce breastfeeding, but the relation with switching formulas has not been studied. Willingness to switch formula can enable families to spend less on formula. **Methods:** Data are from the Infant Feeding Practices Study II, a United States national longitudinal study. Mothers were asked about media exposure to formula information during pregnancy, receiving formula samples or coupons at hospital discharge, reasons for their formula choice at infant age 1 month, and formula switching at infant ages 2, 5, 7, and 9 months. Analysis included 1,700 mothers who fed formula at infant age 1 month; it used logistic regression and longitudinal data analysis methods to evaluate the association between marketing and formula choice and switching. **Results:** Most mothers were exposed to both types of formula marketing. Mothers who received a sample of formula from the hospital at birth were more likely to use the hospital formula 1 month later. Mothers who chose formula at 1 month because their doctor recommended it were less likely to switch formula than those who chose in response to direct-to-consumer marketing. Mothers who chose a formula because it was used in the hospital were less likely to switch if they had not been exposed to Internet web-based formula information when pregnant or if they received a formula sample in the mail. **Conclusions:** Marketing formula through health professionals may decrease mothers' willingness to switch formula. (BIRTH 40:1 March 2013)

**Key words:** formula feeding, formula marketing, formula switching, health profession marketing, longitudinal analysis with time-varying covariates

Infant formula is regulated by the Food and Drug Administration, which requires that formulas sold in the United States contain all of the nutrients in specified amounts known to be necessary for infant development and be tested for quality (1). Because of these

requirements, all formulas are nutritionally adequate with acceptable quality (2).

Although the World Health Organization has developed a code against marketing infant formula by the health professions or directly to consumers (3), marketing

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of infant formula by the health professions near the time of birth is commonly done in the United States by indicating to mothers the specific formula fed to infants in the hospital; giving gift bags to mothers that include formula samples, coupons, or both; and displaying formula materials in physicians' offices (4–7). In 2006 to 2007, 94 percent of hospitals in the eastern United States gave new mothers gift bags with a formula sample (5), and the sample in the gift bag was nearly always for the formula used in the hospital (2,7). Formula marketing through the health professions has been shown to interfere with breastfeeding (4,6,8).

Infant formula is also marketed in the United States directly to consumers through mass media advertising, coupons, and free formula sent to pregnant women and new mothers; websites promoting infant formula; and grocery store displays (9,10). Most formula advertisements include health or infant development statements (11). Mass media advertising has increased in recent years (10), and studies have suggested that it adversely affects breastfeeding rates (12,13). Formula may also be promoted in media stories that either frame formula positively or frame breastfeeding negatively (13). Many magazine articles about infant feeding discuss both breastfeeding and infant formula (15), so that women exposed to information about one topic are also likely to see information related to the other.

All infant formula for healthy infants is produced by four companies in the United States (2). These companies sell formula under a variety of brand names, and some also sell it in various forms (ready-to-feed, concentrate, and powdered forms). Two companies market through the health professions and price their formulas higher than the other two (2). All U.S. formula companies market directly to consumers (2,16). Research and advocacy about health profession marketing of infant formula have focused on the impact on breastfeeding (4,6,17,18), that is, the effect marketing activities have on the number of formula users. However, another possible effect is that health profession marketing may limit switching formula brand or switching the specific formula product (such as basic formula or one with added ingredients to address a specific infant condition) within a brand among mothers who already use formula. Similarly, another possible effect of direct-to-consumer formula marketing may be a mother's increased willingness to switch formula, as suggested by the increased market share of companies that first began marketing directly to consumers (16). Willingness to switch formula brand or product is necessary to take advantage of sales and to use a low-priced formula if the mother began using a high-priced one.

This analysis evaluates the associations between formula marketing, reason for choosing the formula fed to

the infant at age 1 month, and switching formula brand or product through the infant's first 9 months of life.

