The Impact of Changing Consumer Preferences on Baby Food Consumption

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This study examines the relationship between processed baby food consumption, socioeconomic factors, and attitudes and awareness concerning baby food safety and nutrition. The results are consistent with the view that recent concerns about safety may have negatively impacted consumption. Several socioeconomic factors were also found to be significant in explaining consumption.

Introduction

U.S. consumers of all ages are involved in the trend toward eating more healthy foods. This trend includes the baby food market as the health and nutrition concerns of parents extend to their decisions about what foods to place before their newest family members (Harris, 1997).

Changes in marketed baby foods, to some extent, parallel those for adult foods—more organic foods, fewer added starches and sugars, and less preservatives. These changes have resulted from parents' concerns that anything critical to the well-being of their infants should be wholesome and safe (Consumers Union, 1995). These concerns have also been fueled by recent consumer group studies, which have stirred controversy about whether added sugars and starches compromise nutrition. These studies have also raised concerns about whether traces of pesticides in baby food pose a health risk. Despite the changes, U.S. retail sales of baby food (excluding infant formula) declined 7 percent between 1994 and 1996.

Several economic and demographic factors can be associated with baby food consumption and possibly with this decline. Prices and consumer incomes are important factors. There is little doubt that baby food is more expensive than other products in the supermarket; however, it is hard to overlook the economies of scale and packaging associated with baby food. Babies have smaller appetites, and packaging larger quantities is not feasible. Lower birth rates in the United States may also be associated with the leveling and stagnation of sales.

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Increasing nutrition and health knowledge plus health awareness may also be a factor. However, knowledge and awareness may not be prevalent in all segments of the population, such as in higher income groups, regions, races, or other demographic variables.

Identification and assessment of the causes of changes in baby food consumption are important to baby food manufacturers and retailers. Researchers and policymakers are also interested in understanding the factors that explain food demand and are interested in information on the specific determinants of food choice and purchase behavior. They are also interested in the relationship between dietary and health information and its impact on food demand.

This analysis uses a single behavioral equation to estimate the relationship between income, nutrition, health knowledge and awareness, and other socioeconomic characteristics on baby food consumption.

Theoretical Framework

Household production theory provides the theoretical framework used in this analysis. Household production theory consists of the integration of the theory of the consumer with firm production theory (Deaton and Muellbauer,1980). The approach is concerned with the efficient use of market goods, time, and human capital as inputs in the production of utility-yielding "home-produced" commodities in households.

Household production theory allows the researcher to incorporate health knowledge and diet-health relationships into a single-demand equation for baby food. The basic idea is that a person or household combines information, time, and market goods to produce nonmarket goods that yield utility. With this approach, people or households can be viewed as individual production units—which produce a number of commodities, some unob-

served—that maximize their well-being (Blisard, Blaylock, and Smallwood, 1994). Derived demand functions for market goods originate from the demand for these "home-produced" commodities and are constrained by the household's production technology and limited resources.

A derived demand function for baby food can be formulated in the following manner. Households can be thought of as maximizing a utility function:

$$(1) \qquad U=U(H,L,Z),\ U'>0,\ U''<0,$$

where H, L, and Z are, respectively, vectors of health status, leisure, and other household consumption.

Health status can be expressed as a function of foods consumed along with other health-related inputs, such as genetics and medical services. Here, the focus is on food, its nutrient content, and the safety of the food products. The production function for health can be expressed as

$$(2) \qquad H=H(Q_f,Y,X),$$

where Q_f is the food consumed, Y is a vector of nonfood health inputs, including medical services, and X is a vector of observable health-relevant characteristics. Demand functions for market goods can be derived from "home-produced" commodities and are constrained by the individual's production technology and limited resources; therefore, the person or households have a demand function for food that is a function of prices, income, and possibly other socioeconomic variables (Pitt and Rosenzweig, 1984) that can be written as

$$(3) \qquad Q_f=Q_f(P_f,P_x,I,D),$$

where P_f is the price of food, P_x is the price of nonfood items, I is income, and D is a vector of socioeconomic variables.

Further assume that a person's dietary-health knowledge and the knowledge of the safety of food products influence the production of health and directly affect the consumer's choice of food inputs. In other words, knowledge alters the technology of household production and thereby changes the demand for various food products (Jensen, Kesavan, and Johnson, 1992). This knowledge can be introduced as an exogenous factor into the consumer demand for baby food. Thus, the demand for baby food can be expressed as a function of food prices, income, knowledge of the diet-health relationship, and food safety and other socioeconomic variables. Demand for baby food, Q_{bf}, can then be expressed as

$$(4) \qquad Q_{bf}=Q_{bf}(P_{bf},P_x,I,D;K),$$

where K is diet-health awareness and information about the safety of baby food.

