Working Paper Series

WORKING PAPER NO. 694

EGG CONSUMPTION OF YOUNG CHILDREN

by

Katherine Ralston and Sylvia Lane

DEPARTMENT OF AGRICULTURAL AND
RESOURCE ECONOMICS

BERKELEY

CALIFORNIA AGRICULTURAL EXPERIMENT STATION

University of California

DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS
DIVISION OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF CALIFORNIA AT BERKELEY

WORKING PAPER NO. 694

EGG CONSUMPTION OF YOUNG CHILDREN

by

Katherine Ralston and Sylvia Lane

California Agricultural Experiment Station
Giannini Foundation of Agricultural Economics
November, 1993

EGG CONSUMPTION OF YOUNG CHILDREN

by

Katherine Ralston
USDA/ERS/RTD
Washington, D.C.

Sylvia Lane*
Department of Agricultural and Resource Economics
University of California at Berkeley

*Corresponding author.

EGG CONSUMPTION OF YOUNG CHILDREN

The objective of this inquiry was to examine the determinants of egg[1] consumption of children aged one- to five-years old in the United States. Concerns about cholesterol have led to a steady decrease in total egg consumption since 1969 (Putler, 1987 and 1989, and Lutz *et al.*, 1992, Table 1, p. 12). Health concerns may also be partly responsible for eggs' status as an inferior good, meaning that the quantity consumed is lower for higher income households [Nationwide Food Consumption Survey (NFCS), Continuing Survey of Food Intakes by Individuals (CSFII), 1985, p. 7]. Table 1 shows that this pattern holds for children's egg consumption as well. On the other hand, eggs contain almost perfect protein which can contribute importantly to meeting children's nutritional requirements and they are viewed by authorities on child nutrition as "good for children" (McWilliams, 1986a and 1986b; Maryland Department of Health, 1981; and Buttriss, 1987). Further, they are an important part of young children's diets in the United States no matter what their cultural backgrounds (NFCS, CSFII, 1985 and 1986, p. 3). It is important to explore to what extent mothers' concerns about cholesterol are restricting children's egg consumption.

METHODOLOGY

Data for this analysis were from NFCS, CSFII (1985 and 1986) and NFCS (1979). Tobit analyses were used in the attempt to find significant variables explaining young children in a household eating eggs.

MODEL

Children's egg consumption is modeled as a function of the food preparer's egg consumption, the child's age, the child's sex, and whether the child attends a child-

care facility which provides meals. The food preparer's egg consumption was modeled as a function of household characteristics, food preparer's characteristics, and consumer prices indices of eggs and several possible substitutes and compliments. The two equations used appear below:

$C = f(F, A, S, D)$

$F = f(y, y^2, wic, numfs, ed, agefp, nw, s, r, cpie, cpic, cpich, cpiba, cpib, cpigb, cpip, cpicf, cpiff, cpichi)$

where

C = Children's egg consumption

F = Food preparer's egg consumption

A = Child's age

S = Child's sex

y = Income

y^2 = Income squared

wic = Household participates in Women, Infants, and Children (WIC) supplementary food program (dummy variable)

numfs = Number of household members receiving food stamps

ed = Food preparer's education, years

agefp = Food preparer's age

nw = Food preparer is non-white (dummy variable)

s = Size of household

r = Household is rural (dummy variable)

cpie = Consumer Price Index (CPI) for eggs during interview month

cpic = CPI for cereal during interview month

cpich = CPI for cheese during interview month

cpiba = CPI for bacon during interview month

cpib = CPI for beef and veal during interview month

cpigb = CPI for ground beef during interview month

cpip = CPI for pork during interview month

cpicf = CPI for canned fish during interview month

cpiff = CPI for fresh fish during interview month

cpichi = CPI for chicken during interview month.

The equations are estimated using the Tobit procedure, which accounts for the fact that distribution of consumption is truncated at zero.

FINDINGS

The percent of children aged one through five-years old reported as eating eggs on the surveyed day fell from 33 percent in 1977 to 28.5 percent in 1985, but 56.6 percent of the surveyed children ate eggs at least once in four consecutive days of the survey in 1986 (NFCS, CSFII, 1985, p. 13, and 1986, p. 21 and Table 1). Estimated coefficients and t-ratios for the children's egg consumption equation appear in Table 2. Egg consumption by the food preparer was by far the most significant variable in the estimation for the child's egg consumption at any meal and then in estimations in which the dependent variables were the child eating eggs for breakfast, the child eating eggs for lunch, and the child eating eggs for dinner/supper.

