

# Breast-feeding versus formula: Cost comparison

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*Peterkin and Walker published in 1976 a cost estimate of feeding a baby in the U.S.<sup>1</sup> At that time, they found there was little difference in cost between breast-feeding and formula feeding. Since then, however, the cost of formula has risen drastically—more than 150% during the 1980s<sup>2</sup>. One researcher estimated that food and feeding equipment cost \$855 in the first year<sup>3</sup>. Whereas the cost of formula is quite apparent when a family buys it, the cost of breast-feeding is hidden.*

## Introduction

The cost of feeding a newborn is of interest to both the family and the State of Hawaii for planning purposes. There are over 19,000 births annually in the State<sup>4</sup>; a large number of families make decisions on how to feed infants each year. Of the surveyed women residing on Oahu who had delivered in 1983 or 1984, 58% breast-fed their infants exclusively at the time of hospital discharge<sup>5</sup>. Another 19% of the infants were bottle-fed exclusively (presumably with infant formula), whereas 24% were fed breast plus bottle. Preliminary results from an update of this study showed that of all the newborns in Hawaii, at the time of discharge from the hospital, 50% were breast-fed, 22% were formula-fed and 28% were fed both by breast and with formula<sup>5,6</sup>.

Although the changes from 1984 to 1990 in feeding methods are not dramatic, if there is an obvious difference in cost between feeding methods, that observation could affect a family's selection of feeding method and could represent a significant difference in the absolute cost of feeding infants in Hawaii.

Our article presents estimates of current costs associated with 62 days (2 calendar months) of either exclusive breast-feeding or formula-feeding of a hypothetical healthy, full-term newborn in Honolulu. It does not address other important issues regarding the feeding of newborns; for example, compositional differences between these 2 foods (including non-nutritive differences such as immunoglobins and growth factors), how the infant is fed and other aspects of maternal-

infant bonding. Reviews of biological aspects of human milk and infant feeding are available<sup>7,8</sup>. Neither is the equipment used for feeding considered, since it varies widely depending upon individual needs and preferences.

Throughout this article, the term milk refers to either human breast milk or infant formula.

## Methods

The cost of infant formula and the cost of food a mother would consume to produce milk were calculated for the first 62 days of an infant's life. A 62-day period was selected to allow for cost comparison. Costs were assessed based on several assumptions as described below.

## Based on the infant

(1) To simplify calculations with respect to the amount of milk needed by the infant, the full-term, healthy infant was assumed to weigh 4.3 kg for the first 31 days of life and 5.2 kg for the second 31 days of life. These are the 51.3 and 50.3 percentile weights (Z scores of +0.03 and +0.01 and 100.6 and 100.1% of the median, respectively) at 1 and 2 months of age respectively, for a male infant as assessed, using the Centers for Disease Control anthropometric software (1988). By using the weight at the end of the period rather than that at the beginning, cost estimates were slightly higher than actual costs, but the relativity would be the same.

(2) Cost calculations were based on the assumption that dietary energy needs were the same in both formula and breast-fed infants and were 108 kcal per kilogram of body weight per day. According to the National Academy of Sciences<sup>9</sup>, this is about 15% higher than "recent estimates". However, a study published since the NAS document came out suggests that this estimate may be quite correct for 1-month-old formula-fed infants, but it might overestimate the needs of breast-fed infants of the same age, because they had an average need of 99 kcal/kg/d; however, the difference in energy needs was not statistically significant<sup>10</sup>.

There are additional and substantial data which suggest that breast-fed infants utilize energy more efficiently, including its better nutrients, as compared to infants fed proprietary milks<sup>9,11</sup>. However, since it is not yet clear whether the differences are statistically significant or not, the same energy values were applied to both foods. Thus, the cost calculations probably represent an overestimate of cost as applied to breast-feeding.

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Received for publication December 3, 1991.

**Based on the mother**

(1) The mother was assumed to be the hypothetical woman described by the NAS for the purpose of discussing the recommended dietary allowances<sup>9</sup>; ie she was between 25 and 50 years of age, weighed 63 kg (138 lbs), was 163 cm (64 inches) tall, and needed an average amount of energy per day to meet her own needs (36 kcal/kg or 2268 kcal). These assumptions do not have a direct impact on the calculations of the cost of breast-feeding but are mentioned as points of reference. There are 2 assumptions that do affect calculations: the mother produced milk with an energy content of 70 kcal/100 ml and her efficiency in converting dietary energy into human milk energy was 80%, resulting in a need of about 85 kcal of dietary energy to produce 100 ml of human milk<sup>9</sup>. This translates into an intake of an energy need 21% above that needed by the infant.

**Based on the foods**

(1) The energy content of proprietary milk as fed to the infant was 65 kcal/100 ml (20 kcal/oz).

(2) In preparing formulas to feed to the infant: (a) Concentrates required equal volumes of water and formula; and (b) powders required that water be added in preparation to the grams of powder, as stated on the product label, in order to prepare a specified amount of formula. The amount of powdered formula needed to mix with 2 ounces of water varied from 8.3 to 9.6 grams, depending on the brand and the labels of the priced formulas.

