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US Household Food Shopping Patterns: Dynamic Shifts since 2000 and Socioeconomic Predictors

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Abstract

Under the assumption that differential food access might underlie nutritional disparities, programs and policies have focused on the need to build supermarkets in underserved areas, in an effort to improve dietary quality. However, there is limited evidence about which types of stores different income and race-ethnic households use. We used cross-sectional cluster analysis to derive shopping patterns from US households' volume food purchases (Nielsen Homescan) by store from 2000–2012. Multinomial logistic regression identified household SES characteristics that were associated with shopping patterns in 2012. We found three shopping patterns: primary-grocery, primary-mass-merchandise, and combination cluster. In 2012, we found no income/race-ethnic differences for grocery cluster membership. However, low-income non-Hispanic blacks (vs. non-Hispanic whites) had a significantly lower probability of belonging to the mass-merchandise cluster. These varied shopping patterns must be considered in future policy initiatives. Further, it is important to continue studying the complex rationale for people's food shopping patterns.

INTRODUCTION

An important theme in US food research and policy is the reduction of nutrition-related health disparities. One focus of those efforts is the elimination of food deserts in low-income and minority neighborhoods. [1–3] The rationale is that presence of full-service supermarkets in food deserts will increase access to healthy foods and in turn help reduce obesity and chronic disease among these populations. However, availability of supermarkets does not guarantee residents will shop there. Furthermore, a recent review indicates building new supermarkets in low-income areas does not increase healthy food consumption or reduce obesity prevalence. [4]

A major gap in the food access literature for low-income and race-ethnic minorities is the focus on physical access to stores and the lack of data on where people actually shop for

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food or what foods are purchased. To reduce nutrition-related health disparities, we need to better understand where Americans actually shop for food. It has been shown that physical proximity is not a major driver of where people shop [5], and that both low and high-SES groups shop for food beyond their residential food environments. [6–8] However, there is limited evidence about which types of stores different income and race-ethnic households use. Also, evidence from epidemiologic studies indicates food shopping involves multiple store types, [9] however that also has not been incorporated into the research. The existing literature has limited geographical scope, has been conducted on small samples, with limited variability by income and race-ethnicity, and only examines shopping occasions at single points in time.

To understand where Americans shop for food, it is also important to consider changes in the food retailer sector. There has been an emergence of non-traditional food retailers, especially “big box” formats such as warehouse-clubs (i.e., Costco, Sam’s), supercenters or mass-merchandisers (i.e., Walmart and Target), and proliferation of specialty stores (i.e., Whole Foods Market). Moreover, a more recent trend is the introduction of smaller discount stores (e.g., Dollar stores). [10, 11] However, it is unclear how these changes have influenced where US households shop for food.

To the best of our knowledge, no recent study has examined shopping patterns to understand the mix of stores US households rely on for their food purchases. To address this research gap, we utilized the nationally representative Nielsen Homescan dataset. Homescan is unique for studying packaged food purchases (PFPs) across retail stores since households’ record the store source and all the packaged foods/beverages purchased. Nielsen follows households for at least one year, more likely reflecting usual shopping habits. This analysis focuses on two research questions: (1) where are US households shopping for food and has food shopping changed from 2000–2012? and (2) what SES characteristics are associated with recent food shopping patterns?

METHODS

Study Design and Population

We included PFPs data from the US Homescan Consumer Panel dataset from 2000–2012, [12] an ongoing nationally representative survey of US households that captures household purchases of >600,000 packaged foods/beverages or barcoded products. Non-packaged foods (i.e., foods/beverages without barcodes or nutrition information) were not included. Examples include loose produce, meats sold by weight, bakery items, prepared foods, etc. Packaged produce and meats were included (e.g., bag of apples, bagged salad, frozen meats).

Participating households were given barcode scanners, and household members scanned the barcodes on all purchased foods/beverages after every shopping trip for ≥10–12 months. Scanning occurred continuously through the year. Households were sampled from 76 markets, defined as 52 metropolitan and 24 non-metropolitan geographical areas.[13] We conducted cross sectional analysis, treating each year as an independent nationally representative sample of US households.

