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Packaged Food Purchases at Walmart and Other Food Retail Chains Changes In Nutritional Profile From 2000 to 2013

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Abstract

Introduction—Proliferation of food retail chains has created an environment in which a few food retailers account for the majority of U.S. packaged food purchases (PFPs). Despite the major potential for these food retail chains (FRCs) to impact what U.S. consumers buy and eat, little is known about the nutritional profile of PFPs from these retailers, particularly PFPs from Walmart, the U.S.' largest grocer.

Methods—A data set of household PFPs from Nielsen Homescan was linked to data from the Nutrition Facts Panel (N=164,315), analyzed in 2014. Fixed effects models and inverse probability weights accounting for selectivity of shopping at a retailer were used to examine shifts in nutrient densities and key food groups purchased at Walmart and other FRCs from 2000 to 2013, and whether these changes differed for low-income or race/ethnic minority households.

Results—There were substantial declines in energy (−73 kcal/100 g), total sugar (−8 g/100 g), and sodium density (−33 mg/100 g) of Walmart PFPs, coupled with decreases in percentage volume purchased from sweets (−11%), grain-based desserts (−2%), and savory snacks (−3%) and increases in fruits (+3%) and vegetables (+1%). PFPs from other FRCs had a more favorable nutritional profile than Walmart PFPs in 2000, but demonstrated smaller shifts over time. Disparities in the nutritional profile of Walmart PFPs by race/ethnicity but not by income level shrank over time.

Conclusions—The nutritional profile of Walmart purchases has improved over time and in 2013 was similar to PFPs from other FRCs.

Introduction

Public health experts increasingly recognize the food retail sector as a potential ally in the fight against obesity,[1, 2] primarily because food stores provide the majority of daily energy for U.S. children and adults.[3, 4] Moreover, the consolidation and proliferation of food retail chains (FRCs) has created an environment where a few retailers account for the majority of

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U.S. food purchases.[5, 6] Walmart, in particular, has become an increasingly dominant source of food purchases: In 2014, it was the U.S.' biggest FRC, with $117.4 billion in grocery sales in 2013, greater than $40 billion more than the next largest grocer, Kroger.[6] The increasing dominance of FRCs in general and Walmart in particular positions them to have a major impact on what U.S. households buy and eat.

However, little is known about the actual nutritional quality of foods purchased from FRCs, as most dietary surveys do not include information on specific food retailers. Additionally, although a few studies have linked increased Walmart or supercenter densities to poorer diet, these suffered significant limitations. For example, Bonnano et al.[7] reported that increased Walmart store density was associated with a decreased percentage of adults consuming five servings of fruits/vegetables per day, and Volpe and colleagues[8] found that a 1% increase in local market share of supercenters was associated with a 5%–22% decrease in healthful food purchases. However, both studies examined the effect of store density on total purchases, rather than actual nutritional profile of purchases.

Perhaps most importantly, no study has fully accounted for selectivity, or the idea that the relative healthfulness of purchases at a given retailer may stem from the type of customers the retailer attracts, rather than the nutritional quality of products it sells. For example, less-educated, lower-income, and African American individuals are more likely to shop at supercenters[9, 10] and those who shop for bulk items prefer "everyday low pricing" stores like Walmart.[11–13] Selection bias arises if these retailer preferences are also associated with some underlying preference for less or more healthy foods. In addition, major retail environment changes could impact both the nutritional profile of food purchases and who shops at a certain retailer. For example, since 2011, Walmart has increased sales of locally sourced and organic foods and implemented a major initiative to improve the healthfulness of food purchases.[14] Thus, one question is whether the nutrient quality of purchases at Walmart or other retailers actually improved, or whether stores simply attracted a more health–conscious customer.

