Food Choices of SNAP Participants at Convenience Stores and Large Retailers

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Abstract

We estimate an Exact Affine Stone Index demand system with four food-at- home groups and a *numeraire* good using data from the USDA's National Household Food Acquisition and Purchase Survey (FoodAPS). We address estimation issues related to censored demand and price and expenditure endogeneity. We found demand for foods at convenience stores is own-price and expenditure inelastic. The demand for food at c-stores of SNAP participants appear to be less expenditure elastic compared with low-income households. Overall, the demand for food of high-income households is less expenditure elastic than SNAP participants and non-participants. Calorie and nutrient consumption is positively associated with total expenditure. A price increase in healthier foods at convenience stores does not necessarily lead to a decrease in calorie and nutrient consumption due to substitution toward other foods. Protein consumption of SNAP participants decreases with an increase in food prices.

Keywords: c-stores, healthy foods, demand system, SNAP

JEL Classification: D12, O12

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Introduction

While SNAP households' preferences for food-at-home (FAH) have been explored, research on the food choices of SNAP-participating households at smaller grocery, convenience, and gas-mart retailers is limited. The average household spends on average 7% of their total expenditures at dollar stores, convenience, and drug stores, and 4% at small specialty stores (Todd and Scharadin, 2016). When households are seeking a few staple products (e.g., bread and milk), convenience and small food stores may serve as places to satisfy those needs. This could be because of time pressures to purchase these few items or limited access to supermarkets and larger food retailers. While most households use small retailers for fill-in or quick trips, a non-trivial proportion of households (5%) visit convenience and small retailers for their main trips (Morrison and Mancino, 2015). According to Todd and Scharadin (2016), SNAP households are more likely to report purchases from convenience stores, gas stations, and pharmacies than income-eligible non-SNAP households. SNAP households are more likely to identify a convenience retailer as their alternate store than high-income households. This all indicates that some SNAP participants rely on retailers other than supermarkets and supercenters (e.g., Walmart) for some of their FAH purchases. WIC-participating households, however, are more likely to use supercenters as their primary and alternate store compared with non-WIC participants. This could because WIC households have more young family members compared to non-WIC households and therefore they may be more attracted to shop at supercenters to buy larger sized products and infant foods (Ver Ploeg, et al., 2015).

While previous work has evaluated store choice (Taylor and Villas-Boas, 2016, Ver Ploeg, et al., 2015) and food choices among SNAP participants and nonparticipants (Andreyeva, et al., 2012, Garasky, et al., 2016, Todd and Ver Ploeg, 2014), little attention has been dedicated to understand the demand of healthier and less healthy food items at convenience stores. As an attempt to fill this gap in the literature, we model the demand for healthier and less healthy foods at convenience stores (c-stores). SNAP participants also obtain their foods at supercenters, supermarkets, and large grocery retailers and at lower prices (Morrison and Mancino, 2015, Ver Ploeg, 2010, Ver Ploeg, et al., 2015). We also model purchases of healthier and less healthy foods at these large food retailers to capture any substitution effect.

In this study, we estimate a demand system consisting of four food groups (healthier food at c-stores, less healthy food at c-stores, healthier food at supermarkets, and less healthy food at supermarkets) and a *numéraire* good using data from the USDA´s National Household Food Acquisition and Purchase Survey (FoodAPS). We contribute to the literature in two ways. First, this appears to be the first time that a demand system is estimated with the FoodAPS data. Using this data in a demand system, we are able to estimate the impact of prices and income on food demand and diet of SNAP households. Second, our work is the first to estimate a demand system by considering food by retailer type, which allows us to understand food choices across different retailers.

Employing the extended demand system by Zhen, et al. (2013), we addressed all the issues of censored demand, price and expenditure endogeneity simultaneously. We also estimated a utility-theoretic demand model that allows the Hicksian price elasticities to be different between households. This extra flexibility in functional form can be especially useful for comparing the food demand between low-income and high-income households and SNAP participants and income-eligible non-participants. With foods being necessities, demand patterns may be quite distinct between households of different income levels and participation status. The resulting expenditure elasticities by household group can be used by policymakers to simulate the effects of price and income enhancement policy proposals on food and nutrient consumption. For instance, one will be able to simulate the effect of changes in income (i.e., SNAP benefits for SNAP participants) on demand for healthier foods and less healthy foods at c-stores and the overall diet.