## Methods

Data came from the Infant Feeding Practices Study II (IFPS II), a longitudinal study of infant feeding practices in the United States with data collected between May 2005 and June 2007. The sample was drawn from a nationally distributed consumer opinion panel. Criteria for inclusion included the following: mother aged 18 years or more; singleton birth; neither mother nor infant had a health condition likely to affect infant feeding; gestational age at birth 35 weeks or over; birthweight 5 pounds or more; and infant stayed 3 days or less in a neonatal intensive care unit. Compared with a nationally representative sample of United States mothers, the IFPS II sample overrepresents mothers who are older, more highly educated, higher income, white, and employed.

Questionnaires were mailed to mothers once prenatally and 10 times over the infants' first year; 3,033 mothers qualified for the study and answered at least one postnatal questionnaire. This analysis is based on 1,718 mothers who fed their infants formula in the first month and answered at least one questionnaire that asked about formula switching. The details of the overall IFPS II design and response rates have been published previously (19).

We measured formula switching in two ways. The first was whether the mother had switched formula in the past 2 weeks at infant ages 2, 5, 7, and 9 months for reasons other than the infant having a health problem with the formula being used. The second was the number of times the mother had switched formula for any reason in the past 2 weeks at those ages. We assumed that mothers who switched for reasons other than infant intolerance were likely to have switched in response to marketing activities, such as a lower price or having a coupon or sample for a different formula. We analyzed the number of formula switches for all reasons to include switches because of perceived formula intolerance, particularly because studies show that mothers are more likely than physicians to perceive their infants as being intolerant of standard formula (20), and hence such switches may be influenced by formula marketing.

The formula switching questions were the following: "During the past 2 weeks, how many times have you switched the formula you feed your baby?" and "Did you switch formula because your baby had a problem with the formula you were using?" A follow-up question asking the mother which formula she switched from

clarified that formula switch meant using a different brand; base (e.g., milk or soy); or product within a brand (e.g., a formula with docosahexaenoic acid and arachidonic acid or without these fatty acids), but not different forms (e.g., from liquid concentrate to powdered). (Formulas without docosahexaenoic acid and arachidonic acid were sold in the United States at the time of data collection.)

We analyzed exposure and response to two types of formula marketing in the perinatal period: health profession marketing activities and direct-to-consumer marketing. The latter included prenatal media information about infant formula (articles, advertisements, and other types of information) and formula samples sent to the home, labeling statements, sales, or other promotions.

We used the reason for choosing the formula fed at infant age 1 month as an indicator of response to both types of marketing. The question in the month 1 survey asked: "How did you decide to use the formula you fed your baby in the past 7 days?" The 10 options included all influences listed in the Cutler and Wright (16) decision model for choosing infant formula, including doctor recommendation, same formula fed to the baby at the hospital, sample or coupon, advertisement, same formula fed to an older child, friend or relative recommendation, and given by WIC (the Special Supplemental Nutrition Program for Women, Infants, and Children). The other options included the following: labeled as useful for a problem the baby had, heard that the formula was better for my baby in some way, and low price.

Maternal exposure to health profession marketing activities was measured by receiving a gift bag from the hospital at discharge after birth that contained a formula sample, a coupon, or both. Response to health profession marketing was measured by choice of the formula fed at infant age 1 month based on a doctor's recommendation or because it was the formula used in the hospital. Exposure to direct-to-consumer marketing activities was measured by the mother's prenatal exposure to media information about infant formula; saw or heard information about infant formula in the broadcast media (television or radio); in print media (magazines, newspapers, billboards, or posters); or on the Internet or web. In addition, one direct-to-consumer marketing exposure occurred either prenatally or postnatally—received samples of formula in the mail by infant age 1 month. We measured response to perinatal direct-to-consumer marketing by choice of the month 1 formula for marketing reasons: sample or coupon, advertisement, labeled as useful for a problem the baby had, heard it was better for the baby, or low price.