This study makes advances toward understanding the link between FRCs and the healthfulness of food purchases by employing methods to account for the selectivity of shopping at a certain retailer. The authors are especially interested in understanding whether, after accounting for selectivity, low-income and race/ethnic minority households have a worse nutritional profile of purchases, as these groups are more likely to shop at Walmart, and also are more likely to have nutritionally poorer diets.[15–17] To accomplish these objectives, this paper first describes the model developed to account for selectivity, including inverse probability weights and a fixed effects approach, although notably the authors were still unable to account for all possible sources of selectivity, including unobserved, time-varying characteristics like dietary preferences. The authors then apply this model to examine changes in the nutritional profile of packaged food purchases (PFPs) and changes in the percentage volume of key food groups purchased from Walmart and other FRCs from 2000 to 2013. Finally, this study examines whether changes were greater among low-income and race/ethnic minority households.

Methods

This study used data from Nielsen Homescan, a commercial data set of household PFPs from 2000 to 2013.[18] PFPs include all food and beverages with a barcode, including all consumer packaged goods and packaged fresh fruit and vegetables (i.e., a bag of potatoes, which has a barcode) but excluding unpackaged produce (i.e., a single potato) and meat from the deli counter. Households are sampled from 76 metropolitan and non-metropolitan Nielsen demographic markets. Households use handheld scanners to record information on each PFP, including amount and location of purchase.[19] Walmart purchases include all PFPs from Walmart Supercenters and Neighborhood Markets, whereas purchases from other FRCs include all PFPs from chain grocery stores and supermarkets (ten or more locations), supercenters, and mass merchandisers.[20]

The PFPs were aggregated at the quarter level for each household. Households were excluded from the sample if they purchased 0 g or 0 kcal from any store types over an entire quarter, had implausible nutrient outcomes (e.g., PFP energy density >900 kcal/100 g), or if they had fewer than two quarters of observations (n=68,893 observations or 2.6%). The final analytic sample included 2,611,125 household-quarter observations from 164,315 unique households.

Information on PFPs was linked at the barcode level to nutrition data from the Nutrition Facts Panel in each year.[21] Detailed information on these linkages has been published previously,[22] but in short, the authors were able to reliably link 87%–93% of volume purchased to Nutrition Facts Panel data. Descriptions of food groups can be found in Appendix Table 1.

Statistical Analysis

All statistical analyses were performed in 2014 using Stata, version 13. A general equation for all models and detailed covariate description are given in the Appendix. The authors used fixed effects models to separately examine changes in mean nutrient density of PFPs purchased by households from each type of retailer, including energy density (kcal/100 g PFPs from that store type), total sugar (g/100 g PFPs), saturated fat (g/100 g PFPs), and sodium (mg/100 g PFPs). The authors also examined shifts in percentage volume purchased (% g) from 13 key food groups in order to understand shifts in consumer purchasing, which included top contributors to volume purchased (e.g., sugar-sweetened beverages, grain-based deserts) or in some cases, food groups that Walmart indicated as groups targeted for their initiative (e.g., processed meat, salad dressing). Finally, the authors examined whether there were differences in the mean nutritional profile of PFPs from each retailer type over time for households of different income levels and race/ethnicity.

Several methods were used to deal with the possible selectivity of households who shop at Walmart versus other FRCs. To deal with potential dynamic selectivity, all models included time-varying inverse probability weights to account for the changing likelihood of being a Walmart or other FRC shopper over time (Appendix).[23–25] Results were robust to the use of inverse probability weights (Appendix Table 3). To deal with time-invariant selectivity, the

authors used fixed effects models, as selectivity associated with fixed characteristics of the household or community is differenced out.

All models included year indicator variables to estimate changes over time. To control for secular changes in the economic environment, such as the "Great Recession," average quarterly market-level unemployment rate was included,[26] and to control for changes in the food retail environment, this study included average annual market-level Walmart store density (Walmart stores per 100,00 individuals).[27–30] To control for price differences between Walmart and other FRCs, the authors included two variables that are the average of prices of products, weighted by volume, purchased from Walmart or other FRCs per market per quarter. All models also controlled for household-level covariates, including race, income, head of household education, household type, and household composition.

