

An Evaluation of Mother-Centered Anticipatory Guidance to Reduce Obesogenic Infant Feeding Behaviors

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KEY WORDS

well-child visit, obesity prevention, anticipatory guidance, infant feeding

ABBREVIATIONS

AG—anticipatory guidance
BF—Bright Futures
MOMS—maternal-focused advice
OP—Ounce of Prevention

All of the authors made contributions meeting the criteria for authorship, including substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; and final approval of the version to be published.

This trial has been registered at www.clinicaltrials.gov (identifier NCT01565525).

www.pediatrics.org/cgi/doi/10.1542/peds.2011-3027

doi:10.1542/peds.2011-3027

Accepted for publication Apr 27, 2012

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

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FINANCIAL DISCLOSURE: *The authors have indicated they have no financial relationships relevant to this article to disclose.*

FUNDING: Supported by Eunice Kennedy Shriver National Institute of Child Health and Human Development grant 1 R21 HD050944-01 and The Research Institute at Nationwide Children's Hospital. Funded by the National Institutes of Health (NIH).



WHAT'S KNOWN ON THIS SUBJECT: Childhood obesity occurs in 20% of children before they enter kindergarten. Treatment is difficult, making prevention desirable, but little is known about effective methods using anticipatory guidance to prevent obesity in pediatric primary care.



WHAT THIS STUDY ADDS: This study provides a comparison of 2 approaches versus usual care using anticipatory guidance to improve infant feeding during the first year of life, and demonstrates positive specific feeding behavior differences at 1 year in the intervention groups.

abstract



OBJECTIVE: To evaluate the effect of 2 anticipatory guidance styles (maternal focused [MOMS] and infant focused [Ounce of Prevention]) directed at mothers of infants aged newborn to 6 months on their infant feeding behaviors at 1 year compared with routine advice as outlined in Bright Futures (BF).

METHODS: This is a cluster randomized trial. A total of 292 mother/infant dyads were enrolled at their first well-child visit to 3 urban pediatric clinics in Columbus, Ohio. Intervention-specific brief advice and 1-page handouts were given at each well visit. In addition to infant weights and lengths, surveys about eating habits and infant feeding practices were completed at baseline and 12 months.

RESULTS: Baseline data revealed a group with high rates of maternal overweight (62%) and obesogenic habits. At 12 months, the maternal-focused group gave their infants less juice (8.97 oz vs 14.37 oz, $P < .05$), and more daily servings of fruit (1.40 vs 0.94, $P < .05$) and vegetables (1.41 vs 1.03, $P < .05$) compared with BF mothers. Ounce of Prevention mothers also gave less juice (9.3 oz, $P < .05$) and more fruit servings (1.26 $P < .05$) than BF.

CONCLUSIONS: Brief specific interventions added to well-child care may affect obesogenic infant feeding behaviors of mothers and deserves further study as an inexpensive approach to preventing childhood obesity. *Pediatrics* 2012;130:e507–e517

Childhood obesity is a growing concern in the United States and the world.¹⁻⁷ The difficulty of losing weight and keeping it off has led to an intense interest in the prevention of obesity. Among school-aged children, prevention programs have varying degrees of success.⁸⁻¹⁰ Unfortunately, more than 20% of children are overweight before they begin kindergarten.¹¹ Recent reviews of the literature reveal a dearth of prevention interventions in children younger than 5 years.^{12,13}

Risk factors for childhood obesity suggest strategies for obesity prevention. These include parental overweight,^{14,15} obesogenic parental eating,¹⁶ high rates of television watching,¹⁷⁻¹⁹ low family income^{20,21} and education,^{22,23} low intake of vegetables and fruit, and high intake of fast food and sweet drinks.^{14, 18, 24} Anderson and Whitaker²⁵ recently found associations among 3 family habits (eating the evening meal together, adequate child sleep, and restriction of screen time) with lower rates of pre-school obesity. Some of these factors are more readily modifiable than others.

One avenue for obesity prevention is through anticipatory guidance (AG) delivered at well-child visits. AG provides an opportunity for the clinician to share information with parents regarding child health, nutrition, safety, and optimized development. Some elements of AG can enhance the family environment of children, including improving child literacy readiness,²⁶ decreasing parental smoking,²⁷ and screening mothers for postpartum depression.²⁸

Addressing maternal health behaviors at the pediatric health care visit may be particularly helpful.^{29,30} This strategy is logical, as improving the mother's health may improve the child's health. Parents may be willing to change to improve their children's habits. For instance, African American parents who are consciously acting as role models for their children were found to eat less fat and fewer calories themselves.³¹

A review of the literature revealed no published assessment of the effect of AG on obesity prevention in young children or using AG as an avenue to address maternal diet and behaviors. The goal of

this study was to examine the role of AG in changing mothers' obesogenic feeding behaviors during the child's first year of life.

