

# **Educational Intervention to Modify Bottle-feeding Behaviors Among Formula Feeding Mothers in the WIC Program: Impact on Infant Formula Intake, Weight Gain and Fatness**

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## **Summary**

### **Background**

One of the key factors associated with child obesity is a rapid rate of weight gain during infancy. Infant feeding practices are a major contributor to early rapid weight gain. Formula-fed infants consume more energy and gain weight more rapidly than breastfed infants, even during the first few months of life. Recent evidence indicates that there is a long-term effect of infant feeding on body fatness, with children and adolescents who were breastfed being 20-30% less likely to be overweight than children who were formula-fed. The mechanisms underlying these differences are not well understood. One possibility is that the composition of infant formulas has a stimulatory effect on intake and growth, although recent data from one of our own studies suggest that neither the protein content or quality nor the potential renal solute load of formula is the trigger. Another possibility is that it is bottle-feeding, not the composition of the milk in the bottle, that is more important. It has been hypothesized that infants are born with the ability to self-regulate their energy intake. The bottle-feeding caregiver may miss the infant's satiety cues, or encourage the infant to empty the bottle. Our objective was to evaluate whether formula-feeding caregivers who are encouraged to be more sensitive to their infants' satiety cues, and to adopt feeding practices similar to those of breastfeeding mothers, will in fact alter their feeding practices, and whether this results in 1) a lower volume of formula consumed at 4 months of age, and 2) a less rapid rate of weight gain from ~1-2 to 4 months of age

### **Methods**

This project was a double-blind, randomized educational intervention trial with exclusively formula-feeding caregivers in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in Sacramento County. Some of the ideas for this intervention came about as a result of focus groups conducted with WIC mothers in the spring of 2003, which revealed that overfeeding of formula-fed infants is common in this population.

The intervention group received education promoting awareness of early satiety cues and discouraging the use of large bottles (> 6 oz) before 4 mo of age, and the control group received standard nutrition education regarding introduction and feeding of solid foods. After initial screening, caregivers completed a baseline 2-day formula intake record, and were then randomized to attend either the intervention or control nutrition education class. Subjects were stratified by infant sex and maternal language (English or Spanish) and were randomized using computer-generated stratified random lists with a block size of 4. All subjects who attended the class were then followed for no less than 2 months post-class. Formula intake records were again completed at 2 weeks post-class and at ~ 3.5 mo of age. At baseline and at ~ 4 mo of age, infant anthropometry was completed. To identify under- or over-dilution of formula, caregivers were asked to provide samples of prepared formula at baseline and at the end of the study.

### **Results and Discussion**

Of the 836 caregivers screened at the two clinic sites, 214 were eligible and 104 were willing to participate in the study. The most common reason for refusal was lack of time. Access barriers to participation included lack of transportation to the nutrition education class, uncertainty regarding ability to attend the class, and family or personal problems. Of the 104 women who agreed to participate, 101 completed the baseline questionnaire and 61 completed the first formula intake record. The remainder (n = 43) did not complete the baseline intake record and therefore were not included in the randomized trial. In most of these cases, the research staff was never able to reconnect with the caregivers, even after multiple attempts.

Of the 61 caregivers who completed the first intake record and were randomized, 17 never attended the nutrition education class (16 had been scheduled for the class but did not show up even after repeated re-scheduling). Of the 44 caregivers who attended the nutrition education class, 40 caregivers completed the final formula intake record, and 38 of these attended the final measurement session. Among the 40 caregivers who completed the final intake record, there were no significant differences between

intervention and control groups in maternal age, education, BMI, number of children or ethnicity, or infant birth weight, sex, or formula intake at baseline.

There were no significant differences between groups in formula intake at the second record or at the end of the study, even after controlling for infant age at baseline, baseline intake, sex, birth weight, and time in the study. There were also no significant differences between groups in bottle-feeding behaviors at baseline or at the final intake record, including the mean percentage of bottles emptied, the percentage of subjects who emptied the bottle at more than 50% of feedings, and the percentage of bottles offered that were greater than 6 oz. Bottle-emptying increased in both groups over time (from ~50% to ~60% of feedings), as did the use of bottles > 6 oz (from < 5% to ~17% of subjects).

There were no significant differences between groups in infant weight, length or the sum of skinfold thickness at baseline, after controlling for age and sex. However, by the end of the study, infants in the intervention group were heavier and longer than those in the control group, even after controlling for age at measurement, sex, baseline weight or length and time in study. In addition, the sum of skinfold thickness was greater among infants in the intervention group than in the control group after controlling for age at measurement 1, time in study, sex, and sum of skinfold thickness at baseline.

Response to the nutrition education class and follow-up phone call, and to the key messages, was overwhelmingly positive. Most caregivers in the intervention group could accurately repeat the key messages and the demonstrations used to transmit them, and felt that they were easy to comply with and to share with friends and family. However, this did not appear to translate into behavioral change. The adult learning technique used for this intervention was designed to be used in a group setting, but 95% of the classes were conducted with just one caregiver because of no-shows. Although the caregivers seemed to appreciate the one-on-one nature of the classes, the lack of group facilitation may be one reason for not achieving changes in feeding practices. Other possibilities include 1) inadequate reinforcement of messages; 2) insufficient depiction of and/or practice with identifying satiety cues in human infants; 3) not intervening early enough in the feeding relationship to support and foster inherent infant self-regulation; 4) not following caregivers long enough to detect a potential change in bottle-feeding behaviors, and 5) other barriers to responsive feeding related to the desire for infants to cry infrequently and sleep more.

## **Conclusion**

In summary, the results of this study indicate that formula intakes of infants in this population are quite high – probably reflective of overfeeding - and that modifying bottle-feeding behaviors to prevent overfeeding is a challenging task. The more rapid growth of infants in the intervention group is difficult to explain, given that there were no significant differences in the intake variables. The final sample size was quite small, and caregivers participating in the project were not representative of the WIC population in general, which limits the conclusions that can be drawn. However, even though caregivers did not report a difference in intake or bottle-feeding behaviors, the educational intervention was successful in improving knowledge and awareness of the key messages. Further research is needed to understand the attitudes and life circumstances that are constraints to changing infant feeding behaviors.