To aid interpretability, for all models the authors predicted the adjusted mean nutrient density or percentage volume from food groups purchased by households for each year from Walmart and other FRCs. Contrasts in means within each retailer type across years were examined. A Wald chunk test was used to test the interaction of income and race/ethnicity with year. Results were considered statistically significant at $p<0.01$ for main results and $p<0.05$ for interaction. All results were Bonferroni-adjusted for multiple comparisons.

Results

Demographic characteristics of the sample are presented in Appendix Table 4. Over time, the sample remained predominantly non-Hispanic white, with at least some college education.

Overall, the predicted mean nutrient density of household PFPs from Walmart declined from 2000 to 2013, including energy (−73 kcal/100 g), total sugar (−8 g/100 g), and sodium density (− 33 mg/10 0g) (Figure 1) ($p<0.01$). The predicted mean nutrient density of household PFPs from other FRC showed significant but smaller declines in nutrient densities: energy (−11 kcal/100 g), total sugar (−1 g/100 g), and sodium density (−20 mg/100 g). Although the average nutrient density of Walmart PFPs was higher than at other FRCs in 2000, the difference between the two retailers had shrunk by 2013 owing to the relatively larger declines at Walmart.

From 2000 to 2013, the predicted mean percentage volume of grain-based desserts, candy, and savory snacks purchased by households from Walmart declined by 2%, 11%, and 3%, respectively, whereas percentage volume from fruits and vegetables increased (3% and 1%, respectively) ($p<0.01$), with similar but smaller shifts observed among other FRC PFPs (Table 1). There were only minor shifts (<2%) in percentage volume from beverages purchased from either retailer.

There were no major differences in the nutritional profile of Walmart PFPs for higher- versus lower-income households at Walmart, or differential changes over time (Table 2). Higher-income households tended to have slightly lower predicted mean energy, sugar, and sodium densities for PFPs purchased from other FRCs than did lower income households. Though the gap in sugar density of other FRC PFPs between lower- and higher-income

households narrowed over time (p=0.022), the gap in sodium density widened: higher-income households showed bigger declines (−20 mg/100 g) in the sodium density of PFPs from other FRCs than did lower-income households (−1 mg/100 g, p=0.079).

Disparities in the predicted mean nutritional profile of Walmart PFPs shrank over time for Hispanic and non-Hispanic other households (Table 3). Although Hispanics and non-Hispanic others had the highest energy and sodium density of Walmart PFPs in 2000, these groups showed the largest declines in energy and sodium density (p=0.054 and p=0.052 for interaction, respectively). However, non-Hispanic blacks had the smallest declines in nutrient density, and as a result shifted from having similar or lower energy, sugar, and sodium density relative to non-Hispanic whites in 2000 to having higher nutrient densities in 2013. By contrast, non-Hispanic blacks showed the largest decline in sodium and energy density of PFPs from other FRCs (p<0.01 for interaction). However, despite these larger declines, PFPs from other FRCs purchased by non-Hispanic black households had the highest values for energy, sugar, and sodium density, which persisted across time.

Discussion

This study shows that PFPs from Walmart, the U.S.'s largest food retailer, had major declines in energy, sodium, and total sugar densities, and to a lesser degree, saturated fat density. These trends were accompanied by similar but smaller shifts in PFPs from other FRCs. These declines in saturated fat and sodium densities represent a shift toward a more healthful nutritional profile in accordance with the 2010 Dietary Guidelines, which recommended limiting saturated fat to 10% of daily calories and cutting sodium intake.[31] Additionally, declines in energy density could be protective against obesity,[32–36] although further work is needed to link these shifts in food purchasing to health outcomes.