We consistently controlled for the following potentially confounding variables: mothers' sociodemographic characteristics (age, education, poverty level, and parity); infant characteristics (infant age, gestational age at birth, birthweight, gender; WIC participation in month 1; having stool characteristics that mothers might interpret as indicating a formula intolerance, hard, semi-watery, or watery stools) (20,21); having other symptoms that might be interpreted as a formula intolerance (diarrhea, vomiting, fussiness) (20,22); and select infant feeding characteristics: ever breastfed, percent of milk feeds that were breastmilk in month 1, breastfeeding duration, and whether the infant was fed a formula that contained docosahexaenoic acid and arachidonic acid in month 1. We used WIC participation at infant age 1 month because it indicates that infants were given the WIC formula at the time they began consuming formula. The WIC program generally did not provide enough formula for all of the infants' needs at the time of this data collection, particularly at older infant ages (2,16).

#### *Data Analysis*

We used multivariate logistic regression and longitudinal data analysis methods, including both marginal effect models (SAS/PROC GENMOD using generalized estimation equations to provide robust estimates) and random effect models (SAS/PROC GLIMMIX to account for the potential heterogeneity in the data beyond the observed covariates). When a covariate was measured several times, as was infants' age in months, infants' stool characteristics, and other symptoms of formula intolerance, we treated it as a time-varying covariate in the longitudinal models. Data were analyzed using SAS version 9.1 software (23).

This study protocol was approved under expedited review by the institutional review board of the U.S. Food and Drug Administration, Silver Spring, Maryland, United States.

#### **Results**

Among this sample of mothers who fed their infants formula in the first month, most received a sample of infant formula from the hospital in a gift bag given at discharge, and two-thirds received a coupon for formula in the gift bag. Nearly all mothers had seen information about formula in the mass media during their pregnancy, with a greater percentage exposed to print and broadcast media and fewer exposed to web information. In addition, more than one-half had received free formula through the mail by infant age 1 month (Table 1).

**Table 1. Demographic, Infant Characteristics, and Formula Marketing Exposure of Mothers Who Fed Formula at Infant Age 1 Month, Infant Feeding Practices Study II (n = 1,718)<sup>a</sup>**

Variable	Percent or mean (SD)
<b>Mother's characteristics</b>	
Mother's age, mean (SD)	28.3 (5.7)
Mother's education	
High school or less	26.2
Some college	43.3
College graduate or more	30.5
Percent of federal poverty level, mean (SD)	245.4 (191.1)
Primiparous	31.3
<b>Infant characteristics</b>	
Gestational age at birth (<39 wk)	37.5
Birthweight (<7.5 lb)	48.4
Infant gender (male)	49.7
Ever breastfed (yes)	74.5
Percent of milk feeds that were breastmilk in month 1, mean (SD)	33.4 (38.6)
Breastfeeding duration (wk), mean (SD)	11.3 (15.4)
Used a formula with DHA and ARA in month 1 (yes)	82.3
Infant participated in WIC month 1 (yes)	35.3
<b>Exposure to formula marketing through health professionals</b>	
Received gift pack from hospital	89.4
Received formula sample in hospital gift pack	83.8
Received coupon for formula in hospital gift pack	66.8
<b>Exposure to formula information through the media or direct-to-consumer marketing activities</b>	
Exposed to prenatal broadcast information (TV, radio)	72.1
Exposed to prenatal Internet or web information	56.5
Exposed to prenatal print information (magazine, newspaper, billboard, poster)	85.4
Received free formula in mail (not including coupons)	56.5

<sup>a</sup>Sample sizes vary slightly because of missing data. SD = standard deviation; DHA = docosahexaenoic acid; ARA = arachidonic acid; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

The largest percentage, about one-third, of mothers chose the hospital formula for their infant in the first month. Although mothers could indicate more than one reason for using a formula, those who chose the hospital formula were coded as "no" for all other reasons so that the results for all other reasons show the distributions among mothers who did not choose the hospital formula. Almost one-fourth of mothers who did not choose the hospital formula chose one their doctor recommended. Other frequently chosen reasons included direct-to-consumer marketing (had a sample or coupon), previous personal experience (fed to an older child), and given by WIC (Table 2). Slightly fewer than one-half (45.7%) of mothers discussed formula choice with a doctor.