METHODS

Study Design and Description of Population

A cluster randomized trial design was used. Clinic sites were randomized to 1 of 3 study conditions as outlined below (see Fig 1).

Pediatric primary care clinics in Nationwide Children's Hospital Primary Care Network serve families in low-income metropolitan areas in Columbus, Ohio. In these geographic areas, 75% of adults are overweight or obese. The population served by this network is 50% African American, 40% non-Hispanic white, and 10% Hispanic, and 85% receive Medicaid. Of the 11 clinics in this network, the 3 clinics with the largest number of newborn and 2-month-old well-child visits for the previous year were selected for the project. These 3 clinics were then monitored for 1 week

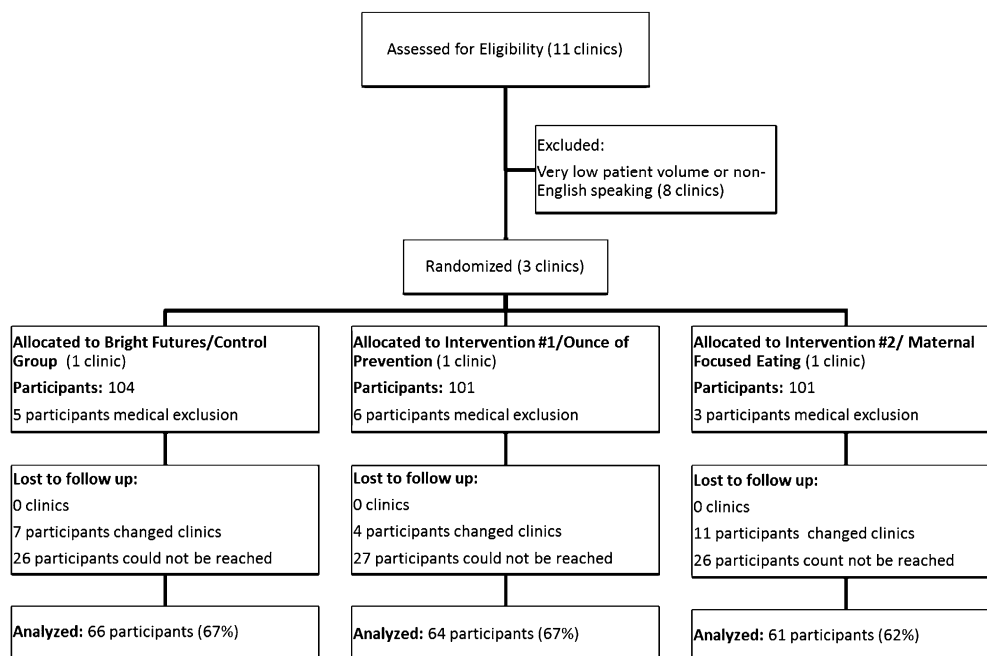


FIGURE 1
Consort diagram.

for the number of well-child visits for full-term infants younger than 3 months as well as the number of these families requiring translators. After determining that these clinics had a sufficient number of newborns and mothers who were eligible to participate, each clinic was randomly assigned to implement 1 of 3 intervention conditions.

The following paragraphs describe the intervention conditions (Table 1 shows a comparison of visits among conditions):

(1) **Maternal-focused intervention (MOMS):** In this intervention, we approached child obesity prevention via anticipatory guidance aimed at maternal eating habits. We crafted simple messages to increase behaviors thought to be protective against the development of obesity. The underlying concept for our unique intervention is that mothers are role models for their children.

Mothers in this group received direct guidance regarding their own eating patterns. Message development focused on how mothers ate and the influence of mothers' behaviors on their children.

Specifically, participants were reminded that children imitate their mothers, and were asked to incorporate the following 7 elements into their eating behaviors: (1) eat 3 planned meals and 2 snacks every day and avoid skipping meals, (2) eat in 1 place in the home, (3) turn off the television while eating, (4) eat together with the family whenever possible, (5) drink 2 glasses of milk daily, (6) eat 5 servings of fruits and vegetables, and (7) limit soda and fast food (see Fig 2 for 6-month MOMS AG handout). This AG was provided by advising on a few items at the first visit. At subsequent visits, the items were reviewed and new items were added.

(2) **Ounce of Prevention (OP):** Mothers in this group received a detailed program of infant feeding AG focusing on serving size and tips for introducing different foods for the infant. Mothers were encouraged to allow the infant to determine when he or she is full, not to force the child to eat, and not to use food as a reward. This program had been pilot tested in a large private pediatric practice

in Cincinnati, Ohio, refined based on the experience there and is available at <http://healthyohioprogram.org/healthylife/nutri2/nutrikids2/ounce.aspx>. (See Fig 3 for 6-month OP AG handout.) This program provides far more details in terms of portion size suggestions and order of food introduction than the usual-care control condition (see following paragraph).