Coefficient values and t-ratios for the food preparer's egg consumption appear in Table 3. Income, an explanatory variable for children, as indicated earlier in Table 1, was also a negatively significant variable in estimations explaining the mother eating eggs at any meal (Table 2). The lower the income level, the higher the food preparer's egg consumption. The mother participating in the WIC program was also a negative indicator even though shell eggs were part of the WIC package. The number of people in a household receiving food stamps was also negatively significant in the equation explaining the mother eating eggs at any meal, as were the food preparer's (generally mother's) level of education and whether the household was rural or not. Household

size was significant and positive. None of the other variables was significant (Table 2). The effect of the food preparer's egg consumption was again positive and highly significant in the equation explaining the young children eating eggs at breakfast. The children's age, sex, and attendance at a child-care facility with meals were negative and significant (Table 3). Variables that were significant at the 5-percent level and negative in the equation, which explained, in part, the mother eating eggs for breakfast, were WIC program participation and the food preparer's educational level. Variables that were significant and positive were the food preparer being non-white and household size (Table 3).

The child eating eggs for lunch was again, as noted earlier, influenced by the mother eating eggs for lunch (the coefficient being positive and highly significant) and by the child's age, the coefficient being negative and significant (Table 3). The food preparer's egg consumption at lunch was significantly affected by the household income (the sign of the coefficient being negative), income squared (the coefficient for which was positive), and the number in the household receiving food stamps and the food preparer's education level (the coefficients being negative for both, Table 2).

The child eating eggs for dinner/supper, once more, significantly depended on the mother eating eggs for dinner/supper (Table 3). The mother eating eggs for dinner/supper was significantly affected by the price of eggs, coefficients for both being positive, and prices of canned fish and fresh fish—two substitutes for eggs (Table 2).

The results clearly indicate that the food preparer's egg consumption is by far the most important determinant of children's egg consumption, for meals individually, and for all meals together. However, the coefficients for mother's egg consumption are all greater than one, suggesting that food preparers serve eggs to children more often than they consume eggs themselves. Examining meal equations individually, children consume about 20 percent more eggs than the food preparer at breakfast, almost twice as much at lunch, and over two and a half times as much at dinner. This

suggests at least some implicit notion being held by some sample members of differences in health implications of egg consumption of children versus adults.

IMPLICATIONS

Since the coefficients for the child's age were negative and significant in the equations explaining, in part, the children's egg consumption at any meal, for breakfast, and for lunch, the implication is that the older the child, the fewer the number of eggs the child will eat.

The child's attending a child-care facility where meals are served was negative and significant (at the 5-percent level or above) only in the equation explaining, in part, the children's eating eggs for breakfast. If the child is going to the child-care facility, the child will be less likely to have eggs for breakfast perhaps because cold cereal, or even instant hot cereal, is faster to prepare or perhaps because the child will have breakfast at the child-care facility.

That income was a negative and significant variable affecting the mother's eating eggs at any meal and/or at lunch implies that eggs are an inferior good, in this case, for both the children and the mothers.

The coefficient for income squared being positive and significant at the 5-percent level or above only in the equation for the mother's eating eggs for lunch (Table 2) implies that the coefficient increases at a decreasing rate. The coefficient for this variable is very small, leading to a surmise that, at relatively high income levels, it will be increasing hardly at all.

The significant negative coefficient for household participation in WIC in the food preparer's breakfast and any meal equations indicates that (WIC being part of real income) real income increases tend to affect household egg consumption negatively as does income not including WIC benefits. The same implication applied to the number of household members receiving food stamps. The coefficients of the

food stamp variable provide further evidence of the status of eggs as an inferior good, especially for dinner. This coefficient is negative for all equations, but its absolute value is largest for the dinner equation, followed closely by the lunch equation. Thus, as income increases, even through the addition of food stamp income, households substitute other preferred protein sources for eggs.

The highest level of significance for the independent variables affecting the mother's egg consumption at any meal, as well as in the equations for breakfast (it was third highest for lunch), was the food preparer's (almost invariably the mother) level of education which was negative. This implies that the more educated the mother, the fewer eggs were eaten for breakfast (or for lunch); this was not the case for dinner. The food preparer's level of education was not significant in the dinner/supper equation.

Household size being positive in the any-meal and breakfast equations, but negative and insignificant in the lunch and dinner equations, implies the larger the household size, the more likely its occupants are to eat eggs at breakfast. That strong positive effect accounts for the positive significance of the variable in the equation for "at any meal."

The food preparer being non-white was only statistically significant at the 5-percent level and, in this case, positive, in the breakfast equation. Relatively more non-white mothers prepare and eat eggs at breakfast. If the household was rural, the mother was less likely to eat eggs at any meal, but this variable was not significant in the equations for the separate meals.