We included all households for years 2000 (n=34,754), 2003 (n=39,858), 2006 (n=62,187), 2009 (n=60,394) and 2012 (n=60,538), for a total of N=257,732. Standard Homescan practices are to utilize quarters where the households capture usual purchases of packaged foods; thus we excluded purchases during quarters deemed unreliable and household-year observations including >1 unreliable quarter (2.2–4.1% of household-year observations, n=8,420 over the 5 selected years). [14] The final analytical sample included 2000 (n=33,976), 2003 (n= 38,613), 2006 (n=59,614), 2009 (n=58,470) and 2012 (n=58,638) household-year observations.

Store Categorization

For every shopping occasion made over a year, each household reported the name of the store where they shopped for food. We defined store type as the place where each household reported purchasing their food. We classified stores into 7 mutually exclusive categories: 1) warehouse-club (e.g., Costco, Sam's); 2) mass-merchandisers-supercenters, hereafter mass-merchandisers (e.g., Walmart, Super-Target); 3) grocery-chains (≥10 units; e.g., Kroger, Safeway); 4) non-chain grocery stores (<10 units); 5) convenience-drug-dollar, hereafter convenience (e.g., Seven Eleven, CVS, Dollar General, gas stations); 6) ethnic-specialty (e.g., Compare Foods, Whole Foods Market); and 7) others (e.g., department stores, book stores, etc.). [15]

Shopping Patterns

We used cluster analysis to group households by their food shopping patterns. We defined food shopping patterns as the mix of stores US households use to shop for food based on the amount of PFPs by store type. [16, 17] We ran cluster analysis using volume (grams or milliliters) of household PFPs by store type separately for years 2000, 2003, 2006, 2009 and 2012. We entered volume of PFPs as a percentage of volume for each store, relative to total volume of PFPs, to account for the fact that households purchased different amounts of packaged foods at the different stores. [16] The purpose of the cluster analysis was to place households into mutually exclusive groups, or clusters, such that households in a given cluster were distinctly similar to each other and distinctly different from households in other clusters with respect to their mean proportion of volume from PFPs by store types. We performed cluster analysis using SAS FASTCLUST, SAS version 9.3, in an iterative process using 1000 replications and randomly selected seeds. [18]

To determine the most appropriate number of clusters, we examined the pseudo F-statistic [19] for each number of cluster solutions, increasing from 2 to 5 clusters. A higher pseudo F-statistic value indicated better intra-cluster homogeneity and inter-cluster heterogeneity. If the more complex cluster solution generated meaningful subgroups, the more complex cluster solution was chosen, as long as the pseudo F-statistic value was comparable. [20]

Clusters analysis revealed 3-cluster solution was optimal with R^2=0.55. We named clusters according to the store types that contributed to the most volume (%) from households PFPs within a single cluster: primary-grocery, primary-mass-merchandise and a combination cluster. We conducted two sensitivity analyses: 1) using percent of households' expenditures by store-type as input variables and 2) separating ethnic from specialty stores. We found

very similar results compared to our original cluster analysis (Exhibits Appendix 1–2. To access the Appendix, click on the Appendix link in the box to the right of the article online).

Covariates

The ratio of family income to poverty threshold was calculated from self-reported household income and was used to categorize households according to the percentage of the Federal Poverty Level as low ≤185%, middle >185-<400%, or high ≥400%. Self-reported race-ethnicity of the household head was categorized as non-Hispanic whites, Hispanic, non-Hispanic blacks, or other races non-Hispanic. For households with two heads of household, Nielsen designates the race of the head of household that makes most of the purchase decisions. If any head of household are Hispanic, the race of the household is designated as Hispanic. Self-reported highest education attainment was categorized as < high school, completed high school, some college, graduated college or post-college graduate. We created household composition variables using number of males and females by age categories: 2–5y, 6–12y, 13–18y, 19–29y, 30–39y, 40–49y, 50–59y, 60–69y and ≥70y. Market was entered as a set of indicator variables.

Statistical Analysis

We conducted all other analyses by using Stata version 14. We used Stata survey commands to incorporate Nielsen survey weights to generate nationally representative estimates. We calculated cross-sectional univariate descriptive statistics by year and by cluster. We report percentages for categorical variables and means for continuous variables.