(3) **Bright Futures (BF), second edition Pocket Guide:** This was the usual-care condition, based on the preexisting BF nutrition pocket guide (2002) for children in the first year of life. Messages consisted of traditional feeding AG focused on recommending breastfeeding, the introduction of infant food and table food, and avoidance of honey and foods that may lead to choking.³² (See Fig 4 for 6-month BF AG handout.)

Project Implementation: Intervention Design and Delivery

Site-specific and age-specific handouts were developed by the research team.

TABLE 1 Intervention Timing and Content

Well Visit	BF	MOMS	OP
2 wk and/or 2 mo	No solids in bottle for bottle feeding; Appropriate formula mixing; No microwave for warming; No honey	Eat 3 meals/day; Eat 5–7 servings of fruits/vegetables; No meal skipping	Feed breast milk or formula only; No juice or cereal in bottle; Not all crying means hungry; Increase nighttime feeding interval at 2 mo
4 mo	Same as 2 mo; Introduction to cereal with spoon	Reiterate above, plus Avoid liquid calories; Create a structure for eating; Eat in one place, turn off television, eat together, let infant watch you, eat good foods; Discuss solids	Breast milk or formula only; If formula limit to 4–6 oz, 4–5/day; No cereal in bottle; No juice or soft drinks; If ready: start single-grain cereal 1–2 T by spoon not bottle
6 mo	Introduction of new foods; No bottle in bed; Limit juice	Reiterate above, plus Mother drink 16–24 oz of milk if can; Drink water; Avoid fast food; Teach infant good nutrition	Continue breastmilk or formula w/Fe; Begin infant food with vegetables; Explain extrusion reflex; Add new food every 3–4 d; Offer new foods >10 times; Portion size 2 T twice daily; Cereal 2–4 T twice daily
9 mo	Same as 6 mo; Introduce cup; Self-feeding soft foods	Reiterate messages	Breastmilk or formula to 12 mo; Start weaning to cup; Offer variety; New foods up to 10 times for acceptance; Limit 100% juice to 2–4 oz; No sweet drinks; Serving sizes fruits/vegetables 1–2 T (1/8 cup) twice daily; Protein/lean meat 6–8 T/d; Food is not a reward
12 mo	Switch to whole milk; Self-feeding; Wean from bottle; 3 meals/2 snacks	Reiterate messages, plus It is normal for infant's appetite to drop; Change to whole milk 16–24 oz/d; Wean and reinforce no bottle in bed; Have consistent routines	Same as 9 mo with added serving sizes; Juice 2–4 oz; Milk/yogurt 1/2 cup; Cheese 1/2 oz; Fruits/vegetables 1/2 cup fresh or 1/3 cup canned; Cereal 1/4 cup; Bread 1/2 slice; Do not force child to eat; Avoid sweet drinks




HEALTHY MOMS
Healthy Kids

6 months

Be a Role Model. Eat Healthy Everyday!

You are your baby's best role model. Your baby watches everything you eat and drink. Be a healthy mom by making nutritious food choices and offering them to your baby. Eat 3 meals and 2 healthy snacks a day, and include fruits and vegetables with your meals/snacks. Drink plenty of water or drink milk, and limit soft drinks or sweetened beverages. Make mealtimes special by teaching your child today how to eat well and live well!
Eat together with members of your household, and turn off the TV when eating.
Follow these simple tips for making mealtimes special!

- Pay attention to what you eat for meals/snacks
- Plan and eat 3 meals and 2 healthy snacks a day
- Eat fruits and vegetables with meals/snacks (5 to 7 per day)
- Don't skip meals and avoid eating fast food
- If you drink milk, drink 16-24 oz. per day
- Drink plenty of water and limit soft drinks
- Eat meals/snacks in one place with members of your household
- Turn off the TV when eating





Parent Notes for Child Wellness Visit: _____

Child's Name _____

Height _____ Weight _____ Date _____

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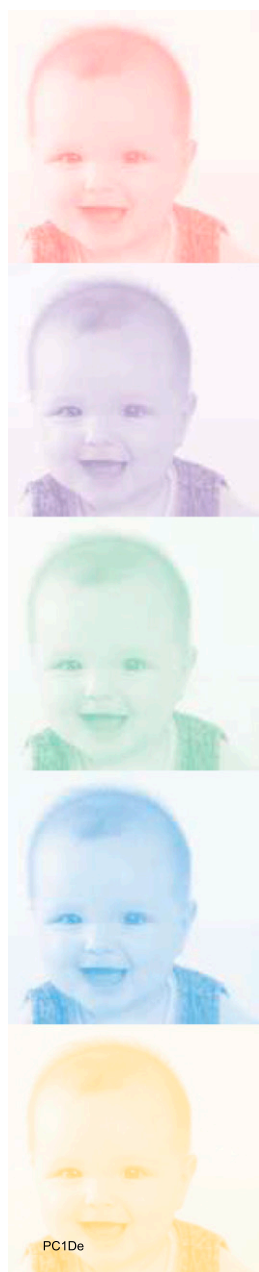
WE1De

FIGURE 2
Sample MOMS handout.