Declines in groups like grain-based desserts and sweets are promising, considering that candy and grain-based desserts are among the largest sources of added sugar in the U.S., and grain-based desserts are the top source of solid fats.[37] Although increases in fruit and vegetable purchases were relatively small, this may be attributable to lack of data on unpackaged produce, which likely showed even steeper increases due to Walmart's efforts to boost sales of locally sourced and organic produce.[38, 39] Considering this limitation, and because increases purchases do not necessarily translate to increased intake, more work is needed to confirm that increases in fruit and vegetable purchases were accompanied by increased consumption. Regardless, these results demonstrate that although the overall nutritional profile of PFPs at Walmart was "less healthy" in 2000, it became healthier at a faster rate, and was similar to other FRCs by 2013.

It is unclear what drove these changes. The authors could not disentangle Walmart-driven changes from other secular trends, including industry-wide reformulations, changes in consumer behavior, or changes to nutrition assistance programs.[19] For example, one would have expected to see declines in energy density of PFPs purchased at both Walmart and other FRCs, considering the large decline in trillions of calories sold by food manufacturers as part of a pledge to remove calories.[21, 40, 41] Yet, the bigger changes at Walmart suggests

these results were unique to Walmart and not simply reflective of some industry-wide trend. The relatively larger changes at Walmart could indicate that either:

1. Consumers changed the types of products they were purchasing at Walmart, but not at other FRCs.
2. The underlying nutritional profile of PFPs available at Walmart was changing faster than other FRC PFPs, either due to introduction of new products or through product reformulation.

The present results indicate that consumers at Walmart did make different choices in the percentage volume purchased from key food groups over time; however, the authors were not able to ascertain the degree to which products were reformulated simultaneously.

One question is whether these improvements in nutritional profile resulted from Walmart's healthier foods initiative, which involved efforts to improve the underlying healthfulness of its product assortment (e.g., product reformulation) as well as efforts to improve the healthfulness of consumer decision making (e.g., front-of-package labeling initiatives).[14, 42] As retailer-based healthier foods initiatives become increasingly common,[43, 44] more work is needed to understand whether Walmart's initiative was responsible for observed improvements, and which aspects were key drivers. More research should also address how food retailer–based initiatives interact with other industry- and government-led efforts, such as product reformulations or menu labeling, to improve the healthfulness of what people buy and subsequently eat.

A final possible explanation for Walmart's relatively bigger changes is that the overall nutritional profile at other FRCs was comparably "healthier" in earlier years, leaving less room for change: Walmart PFPs simply shifted to match PFPs from other food stores. In fact, these results are comparable to those of Volpe et al.,[8] who found that increased supercenter density (i.e., Walmart density) was associated with less healthful PFPs from 2000 to 2006, but the disparity in healthfulness of PFPs between supercenter and supermarket had mostly diminished by 2006.

The present work shows that low-income households do not buy disproportionately less healthy foods at Walmart; in fact, there were bigger differences in nutritional profile by income status at other FRCs (although these were still minor). The authors also found evidence that for Hispanics and non-Hispanic others, race/ethnic disparities in the nutritional profile of Walmart PFPs lessened over time. However, it was troubling that PFPs purchased from Walmart by non-Hispanic blacks showed the smallest improvements in nutritional profile. In fact, Walmart PFPs by non-Hispanic blacks actually became less healthy relative to those purchased by non-Hispanic whites, which is contrary to other publications indicating that white–black gradient in diet is decreasing.[45] Although PFPs from FRCs purchased by non-Hispanic blacks showed the biggest declines in energy, sugar, and sodium density, PFPs purchased by non-Hispanic blacks still had higher nutrient densities in 2013. Among PFPs from both retailers, non-Hispanic blacks had the highest sodium density in 2013, suggesting that this might be one key area for chain retailers to target for future intervention. In general, more work is needed to understand the drivers of these food purchasing disparities in order to inform effective strategies for reduction.