Multinomial logistic regression—We used cross-sectional analysis to examine associations between SES characteristics and shopping patterns in 2012, the most recent year of data. We used multinomial logistic regression with three 2012 shopping pattern clusters as outcomes to examine associations with household income and race-ethnicity adjusting for household education, household composition and market. To assess whether the association between household income and food shopping patterns differed by race-ethnicity, we conducted Wald “chunk” test for the joint significance of the income and race-ethnicity interaction terms with $P<0.05$ considered statistically significant. Results are presented as adjusted predicted probabilities (95% CIs). Within each income group, we used non-Hispanic whites as the referent. We tested for statistically significant differences using Student’s *t* test with Bonferroni corrections. A two-sided *P* value of 0.05 was set to denote statistical significance.

Limitations

The application of pattern techniques to nutritional epidemiology studies offers advantages, such as the identification of the mix of stores US households use to purchase food and may better represent shopping behaviors. However, cluster analysis is a data-driven method that involves subjectivity in deciding the number of clusters to retain and when naming the clusters. Homescan does not capture non-store sources of foods (e.g., restaurants, farmers-markets), therefore, our food shopping patterns do not capture all places where US households purchase food. Although we do not include purchases from non-packaged foods (e.g., loose produce, meats sold by weight), we know whether a household shopped at a

given store. Because recording purchases might be time consuming and could result in underreporting, there may be systematic underreporting of PFPs from a specific type of store. Finally, the proportion of non-Hispanic white, high-income and highly educated households in Homescan is higher than the US population [21]. Nonetheless, validation studies found that the accuracy of Homescan at measuring purchases at the national level was comparable to other widely used economic datasets. [22]

RESULTS

Exhibit 1 shows the volume of household packaged food purchases (PFPs) by store and households' SES characteristics for selected years. Per-capita proportion of volume from PFPs decreased over time for grocery-chains and non-chain grocery, and increased for warehouse-club, convenience stores, and mass-merchandisers. The sample was predominantly non-Hispanic white and highly educated. The average household size was <3, and the majority of households were composed of only adults.

Using cluster analysis we identified three distinct shopping patterns in each year (Exhibit 2 and Exhibit Appendix 3. To access the Appendix, click on the Appendix link in the box to the right of the article online). One cluster was characterized by a high proportion of PFPs made predominantly at grocery-chains, and therefore named primary-grocery cluster. The second cluster was characterized by a high proportion of PFPs made at mass-merchandisers (or non-chain grocery stores in 2000), and therefore named primary-mass-merchandiser cluster. The third cluster was characterized by household purchases of packaged foods at a mixture of stores such as warehouse-club, ethnic-specialty, grocery-chains, and mass-merchandisers. Although the proportion of purchases from convenience stores was small, this cluster had a relatively higher proportion of purchases from convenience stores compared to the other two clusters. This pattern was named the combination cluster. Overall, 50–60% of households were categorized into the primary-grocery cluster, regardless of year. However, over time, there was a shift towards fewer households categorized in the primary-grocery cluster (63.9% in 2000 to 50.2% in 2012) and more households categorized in the primary-mass-merchandise cluster (16.5% in 2003 to 22.5% in 2012). We also observed that over this 13-year period, 24.5–27.3% of households used a combination of stores to shop for food.

We present univariate household SES characteristics by cluster and year in Exhibit 3 and Exhibit Appendix 4 (To access the Appendix, click on the Appendix link in the box to the right of the article online). The proportion of households categorized in the primary-grocery cluster was the highest for every race-ethnic and income group, however, these proportions decreased over time. For all race-ethnic and income groups, the proportion of households categorized in the primary-mass-merchandise cluster and the combination cluster increased over time. For the primary-mass-merchandise cluster, the biggest increases occurred for non-Hispanic white and low-income households, while for the combination cluster, the biggest increases occurred for other non-Hispanic and high income households.

We found a statistically significant interaction between household income and race-ethnicity in our adjusted multinomial logistic model (Wald "chunk" test $Chi^2_{22.74,\ 12}$, p=0.03). Exhibit

4 shows the adjusted predicted probability of food shopping pattern membership by income and race-ethnic in 2012. For every income/race-ethnic group, the majority of households shopped at the primary-grocery cluster. Among low-income households, for the primary-grocery cluster, no differences were observed by race-ethnicity. For the primary-mass-merchandise cluster, non-Hispanic blacks had a significantly lower probability of being categorized at the primary-mass-merchandise cluster compared to non-Hispanic whites. For the combination cluster, Hispanics had a higher, although non-significant probability of being categorized at the combination cluster than non-Hispanic whites.