These were tailored for ease of readability and reading level at grade 6. Clinic physicians, nurses, and medical assistants were trained by research staff in implementing the appropriate AG program for their respective clinic before the start of the project, with a refresher session at 6 months after the project began. The staff were all told that they were implementing an intervention to

optimize nutrition and good eating habits in the first year of life and were unaware of group assignment. Research staff did not participate in delivery of any component of the intervention. Brief reminders for clinicians were embedded in AG checklists in the infant's chart. The intervention was designed to be delivered at the 2-, 4-, 6-, 9-, and 12-month pediatric well-child visit corresponding

handouts. All mothers received the same clinic-specific AG regardless of their enrollment in the study; in other words, mothers who were not eligible or refused study participation still received the same AG. Nurses and medical assistants weighed and measured the infant per usual clinic protocol, recorded the data in the medical record, and ensured that the AG handout was given to the mother.



PC1De

6 months *fourth visit...*

Food for Thought

Which solid food is your baby eating?

How often is your baby being fed solid food?

Is your baby having problems with any food?

How does your baby let you know how much food is enough?

Feeding Advice

Add variety~

Vegetables – Start with plain, strained vegetables (carrots, spinach, squash, peas, green beans). Try one new food at a time and feed the food for 3-4 days to know if your baby can tolerate it. **DO NOT** start with mixed vegetables.

Fruit – Gradually introduce strained fruits (peaches, pears, bananas). Add one new fruit at a time and watch for any reactions. **DO NOT** give fruit desserts.

- If juice is given, it should be 100% fruit juice and no more than 3 oz./day in a cup.

Feeding tips ~

- Always start with vegetables first at every meal.
- Use a spoon and dish, never feed from the jar.
- Your baby may spit out food as a normal response, so offer new foods many times.
- Your baby does not need salt, sugar or margarine/butter added to foods.
- Meal times can be messy, have fun and enjoy family meals!

Your baby's diet ~

- Breastmilk or formula.
- Cereal 2-4 T twice per day.
- Vegetables 2-4 T once per day.
- Fruits 2-4 T once per day.
- Between 7 and 9 months you will introduce strained meats & chicken.
- Continue to offer a variety of fruits & vegetables.

Breastmilk and formula intake will decrease as your baby begins to eat more food.

Let your baby decide how much food or breastmilk/formula is enough! Some days your baby will eat more than other days.

Be Active

- Encourage crawling, sitting alone and exploring!
- Screen time (TV, computer, electronic games) not recommended under age 2.

Child's name _____

Height _____ Weight _____ Date _____

Weight for Height percentile _____ %

A collaboration of Healthy Ohioians, the American Academy of Pediatrics, Ohio, Ohio Department of Health, Ohio Dietetic Association, Children's Hospital, Borden's Center for Nutrition & Wellness and the American Dairy Association & Dairy Council Mid East. May be reproduced in its entirety for educational purposes. January 2006



FIGURE 3

Sample Ounce of Prevention handout.

Study Procedures: Enrollment, Consent, and Inclusion and Exclusion Criteria

The institutional review board at Nationwide Children's Hospital approved the project protocol. All recruitment and data collection were done by research staff. Sample size was determined to be 63 per group by statistical analysis of differences between proportions with an α of 0.5, power = 0.80, and a moderate effect size

(0.5). Potential participants were identified by screening clinic schedules for infants 2 months of age or younger and by screening of waiting families by research staff. Once a potential participant was identified, research staff obtained written, informed consent and described the study in depth. Inclusion criteria were English-speaking mother (research staff could not be sure of the fidelity of AG delivered via interpreters), healthy

full-term infant, lives with biological mother, and infant aged 2 months or younger. Exclusion criteria were history of NICU stay, gestation <37 weeks, chronic disease, foster placement, or known genetic disorder.

Timing and Content of Data Collection

Mothers were interviewed by research staff at baseline and when their infants

HEALTHY MOMS
Healthy Kids

6 months

Create a Bright Future for Your Baby - Healthy Eating at Every Age!
To encourage healthy eating, make mealtimes special. Feed your baby breastmilk or iron-fortified formula.
When ready for solids, offer your baby single-grain, iron-fortified cereal.
Offer one new food at a time and watch for allergies.
Follow these simple tips to give your baby a bright and healthy future!