Price effects were only significant in the mother's egg consumption at the dinner/supper equation. In this equation, the CPI for canned fish and fresh fish was both a positive and significant variable. Therefore, these are important substitutes for eggs in the mothers' diets. The CPI for eggs was also positive and significant in the mother's egg consumption at the dinner/supper equation, implying that, for this case,

eggs are a Giffen good. Giffen goods are a special case of inferior goods for which the budget share is so large that, as the price increases, the income effect outweighs the substitution effect. Whereas normally a price increase would lead to substitution of other goods as they become cheaper in relative terms, in the case of Giffen goods, the price increase decreases real income to the extent that consumption of the good actually increases because other goods are no longer affordable. In this case, while the effect of the egg's CPI is positive, it seems unlikely that eggs represent a clear example of a Giffen good, since the budget share for eggs is small, even for low-income families. The observed positive own-price effect may possibly be due to a seasonal pattern in both prices and consumption: Consumption may be higher during some seasons when prices are also high.

CONCLUSIONS

Widespread concerns about cholesterol resulted in notable decreases in the quantity of shell eggs sold to consumers between 1977 and 1985 but, as noted earlier, over half of the children in households surveyed were reported as having eaten eggs in four nonconsecutive days of the survey in 1986. The food preparer's egg consumption was the most significant variable explaining children's egg consumption, yet food preparers appear to be serving eggs to children more than they are consuming eggs themselves. The child's age significantly affected the child's egg consumption negatively (except for dinner/supper) leading to the surmise that older children eat fewer eggs than younger children in the age group studied. Children who attend child-care facilities that serve meals apparently ate fewer eggs at home for breakfast.

Income significantly and negatively affects the mother eating eggs at any meal but, in this case, it was only for breakfast. Eggs are an inferior good both for children and their mothers. The household's participation in the WIC program or the number in the households receiving food stamps affected egg consumption of the mothers

negatively. Apparently, the negative income effect of the programs was significant. This was an inferior good. The significant negative effect of education on the food preparer's consumption of eggs reflects the increased concern about cholesterol among educated consumers—a previously noted finding (Putler, 1987). Lower egg consumption of rural food preparers has no rationale that we could find in the literature. Higher egg consumption by non-white food preparers and food preparers in larger families suggests that these households may still be the largest consumers of larger breakfasts.

The positive coefficients on the eggs CPI raises the possibility that eggs are a Giffen Good, a finding that is contradicted by other studies (Putler, 1987 and 1988). While eggs are clearly an inferior good, the Giffen good finding requires further investigation to rule out confounding effects such as seasonality.

Footnote

[1]Eggs in this disquisition invariably refer to fresh shell eggs.

References

Buttriss, J. (1987). Diet and the Under Fives. Forbes Publications, London. pp. 10-12.

Lutz, S.M.; D.M. Smallwood; J.R. Blaylock; and M.Y. Hama (1992). Changes in food consumption and expenditures in American households during the 1980s. USDA, Statistical Bulletin No. 849, ERS, HNIS.

Marshall, A. (1985). Principles of Economics. MacMillan and Co., Ltd., London. 3d edition.

Maryland Department of Health and Mental Hygiene (1981). Exploring Foods Workbook. Maryland Department of Health and Mental Hygiene, Baltimore, MD.

McWilliams, M. (1986a). The Parents' Nutrition Book. John Wiley and Sons, Inc., New York.

_____. (1986b). Nutrition for the Growing Years. John Wiley and Sons, Inc., New York. .4th ed., p. 173.

NFCS (1979). U.S. Department of Agriculture, Preliminary Report No. 1, Science and Education Administration, August.

NFCS, CSFII (1985). U.S. Department of Agriculture, Report No. 85-4, Nutrition Monitoring Division of the Human Nutrition Information Service.

_____. (1986). U.S. Department of Agriculture, Report No. 86-3, Nutrition Monitoring Division of the Human Nutrition Information Service.

Putler, D.S. (1987). The effect of health information on shell egg consumption. Paper presented at the meetings of the American Agricultural Economics Association in East Lansing, Michigan, August.

_____. (1988). Reference Price Theory: A Behavioral Analysis of Consumer Response to Price Changes. Ph.D. Dissertation. University of California, Department of Agricultural and Resource Economics, Berkeley, December.

TABLE 1

Percentage of children aged one to five years old, eating eggs at least once, four non-consecutive days, 1986

Income level	
Under 131% of poverty	67.0
131-300% of poverty	54.6
Over 300% of poverty	47.3

Note: The 1986 poverty threshold for a household of four was $11,000. It ranged from $5,360 for a one-person household to $18,520 for an eight-person household. For larger households, $1,880 was added for each additional member (NFCS,CSFII, 1986, p. 161).