Among middle-income households, no differences were observed by race-ethnicity at the primary-grocery and primary-mass-merchandiser cluster However, for the combination cluster, non-Hispanic blacks were more likely to be in the combination cluster compared to non-Hispanic whites. Among high-income households, for the primary-mass-merchandiser cluster, no differences were observed by race-ethnicity. Similar to middle-income households at the combination cluster, among high-income households, non-Hispanic blacks had a higher probability than non-Hispanic whites of being categorized at the combination store cluster.

DISCUSSION

Despite the growing interest in food deserts, [11] there has been very little empirical research on food purchasing at mass-merchandisers, warehouse-clubs and other non-grocery formats because of the lack of data on households purchases by store type. [23] While grocery-chains still account for the majority of the total volume of food purchases by US households, our cluster analysis revealed that for some households, their main food purchases were not made at grocery-chains but at mass-merchandisers, with Walmart being an important player.[24] In addition, in 25–27% cases, shopping for food involved visiting multiple types of stores, including a mixture of large and small stores.

Within the US, policymakers have advocated for improvements in local access to food by building new supermarkets or grocery-stores in disadvantaged areas as one way to improve diet quality and reduced health disparities. [25–28] These strategies assume that improving access to supermarkets or grocery-stores can cause residents to shop for food in these newly placed stores. However, evidence from the UK [29–31] and the US [32, 33] have shown that simply introducing supermarkets in communities does not necessarily result in increased shopping at such stores or in dietary habits improvements. While a large proportion of US households still make their majority of their food purchases at grocery-stores, as seen in our cluster analysis, other households primarily shop at mass-merchandisers or at multiple types of stores. Therefore, policy strategies focusing only on supermarkets or grocery stores ignore other places where US households increasingly purchase some or all of their food. [34]

Among low- and middle-income households, we found no race-ethnic differences in the probability of shopping primarily at grocery-stores. The literature suggests that residents of low-income and predominantly African-American neighborhoods are less likely to have access to grocery-stores or supermarkets, compared to wealthier and white neighborhoods. [35–37] However, other research suggests that such disparities are smaller,

absent, or reversed. [38–41] Additionally, studies suggest that residents of low-income neighborhoods shop outside their residential neighborhoods. [42–44] We provide two possible explanations for our primary-grocery cluster findings. It is possible that in our sample, racial minorities and economically disadvantaged households overcome barriers to shop at grocery-stores, or as shown in other studies, there are no large disparities in shopping at grocery-stores.

While we were unable to examine neighborhood characteristics or physical access/proximity to stores, one of the strengths of our study is that we used information on the types of store where households actually shopped for food to describe shopping patterns and subpopulations differences. We found that among low-income households, non-Hispanic blacks were less likely to do their shopping primarily at mass-merchandise stores. These findings may reflect regional differences. Racial minorities may be more likely to live in large metropolitan areas, while mass-merchandise stores are usually located in suburban areas. [24, 45] We also found that at middle- and high-income levels, non-Hispanic blacks were more likely to shop at a combination of store types. However, it is hard to determine whether differences reflect true shopping pattern differences, or whether there is differential patterning by race-ethnicity captured in our combination cluster.

Under the assumption that differential food access might underlie nutritional and health disparities, programs and policies at the state and national level have focused on the need to build grocery-stores or supermarkets in food deserts. These strategies are based on the assumption that people living in food desserts have less physical access to stores that offer healthy foods, such as grocery-stores or supermarkets and at the same time, they have more physical access to convenience stores. Our study shows that Americans not only shop at grocery-stores, in fact, they use other types of retailers to purchase food. Additionally, we show that economically disadvantage households and race-ethnic minority food purchases do not mainly come from convenience and small stores, but rather from a large variety of stores. Our findings do not imply that the residential neighborhood food environment do not influence households' food choices, but it does highlight the need to incorporate food shopping pattern preferences into future research and policy. Additionally, a number of studies question whether location alone is the key to improving diet quality. [44, 46] Programs and policies need to simultaneously offer better prices for healthy foods relative to less-healthy foods while promote nutrition education and actively marketing healthy foods. [47]

We did not study underlying factors related to store choice, rather we described shopping patterns using household purchase data. We acknowledge that the decision to shop at a specific store, or combination of stores, is complex and it is influenced by many factors such as: food preferences; location of the store and consumer travel patterns; [48] individual characteristics (e.g., car ownership, time costs), as well as neighborhood characteristics (e.g., public transportation, sidewalks, crime rates). [49–51]

A major strength of our study is that we know the type of store and the amount of PFPs where households actually shopped for food. Furthermore, we included relevant food sources such as pharmacies, gas stations, and other retail stores whose primary business is not food. [52] For each household we used purchase data for at least a year, reflecting usual

shopping habits. The large sample size allowed us to explore predictors of shopping patterns by income and race-ethnicity.