Feed your baby breastmilk or iron-fortified formula
 If breastfeeding exclusively, give iron supplement
 When ready to begin solids, start with single grain, iron-fortified cereal
 Introduce one new food at a time
 Watch for allergic reactions or choking hazards
 Limit juice consumption.

Do NOT give your baby honey
 Do NOT put solids in your baby's bottle
 Do NOT put your baby to bed with a bottle



Parent Notes for Child Wellness Visit: _____

Child's Name _____
 Height _____ Weight _____ Date _____

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Columbus Children's Research Institute;
and The Ohio State University



FIGURE 4
Sample Bright Futures handout.

were 6 and 12 months old. Maternal information collected included self-reported height and weight, demographics, and family and personal health history of obesity-related diseases. Maternal nutritional intake was assessed by using questions from the Behavior Risk Factor Surveillance Fruit and Vegetable module,³³ with additional questions to assess protein, carbohydrate, soda, fast food, and water intake.

Eating habits with regard to breakfast consumption, family meals, meal skipping, dining location, television watching during meals, and meal planning were measured. Health numeracy, maternal depression, and food security were assessed as potential confounders of maternal feeding and eating habits. Child variables included weights and lengths that were obtained via chart review. Infant nutrition

information collected included formula volumes, satiety cues, feeding preparation, juice intake, and additions made to the bottle. Child feeding behavior questions regarding food restriction or pressuring were added at 12 months. Further details on study design, methods, and evaluation tools have been published elsewhere.³⁴ A summary of the survey instruments is outlined in Table 2.

TABLE 2 Survey Instruments at Baseline and 12 Months

	Sample Items	Baseline Survey	12-mo Survey
Maternal BMI (self-report)		0	0
Health & other demographics		0	0
Nutritional intake (Behavioral Risk Factor Surveillance System): 5 items	Not counting carrots, potatoes, or salad, how many servings of vegetables do you usually eat? (For example, a serving of vegetables at both lunch and dinner would be TWO SERVINGS.)	0 (Cronbach α = 0.39)	0 (Cronbach α = 0.44)
Eating behavior patterns questionnaire (EBPQ): 14 items, 9 from EBPQ	How often do you eat breakfast? Where do you usually eat your main meal of the day? How often do you skip meals?	0 (Cronbach α = 0.68)	0 (Cronbach α = 0.73)
Center for Epidemiologic Study-Short Depression Scale: 10 items	I was bothered by things that don't usually bother me? I was depressed.	0 (Cronbach α = 0.69)	x
Positive & Negative Affect Schedule: 20 items	During the past week to what extent have you felt scared? Attentive? 1–5 very slightly to very much	x	0 (Cronbach α = 0.86 NA) (Cronbach α = 0.88 PA)
US Department of Agriculture Food Security/hunger scale: 1 item	In the past 12 mo, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food?	0	0
Health numeracy: 2 items	A label on your prescription bottle reads – "Take 1 tablet by mouth every 6 hours as needed." If you take the first tablet at 7:00 AM, when should you take the next one?	0	x
Eating habits	How many meals do you eat in a day? How often do you eat food together with your family?	0 9 items	0 7 items
Meal planning: 14 items	I am able to plan meals for my family. I take a grocery list to the store when I shop. I never know what I am going to eat for my next meal. 5-point Likert scale	0 (Cronbach α = 0.70)	x
Child height and weight		0	0
Child feeding questionnaire: 8 items, 4 of Pressure to Eat	When your child is at home, how often are you responsible for feeding him/her? I have to be careful not to feed my child too much. 4-point Likert scale	x	0 (Cronbach α = 0.70)
Infant nutrition	How often does your child eat grains (Cheerios, oatmeal, bread, pancakes)? How often does your child eat vegetables (green beans, sweet potatoes)?	0 17 items—all 6 items-only for exclusive breastfeeding	0 36 items

0, survey instrument included; x, survey instrument not included.

Recruitment and Retention of the Study Population

Our overall approach to recruitment and retention of subjects was to use multiple strategies simultaneously. These included piloting recruitment procedures, getting "buy-in" from clinic staff, using participant incentives, establishing a dedicated research phone line for families to schedule appointment, maintaining contact with participants, establishing a project identity through logos and mailings to participants, emphasizing convenience for participants, and establishing

personal contact between families and the research staff. A full discussion of these methods has been published.³⁵ There were no measured differences between those subjects who were retained and those who were lost to follow-up.