Limitations

One concern is that the declines in nutritional profile of Walmart PFPs simply reflect a shift in how people shop for food at Walmart. As perceptions of Walmart as a grocery store increased, people purchased a wider variety of foods there, leading to a decline in nutrient density relative to earlier years, when people may have only purchased foods like candy or snacks while shopping for other non-grocery items. Although the study attempted to reduce selectivity through use of fixed effects models and time-varying inverse probability weights, it was unable to account for time-varying unobservables, such as shifts in dietary preferences, which could affect whether people shop at Walmart (or FRCs) and what they purchase. In addition, the Nielsen Homescan sample tends to be higher educated and higher income than the general U.S. population. This analysis was not nationally representative, limiting generalizability.

From a modeling perspective, ideally, the study's models also would have included more-specific geographic units than Nielsen markets, to better characterize the economic and food retail environments in which each household makes food shopping choices. In addition, because households who shopped at FRCs and Walmart represented two overlapping but distinct samples, the study was unable to formally test differences between the two retailers.

This study did not include food purchases at other non-chain food retailers, like specialty stores or ethnic food stores, or from other food establishments like restaurants, fast food chains, or gas stations/convenience stores. However, considering that percentage of daily caloric intake from food stores overall remained relatively stable from 2000 to 2010,[4] and that within food stores, the proportion of PFPs purchased from mass merchandisers and grocery chains did not change from 2000 to 2013 (72% to 70%, respectively) (D Stern, University of North Carolina, unpublished observations, 2015). It seems unlikely that observed changes in nutritional profiles are due to differential purchasing at other food retailers or restaurants.

Conclusions

From 2000 to 2013, the nutritional profile of PFPs from Walmart improved, and by 2013, was similar to those from other FRCs. Race/ethnic disparities in the nutritional profile of PFPs at Walmart declined for non-Hispanic others and Hispanics, but worsened over time for non-Hispanic blacks, whereas at other FRCs, blacks consistently had worse nutritional profile of purchases. These results suggest that, after taking into account the selectivity of shopping at a certain retailer, Walmart PFPs are not more or less healthy than PFPs from other FRCs—but disparities for blacks persist across retailers and require additional attention. More work is also needed to the degree to which food retailer–based initiatives, alongside government-, industry-, and consumer-led efforts, are responsible for improvements in the nutritional profile of U.S. PFPs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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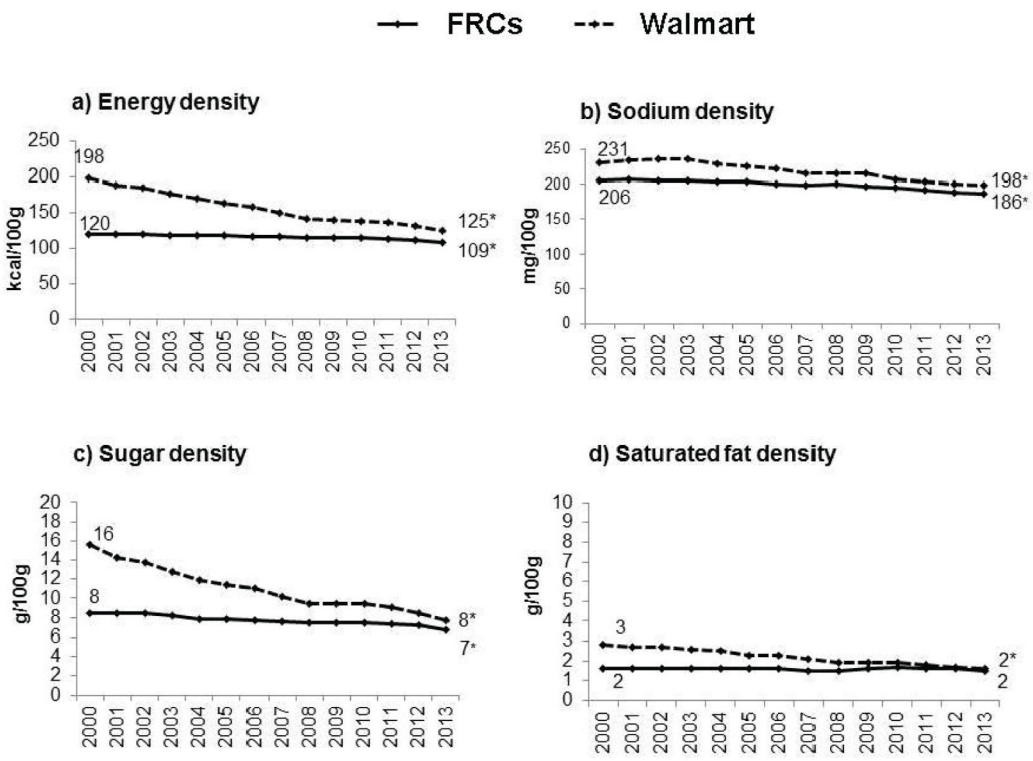