Conclusions

The majority of US households shopped at grocery-stores, but a growing proportion shopped at mass-merchandisers. Additionally, an important proportion of households shopped at a mix of large and small store types. Regardless of income and race-ethnicity group, households predominantly shopped at grocery-stores. We also show that economically disadvantage households and minority food purchases do not mainly come from convenience and small stores. These varied shopping patterns must be considered in future policy initiatives. Further, it is important to continuing to study the complex rationale for people's food shopping patterns.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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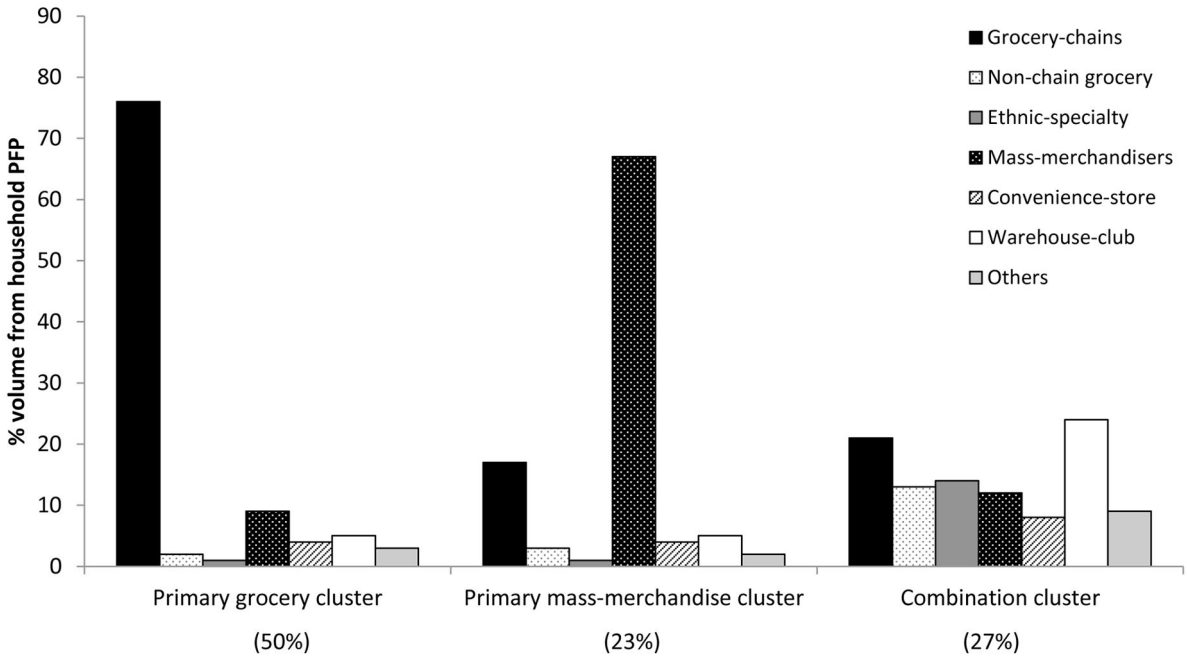

Exhibit 2. Households food shopping patterns (clusters), Homescan 2012[a]

SOURCE: Authors' analysis. [a]All data were derived from the 2012 survey year of Homescan. **NOTES:** Values represent means. Values below bars indicate the proportion of households classified in each cluster, weighted to be nationally representative.