Samples and coupons for formula in the hospital gift bag had different associations with choice of the formula used in month 1. Mothers were more likely to use the hospital formula at month 1 if they received at discharge a formula sample, compared with those who did not receive a sample, but were less likely to do so if they received a coupon, compared with those who did not receive a coupon (Table 3). The longitudinal analysis indicated that few mothers switched formula throughout infancy, and most formula switches in the second half of infancy were for nonhealth-related reasons. The percentage of mothers who switched formula for any reason decreased as the infants grew older (Table 4).

**Table 2. Mothers' Reasons for Choosing the Formula Used at Infant Age 1 Month (n = 1,718)**

Reasons for choosing formula	Percent
Health professional marketing or recommendation	
Hospital formula <sup>a</sup>	34.4
Doctor-recommended formula	23.2
Direct-to-consumer marketing reasons	
Had a sample or coupon	19.6
Saw ad and wanted to try it	2.1
Labeled as useful for baby's problem	6.7
Heard is better in some way	8.0
Low price	3.7
Previous experience reasons	
Fed to older child	18.7
Friends or relatives recommended	6.5
Given by WIC	14.2

The percentages do not sum to 100 because mothers could choose all that apply; 22.0% of mothers gave more than two reasons for choosing formula.

<sup>a</sup>Hospital formula means the formula fed to the infant in the hospital. The remaining reasons are coded as "No" if hospital formula = yes. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

**Table 3. The Association between Health Profession and Direct-to-Consumer Formula Marketing and Mother's Use of the Hospital Formula<sup>a</sup> at Infant Age 1 Month (*n* = 1,355)**

Variable	AOR	p
Health profession marketing		
Received sample of formula from hospital	1.74	<0.01
Received a coupon for formula from hospital	0.71	0.01
Direct-to-consumer marketing		
Exposed to prenatal formula information by broadcast media	0.88	NS
Exposed to prenatal formula information by print media	1.09	NS
Exposed to prenatal formula information from the web	1.12	NS
Received sample of formula in the mail by month 1	0.81	NS

The multivariate logistic regression model controlled for mother's age, education, percent of federal poverty level, parity, gestational age, birthweight, infant gender, WIC participation of infant in month 1, ever breastfed, and the percent of milk feeds that were breastmilk in month 1.

<sup>a</sup>Hospital formula means the formula fed to the infant in the hospital. AOR = adjusted odds ratio; NS = nonsignificant.

Although both marginal and random effects longitudinal models were used to evaluate the associations between formula marketing and formula switching while controlling for the 15 confounders, the two methods produced similar results; hence, only the results of the marginal models are reported. If mothers chose the month 1 formula because a doctor recommended it, they were less likely to switch formula for reasons other than infant health. If mothers chose the month 1 formula because they had a sample or coupon, saw an advertisement, thought it was labeled as useful for a problem the baby had, heard it was better for the baby, or had a low price, they were more likely to switch formula for nonhealth reasons and switched more often in later months than mothers who did not choose the month 1 formula for these direct-to-consumer marketing reasons. In addition, mothers were more likely to switch formula for nonhealth reasons if they chose the month 1 formula because they or friends had previous experience with the formula than if they did not choose formula from previous experience, but they were less likely to switch for nonhealth reasons in later months if their infant participated in WIC in the first month, compared with those whose infants were not enrolled in WIC (Table 5).

