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## **Composition of Food-at-Home Expenditures and Childhood Obesity**

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***Selected Paper prepared for presentation at the 2017 Agricultural & Applied Economics Association Annual Meeting, Chicago, Illinois, July 30-August 1***

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Despite the fact that food-away-from-home (FAFH) expenditures have increased steadily since late 1990s, food-at-home (FAH) expenditures still constitute the bulk of U.S. households' total food expenditures. According to the Consumer Expenditure Survey by the Bureau of Labor Statistics, American families on average spent \$4,015 and \$3,008 in 2015 on food at home and food away from home, respectively. In 2015, total food expenditures accounted for approximately 13% of annual expenditures among families with children<sup>1</sup> (BLS, 2017). Parents of children in kindergarten, first and third grade reported that they ate about 10 meals with family in a typical week (Gable et al., 2007). There was evidence that the number of family meals children take was negatively associated with their risk of overweight (Gable et al., 2007). FAH expenditures may exert an important impact on what children eat at home and consequently their weight status.

### **FAH Expenditures and Obesity**

Although a number of studies have been conducted in the public health literature concerning the relationship between home food availability and obesity, there is limited evidence in the economics literature regarding the association between FAH expenditures and obesity. One study found that FAH expenditures were negatively related to adult obesity rates, whereas FAFH expenditures were positively associated with adult obesity rates (Cai et al., 2008). Children's food consumptions are especially influenced by what is presented to them at home. Less availability of obesity-protective foods such as fruits and vegetables was often associated with less consumption, whereas more availability of obesogenic foods was associated with higher consumption, with each pathway increasing the likelihood of obesity (Rosenkranz and Dzewaltowski, 2008).

### **Food Shopping Channels and Obesity**

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<sup>1</sup> Families with children include married couple with children and single parent with at least one child under 18.

There is rarely any direct evidence suggesting the association between the type of shopping channels and obesity. Rather, a number of studies in the economics literature have examined the association between availability of food stores, especially supermarkets, and outcomes related to food consumption and body weight. There is no overwhelming evidence that access to food stores, particularly supermarkets, is strongly associated with food consumption. Utilizing the Nielsen HomeScan data and food store establishments from County Business Patterns by the U.S. Census Bureau, Kyureghian et al. (2013) did not find a significant association between densities of food stores, especially supermarkets, and purchases of fruits and vegetables. In this study, coefficients for the density variables were assumed to be random in the mixed effects models. Using an instrumental variables approach and French data, Caillavet et al. (2015) found that the number of food stores was negatively associated with the probability of consuming the recommended servings of fruits and vegetables, whereas the total area of the stores devoted to food sales was positively associated with consuming the recommended number of servings of fruits and vegetables.

The evidence regarding access to food stores and obesity is also mixed. One study using an instrumental variables strategy attributed 10 percent of the rise in US obesity rates to the proliferation of Walmart supercenters (Courtemanche and Carden, 2011). Using a random effects model, Powell and Bao (2009) found that higher densities of supermarkets were significantly associated with lower child BMIs.

There is also evidence that increased market share of supercenters was negatively associated with the healthfulness of FAH purchases (Volpe et al., 2013). However, it is not clear whether where households make FAH purchases would matter for obesity if what households buy is being controlled for. That is, if households had the same composition of FAH expenditures, does it matter if they get them from different places? First, this study aggregated FAH expenditures into a single variable that

reflects healthfulness of the food shopping basket and investigated this variable's relationship to obesity or overweight status for children under the age of 18. Second, we also examined households' FAH purchasing shares from different food outlets and their association with childhood overweight or obesity. Understanding the composition of FAH expenditures and the channel sources of household's FAH purchases will help us better prevent childhood obesity by shopping smartly.

### **FAH Expenditures and Shopping Channels for Families with Children in the U.S.**

Nested in 1,731 households, a sample of 2,645 children who could be followed over the three years was extracted from the 2010-2012 MedProfiler surveys ( $n = 2,645 \times 3 \text{ years} = 7,935$ ). The demographic and health related information of children were reported by the adult primary member in the household. The households resided in 737 counties across the U.S. The children's data were merged with the matching households' socio-demographics and FAH expenditures in the 2010-2012 IRI Consumer Panel (Sweitzer et al., 2016).

Based on self-reported weight and height, we first calculated children's BMIs ([weight in pounds/(height in inches)<sup>2</sup>×703]). Children with BMIs lower than the 5th percentile for their age and gender were classified as underweight; those with BMIs greater than or equal to the 5th percentile but lower than the 85th percentile were categorized as normal weight; those with BMIs greater than or equal to the 85th percentile but lower than the 95th percentile were categorized as overweight; and those with BMIs greater than or equal to the 95th percentile were classified as obese (CDC, 2014).

Overall, households made FAH purchases from four major outlets including supermarkets, supercenters, club stores, and mass merchandisers. Although there were no clear differences in FAH expenditures from different channels for children with different weight statuses, it seems that families of normal-weight children had higher expenditure shares from the four major channels (Figure 1).