Figure 1.

Predicted adjusted mean nutrient density of packaged food purchases purchased by households from Walmart and other food retail chains (other FRC) from 2000 to 2013. Source: Calculations based in part on data reported by Nielsen through its Homescan Services for the food and beverage categories for the U.S. market. ©2013, The Nielsen Company.

Table 1

Predicted Mean Percent Volume From Top Food and Beverage Groups Purchased by Households from Walmart and Other Food Retail Chains (FRCs) From 2000 to 2013[a]

	2000 Mean % (SE)	Other FRCs 2013 Mean % (SE)	Difference	2000 Mean % (SE)	Walmart 2013 Mean % (SE)	Difference
Grain-based desserts	1.9 (0.02)	2.0 (0.02)	0.1	5.3 (0.23)	3.0 (0.12)	**−2.3*****
Fruit	0.6 (0.02)	2.9 (0.02)	**2.3*****	−0.3[b] (0.09)	2.8 (0.06)	**3.1*****
Vegetables	3.7 (0.03)	3.5 (0.03)	**−0.2*****	2.0 (0.1)	2.8 (0.06)	**0.8*****
Savory snacks	2.2 (0.02)	2.3 (0.02)	0.1	6.2 (0.25)	3.1 (0.12)	**−3.1*****
Ready-to-eat bread	2.4 (0.02)	2.6 (0.02)	0.2	1.9 (0.13)	2.8 (0.08)	**0.9*****
Ready-to-eat breakfast	1.7 (0.02)	1.9 (0.02)	**0.2*****	1.9 (0.14)	3.0 (0.08)	**1.1*****
Sweets	2 (0.03)	0.8 (0.03)	**−1.2*****	13.1 (0.36)	1.8 (0.18)	**−11.3*****
Processed meat	1.3 (0.01)	1.9 (0.01)	**0.6*****	1.1 (0.08)	1.9 (0.05)	**0.8*****
Salad dressing	0.4 (0.01)	0.6 (0.01)	**0.2*****	0.2 (0.05)	0.6 (0.03)	**0.4*****
Milk	10.7 (0.05)	9.2 (0.05)	**−1.5*****	6.4 (0.19)	6.2 (0.11)	−0.2
100% Juice	3.3 (0.03)	1.6 (0.02)	**−1.7*****	1.9 (0.1)	1.2 (0.06)	**−0.7*****
SSB	10.2 (0.06)	9.7 (0.06)	**−0.5*****	9.3 (0.28)	8.3 (0.16)	−1.0
Diet beverages	5.8 (0.05)	6.1 (0.05)	0.3	5.8 (0.23)	4.7 (0.13)	**−1.1*****

Source: Calculations based in part on data reported by Nielsen through its Homescan Services for the food and beverage categories for the U.S. market. ©2013, The Nielsen Company.

Note: Boldface indicates statistical significance for the comparison between predicted percent volume in 2013 compared to 2000, $p<0.01$.

[a] Predicted adjusted mean values from fixed effects models with inverse probability weights, controlling for race/ethnicity, income, household size, household composition, head of household education, household type (single adult, multiple adults with no kids, adult(s) with kids), average quarterly market-level unemployment rate, average annual market-level Walmart store density, and average price of products at Walmart and other chain retailers.