(3) The cost of the food consumed by the mother needed to produce the milk to feed the infant was assessed according to the actual cost of specific food items used by the United States Department of Agriculture's cost estimate of breast-feeding<sup>1,12</sup>. Two spending plans were used, one moderate (M) and the other thrifty (T). The moderately priced plan consisted of 178 ml (6 oz) of orange juice, 14 g (0.5 oz) of butter, 1 L of (whole) milk, 1 egg and 2 slices of whole wheat bread<sup>12</sup>. The thrifty plan consisted of 100 g of nonfat milk solids, 60 ml of cooking oil, 28 g (1 oz) enriched cornmeal, 150 g turnip greens (fresh), and a multivitamin and mineral supplement<sup>12</sup>. These plans cost 53 cents and 18 cents respectively per day in 1978.

When these diet plans were analyzed using Nutritionist III software (N-Squared Computing, Silverton, Oregon, 1985), fat contributed a high proportion of total energy: About 41% and 53% respectively. Both plans were therefore modified to reduce fat, reflecting current trends in dietary recommendations. They also were modified to provide the same amount of energy, 728 kcal, and to be somewhat similar in the content of protein, calcium, and iron. To reduce fat in the M plan, butter was omitted and whole milk was changed to 2% (fluid) milk. In addition, the bread was reduced to one slice. Because fresh vegetables are costly, the fresh greens in the T plan were replaced with frozen turnip greens, the lowest-priced frozen greens in the surveyed store. Both plans (with modifications) provided 728 kcal, of which fat contributed 32% or 34% of the energy respectively (Table 1). The food items in the M plan had more cholesterol and vitamin C whereas the T plan was much higher in vitamin A (Table 1). Finally, as the nutri-

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ent composition of the T plan was actually superior to the M plan for some nutrients, and the fact that multivitamin and mineral supplements are no longer routinely recommended<sup>9</sup>, the nonfood supplement for the T plan was omitted. Table 2 shows the actual foods and quantities for both plans.

**Data collection and utilization**

A Honolulu store belonging to a chain that uses the uniprice system was selected for pricing. This meant the

**TABLE 1**  
**Nutrient Composition\* of Modified USDA Food Plans for Lactation Supplement**

Nutrient (weight or units)	PLAN	
	Moderate	Thrifty
Protein (g) (% energy from protein)	43.3 (24%)	40.2 (22%)
Fat (g) (% energy from fat)	26.1 (32%)	28.8 (34%)
Cholesterol (mg)	347.8	17.6
Calcium (mg)	1282.0	1359.0
Iron (mg)	2.7	3.1
Vitamin A (IU)	2455.0	9076.0
Vitamin C (mg)	82.2	23.6

\*Determined with Nutritionist III software (N Squared Technology, Washington, 1985).

**TABLE 2**  
**Food Items and Cost of Modified USDA Food Plans for 728 kcal Daily Lactation Supplement**

**Moderately Priced Diet Plan**

Item	Portion	Cost
Orange juice, frozen, diluted	189 g	\$0.27
Milk, fluid, 2%	1 L	0.87
Egg, large, hard boiled, no shell	1	0.12
Bread, whole wheat	1 slice	0.10
TOTAL		\$1.36

**Thrifty Diet Plan**

Item	Portion	Cost
Milk, nonfat, instant, dried	100 g	\$0.54
Cornmeal, degermed, enriched, dry	28 L	0.06
Vegetable oil, soybean	27 g	0.07
Turnip greens, frozen, boiled	83 g	0.26
TOTAL		\$0.93

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prices for the food items were the same in 12 stores on Oahu. The store was surveyed twice, 12 months apart, for the cost of all food items. The most recent pricing was conducted in September 1990. The lowest-priced brand of each formula type (powder, concentrate, etc) was used in calculating formula costs. Two brands of formula were excluded; one was excluded because the label indicated it was for babies over 6-months of age and, therefore, was not suitable for the age group in this study. The other was omitted because it was new on the market in 1990 and had not been on the shelves in 1989.

**TABLE 3**  
**Cost of Feeding Neonate Assuming Energy Needs are the Same for Both Breast and Formula Fed Infants (108 kcal/kg)**

Period	FEEDING METHOD		
	Breast-fed by Mother's Diet*		
	Formula-Fed*	Thrifty	Moderate
First 31 days	\$53.93	\$22.25	\$32.54
Second 31 days	<u>65.21</u>	<u>26.91</u>	<u>39.35</u>
Total Cost	\$119.14	\$49.16	\$71.89

\*This was based on the total energy intake needed by the mother which is 21% greater than that needed by the infant. Food costs were based on the brand with the lowest per unit cost for each item. See Table 2 for a list of items.

\*\*The cost was based on the lowest cost form and brand. Powdered formula was the lowest cost form for all brands which had more than one form. The lowest cost formula was a powdered milk-based formula. The infant needed 14,396 kcal in the first month (464 kcal/day) and 17,410 in the second month (562 kcal/day).