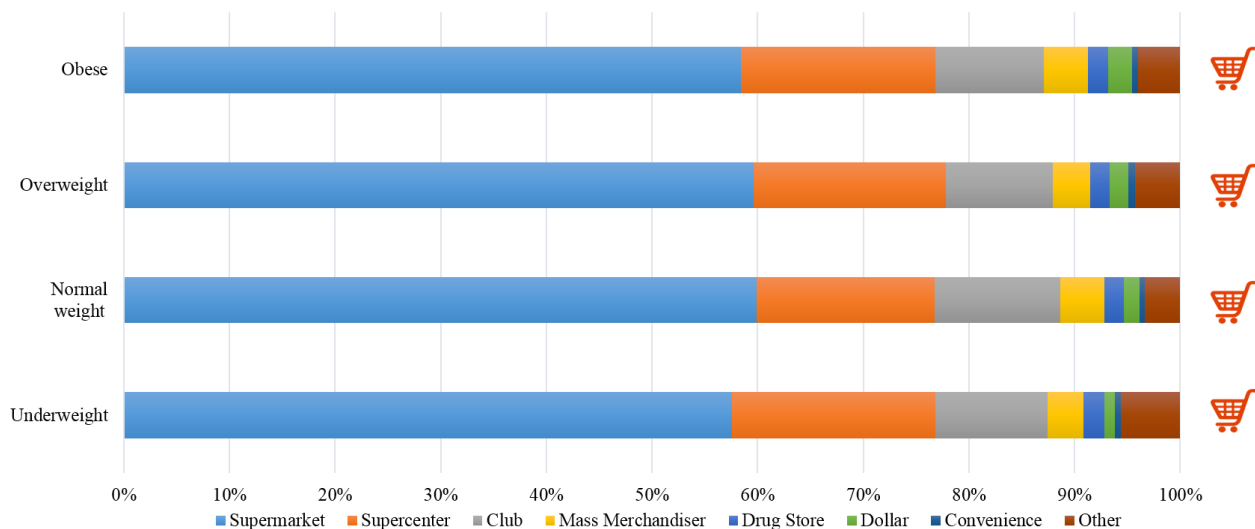


Figure 1. FAH Expenditure Shares from Different Channels by Weight Status of Children

On average, households in the dataset recorded \$252 in monthly FAH expenditures from 2010 to 2012. There was no significant differences in households' monthly FAH expenditures among children with different weight statuses. However, the composition of monthly FAH expenditures differed across weight groups (Figure 2). It is obvious that families of overweight or obese children spent more money on soft drinks, sodas, fruit drinks, ades, and rice beverages, compared to families of normal-weight and underweight children (Figure 2).

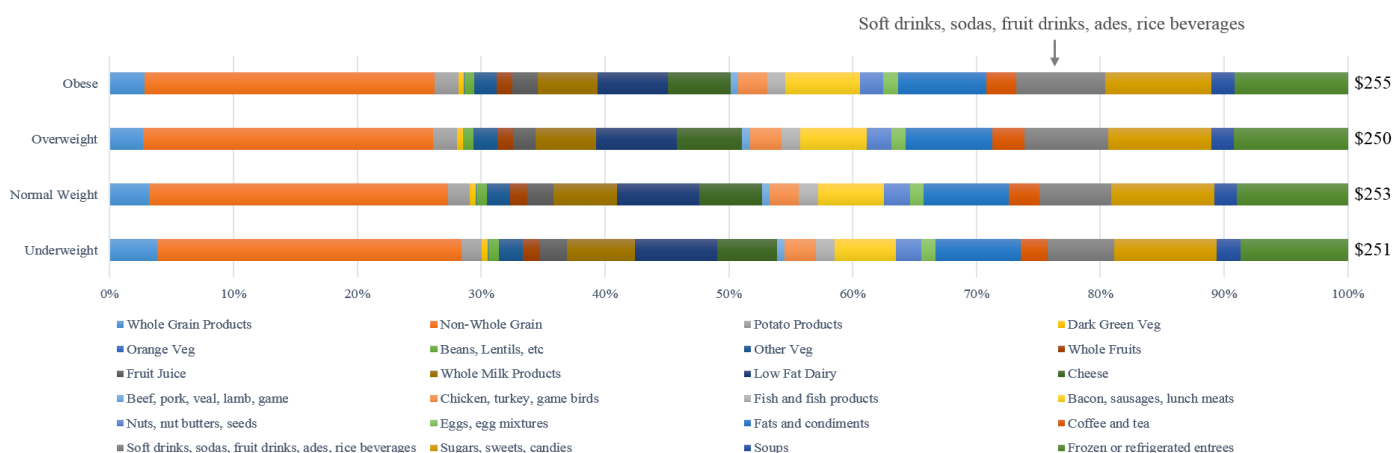


Figure 2. Composition of Monthly Food-at-Home Expenditures by Weight Status of Children

The composition of FAH expenditures was evaluated by a healthy index (hereafter FAH healthy index) introduced by Volpe and Okrent (2012). This index reflects a household’s adherence to USDA recommended expenditure shares for 24 food categories, derived based on the USDA Food Plans. These recommended shares vary across households depending on household demographics that include the age of male household head, age of female household head, and the presence and age of children. Two sample t-tests indicate that families of overweight or obese children had significantly lower FAH healthy indices than those for families of normal weight children (Figure 3).