Food Local Retail Environment and Diet

Previous evidence suggests that on average the diet quality of SNAP participants is not significantly higher than the diet quality of income-eligible non-participants (Condon, et al., 2015, Gregory, et al., 2013, Leung, et al., 2012). The lack of access to supermarkets and the limited stock of healthy items at convenience retailers in low-income neighborhoods might be important factors explaining small improvements in the diet of SNAP participants.

Low-income households' primary shopping happens at supermarkets, however, they make fill-in trips to convenience stores more often than the average household (Morrison and Mancino, 2015). According to Todd and Scharadin (2016), SNAP households are more likely to report purchases from convenience stores, dollar stores, gas stations, and pharmacies (51%) than income-eligible non-SNAP households (39%) and higher income non-SNAP households (41%). The difficulty in accessing to supermarkets and large grocery retailers makes convenience stores an alternate store to obtain staple foods for SNAP households (Todd and Scharadin, 2016). The quality of the diet of low-income households was related to the frequency of their shopping trips to convenience stores (Sharkey, et al., 2013). Food purchases and diet quality of SNAP recipients have been examined, yet previous work has not differentiated purchases at c-stores from overall FAH purchases. The small variety and lack of availability of nutritious foods and high food prices of healthy food at convenience stores can be important factors preventing SNAP recipients to reach healthy nutritional goals. To date, there is no evidence how prices and income influence the diet quality of foods purchased by low-income families at small retailers.

Demand System

We evaluate household food-at-home preferences for healthier and less healthy foods purchased at small and larger stores using a two-way Exact Affine Stone Index (EASI) demand system with four food-at-home (FAH) categories (healthier food at c-stores, less healthy food at c-stores, healthier food at supermarkets, and less healthy food at supermarkets), and a composite *numéraire* good that include all other goods and services including food-away-from home. We choose the EASI demand system developed by Lewbel and Pendakur (2009) and extended by Zhen, et al. (2013) to account for censored purchases and endogenous prices for different reasons. First, it allows accounting for censored demand in estimation. Second, the EASI model allows the Engel curves to be flexible and determined by the data. This advantage can be important when analyzing food preferences at different income levels (e.g., SNAP vs. income-eligible non-SNAP households). More importantly, a two-way EASI model allows the demand to have flexible price effects.

The two-way linear approximate EASI demand system is specified as follows:

(1) $$w_{hit}^{*} = \sum_{j=1}^{J} a_{ij} lnp_{hjt} + \sum_{j=1}^{J} a_{ijy} y_h lnp_{hjt} + \sum_{r=1}^{L} b_{ir} lnY_{ht}^{r} + \sum_{k=1}^{K} g_{ik} z_{hkt} + u_{hit},$$

h=1,…,H; i=1,…J-1; t=1,…T

where w_{hit}^{*} is the latent budget share of category *i* in period *t* for households *h. J i*s the number of categories (four food-at-home categories and a *numéraire*); p_{hjt} is the price index for household *h* and category *j; L* is the highest order polynomial in y_{ht}; *H* is the number of households; Y_{ht}^{r} is real total household expenditure; z_{hkt} is the k^{th} demand shifter; and u_{hit} is the residual. The corresponding model parameters are a_{ij}, a_{ijt}, b_{ir}, and g_{ik}. The latent budget share is related to the observed budget share as follows $w_{hit} \equiv \max(0, w^*_{hit})$, where w_{hit} is calculated as is calculated as the category-level expenditure divided by weekly total expenditures. The real household expenditures Y^r_{ht} is calculated as the Stone price-deflated real expenditures: $lnx_{ht} - \sum_{j=1}^{J} w_{hjt}\, lnp_{hj}$, where x_{ht} is nominal total household expenditures on food and other goods and services. We specify the demand shifters z_{hkt} to include log household size, log household head age, and binary indicators: married household head and household head with college degree.

We classify healthier and less healthy foods based on the Healthy Eating Index (HEI) (Guenther, et al., 2013) and define healthier items as those that score above the median HEI (i.e., 49) of all food-at-home (FAH) items and less healthy items as those falling below the median. We define convenience, pharmacy, and gas-mart retailers as "convenience stores" and supermarket, superstores, club stores, and large grocery stores as "large stores".