Data

Data from the 1994–96 continuing survey of food intakes by individuals (CSFII) and the 1994–96 diet and health knowledge survey (DHKS) are the source of data for this analysis. The surveys are conducted by the U.S. Department of Agriculture's (USDA) Agricultural Research Service and provide information about food and nutrient intakes for individuals in U.S. households. They contain information about food intake, attitudes, and knowledge concerning nutrition, diet, and health. The surveys are constructed so that DHKS data can be linked to information on food and nutrient consumption in the CSFII.

The 1994–96 CSFII provides two nonconsecutive days of dietary data for individuals of all ages. The data were collected from January 1994 – January 1997 through in-person interviews. The three years of data include information on food and nutrient intakes by 16,103 individuals who provided at least one day of dietary data.

The 1994–96 DHKS was conducted through telephone follow-up after the CSFII was conducted. The DHKS includes information on knowledge and attitudes toward diet and health from 5,765 individuals who are 20 years of age and older and who participated in the 1994–96 CSFII.

A subset of the CSFII and DHKS data is used to conduct the analysis presented in this paper. The subset consists of households that consumed baby food (baby food includes strained foods, juices, meats, desserts, and cereals, but excludes infant formula) during the survey period. These households were matched with DHKS information for primary meal planners and resulted in complete information for 91 households.

Model Specification and Variables

Among the households in the matched data subset, 87 percent of the meal planners felt that the safety of the food they purchase was very important (Table 1). A slightly smaller percentage, 74 percent, indicated that they had heard about health problems associated with consuming excessive amounts of sugars.

Table 1. Selected Descriptive Statistics, 1994–96.

Variable	Unit	Mean	Standard Error
Northeast	percent	20	40
West	percent	15	42
South	percent	42	50
Inner City	percent	33	47
Income	dollars	181.47	129.28
White	percent	79	41
Hispanic	percent	15	36
Education	years	13	2
Unemployed	percent	11	31
WIC Program	percent	5	23
Safety[a]	percent	87	34
Sugar[b]	percent	74	44

[a] The importance, to meal planners, of the safety of food purchased. This variable reflects those meal planners who consider safety very important.

[b] This variable reflects whether meal planners have heard about health problems associated with consuming excessive amounts of sugars.

Mean weekly household income was $181.47, and 79 percent was white. The average education level was 13 years, and 33 percent lived in inner city locations. Also, 11 percent of the meal planners were unemployed, and 15 percent was Hispanic.

The model focuses on the primary meal planners in households. These individuals make the primary purchase decisions in the household. Presumably, their own level of information and awareness influence the purchase of baby food.

The dependent variable in the model is grams of baby food consumed per capita per day. Socioeconomic variables included in the model are household residence, residence in the inner city, income, race, Hispanic, education, whether they are employed, and whether they participated in the special supplemented food program for Women, Infants, and Children (WIC).

The region of household residence, whether residence is in the inner city, race, Hispanic, unemployment, and WIC are binary variables. The region variables are used to capture regional consumption differences. Inner city residents are hypothesized to have different consumption patterns relative to their suburban and rural counterparts. Rural households, especially, may consume less than inner city households due to rural food production from gardens and orchards. These fresh products can provide fruits and vegetables that can be processed into baby food at home. The race and Hispanic variables are used to capture differences in consumption patterns between whites and nonwhites as well as Hispanics. The employment variable is used to capture consumption differences due to unemployment. About 11 percent of the meal planners who purchased baby food were unemployed. Households that participate in the WIC program only consume infant formula, cereals, and baby juices; therefore, WIC households are hypothesized to consume higher rates of infant formula and lesser rates of baby food.

Higher income households are hypothesized to consume more baby food than lower income households, and education was hypothesized to have a negative effect on consumption since better-educated consumers may be more aware of the harm of high sugar intake and also aware of safety concerns regarding the safety of processed baby foods.

Safety is a binary variable used to indicate whether the primary meal planner feels that the safety of the food that s/he purchases is very important. It is hypothesized that meal planners who feel more strongly about the safety of food may consume less baby food than meal planners in other households due to these concerns, or they might even prepare their own baby foods in the home. The sugar variable is included to capture the effects of knowledge about health problems associated with consuming excessive amounts of sugars. It is hypothesized that increased knowledge may reduce consumption since many baby foods consumed during this period contained added refined sugars. Babies need calories; how-

ever, some parents may object to them getting those calories from added refined sugars.