Statistical Analysis

The unit of analysis was the individual. Analyses were conducted to describe differences in maternal behaviors and child feeding behaviors across the 3 study conditions: BF, MOMS, and OP. Because intraclass correlation (shared

variance) among the women who were within the same clinic is not likely to be meaningfully significant, individual-level analyses were deemed to be the appropriate unit of analysis. All analyses used the BF (usual care) group as the reference group. All regression analyses were adjusted for maternal demographics (race, education, age, BMI, marital status) and maternal behaviors (ever breastfed, often snacking while watching television). The only factors not adjusted for were Supplemental Nutrition Program

for Women, Infants, and Children, food stamps, and private insurance. Given that this was almost entirely a low-income sample of women, this adjustment would not have influenced the study results. To evaluate differences in continuous variables, general linear regressions were conducted to evaluate the least-square means by 3 study conditions at the child's 12-month visit. To evaluate dichotomous outcomes, logistic regression analyses were conducted to evaluate differences in the odds of each outcome by study condition at the child's 12-month visit. Statistical significance was evaluated at $P < .05$. The analyses for this article were generated by using SAS/STAT software, Version 9.2 of the SAS System for PC (SAS Institute Inc., Cary, NC).

RESULTS

An initial sample of 306 mother-child dyads was recruited for the baseline survey during 11 months between June 2005 and March 2006 (see Fig 1). Fourteen infants were excluded because of entry into foster care or diagnosis of pyloric stenosis or hypothyroidism; 292 mother-child dyads remained. The retention rate across all groups (proportion of enrolled subjects who could be reached for follow-up) was 75% and 64% at 6 months and 12 months after recruitment respectively, with 57% of participants having complete data at the 3 time points of baseline, 6 months, and 12 months. At 12 months (data presented in this article), there was no difference in retention by race or maternal education.

Demographic Data

Demographic data are presented in Table 3. This was a young, low-income group of mothers. By their own report, most of the mothers were overweight (average BMI 28; 62% overweight or obese). The 3 groups were equivalent in most baseline measures with 3 exceptions: both the OP and BF moms were more likely to be single, the BF

group was more likely to have finished high school, and the MOMS group was less likely to be African American (MOMS 20%; OP 74%; BF 61%, $P < .05$).

Baseline Maternal Eating Habits and Infant Feeding Practices

At baseline, the mothers had high rates of obesogenic personal eating habits, including fast food consumption,

snacking during television viewing, and meal skipping. There were significant differences between groups in the rate of pizza consumption, and consumption of food and soda during television viewing (Table 4). The groups were also different at baseline in terms of infant feeding methods and attitudes (Table 5).

There was no difference in the physician-reported rate of delivering interventions

TABLE 3 Baseline Demographics

	BF (n = 99), n (%)	MOMS (n = 98), n (%)	OP (n = 95), n (%)
Mother's age, mean	23.89	23.49	23.25
Mother's BMI, mean	27.55	29.17	28.09
CES-D10 score >11 (depression)	71 (73.1)	61 (61.3)	53 (56.4)
Mother's education			
< High school	19 (19) ^a	35 (36)	32 (34) ^b
High school diploma	47 (47)	40 (41)	32 (34)
Some college or more	33 (33)	23 (23)	31 (33)
Both health numeracy questions correct	74 (75)	72 (74)	59 (62)
Mother's marital status			
Single	49 (49) ^a	26 (27)	49 (52) ^a
Cohabiting	30 (30)	38 (39)	23 (24)
Married	18 (18)	30 (31)	18 (19)
Widow	1 (1)	4 (4)	2 (2)
Chose not to answer	1 (1)		3 (3)
Mother's race			
Black	60 (61) ^a	20 (20)	70 (74) ^a
White	24 (24) ^a	65 (66)	20 (21) ^a
Other	15 (15)	13 (13)	5 (5) ^b
WIC recipient	92 (93)	89 (91)	(91) 96
Food stamps	59 (60)	52 (53)	65 (68)
Private insurance	18 (18)	11 (11)	7 (7)
Infant is female	45 (45)	52 (53)	43 (45)
Infant weight/height z score ^c	-0.22	-0.29	-0.40

WIC, Supplemental Nutrition Program for Women, Infants, and Children.

^a $P < .05$ compared with BF.

^b $P < .05$ compared with MOMS.

^c Reported in z scores by using Centers for Disease Control and Prevention Growth Charts 2000 (Centers for Disease Control and Prevention, National Center for Health Statistics. CDC growth charts: United States. Available at: www.cdc.gov/growthcharts/. Accessed May 30, 2000); represents average distance from mean weight-for-height for gender in SDs.