Exhibit 1

Household socio-economic characteristics, sample sizes and volume of packaged food purchases by store for selected years, Homescan[a]

	2000	2006	2012
n	33,976	59,614	58,638
Volume of PFPs by store			
Warehouse-club	5.6 ± 0.4	7.8 ± 0.6	9.4 ± 0.7
Convenience-store	3.7 ± 0.2	4.7 ± 0.2	5.6 ± 0.2
Ethnic/specialty	4.0 ± 1.2	4.0 ± 1.2	4.4 ± 1.3
Grocery-chain	59.7 ± 1.6	50.8 ± 1.7	47.7 ± 1.6
Mass-merchandisers	12.4 ± 1.1	21.4 ± 1.6	23.4 ± 1.4
Non-chain grocery	10.4 ± 0.8	6.7 ± 0.6	5.3 ± 0.5
Others	4.3 ± 0.2	4.6 ± 0.2	4.2 ± 0.2
Household income[b]			
Low	4,541 (23.1)	11195 (25.3)	12629 (29.8)
Middle	15,069 (42.3)	23322 (33.3)	24214 (37.3)
High	14,366 (34.7)	25097 (41.4)	21795 (32.9)
Race-ethnicity[c]			
Non-Hispanic whites	28,686 (79.2)	49188 (74.4)	47384 (71.5)
Hispanics	1,798 (8.7)	3148 (10.3)	3021 (11.9)
Non-Hispanic blacks	2,696 (10.7)	4937 (10.8)	5390 (11.1)
Non-Hispanic others	796 (1.4)	2341 (4.4)	2843 (5.5)
Education[d]			
Less than high-school	740 (3.6)	911 (3.0)	718 (2.7)
Graduated high-school	6,996 (27.8)	11016 (29.5)	9532 (27.1)
Some college	10,606 (35.3)	18772 (32.6)	17078 (32.6)
Graduated college	10,330 (23.1)	19620 (23.5)	21091 (25.5)
Post college graduate	5,304 (10.2)	9295 (11.4)	10219 (12.1)
Household type[e]			
Single	8765 (26.5)	14978 (26.9)	14978 (26.5)
Adults, no kids	15694 (40.0)	28435 (37.3)	30457 (40.0)
Adult(s) and kid(s)	9,517 (33.4)	16201 (35.8)	13203 (33.4)
Household size[f]	2.5 ± 0.0	2.6 ± 0.0	2.6 ± 0.0

SOURCE: Authors' analysis.

[a] All data were derived from the 2000, 2006, and 2012 survey years of Homescan.

NOTES: Values of volume of PFPs by store are presented as per-capita mean proportion of volume ± SE from packaged food purchases (PFPs) by store. Percentages have been weighted to be nationally representative. Households' socio-economic values are presented as counts and column percentages for the different survey years [household size (mean ± SE)]. Percentages have been weighted to be nationally representative.

[b] Ratio of family income to poverty threshold, calculated from self-reported household income, was used to categorize income according to the percentage of the Federal Poverty Level (low ≤185%; middle >185–<400%; or high ≥400%).

[c] Self-reported race-ethnicity of the household head was categorized as non-Hispanic whites, Hispanic, non-Hispanic blacks, or other races non-Hispanic. For households with two heads of household, Nielsen designates the race of the head of household that makes most of the purchase decisions. If either of the two heads of household are Hispanic, the race of the household is designated as Hispanic.

[d] Household self-reported highest educational attainment.

[e] Children were all household members ≤18y old. Adults were all household members >19y old.

[f] Number of people living in the household.

University of North Carolina calculation based in part on data reported by Nielsen through its Homescan Services for all food categories, including beverages and alcohol for the 2000–2012 periods, for the U.S. market. Copyright © 2014, The Nielsen Company.

Exhibit 3

Univariate households socio-economic characteristics by food shopping patterns (clusters) for selected years, Homescan[a]