Endogeneity

There are three potential sources of endogeneity in equation (1). First, total real expenditures Y_{ht} is endogenous because budget shares are used in its construction via the Stone price index. Although, this form of endogeneity has been found to have a minor impact (Lewbel and Pendakur, 2009, Zhen, et al., 2013), we use $\overline{w}_j$ as an instrument for w_{hj}. Second, total expenditures x_{ht} is a choice variable and therefore is endogenous with category demand. We use household income data to construct an instrument for lnx_{ht}.

Third, category-level prices are endogenous because unit values are used to calculate these price indexes. Omitted variable bias is analogous to the bias from using unit values. Households who value quantity over quality would prefer products with lower prices. In the next section, we explain how we address unit value bias.

We use the extended Amemiya's generalized least squares (AGLS) estimator developed by Zhen et al. (2014) to estimate the Tobit demand system (equation 1) while controlling for price and expenditure endogeneity. The three-step extended AGLS estimator is efficient among a class of limited information estimators (Newey 1987). The extended AGLS is also feasible when some explanatory variables may be endogenous (See Zhen, et al., 2013 for details).

Data

Our sample consists of 1,147 households (30% SNAP households, 20% low-income non-SNAP households, and 50% high-income households) who reported food-at-home purchases from a food retailer as well as completed the interview questions. We define as low-income non-SNAP households those households who do not participate in SNAP with an income less than the 185 percent of the poverty guideline. This threshold is used by USDA food assistance programs to identify income eligibility for SNAP benefits. On the contrary, high-income households are those non-SNAP households with income greater or equal to 185 percent of the poverty guideline.

Table 1 reports weekly average budget shares, per capita consumption quality, and per capita calorie consumption by food category and household group. SNAP and low-income households spend at least 2% of their total budget to buy healthier food at c-stores, while high-income households spend only 1%. There are also differences in food preferences with program participation. For low-income households, healthier food at large stores accounts for the largest budget share (48%) while less healthy food at large stores is the dominant food group in terms of budget share for SNAP households (46%). Similarly, healthier food at large stores represents the largest budget share for high-income households. Less healthy food at large stores provided the most calories to all households.

The last column of table 1 illustrates the proportion of observations that are censored at zero. Less healthy food at convenience stores is the food group that had the highest degree of censoring at 97% while less healthy food at large stores had the lowest percentage of censored observations with 57% of households not reporting weekly consumption.

To facilitate interpretation of the calorie and nutrient elasticities later in the study, we present total calorie and nutrient density for 11 nutrients by food group per 100 grams or milliliters of food or beverage item in table 2.

Instruments and Category-Level Price Index

To create the instrument for total household expenditure, we regress total expenditure on average monthly income and the last payment of SNAP benefits. In addition, we included household size, regional dummies and quadratic and cubic terms of average monthly income.

We address the unit value bias and potential biases from consumer cost minimization behavior in three ways. First, we employ travel cost methods to create food price variation at the stores over time and space. We add travel costs (i.e., fuel costs to drive per item) to the average prices (weighted by expenditures shares) to construct a price index for each category. Second, we construct the weighted household average prices at the food category level using barcode unit values as elements and expenditure shares of individual food items within food group as weights. Unit values are missing if a household did not buy a product. Missing unit values can be imputed with the average unit value of households in the same geographic location and time period (Deaton, 1988). We aggregate household unit values at store category, county, and week level and input the missing values.

Compared with using category-level unit values as the price variables for equation (1), this price index reduces the part of unit value bias. However, to the extent that the price index uses barcode-level unit values as its elements, it is still subject to the unit value bias. We create an instrument for each category-level price index.

The price index instrument is the weighted average of category-level household-specific unit values of the same food category for all other households in the same county, excluding those living in the same census tract as the target household. Exclusion of households residing in the same census tract as the target household from the calculation of the price instrument is intended to avoid the situation when prices faced by households in a census tract are affected by common demand shocks (Zhen, et al., 2013).

The price index p_{hj} for the *numéraire* good is the expenditure share-weighted average of the price index for food away from home (FAFH), price index of Other Stores (stores other than convenience and large stores), and the Consumer Price Index (CPI). Similarly, the instrument for the *numéraire* good is the share-weighted average of FAFH, Other Stores, and CPI instruments. The price instruments for FAFH, Other Stores, and CPI are created in the same way as FAH price instruments. The CPI at county level was obtained from the US Census Bureau.