[b] A negative percent of purchases is in reality not possible; this value reflects a prediction from a fitted line based on regression results which can sometimes yield negative results due to the linear nature of the model.

Table 2

Predicted Mean Nutritional Profile of PFPs Purchased by Households from Walmart and Other FRCs by Household Income[a]

Other FRCs

PFPs

	Energy density (kcal/100 g)				**Sugar density (g/100 g)**			
	Higher income		**Low income**		**Higher income**		**Low income**	
	Mean	**(95% CI)**	**Mean**	**(95% CI)**	**Mean**	**(95% CI)**	**Mean**	**(95% CI)**
2000	119	(119,120)	**125**	(122,128)	8.4	(8.3,8.4)	**9.0**	(8.7,9.3)
2013	108	(108,109)	**114**	(111,116)	6.7	(6.6,6.7)	**7.0**	(6.8,7.2)
Difference[b]	−11		−11		−1.7		**−2.0**	

	Saturated fat density (g/100 g)				Sodium density (mg/100 g)			
	Higher income		Low income		Higher income		Low income	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
2000	1.6	(1.5,1.6)	**1.7**	(1.6,1.8)	205	(204,206)	209	(202,215)
2013	1.5	(1.5,1.6)	**1.6**	(1.5,1.7)	185	(183,206)	208	(203,213)
Difference	−0.1		−0.1		−20		−1	

Walmart PFPs

	Energy density (kcal/100 g)				**Sugar density (g/100 g)**			
	Higher income		**Low income**		**Higher income**		**Low income**	
	Mean	**(95% CI)**	**Mean**	**(95% CI)**	**Mean**	**(95% CI)**	**Mean**	**(95% CI)**
2000	200	(195,204)	190	(175,205)	15.7	(15.2,16.2)	14.6	(12.5,16.6)
2013	124	(122,126)	127	(120,134)	7.7	(7.4,7.9)	8.4	(7.7,9.2)
Difference	−76		−63		−8.0		−6.2	

	Saturated fat density (g/100 g)				Sodium density (mg/100 g)			
	Higher income		Low income		Higher income		Low income	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
2000	2.8	(2.7,2.9)	2.8	(2.5,3.2)	231	(225,238)	231	(210,252)
2013	1.6	(1.5,1.6)	1.6	(1.5,1.8)	198	(194,201)	200	(190,210)

Walmart PFPs

	Energy density (kcal/100 g)				Sugar density (g/100 g)			
	Higher income		Low income		Higher income		Low income	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
Difference	−1.2		−1.2		−33		**−31**	

Source: Calculations based in part on data reported by Nielsen through its Homescan Services for the food and beverage categories for the U.S. market. ©2013, The Nielsen Company.

[a] Household income categorized as higher income (income >130% the federal poverty level [FPL]) or low income (income ≤ 130% FPL)

[b] Difference between 2013 and 2000, within income group

Note: Boldface indicates that the predicted mean nutrient density was different between higher income vs. low income households, within retailer and year, $p \leq 0.05$. For rows indicating the difference between 2013 and 2000, Boldface indicates that changes in the predicted mean nutrient density of PFPs purchased by low-income households was different than changes in the predicted mean nutrient density of PFPs purchased by higher-income households.