TABLE 4 Baseline Rates of Maternal Eating Behaviors That Promote Obesity per Group

	BF (n = 99), n (%)	MOMS (n = 98), n (%)	OP (n = 95), n (%)	P
Consume <3 glasses of water per day	69 (66.4)	58 (57.4)	67 (66.3)	.31
Consume >2 glasses of juice or soda per day	31 (29.8)	40 (39.6)	38 (37.6)	.30
Consume <1 serving of dairy per day	20 (19.2)	11 (10.9)	16 (15.8)	.25
Consume fast food on weekly basis	85 (81.7)	71 (70.3)	75 (74.3)	.15
Consume pizza on weekly basis	53 (58.9)	29 (34.1)	29 (35.8)	<.01
Skip at least 1 meal per day	31 (30.1)	31 (30.7)	33 (32.7)	.92
Snack in place of meal at least 1 per day	30 (28.9)	36 (36.0)	38 (38.0)	.35
Snack while watching television half or all of the time	54 (51.9)	39 (38.6)	55 (55.5)	.04
Consume soda while watching television half or all of the time	33 (31.7)	41 (40.6)	49 (48.5)	.049
Food insecurity (scaling back or skipping meals in the past year)	25 (24.1)	18 (17.8)	16 (15.8)	.30

Centers for Disease Control and Prevention, National Center for Health Statistics. CDC growth charts: United States. Available at: www.cdc.gov/growthcharts/. Accessed May 30, 2000.

TABLE 5 Maternal Infant Feeding Behaviors per Group at Baseline

	BF (<i>n</i> = 99), <i>n</i> (%)	MOMS (<i>n</i> = 98), <i>n</i> (%)	OP (<i>n</i> = 95), <i>n</i> (%)	<i>P</i>
Feeding type				
Breastfeed exclusively	18 (17.3)	14 (13.9)	8 (7.9)	.04
Formula	66 (63.5)	78 (77.2)	72 (71.3)	
Both breastfeed and formula	20 (19.2)	9 (8.9)	21 (20.8)	
Feed infant >24 oz of formula per day	28 (34.6)	39 (48.2)	32 (31.7)	.06
Add cereal to infant bottle	17 (17.7)	13 (13.8)	11 (11.5)	.46
Add juice to infant bottle	9 (8.7)	8 (8.1)	9 (8.9)	.98
Mothers supplement >50% of infant's feeding with formula when breastfeeding (<i>n</i> = 69)	7 (26.9)	5 (35.7)	13 (44.8)	.39
Continue to feed infant after infant falls asleep	27 (26.0)	41 (41.0)	20 (19.8)	<.01
Agrees that infant crying indicates hunger	55 (52.9)	60 (59.4)	50 (49.5)	.36

(60%) or in the maternal reported rate of having read the handouts at 6 months (40%).

Adjusted Group Differences at 12 Months

At 12 months, the groups demonstrated significant differences (Table 6) after adjusting for maternal education, race, marital status, having ever breastfed the child, and baseline snacking behavior while watching television. Both the MOMS and OP groups gave their children less juice and more servings of whole fruit than the BF group mothers. The MOMS mothers gave their children more servings of vegetables than the BF group. Mothers in the OP group were

less likely to have daily family meals than mothers in the other 2 groups. There was no difference in reported television watching while eating among the 3 groups. There were no differences among groups for infant growth parameters.

DISCUSSION

This pilot study adds to the emerging data on the effectiveness of specific anticipatory guidance. The mothers in both intervention groups (MOMS and OP) had healthier child feeding habits than those in the BF control group, with the maternal-focused MOMS group performing well in the number of servings of fruits and vegetables given to the infants,

in spite of having no direct instructions to do so. Additionally, the OP group of mothers reported fewer family meals than MOMS and BF (usual care) by age 12 months.

There are positive differences in what mothers feed their infants following simple advice to reduce obesogenic maternal-eating habits, such as snacking instead of meals, television watching while eating and caloric beverage and fast food consumption, when compared with mothers who did not receive such advice. Although there has been a virtual storm of publication about childhood obesity in the past 5 years, there have been few attempts to study interventions and fewer still looking at prevention interventions. Those that have been published have generally taken place in schools and other institutions where there is some level of control of the subjects.

This is the first publication of an intervention in infancy in the pediatric office. Our choice to work with maternal eating patterns was made as we realized that the eating patterns of children are closely related to that of their families. Recent correlational work by Anderson and Whitaker²⁵ would suggest that the recommendations of eating scheduled meals with other family members and turning off the television might be particularly helpful. The ecology of family eating is one that is built on over time. The difficulty of changing behaviors after they are well established has been demonstrated by our difficulties in treating obesity. The approach of improving maternal eating habits allows us to attempt to improve the eating environment without intruding into the feeding of the infant with specific discussions of serving size and running the risk of interfering with infant satiety signals. It also has the potential advantage of avoiding the intercultural miscommunications that may occur with the recommendation of specific foods.