	Food shopping patterns(clusters)[b]								
	2000			2006			2012		
	Primary grocery cluster	Primary non-chain grocery cluster	Combination cluster	Primary Grocery cluster	Primary mass-merchandiser cluster	Combination cluster	Primary Grocery cluster	Primary mass-merchandiser cluster	Combination cluster
n (%)	22,354 (63.9)	3,306 (11.5)	8,316 (24.5)	31,929 (53.7)	12,980 (21.0)	14,705 (25.4)	29,747 (50.2)	12,845 (22.5)	16,046 (27.3)
Household income[c]									
Low	63.1 ± 2.3	16.1 ± 1.3	20.9 ± 1.9	51.2 ± 2.2	24.5 ± 2.1	24.3 ± 1.6	48.3 ± 2.1	26.1 ± 1.9	25.6 ± 1.7
Middle	62.2 ± 2.2	12.0 ± 1.1	25.7 ± 2.1	51.9 ± 2.2	23.3 ± 2.2	24.8 ± 1.7	50.4 ± 2.1	23.1 ± 1.8	26.5 ± 1.8
High	66.5 ± 2.3	7.9 ± 0.9	25.6 ± 2.3	56.7 ± 2.3	16.9 ± 1.9	26.5 ± 1.9	51.6 ± 2.4	18.4 ± 1.7	29.9 ± 2.1
Race-ethnicity[d]									
Non-Hispanic whites	63.6 ± 2.1	11.9 ± 1.0	24.6 ± 2.0	54.1 ± 2.3	22.5 ± 2.0	23.4 ± 1.5	51.2 ± 2.2	24.2 ± 1.8	24.6 ± 1.7
Hispanics	65.1 ± 4.2	9.4 ± 1.4	25.5 ± 4.2	51.8 ± 3.5	15.2 ± 2.9	33.0 ± 3.6	48.7 ± 3.1	16.5 ± 2.2	34.7 ± 3.2
Non-Hispanic blacks	65.5 ± 2.6	11.3 ± 1.9	23.2 ± 2.2	52.2 ± 2.7	18.6 ± 2.5	29.2 ± 2.5	47.8 ± 2.6	19.9 ± 1.9	32.3 ± 2.0
Non-Hispanic others	63.5 ± 4.1	9.7 ± 2.2	26.7 ± 3.9	55.1 ± 2.0	14.6 ± 2.1	30.3 ± 2.1	44.6 ± 2.0	17.8 ± 2.3	37.6 ± 2.6
Education[e]									
Less than high-school	64.4 ± 3.2	16.4 ± 2.3	19.2 ± 2.6	51.0 ± 3.0	23.6 ± 2.6	25.3 ± 2.3	45.3 ± 2.9	24.5 ± 3.0	30.2 ± 2.5
Graduated high-school	61.6 ± 2.1	14.5 ± 1.3	24.0 ± 2.1	52.2 ± 2.4	23.6 ± 2.1	24.2 ± 1.6	50.3 ± 2.1	26.2 ± 2.0	23.4 ± 1.7
Some college	63.3 ± 2.4	11.1 ± 1.0	25.6 ± 2.2	53.1 ± 2.2	22.1 ± 2.0	24.7 ± 1.6	49.2 ± 2.1	23.7 ± 1.8	27.1 ± 1.8
Graduated college	66.0 ± 2.2	9.8 ± 1.0	24.2 ± 2.1	55.1 ± 2.3	18.8 ± 2.0	26.2 ± 1.9	50.9 ± 2.2	19.4 ± 1.8	29.7 ± 2.1
Post college graduate	67.4 ± 2.3	7.2 ± 1.0	25.4 ± 2.2	57.1 ± 2.3	14.5 ± 1.9	28.4 ± 2.0	52.3 ± 2.5	16.4 ± 1.4	31.2 ± 2.1
Household type[f]									
Single	64.3 ± 2.4	12.6 ± 1.1	23.1 ± 2.0	55.4 ± 2.2	18.1 ± 1.7	26.5 ± 1.7	51.7 ± 2.2	21.4 ± 1.7	27.0 ± 1.9
Adults, no kids	63.2 ± 2.1	10.6 ± 1.0	26.2 ± 2.4	53.7 ± 2.3	19.8 ± 2.0	26.5 ± 1.8	50.2 ± 2.3	22.3 ± 1.8	27.5 ± 1.8
Adult(s) and kid(s)	64.5 ± 2.4	11.8 ± 1.1	23.7 ± 1.8	52.4 ± 2.3	24.3 ± 1.6	23.3 ± 1.6	49.1 ± 2.1	23.5 ± 2.0	27.4 ± 1.9
Household size[g]	2.5 ± 0.0	2.6 ± 0.0	2.5 ± 0.0	2.5 ± 0.0	2.7 ± 0.0	2.5 ± 0.0	2.6 ± 0.0	2.6 ± 0.0	2.6 ± 0.0

SOURCE: Authors' analysis. All data were derived from the 2000, 2006, and 2012 survey years of Homescan

NOTES:

[a] Households socio-economic characteristics are presented as row percentages ± SE by food shopping patterns (or cluster) for the different survey years [except for household size (mean ± SE)] and have been weighted to be nationally representative.