Results

We estimate the system of *J*-1 Tobit equations (1) using the extended AGLS. The parameters of the budget share equation for the *numéraire* good, which is not censored, are recovered postestimation using the homogeneity, symmetry, and adding-up restrictions on the latent demand (See Zhen, et al., 2013).

We determined that the proper degree of polynomial on real total household expenditure is *L*=1 by increasing the value of *L* sequentially and testing the joint significance of the (*i* =1,..., *J* - 1) coefficients by minimum distance without imposing the homogeneity and symmetry conditions on the demand system. It is possible that our demand system with highly aggregated food and beverage categories have reduced the variation in category expenditures, resulting in Engel Curves that are linear in real expenditures.

Price Elasticities

Table 3 presents the median Marshallian elasticities for the whole sample. An earlier comparison of own-price elasticities by household group reveals that food-at-home demand is similar across households; therefore, we only report the own-price elasticities for the whole sample only. As expected, all own-price elasticities are negative at the median. Three out of four FAH categories have median own-price elasticities less than unity in absolute value and therefore have inelastic demand. Previous work also found that FAH has an inelastic demand (Andreyeva, et al. 2012). Only the demand for less healthy food at large stores is elastic (–1.36), indicating that purchases of this food are very responsive to its price changes. Changes in purchases also depend on the signs and magnitudes of cross-price elasticities between a food category and related food categories.

Many cross-price elasticity estimates are consistent with *a priori* expectations. For example, substitution is found between healthier food and less healthy food at c-stores and between healthier food and less healthy food at large stores. Interestingly, food at large stores is estimated to be a substitute to food at c-stores, while food at c-stores is a complement good for healthier food at large stores but a substitute for less healthy food at large stores. Evidence showing that c-stores are often used for alternate or fill-in shopping trips supports our finding that food at c-stores can be considered a complement to healthier food at large stores.

Expenditure Elasticities

Table 3 also presents the median expenditure elasticity by food category and household group. Consistent with the intuition that foods are necessities, expenditure elasticities for all food categories are below unity, except for healthier food at large stores, which has an income elasticity above one (1.123). Except for less healthy food at large stores, the income elasticity for high-income households is lower than the income elasticity for their low-income counterparts in the same food category. This is also a consequence of foods being a necessity, especially for less well-off households. Healthier food is often expensive and therefore can be less affordable for low-income households than for high-income families. All households' highest expenditure elasticity for healthier food may suggest that all households including low-income households are more attentive to the nutritional value of this food more than other foods at large stores.

Interestingly, the expenditure elasticity (table 3) for healthier food is lower than for less healthy food at c-stores across all households.

Nutrient Elasticities

We follow Huang (1996) and Huang and Lin (2000) to back out the calorie and nutrient elasticities from price and expenditure elasticities. Tables 4a–e present the calorie and nutrient price and expenditure elasticities for the whole sample and each household group. The nutrient price elasticity measures the percent change in consumption of nutrient *k* with respect to a 1% change in the price of the *j*th good. For example, table 4a indicates that the elasticity of protein with respect to less healthy food price at c-stores is –0.019 for all households. This means FAH protein consumption will decrease by 0.2% if the price of less healthy food at c-stores increases by 10%.

The nutrient expenditure elasticity presented in the last rows of tables 4a–d, measures the percent change in the consumption of nutrient *k* with respect to a 1% change in total expenditures. For example, the calorie elasticity for all households is estimated to be 0.994 (table 4a). This indicates that when total expenditure increases by 10%, consumption of calorie from FAH sources increases by 10%.

In general, the estimated nutrient price elasticities are negative and small in magnitude. One exception is the nutrient price elasticity of healthier food at c-stores. A price increase of healthier food at c-stores does not necessarily reduce overall calorie and nutrient consumption. One explanation is that while nutrients from this food group that experienced the price increase must decrease, nutrients from substitute food groups such as less healthy food at c-stores (table 3) can increase because of substitution effects. In fact, overall nutrient consumption could potentially increase if the degree of substitution is sufficiently large and the substitute food groups have a higher calorie and nutrient density. For example, according to table 4a, the elasticity of saturated fat consumption with respect to the price of healthier food at c-stores is 0.04—a 10% increase in this food group price increases total saturated fat consumption by 0.4%. This is partly driven by substitution toward less healthy food at c-stores, and that this food is more saturated fat-dense than healthier food (table 2).