TABLE 6 Differences in Maternal Eating and Child Feeding Behaviors at 12 Months, by Condition

	BF (<i>n</i> = 64) ^a Mean (SE)	MOMS (<i>n</i> = 61) Mean (SE)	OP (<i>n</i> = 59) Mean (SE)
Linear regression			
Mom eats breakfast per week	5.08 (0.34)	5.26 (0.37)	5.21 (0.35)
Meals eaten with family per day	2.60 (0.26)	2.34 (0.29)	1.89 (0.29) ^c
Child juice (oz) per day	14.37 (1.23)	8.97 (1.36) ^b	9.30 (1.31) ^c
Child fruit per day (servings)	0.94 (0.10)	1.40 (0.11) ^b	1.26 (0.11) ^c
Child vegetables per day (servings)	1.03 (0.10)	1.41(0.11) ^b	1.20 (0.11)
Child milk (oz) per day	24.05 (1.74)	25.11 (1.91)	22.75 (1.94)
Infant weight/height z score ^c	0.41	0.39	0.64
Logistic regression			
Child tries to feed self	Reference	0.97 (0.06–15.83)	0.13 (0.01–1.61)
Child drinks juice from cup	Reference	1.51 (0.31–7.48)	0.69 (0.19–2.52)
Eat main meal in kitchen (versus living room or other)	Reference	0.67 (0.27–1.65)	1.26 (0.54–2.92)
Television on 8+ hours per day	Reference	0.90 (0.43–1.91)	0.96 (0.50–1.84)
Child watches <2 h of television per day	Reference	2.04 (0.76–5.50)	2.68 (1.13–6.32)

Analyses adjusted for maternal demographics (race, age, BMI, marital status) and behaviors (ever breastfed and frequent snacking) at baseline. CI, confidence interval.

^a Note *n* now omits subjects lost to follow-up.

^b *P* < .05 compared with BF.

^c Reported in z scores by using Centers for Disease Control and Prevention Growth Charts 2000; represents average distance from mean weight-for-height for gender in SDs.

This study has some very clear limitations. Because of the risk of intervention contamination had we tried to randomize at the patient level, we randomized at the clinic level. In spite of our attempts to select clinics with similar demographics, the samples had differences in race, marital status, and educational level, which may explain some of the baseline differences in maternal eating habits. Although the differences we found remained even after controlling for baseline differences, it is certainly possible that these differences are accompanied by others that were undetected and affected the outcome, making this a major weakness in the study. Variables that differed among the groups and variables that are known to relate to infant obesity, such as breastfeeding were controlled for, but owing to small sample sizes, the model could not be expanded to include all of the variables that were collected. We did not correct for use of the Supplemental Nutrition Program for Women, Infants, and Children, food stamps, and public insurance. This adjustment would not have influenced the study results owing to the high prevalence of participation in all of these programs. As a pilot, it was done in one community and it may not generalize to other communities. Finally, the study is primarily a study of self-report. Although the items came from validated tools, it is possible that the mothers were telling us what we wanted to hear; however, it is interesting that infant feeding was not part of the instructions given to the MOMS mothers, yet the group had significant differences in reported infant intake.

Although it would have been gratifying to demonstrate differences in weight among groups, it is not surprising that at this early age such a difference would not be found. This was a short trial that did not go past 12 months. The next step may be to carry out both intervention and evaluation into the toddler years when children are even more integrated into family eating style.

In spite of the apparent positive effects of the intervention, there is much room for improvement in all groups. For instance, none of the groups came close to the recommendations of the Centers for Disease Control and Prevention for fruit and vegetable servings per day. Although the MOMS group had the lowest juice intake, the 12-month-olds were still drinking more than 8 oz of juice a day and 23% were watching more than 2 hours of television per day with 39% of homes having the television on for more than 8 hours per day. It is also worth noting that the interventions may have had unintended effects. For example, the OP group reported eating fewer family meals than the BF and MOMS groups at 12 months. This may be related to some unmeasured baseline difference in the groups, or may be that the very specific portion size suggestions disrupted family meals because of the need to monitor what the infant ate more closely.

CONCLUSIONS

Providing mothers with information aimed at changing their own eating patterns showed positive differences in reported infant feeding behaviors.

There was not a difference in weight at this early age. The approach appears to have been successful in introducing habits associated with lean families into obesity-prone families and thus may ultimately help reduce childhood obesity. Having a newborn may be a “teachable moment” for a mother, allowing her to change her own lifestyle habits for the sake of improved health of her child. Unlike obesity-prevention models that require extra time and personnel and the development of new infrastructures, this model uses a system already in place, the well-child visit, substituting 1 to 2 minutes of more effective anticipatory guidance for the guidance that was already being given, therefore leaving the time cost of the visit unchanged. Brief effective interventions incorporated into well-child care accessed by most parents in the United States could have significant impact on obesogenic behaviors of families, and thus play an important role in the community’s effort to prevent obesity in young children and their families. Currently, however, there is little evidence to support the specific content and style of anticipatory guidance. This study offers a small step in that direction. Both interventions were more effective than the routine BF recommendations, but neither was as helpful as we had hoped. Future work might include combining child-directed and mother-directed intervention and continuing interventions and follow-up into early childhood. Such studies of specific content and style could provide a “brighter future” for anticipatory guidance.

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