The relation between formula switching and response to health profession marketing activity, indicated by choosing the hospital formula at month 1, was different depending on whether the mother had been prenatally

**Table 4. Percentage of Mothers Who Switched Formula for Nonhealth Reasons after Month 1, Percentage Who Switched Each Number of Times, and Percentage of Infants with Stool Characteristics and Other Symptoms that Mothers Might Interpret as Signs of Formula Intolerance, by Infant Age in Months**

Variable	Infant age (n)			
	2 Mo (1,346)	5 Mo (1,147)	7 Mo (1,063)	9 Mo (1,008)
Switched formula for nonhealth reasons	8.8	6.1	6.8	6.9
Percentage of mothers who switched formula each number of times for any reason in the past 2 wk				
0	82.5	89.9	92.4	91.7
1	13.7	7.5	5.6	6.3
2	3.2	2.1	2.0	1.3
3	0.4	0.4	0.0	0.7
4	0.2	0.1	0.0	0.0
5+	0.1	0.0	0.0	0.0
Infant had stool characteristic <sup>a</sup> that might indicate formula or food intolerance	27.4	14.3	15.4	17.6
Infant had other symptom <sup>b</sup> that might indicate formula or food intolerance	33.7	22.9	32.8	38.6

<sup>a</sup>Included hard, watery, or semiwatery stools. <sup>b</sup>Included diarrhea, vomiting, and fussiness.

exposed to direct-to-consumer marketing activity, as indicated by significant interaction terms. Mothers who chose the hospital formula at month 1 were more likely to switch formula for nonhealth reasons and switched more frequently if they had prenatally seen information about formula on the web, relative to mothers using the hospital formula who had not seen web information about formula. In contrast, mothers who did not choose the hospital formula had the opposite pattern: They were less likely to switch formula for nonhealth reasons and switched less frequently if they had prenatally seen infant formula information on the web, relative to those who had not seen web information about formula. This result suggests that prenatal exposure to direct-to-consumer marketing on the web overcomes the mother's tendency to continue using the hospital formula if she initially chose it.

Mothers who chose the hospital formula at month 1 were less likely to switch formula for nonhealth reasons and switched less often if they received a sample in the mail, relative to those using the hospital formula who

**Table 5. The Association<sup>a</sup> between Health Profession and Direct-to-Consumer Formula Marketing Activities and Formula Switching in the Past 2 Weeks at Infant Ages 2, 5, 7, and 9 Months**

Measure of Formula Marketing	Switched for Nonhealth Reasons in Past 2 wk (n = 1,346)		Number of Switches in Past 2 wk (n = 1,261)	
	AOR <sup>b</sup>	p	AOR <sup>b</sup>	p
Variable				
Intercept	0.07	NS	0.11	NS
Infant age	0.96	NS	0.88	<0.0001
Health profession marketing or recommendation				
Chose hospital formula at 1 mo	1.20	NS	0.87	NS
Doctor recommended the 1 mo formula	0.62	<0.01	0.84	NS
Received sample at hospital discharge	0.71	NS	0.72	NS
Received coupon at hospital discharge	0.97	NS	1.11	NS
Direct-to-consumer marketing				
Exposure to prenatal broadcast information on formula	0.96	NS	1.00	NS
Exposure to prenatal print information on formula	1.08	NS	1.04	NS
Exposure to prenatal Internet information on formula	0.71	NS	0.70	<0.05
Received sample in mail by age 1 mo	1.54	<0.05	1.26	NS
Chose formula for direct-to-consumer marketing reasons at month 1 <sup>c</sup>	1.38	<0.05	1.38	<0.05
Other				
Chose formula by previous experience at month 1 <sup>d</sup>	1.40	<0.05	1.21	NS
Infant was on WIC in month 1	0.62	<0.05	0.76	NS
Interaction <sup>e</sup> : Exposure to prenatal Internet information by chose hospital formula at month 1	2.16	<0.05	2.13	<0.01
Interaction: Received coupon at hospital discharge by chose hospital formula at month 1	1.27	NS	0.90	NS
Interaction: Received sample at hospital discharge by chose hospital brand at month 1	0.82	NS	1.14	NS
Interaction <sup>e</sup> : Received sample in the mail by chose hospital brand at month 1	0.51	<0.05	0.60	<0.05