Finally, all calorie and nutrient expenditure elasticities are positive and close to one across households. Therefore, calorie and the 11 nutrients are normal goods for households. Compared with low-income households, the calorie expenditure elasticity is smaller for SNAP households (0.98 vs. 0.99).

Conclusions

We developed a demand model of healthier and less healthy foods at c-stores (i.e., convenience stores, gas stations/market, pharmacy, and liquor store) and large-format stores (i.e., supermarkets, superstores, club stores, and large grocery stores). Using data from the FoodAPS data, we estimated an EASI demand system with four-FAH groups (healthier foods at c-stores, less healthy foods at c-stores, healthier foods at large stores, and less healthy foods at larger stores) and a *numéraire* good for all other consumption goods and services including food-away-from home. Our econometric model addressed the issues of censored demand, and price and expenditure endogeneity. To our knowledge, this is so far the first demand system for healthier and less healthy foods at retailer level for US households, including SNAP participants.

The empirical results show that demand for less healthy food at large stores is price elastic while food (healthier and less healthy) at convenience stores and healthier food at large stores is price inelastic. Hence, price policies targeted at larger stores, especially on less healthy food will have a larger effect than at convenience retailers. For instance, tax on junk foods will have a larger effect on purchases at larger stores than at c-stores. The results also indicate that healthy food demand is more elastic than the demand for healthy food at large retailers. This points out that subsidies on healthy foods will have a large impact on purchases at c-stores than at large stores. US households have positive expenditure elasticities, which indicates that income growth can increase expenditures on foods, especially on healthier food at large stores. For SNAP households, an increase in their income (i.e., SNAP benefits) by 10% will encourage an 11% increase in purchases of healthy food at large retailers and only 4% increase of healthy food at c-stores.

In addition to price and expenditure elasticities by household group, we also calculated price and expenditure elasticities for calorie and eleven nutrients for each household category. These elasticities estimate changes in nutrient and calorie intake from FAH as price and total expenditure change. An important finding from the nutrient analysis is that total calorie and consumption of most nutrients from FAH do not decline when the price of healthier foods at c-stores increases. It is possible that households find substitutes that they are more calorie and nutrient-dense when they experience a price increase in this food category.

The effects of an increase in total expenditure on calorie and nutrient intake are positive, and larger in magnitude relative to price elasticities, especially among high-income households. Overall, we did not find differences between the demand patterns of SNAP and income-eligible non-SNAP households.

For practical purposes, we employed unit values of FAH to create price index of each food category. We applied Zhen (2014) demand system to handle price endogeneity. However, it will be valuable for future work to create price index based on exogenous variables (e.g., store prices). To our experience, store data available that match the FoodAPS data is limited.

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Table 1. Summary statistics by Food Category and Household Group

Food Group	Average Budget Share			Average Quantity[a]			Average Energy (Kcal)[b]			%Observations Censored
	SNAP	LowInc	HighInc	SNAP	LowInc	HighInc	SNAP	LowInc	HighInc	
Healthier C-Stores	0.04	0.02	0.01	1.87	0.76	0.90	97.80	32.52	37.25	0.04
Less Healthy C-Stores	0.03	0.03	0.02	4.01	1.62	2.18	139.30	58.64	50.88	0.03
Healthier Large Stores	0.40	0.48	0.46	28.54	27.66	41.45	1960.47	1782.59	1994.89	0.40
Less Healthy Large Stores	0.43	0.40	0.40	66.38	48.09	62.82	3403.80	3127.93	2695.74	0.43
All Other Goods	0.11	0.08	0.10							0.11
N	370	263	678	370	263	678	370	263	678	

Note: LowInc, HighInc, and SNAP denotes low-income non-SNAP, high-income, and SNAP households, respectively. [a]per capita quantity per week; 1 unit=100 g or ml; drinks are measured by a combination of grams (g) and milliliters (ml); all other food groups measured in grams. [b]Dietary energy is measured in per capita kcal per week. Survey weights applied.