[b] We used cluster analysis to group households by their food shopping patterns. We defined shopping patterns as the combinations of store-types US households use to shop for food based on the dollars spent on packaged food purchases (PFPs) by store-type. We found 3 food shopping patterns or clusters: 1) primary-grocery cluster, characterized by households purchasing the majority of their packaged foods and beverages at grocery-chains (e.g., Kroger, Safeway) ; 2) primary-mass-merchandiser cluster, characterized by households purchasing the majority of their packaged foods and beverages at mass-merchandisers (e.g., Walmart, Super Target); and 3) combination cluster, characterized by households purchasing their packaged foods and beverages at a combination of store-types. Only in 2000, the second cluster was characterized by households purchasing the majority of their packaged foods and beverages at non-grocery chains, and therefore was named Non-grocery chain cluster.

[c] Ratio of family income to poverty threshold, calculated from self-reported household income, was used to categorize income according to the percentage of the Federal Poverty Level (low ≤185%; middle >185–<400%; or high ≥400%).

[d] Self-reported race-ethnicity of the household head was categorized as non-Hispanic whites, Hispanic, non-Hispanic blacks, or other races non-Hispanic. For households with two heads of household, Nielsen designates the race of the head of household that makes most of the purchase decisions. If either of the two heads of household are Hispanic, the race of the household is designated as Hispanic.

[e] Household self-reported highest educational attainment.

[f] Children were all household members ≤18y old. Adults were all household members >19y old.

[g] Number of people living in the household.

Exhibit 4

Predicted probability of food shopping patterns (clusters) membership by income and race-ethnic group, Homescan 2012[a]

	Primary grocery cluster[b]		Primary mass-merchandiser cluster		Combination cluster	
	Predicted probability (95% CI)					
High income[c]						
Non-Hispanic white[d]	0.53	0.52, 0.55	0.19	0.17, 0.20	0.28	0.27, 0.29
Hispanic	0.48	0.44, 0.53	0.19	0.15, 0.23	0.33	0.29, 0.36
Non-Hispanic black	**0.47**	**0.43, 0.51**	0.19	0.16, 0.22	**0.34**	**0.31, 0.38**
Middle income						
Non-Hispanic white	0.54	0.53, 0.56	0.21	0.20, 0.22	0.24	0.23, 0.25
Hispanic	0.52	0.48, 0.56	0.17	0.14, 0.20	0.30	0.27, 0.34
Non-Hispanic black	0.51	0.47, 0.54	0.17	0.15, 0.20	**0.32**	**0.29, 0.35**
Low income						
Non-Hispanic white	0.53	0.51, 0.55	0.22	0.21, 0.24	0.25	0.23, 0.26
Hispanic	0.50	0.45, 0.55	0.19	0.15, 0.23	0.31	0.27, 0.35
Non-Hispanic black	0.57	0.53, 0.61	**0.16**	**0.14, 0.19**	0.27	0.23, 0.30

SOURCE: Authors' analysis.

[a] All data were derived from the 2012 survey year of Homescan.

NOTES: Values represent predicted probabilities from multinomial logistic regression, adjusted for households' maximum level of education, household composition and market, and weighted to be nationally representative. The sample size was n= 58,638. For each cluster, within each income group, comparisons were made using non-Hispanic whites as the referent category. Statistically significant differences are denoted in bold; all at a p≤0.05 (Bonferroni-adjusted t-test).

[b] We used cluster analysis to group households by their food shopping patterns. We defined shopping patterns as the combinations of store-types US households use to shop for food based on the volume from packaged food purchases (PFPs) by store-type. We found 3 food shopping patterns or clusters: 1) primary-grocery cluster, characterized by households purchasing the majority of their packaged foods and beverages at grocery-chains (e.g., Kroger, Safeway); 2) primary-mass-merchandiser cluster, characterized by households purchasing the majority of their packaged foods and beverages at mass-merchandisers (e.g., Walmart, Super Target); and 3) combination cluster, characterized by households purchasing their packaged foods and beverages at a combination of store-types.

[c] Ratio of family income to poverty threshold, calculated from self-reported household income, was used to categorize household income according to the percentage of the Federal Poverty Level (low ≤185%; middle >185–<400%; or high ≥400%).

[d] Self-reported race-ethnicity of the household head was categorized as non-Hispanic whites, Hispanic, non-Hispanic blacks, or other races non-Hispanic. For households with two heads of household, Nielsen designates the race of the head of household that makes most of the purchase decisions. If either of the two heads of household are Hispanic, the race of the household is designated as Hispanic.