<sup>a</sup>Longitudinal logistic regressions modeled switching for nonhealth reasons in past 2 weeks, and longitudinal Poisson regressions modeled number of switches in the past 2 weeks. Results based on the best model fit are reported. Models controlled for mother's age, education, poverty level, parity, gestational age, birthweight, infant gender, WIC participation in month 1, having stool characteristics that mothers might interpret as indicating a formula intolerance (hard, semiwatery, or watery stools), having other symptoms that might be interpreted as a formula intolerance (diarrhea, vomiting, fussiness), ever breastfed, percent of milk feeds that were breastmilk in month 1, breastfeeding duration, and whether the infant was fed a formula that contained docosahexaenoic acid and arachidonic acid in month 1.

<sup>b</sup>The adjusted odds ratio (AOR) is calculated as  $e$  (the mathematical constant approximately equals to 2.718) raised to the power of the coefficient.

<sup>c</sup>Direct-to-consumer marketing reasons for formula choice include the following: had a sample or coupon; saw ad and wanted to try it; labeled as useful for baby's problem; heard is better in some way; and low price.

<sup>d</sup>Previous experience included used for an older child and family or friends recommended the formula.

<sup>e</sup>A significant interaction indicates that the relation between each of the interacting variables and the dependent variable depends on the value of the other interacting variable. In this model, it indicates that the relation between choosing the hospital formula and formula switching depended on whether mothers had been exposed to web-based formula information when pregnant and whether they received a formula sample in the mail. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children; NS = nonsignificant.

did not receive a sample in the mail. Those who did not use the hospital formula in month 1 were more likely to switch formula for nonhealth reasons if they received a mail sample compared with those who did not receive a mail sample. This result suggests that mothers who did not respond positively to health profession formula marketing were more responsive to direct-to-consumer marketing activity. Other exposures to prenatal formula information, including broadcast (television or radio) and print (newspaper, magazine, billboard, or poster) information, were not associated

with later formula switching by either measure (Table 5).

## Discussion

Marketing of infant formula in the perinatal period through the health professions, including hospitals, is extensive in the United States. Implicit and explicit health professional recommendations for a specific formula are associated with mothers' formula choice at

infant age 1 month and their later formula switching behaviors. The most common two reasons for choosing the month 1 formula in this sample were because it was the formula fed to the infant in the hospital and because a doctor recommended it. Mothers who received a sample of formula in the hospital gift bag were more likely than mothers who did not receive a sample to choose the hospital formula at infant age 1 month, and mothers who chose the doctor-recommended formula in month 1 were less likely than mothers who did not use the doctor-recommended formula in month 1 to switch formula for nonhealth reasons in later infancy.

In addition, mothers who chose the hospital formula were sometimes less likely to switch and switched less often, depending on their prior exposure to certain direct-to-consumer marketing. Formulas marketed by the health professions are priced higher than those not marketed this way (2). Given that all infant formulas sold in the United States meet the Food and Drug Administration's nutritional and quality standards, families can safely reduce their expenditures on infant formula if they are willing to switch formula to take advantage of lower priced brands, sales, and other promotions.

Direct-to-consumer formula marketing does not counter the influence of implicit medical recommendations on formula choice at infant age 1 month, as shown by the lack of significance between prenatal exposure to formula information through the mass media and using the hospital formula at month 1. However, direct-to-consumer formula marketing increases switching behavior in later infancy. Mothers who chose their month 1 formula based on direct-to-consumer marketing reasons were more likely to switch for nonhealth reasons and had a higher switching rate in later infancy than mothers who chose the month 1 formula for other reasons.