Table 2. Energy and nutrient density per unit or 100 g (ml) of food (beverage) by Food Category

Food Group		Healthier C-Stores			Less Healthy C-Stores			Healthier Large Stores			Less Healthy Large Stores		
		SNAP	LowInc	HighInc	SNAP	LowInc	HighInc	SNAP	LowInc	HighInc	SNAP	LowInc	HighInc
Energy	(kcal)	52.32	42.64	41.28	34.76	36.13	23.31	68.68	64.44	48.12	51.28	65.04	42.91
Protein	(g)	3.80	5.24	2.75	1.89	3.25	3.00	16.60	14.62	13.59	7.41	8.69	7.69
Vit A (RE)	(mcg)	1.83	1.72	2.49	1.10	2.73	1.66	7.26	7.17	8.19	2.97	4.91	3.88
Vit C	(mg)	0.47	0.98	0.51	0.06	0.25	0.23	1.35	1.56	1.65	0.18	0.24	0.16
Vit D	(mcg)	0.01	0.01	0.00	0.00	0.03	0.01	0.03	0.03	0.04	0.02	0.03	0.02
Vit B12	(mg)	0.02	0.01	0.01	0.01	0.05	0.02	0.04	0.04	0.04	0.03	0.04	0.04
Iron	(mg)	0.09	0.10	0.07	0.07	0.15	0.05	0.20	0.21	0.18	0.11	0.18	0.12
Calcium	(mg)	2.46	3.24	3.11	2.65	3.14	3.63	5.46	7.27	6.80	5.93	9.47	7.97
Phosph	(mg)	6.71	5.85	5.95	3.57	3.83	4.32	10.46	12.16	11.62	8.12	10.78	9.81
Potassium	(mg)	22.15	21.71	16.64	4.65	5.22	6.05	34.35	52.99	35.60	9.02	12.67	10.19
Sat Fat	(g)	0.12	0.13	0.07	0.14	0.18	0.15	0.15	0.14	0.13	0.25	0.33	0.28
Unsat Fat	(g)	0.26	0.22	0.16	0.08	0.05	0.05	0.24	0.23	0.22	0.14	0.14	0.11

Note: LowInc, HighInc, and SNAP denotes low-income non-SNAP, high-income, and SNAP households, respectively. RE=Retinol Equivalent

Table 3. Marshallian price elasticities, Whole Sample

	With respect to Price					Expenditure Elasticity			
Demand elasticity	Healthier C-Stores	Less Healthy C-Stores	Healthier Large Stores	Less Healthy Large Stores	All Other Goods	Whole Sample	SNAP	LowInc	HighInc
Healthier C-Stores	-0.949	0.044	-0.057	0.071	-0.015	0.373	0.401	0.415	0.364
Less Healthy C-Stores	0.051	-0.778	-0.041	0.015	-0.033	0.513	0.518	0.525	0.510
Healthier Large Stores	0.201	0.167	-0.909	0.101	-0.105	1.123	1.135	1.132	1.121
Less Healthy Large Stores	0.372	0.220	0.007	-1.036	-0.083	0.922	0.923	0.922	0.922
All Other Goods	1.101	0.727	-0.354	0.066	-1.188	1.156	1.172	1.161	1.153

Note: LowInc, HighInc, and SNAP denotes low-income non-SNAP, high-income, and SNAP households, respectively. All elasticities are median values.

Table 4a. Energy and nutrient elasticities, Whole Sample

	elasticity of Availability of											
With respect to Price	Energy	Protein	Vit A	Vit C	Vit D	Vit B12	Iron	Calcium	Phosph	Potassium	Sat Fat	Unsat Fat
Healthier C-Stores	0.010	0.001	-0.005	-0.045	0.003	0.013	0.003	0.024	0.012	-0.024	0.040	-0.008
Less Healthy C-Stores	-0.016	-0.019	-0.021	-0.037	-0.020	-0.016	-0.019	-0.012	-0.015	-0.027	-0.008	-0.020
Healthier Large Stores	-0.315	-0.433	-0.475	-0.762	-0.433	-0.340	-0.401	-0.253	-0.331	-0.591	-0.118	-0.450
Less Healthy Large Stores	-0.578	-0.470	-0.424	-0.124	-0.470	-0.562	-0.497	-0.650	-0.568	-0.302	-0.785	-0.441
All Other Goods	-0.086	-0.146	-0.158	-0.274	-0.141	-0.101	-0.126	-0.064	-0.096	-0.206	-0.011	-0.143
With respect to Expenditures	0.994	1.0257	1.031	1.091	1.02	1	1.014	0.984	1.0001	1.055233	0.956	1.02115

Note: All nutrient elasticities are median values.