**TABLE 4**  
**Time Trend in Cost of Feeding a Newborn for the First 62 Days, By Food Type**

Food Type	ACTUAL COST*		
	YEAR		Percent Increase
	1989	1990	
Formula	\$104.56	\$119.14	13.9
Breast-fed— Thrifty Food Plan	48.64	49.69	2.2
Breast-fed— Moderate Food Plan	67.67	72.42	7.0

\*Cost is based on lowest cost items. The formula is a powdered milk-based infant formula.

As for the food items for breast-feeding mothers, the lowest priced brand per unit measurement was used (sale prices were excluded). In calculating the cost of breast-feeding, the actual amount of energy needed by the mother (based on the infant's energy needs plus the mother's need for an additional 21% to produce the milk) was calculated and that number was divided by the energy provided by the plan (728 kcal). This number was then multiplied by the cost of each of the 2 food plans (thrifty or moderately priced).

**Results**

Thirty-six proprietary milks and 29 different items for the mother's food plans were priced.

Table 3 presents the costs assuming the infant needed 108 kcal/kg, regardless of milk type. Foods for breast-feeding cost substantially less than formula, regardless of the plan (Table 2). Even the moderate plan was 39% less than the cost of the cheapest formula. The difference in cost increases substantially when the lowest-cost formula is not used. The lowest-priced concentrated formula cost \$149.86 for the 2-month period, over twice as much as the moderate food plan and 3 times the cost of the thrifty food plan. The lowest-priced ready-to-feed (RTF) formula (in 32 ounce containers) cost \$178.41, 3.6 and 2.5 times the cost of the thrifty and moderate food plans, respectively.

Table 4 shows the trend over time in feeding costs. Using the lowest-cost items, the cost increased by 13.9% in one year for formula, whereas the T and M plans only increased by 2.2 to 7.0%, respectively. Changes in costs of formula differed by formula category, however, with relatively small increases (2.5 to 2.8%) in one year for the lowest-priced concentrated and RTF formulas. Thus, while these 2 types of formula continued to cost a lot more than foods for breast-feeding, the ratio of costs did not change significantly in the 12 months of study.

**Discussion**

Over a decade ago, the cost of food for a newborn did not differ greatly depending on whether the infant was breast-fed or formula-fed; that is no longer the case in Hawaii today. The cost of food for the neonate in the first 62 days of life differed substantially by feeding method, the cost being much lower for the breast-fed infant. This difference exists in spite of the fact that the cost difference was probably minimized by using the lowest-priced formula and the same energy need in both breast and formula-fed infants, since there is substantial evidence that, on average, breast-fed infants need to consume less food energy as compared to formula-fed infants<sup>9,11</sup>.

These relative differences in cost have significant implications for infant feeding programs that are trying to reduce cost or to minimize cost increases. In June 2, 1990, Cable News Network reporter Eugenia Halsey noted that infant formulas had nearly doubled in price since 1980. Government programs such as the United States Department of Agriculture's Supplemental Food Program for Women, Infants, and Children (WIC) have been trying to hold down costs by promoting breast-feeding, but it has been difficult to do.

Based on the cost estimates in our study, it would cost at

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**How Supplied:** Oral tablets of Yocon® 1/12 gr. 5.4 mg in bottles of 100's NDC 53159-001-01 and 1000's NDC 53159-001-10.

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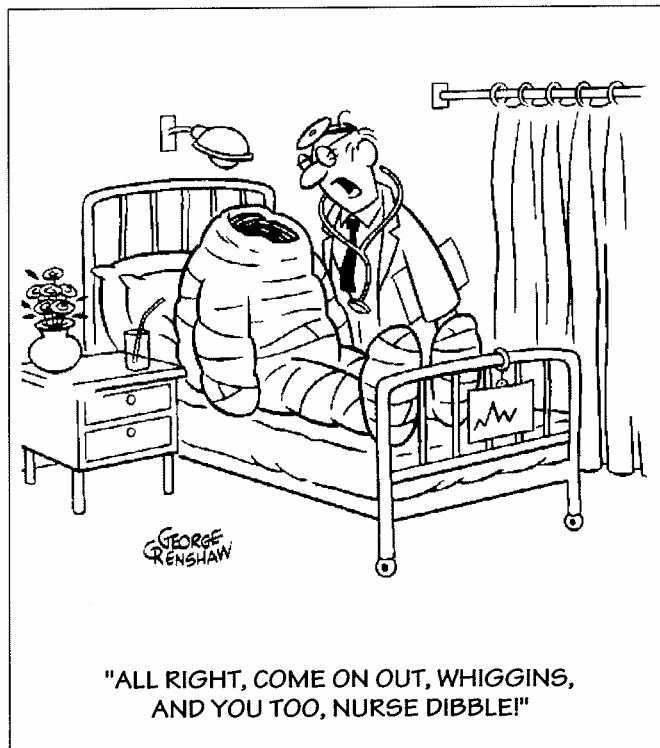
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least an extra \$45 to \$70 to feed a newborn formula for 62 days; put in another way, 2 newborns could be breast-fed for the cost of one newborn who is formula-fed.

Although one could argue over our assumptions, it is evident that food for the mother who breast-feeds costs considerably less than buying formula for the infant. This may be an important consideration in helping families decide what should be the first milk for the newborn baby.

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