The association between switching and two direct-to-consumer marketing activities depended on whether the mother chose the hospital formula in month 1. If mothers chose the hospital formula, prior exposure to prenatal web information increased both the likelihood and rate of formula switching in later months, and being sent formula in the mail decreased switching by both measures. The interpretation of this latter finding is difficult because it is possible that the mothers received the hospital formula in the mail. In the United States, where formula is marketed in a variety of ways, direct-to-consumer marketing probably helps formula-using families to make decisions that save them money without compromising the nutrition of their infants, whereas formula marketing through the health professions probably encourages families to use more expensive brands exclusively.

Health profession marketing of infant formula has been shown to reduce breastfeeding success (4,6,8), and this result has been interpreted as indicating that formula companies market through health professionals to increase the number of formula users. Our results, especially reduced switching if the mother chose a formula in response to health profession marketing, suggest that another reason for such marketing is to ensure that mothers who begin using a particular formula will not switch away from it for a lower priced formula.

Although we used three summarized media sources of prenatal exposure to information about infant formula, we found that only exposure to information on the Internet or web was related to subsequent formula switching; exposure to information from broadcast or print media was not related. It is possible that the sources are associated differently with formula switching because broadcast and print media are more likely to be encountered passively, whereas information on the web may be encountered more often while actively seeking information. Although we measured exposure to web information prenatally, it is possible that women more open to using any brand of formula were more likely to seek formula information on the web. In addition, print media, particularly magazines, are likely to present breastfeeding information more frequently than formula information (15), which may balance effects.

A Government Accountability Office report listed ways that formula is marketed directly to consumers (10). They included television, radio, and print advertisements; coupons and free formula mailed to the home; websites; and grocery store shelf displays. The analysis reported here included all these ways except the last, demonstrating that our measures of mass marketing are nearly comprehensive. The Government Accountability Office found that mass media advertising of formula increased between 1999 and 2004, as measured by number of advertisements shown and by annual formula company expenditures for advertising.

The strengths of this study include its large sample size, national sample distribution, prospective design, detailed information about formula switching over time, and use of extensive longitudinal models to control for confounders, including time-varying covariates. It is particularly important that the measures of exposure to formula information in the media were asked prenatally, before the mother began using the product, so that they are not biased by product use.

The study has several weaknesses. We do not know about the content of the information with respect to infant formula in the mass media or on the web, including whether it was an advertisement or some other type of information. We do not have brand information for the marketing activities or for the formula

used, and so we cannot determine details such as whether the hospital brand of formula was the same as the brand mailed to the home. In addition, we do not know the detail of how the mother determined that a doctor recommended the formula she was using. The physician may have said to use a certain formula or the mother may have assumed that the formula sample in a gift bag or office display was a recommendation. In addition, our sample had higher education and income than the total population of new mothers and included only healthy infants, and therefore, the results may not be representative of all United States mothers.

### Conclusions

Health profession marketing of infant formula during the perinatal period is related to mothers' choice of the marketed formula and to reduced formula switching in later infancy. Because all formula sold in the United States is nutritionally adequate and of sufficient quality, willingness to switch formula enables families to buy at lower prices without compromising infant health. Health professionals who care for mothers during the perinatal period should recognize that their marketing activities affect mothers' choices. If they do not intend to encourage mothers to use a specific formula, they need to be careful that a specific formula is not highlighted in their practice. Health professionals should make it clear to mothers whether a hospital brand is recommended over alternative formulas. Direct-to-consumer marketing is related to greater switching of formula and so may help formula-feeding families to spend less on formula, but it should not be endorsed as a counterbalance to health profession marketing because other studies have found that both types of marketing interfere with breastfeeding.