Source: NFCS, CSFII (1985 and 1986, p. 21) and NFCS (1979).

TABLE 2

Tobit coefficients for determinants of food preparer's egg consumption (grams)

	Any meal	Breakfast	Lunch	Dinner
Income (x $1,000)	-0.0305* (-2.8902)**	-0.0119 (-1.0031)	-0.0574* (-3.4499)	-0.0357 (-1.3278)
Income squared	0.0004 (1.3624)	-0.223 (-0.2564)	0.0014* (3.0712)	0.0004 (0.3668)
Receives WIC (dummy)	-0.0670*** (-2.1569)	-2.269*** (-2.2953)	0.0266 (0.6185)	-0.1737 (-1.4715)
Number of food stamps	-0.0247*** (2.1569)	-1.129 (-1.0830)	-0.0600* (-2.8002)	-0.0514 (-1.7886)
Food preparer's education	-0.0461 (-0.8363)	-4.301* (-4.3144)	-0.0438* (-3.0431)	-0.0197 (-0.9678)
Food preparer's age	-0.0032 (0.1554)	-0.902 (-0.8621)	-0.0033 (-0.5014)	0.0041 (0.4565)
Food preparer is non-white (dummy)	0.0965 (0.0677)	2.356*** (2.5116)	0.0633 (0.6614)	-0.0525 (-1.1834)
Household size	0.0361*** (2.2529)	3.058*** (2.9549)	-0.0085 (-0.2662)	-0.1368 (-1.0539)
Household is rural (dummy)	-0.1113*** (-2.0120)	-1.343 (-1.3070)	-0.2183 (-1.8768)	0.1365 (1.0404)
Egg CPI	0.0063 (0.5917)	0.607 (0.6676)	0.0011 (0.0495)	0.0916*** (2.3786)
Cereal CPI	-0.0413 (-0.6189)	-0.312 (-0.3188)	-0.1188 (-0.9325)	0.0145 (0.0735)
Cheese CPI	-0.0135 (-0.0867)	-0.405 (-0.3907)	0.2669 (0.8554)	-0.6945 (-1.6648)

(Table 2 continued on next page.)

Table 2—continued.

	Any meal	Breakfast	Lunch	Dinner
Bacon CPI	0.0433 (0.8792)	1.166 (1.672)	-0.0507 (-0.5144)	0.1266 (0.9039)
Beef and veal CPI	0.0227 (0.1530)	0.197 (0.1978)	-0.0006 (-0.0021)	-0.2955 (-0.7018)
Ground beef CPI	-0.1240 (-1.4090)	-1.449 (-1.4679)	0.0424 (0.2289)	-0.4721 (-1.5606)
Pork CPI	-0.0234 (-0.3405)	-0.695 (-0.6922)	0.0943 (0.6781)	-0.0696 (-0.3420)
Canned fish CPI	0.1632 (1.1382)	1.228 (1.2197)	-0.1468 (-0.5054)	1.1473* (2.7649)
Fresh fish CPI	0.0023 (0.1064)	0.641 (0.6712)	-0.0523 (-1.3032)	0.1650*** (2.6033)
Chicken CPI	-0.0284 (-1.1842)	1.075 (-1.0897)	-0.0214 (-0.4681)	-0.0453 (-0.4885)
Total observations	3230	3230	3230	3230
Number eating eggs	782 (24.2%)	633 (19.6%)	103 (3.2%)	53 (1.6%)

*Significant at alpha = 0.01.

**Figures in parentheses are asymptotic t-ratios.

***Significant at alpha = 0.05.

TABLE 3

Tobit coefficients for determinants of children's egg consumption (grams)

	Any meal	Breakfast	Lunch	Dinner
Food preparer's egg consumption	1.3000* (26.3010)**	1.2502* (23.4465)	1.9950* (15.7014)	2.5825* (15.5115)
Child's age	-0.0721* (-4.2567)	-0.0629* (-3.5325)	-0.0889*** (-2.4783)	-0.0484 (-1.0885)
Child's sex	-0.0170 (-0.3618)	-0.0249 (-0.5023)	-0.0857 (-0.8507)	-0.1735 (-1.3809)
Child care with meals	-0.1257 (-1.7694)	-0.1614*** (-2.1209)	-0.0312 (-0.2095)	0.2500 (1.6069)
Constant	-0.7107* (-8.0593)	-0.8250* (-8.9283)	-1.7485* (-9.8851)	-1.9801* (-9.0270)

*Significant at alpha = 0.01.

**Figures in parentheses are asymptotic t-ratios.

***Significant at alpha = 0.05.