PFP, packaged food purchases; FRC, food retail chains

Table 3

Predicted Mean Nutritional Profile of PFPs Purchased by Households From Walmart and Other FRCs by Race/Ethnicity

Other FRC PFPs								
	Energy density (kcal/100 g)							
	NH White		**Hispanic**		**NH Black**		**NH Other**	
	Mean	**(95% CI)**	**Mean**	**(95% CI)**	**Mean**	**(95% CI)**	**Mean**	**(95% CI)**
2000	119	(119,120)	**115**	(113,118)	**128**	(126,131)	116	(113,119)
2013	108	(107,108)	109	(106,111)	115	(113,117)	116	(114,119)
Difference[a]	−11		**−6**		**−13**		**0**	
	Sugar density (g/100 g)							
	NH White		Hispanic		NH Black		NH Other	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
2000	8.3	(8.3,8.4)	8.3	(8.1,8.6)	**9.4**	(9.2,9.6)	8.5	(8.2,8.8)
2013	6.6	(6.6, 6.7)	6.7	(6.5, 6.9)	**7.6**	(7.5, 7.8)	**6.9**	(6.7, 7.1)
Difference	−1.3		**−1.0**		**−1.4**		**−1.5**	
	Saturated fat density (g/100 g)							
	NH White		Hispanic		NH Black		NH Other	
	Mean	(95% CI)	(95% CI)	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
2000	1.6	(1.6,1.6)	**1.4**	(1.4,1.5)	1.5	(1.5,1.6)	**1.5**	(1.4,1.5)
2013	1.5	(1.5,1.6)	**1.4**	(1.4,1.5)	1.6	(1.5,1.6)	1.6	(1.5,1.7)
Difference	−0.1		**0.0**		**0.1**		**0.1**	
	Sodium density (mg/100 g)							
	NH White		Hispanic		NH Black		NH Other	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
2000	204	(202,205)	202	(196,207)	**232**	(226,237)	203	(195,211)
2013	184	(182,185)	184	(179,190)	**201**	(197,206)	**191**	(185,197)
Difference	−20		**−18**		**−31**		**−12**	

Walmart PFPs

	Energy density (kcal/100 g)							
	NH White		**Hispanic**		**NH Black**		**NH Other**	
	Mean	**(95% CI)**	**Mean**	**(95% CI)**	**Mean**	**(95% CI)**	**Mean**	**(95% CI)**
2000	199	(194,203)	210	(191,230)	178	(162,194)	238	(194,281)
2013	123	(121,126)	127	(117,137)	135	(128,143)	127	(114,139)
Difference	−76		**−83**		**−43**		**−111**	
	Sugar density (g/100 g)							
	NH White		Hispanic		NH Black		NH Other	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
2000	15.6	(15.1,16)	17.9	(14.3,22.5)	14.0	(12.3,15.7)	18.1	(13.5,22.7)
2013	7.7	(7.4,7.9)	7.1	(5.7,8.5)	9.0	(8.2,9.7)	8.1	(6.8,9.3)
Difference	−7.6		−11.0		−5.0		−10.1	
	Saturated fat density (g/100 g)							
	NH White		Hispanic		NH Black		NH Other	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
2000	2.9	(2.8,3.0)	2.5	(2.0,3.0)	2.5	(2.1,2.9)	**4.1**	(3.2,5.1)
2013	1.6	(1.5,1.7)	1.9	(1.6,2.2)	1.6	(1.4,1.8)	1.5	(1.2,1.8)
Difference	−1.3		−0.6		−0.9		−2.6	
	Sodium density (mg/100 g)							
	NH White		Hispanic		NH Black		NH Other	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
2000	229	(223,235)	256	(227,286)	230	(207,254)	277	(223,331)
2013	196	(193,200)	189	(174,204)	**212**	(200,224)	211	(190,231)
Difference	−33		**−67**		**−18**		**−66**	

Source: Calculations based in part on data reported by Nielsen through its Homescan Services for the food and beverage categories for the U.S. market. ©2013, The Nielsen Company.

[a]Difference between 2013 and 2000, within income group

Note: Boldface indicates that the predicted mean nutrient density was different between the Hispanic, NH Black, or NH Other vs. NH White households, within retailer and year, $p \leq 0.05$. For rows indicating the difference between 2013 and 2000, boldface indicates that there were differential changes in the predicted mean nutrient density of PFPs purchased by race/ethnic groups over time.

PFP, packaged food purchases; FRC, food retail chains