Table 4b. Energy and nutrient elasticities, SNAP Households

	elasticity of Availability of											
With respect to Price	Energy	Protein	Vit A	Vit C	Vit D	Vit B12	Iron	Calcium	Phosph	Potassium	Sat Fat	Unsat Fat
Healthier C-Stores	0.01	0.00	0.00	-0.05	0.01	0.02	0.00	0.03	0.01	-0.03	0.03	-0.01
Less Healthy C-Stores	-0.02	-0.02	-0.02	-0.03	-0.01	-0.02	-0.03	-0.02	-0.02	-0.03	-0.02	-0.02
Healthier Large Stores	-0.25	-0.38	-0.40	-0.65	-0.30	-0.24	-0.32	-0.18	-0.25	-0.50	-0.09	-0.31
Less Healthy Large Stores	-0.61	-0.51	-0.49	-0.23	-0.59	-0.65	-0.55	-0.71	-0.63	-0.36	-0.78	-0.55
All Other Goods	-0.06	-0.13	-0.14	-0.24	-0.09	-0.07	-0.09	-0.04	-0.06	-0.16	0.00	-0.08
With respect to Expenditures	0.994	1.02	1.02	1.07	1.00	0.98	1.00	0.97	0.98	1.03	0.95	0.99

Note: All elasticities are median values.

Table 4c. Energy and nutrient elasticities, Low-Income Households

	elasticity of Availability of											
With respect to Price	Energy	Protein	Vit A	Vit C	Vit D	Vit B12	Iron	Calcium	Phosph	Potassium	Sat Fat	Unsat Fat
Healthier C-Stores	0.02	0.00	0.01	-0.05	0.02	0.03	0.01	0.03	0.01	-0.03	0.04	0.00
Less Healthy C-Stores	-0.01	-0.02	-0.02	-0.04	-0.02	-0.02	-0.02	-0.01	-0.01	-0.03	-0.01	-0.02
Healthier Large Stores	-0.26	-0.39	-0.35	-0.67	-0.28	-0.22	-0.29	-0.20	-0.29	-0.60	-0.10	-0.37
Less Healthy Large Stores	-0.64	-0.52	-0.55	-0.20	-0.61	-0.67	-0.60	-0.70	-0.61	-0.29	-0.80	-0.52
All Other Goods	-0.07	-0.13	-0.12	-0.25	-0.09	-0.05	-0.09	-0.06	-0.09	-0.23	-0.01	-0.12
With respect to Expenditures	0.994	1.02	1.01	1.08	0.99	0.98	0.99	0.98	1.00	1.07	0.95	1.01

Note: All elasticities are median values.

Table 4d. Energy and nutrient elasticities, High-Income Households

	elasticity of Availability of											
With respect to Price	Energy	Protein	Vit A	Vit C	Vit D	Vit B12	Iron	Calcium	Phosph	Potassium	Sat Fat	Unsat Fat
Healthier C-Stores	0.01	0.00	-0.01	-0.04	0.00	0.01	0.00	0.02	0.01	-0.02	0.04	-0.01
Less Healthy C-Stores	-0.02	-0.02	-0.02	-0.04	-0.02	-0.02	-0.02	-0.01	-0.02	-0.03	-0.01	-0.02
Healthier Large Stores	-0.32	-0.44	-0.48	-0.77	-0.44	-0.34	-0.41	-0.26	-0.34	-0.59	-0.12	-0.46
Less Healthy Large Stores	-0.58	-0.47	-0.42	-0.12	-0.47	-0.56	-0.50	-0.65	-0.57	-0.30	-0.78	-0.44
All Other Goods	-0.09	-0.15	-0.17	-0.29	-0.15	-0.11	-0.13	-0.07	-0.10	-0.21	-0.01	-0.15
With respect to Expenditures	0.994	1.03	1.04	1.09	1.03	1.01	1.02	0.99	1.00	1.06	0.96	1.03

Note: All elasticities are median values.