The single equation depicting baby food consumption is, therefore, specified as:

$$\begin{aligned}(5)\quad Dayamt=&B_0+B_{11}Northeast+B_{12}West+B_{13}South\\&+B_{14}Inner\ city+B_{15}Income+B_{16}Race+B_{17}Hispanic\\&+B_{18}Education+B_{19}Employment+B_{20}WIC\\&+B_{21}Safety+B_{22}Sugar.\end{aligned}$$

Variable definitions can be found in Table 2, and descriptive statistics can be found in Table 1.

Table 2. Variable Definitions.

Variable	Definition
Dayamt	Daily consumption of baby food (strained fruit, strained vegetables, strained meats, strained desserts, juices, cereal)
Northeast	Equals 1 if household resides in the northeast; zero otherwise
West	Equals 1 if the household resides in the west; zero otherwise
South	Equals 1 if the household resides in the south; zero otherwise
Inner City	Equals 1 if the household resides in the central city; zero otherwise
Income	Household weekly per capita income
Race	Equals one if white; zero otherwise
Hispanic	Equals 1 if Hispanic; zero otherwise
Education	Years of formal education
Employment	Equals 1 if unemployed; zero otherwise
WIC	Equals 1 if enrolled in Women, Infant, and Child Program; zero otherwise
Safety	Equals 1 if the meal planner thinks the safety of the food that they purchase is very important
Sugar	Equals 1 if the meal planner has heard of health problems associated with consuming excess amounts of sugars

Empirical Results

Estimated parameters for the baby food demand equation are presented in Table 3. The results indicate that 7 out of 12 variables were significant at the 10 percent level or higher. Income, education, and employment were all significant at the 5 percent level. As hypothesized, income was positive and indicates that, for each additional dollar of weekly income, consumption increases 0.39 grams per day. The education variable yielded the expected negative sign, and more educated meal planners were found to purchase 19.52 grams per day less baby food than less educated meal planners for each additional year of education. More educated meal planners may be more aware of publicized safety concerns regarding baby food and also more aware of the diet-health relationship associated with excess consumption of sugars. Unemployed meal planners were found to consume less baby food than employed meal planners—162.08 grams per day less than those who were employed.

Table 3. OLS Estimates for Consumption Equation.[a]

Variable	Coefficient	Standard Error
Constant	598.54***	162.87
Northeast	-68.40	62.68
West	22.68	71.32
South	-4.83	53.10
Inner City	- 75.67*	43.33
Income	0.39**	0.18
Race	- 85.59*	51.44
Hispanic	61.60	64.16
Education	-19.52**	10.08
Employment	-162.08**	69.82
WIC	-230.57*	94.41
Safety	-113.98*	60.36
Sugar	4.22	47.36
R^2=.24	F=2.11	

[a] significant at the 0.10 level; ** = significant at the 0.05 level; and *** = significant at the 0.01 level.

Four variables were found to be significant at the 10 percent level—inner city, race, WIC, and safety. Inner city meal planners were found to consume 75.67 grams per day less baby food than suburban and rural meal planners. White meal planners also consumed less than nonwhites, 85.59 grams less per day. People in the WIC program also consumed less baby food per capita than other households, 230.57 grams less. WIC participants may be using more infant formula and also are restricted in terms of which types of baby food they may consume under the program. Participants are limited to baby cereals and juices only and do not get other types of baby food under the program. The safety variable was also significant and negative. Households, which feel that the safety of the food they purchase is very important, apparently consumed less processed baby food. These households, if they have heard all the publicity about the safety of baby food (that is, pesticide residues), may have reduced

their consumption, prepared their own baby food, and/or consumed more organic baby food. In other words, households that are very concerned about food safety may have a higher propensity to translate negative health and safety information into reduced consumption.

The sugar variable was insignificant and had an unexpected sign. This result implies that any information consumers may have heard about a link between health and consuming excessive amounts of sugar was not translated into their consumption level or that they may not be aware that baby food can contain added refined sugars.

Concluding Remarks

There is little doubt that many parents have changed their preferences for some of the nutrition and safety attributes of the specific type of baby food that they consume. Many are demanding more natural baby foods (no added sugars or fillers) and more organic baby foods. New products contain less added starches, sugars, and preservatives. Gerber removed added ingredients from many of its products in 1996, and Beechnut now only adds refined sugar to its dessert products.

Organic baby foods contain no added sugar, salt, preservatives, artificial flavors, colors, or modified starches. These products are also grown organically. Consumers who purchase organic products pay a significant price premium. While total sales of all baby foods have declined somewhat, organic sales have increased dramatically (percentage-wise, Earth's Best increased 2,200 percent between 1989 and 1995); however, organic only accounts for about 2.5 percent of the market (Harris, 1997). Gerber introduced a new line of organic baby foods in 1997.

Some parents may also have reduced their consumption of baby foods in favor of carefully prepared homemade baby food; however, parents who prepare their own foods give up the convenience of manufactured baby foods.

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