### References

1. Infant Formula Quality Control Procedures; Infant Formula Nutrient Requirements. 21 C.F.R. Sect. 106, 107.100 (1985) (electronic Code of Federal Regulations).
2. Oliveira V, Prell M, Smallwood D, Frazao E. WIC and the retail price of infant formula. United States Department of Agriculture, Economic Research Service. Food Assistance and Nutrition Research Report Number 39, May 2004.
3. World Health Organization. *International Code of Marketing of Breastmilk Substitutes*. Geneva: World Health Organization, 1981. Accessed March 5, 2012. Available at: [http://www.who.int/nutrition/publications/code\\_english.pdf](http://www.who.int/nutrition/publications/code_english.pdf).
4. Howard C, Howard F, Lawrence R, et al. Office prenatal formula advertising and its effect on breastfeeding patterns. *Obstet Gynecol* 2000;95:296–303.
5. Merewood A, Fonrose R, Singleton M, et al. From Maine to Mississippi: Hospital distribution of formula sample packs along the Eastern seaboard. *Arch Pediatr Adolesc Med* 2008;162:823–827.
6. Rosenberg K, Eastham C, Kasehagen L, Sandoval A. Marketing infant formula through hospitals: The impact of commercial hospital discharge packs on breastfeeding. *Am J Public Health* 2008;98:290–295.
7. Bartick M, Stuebe A, Shealy K, et al. Closing the quality gap: Promoting evidence-based breastfeeding care in the hospital. *Pediatrics* 2009;124:e793–e802.
8. Philipp B, Frank D, Humphreys R, Jean-Marie S. Distribution of industry-sponsored diaper bags from maternity facilities in Massachusetts. *Breastfeed Med* 2007;2:255–260.
9. Greer F, Apple R. Physicians, formula companies, and advertising: A historical perspective. *Am J Dis Child* 1991;145:282–286.
10. United States Government Accountability Office. *Breastfeeding: Some strategies Used to Market Infant Formula may Discourage Breastfeeding: State Contracts Should Better Protect Against Misuse of WIC Name*. Washington, DC: Government Accountability Office, 2006.
11. Stang J, Hoss K, Story M. Health statements made in infant formula advertisements in pregnancy and early parenting magazines: A content analysis. *Infant Child Adolesc Nutr* 2010;2:16–25.
12. Foss K, Southwell B. Infant feeding and the media: The relationship between Parents' Magazine content and breastfeeding, 1972–2000. *Int Breastfeed J* [online] 2006;1(10). doi:10.1186/1746-4358-1-10.
13. Sobel H, Iellamo A, Raya R, et al. Is unimpeded marketing for breast milk substitutes responsible of the decline in breastfeeding in the Philippines? An exploratory survey and focus group analysis. *Soc Sci Med* 2011;73:1445–1448.
14. Brown J, Peuchaud S. Media and breastfeeding: Friend or foe? *Int Breastfeed J* [online] 2008;3(15). doi:10.1186/1746-4358-3-15.
15. Frerichs L, Andsager J, Campo S, et al. Framing breastfeeding and formula-feeding messages in popular U.S. magazines. *Women Health* 2006;44:95–118.
16. Cutler B, Wright R. The U.S. infant formula industry: Is direct-to consumer advertising unethical or inevitable? *Health Mark Q* 2002;19:39–55.
17. American Academy of Pediatrics Section on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics* 2005;115:496–506.
18. U.S. Department of Health and Human Services. *The Surgeon General's Call to Action to Support Breastfeeding*. Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General, 2011.
19. Fein S, Labiner-Wolfe J, Shealy K, et al. Infant Feeding Practices Study II: Study methods. *Pediatrics* 2008;122(suppl 2):S28–S35.
20. Breseth C, Mitmesser S, Ziegler E, et al. Tolerance of a standard intact protein formula versus a partially hydrolyzed formula in healthy, term infants. *Nutr J* [online] 2009;8(27). doi:10.1186/1475-2891-8-27.
21. Hyams J, Treem W, Etienne N, et al. Effect of infant formula on stool characteristics of young infants. *Pediatrics* 1995;95:50–54.
22. Nevo N, Rubin L, Tamir A, et al. Infant feeding patterns in the first 6 months: An assessment in full-term infants. *J Pediatr Gastroenterol Nutr* 2007;45:234–239.
23. SAS Institute. *Version 9.1 of the SAS System for Windows*. Cary, North Carolina: SAS Institute, 2002–2003.



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