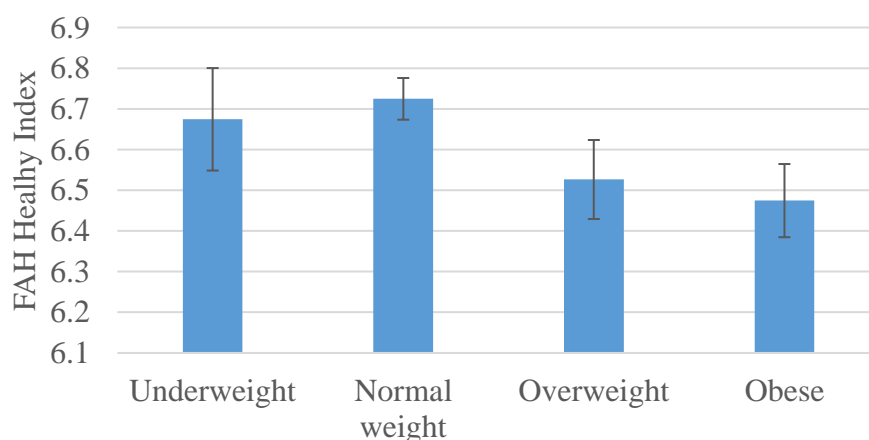


Figure 3. FAH Healthy Indices with 95% CI by Weight Status of Children

### **Individual-level Behavioral Risk Factors and Household-level FAH Expenditures Associated with Childhood Overweight and Obesity**

To account for the multilevel data structure, a random-intercept logistic model was used to analyze the individual- and household-level factors associated with being overweight or obese among children, compared to being underweight or normal weight. At the individual level, we included age, gender, whether children ate at a fast-food restaurant on most days of a week (“fast food”), whether they exercised for at least 20 minutes per day on most days of a week (“exercise”), and a diet feature variable

indicating whether children consumed high-fiber, high-protein, low-calorie, low-carbohydrate, low-fat, low-salt, and low-sugar diets. At the household level, we included household sociodemographic characteristics, households' FAH healthy index, and their monthly expenditure shares from different food shopping channels. The results of the model are presented in Table 1.

Table 1. Individual- and Household-level Factors Associated with Overweight or Obese Children: United States, 2010 to 2012

Independent Variables	Odds Ratio (95% CI)
Individual level	
Age	0.92 (0.89, 0.95)***
Male (reference)	
Female	0.63 (0.49, 0.81)***
Diet feature	1.14 (1.04, 1.26)**
Fast food	1.20 (0.60, 2.40)
Exercise	0.56 (0.46, 0.68)***
Household level	
Non-Hispanic White (reference)	
Hispanic	1.60 (0.85, 3.02)
Non-Hispanic Black	2.10 (1.24, 3.56)**
Asian	0.59 (0.30, 1.18)
Other race	1.58 (0.56, 4.48)
Household size	0.87 (0.76, 1.00)*
Log (income)	0.69 (0.54, 0.89)**
≤ High school (reference)	
Some college	0.56 (0.32, 0.97)*
College graduate	0.42 (0.25, 0.71)***
Post-college graduate	0.33 (0.18, 0.59)***
Married	0.79 (0.48, 1.31)
FAH healthy index	0.92 (0.85, 0.99)*
Supermarket share	0.75 (0.26, 2.16)
Drug store share	0.79 (0.05, 11.67)
Mass merchandiser share	0.35 (0.07, 1.73)
Supercenter share	0.76 (0.25, 2.34)
Convenience store share	1.86 (0.02, 148.11)
Dollar store share	0.76 (0.08, 6.94)
Club store share	0.54 (0.15, 1.89)

\*\*\* $p \leq 0.001$ ; \*\* $p \leq 0.01$ ; \* $p \leq 0.05$



Most of the individual-level variables were strongly correlated with children's weight status. Consuming special diets were positively associated with being overweight or obese. Since this model does not indicate a causal relationship, it is likely that overweight or obese children were sometimes treated with special diets. Heavy fast food consumption was not significantly associated with being overweight or obese. About 2.4% obese children and less than 2% of children with other kinds of weight statuses had meals in a fast-food restaurant for most days of a week. This small portion indirectly suggested the less important status of eating at a fast-food restaurant than food intake at home and school for children. Exercising at least 20 minutes a day on most days of a week reduced the odds of being overweight or obese by 44%.

Childhood overweight and obesity were associated with a number of household sociodemographic characteristics. Children living in families with a Black household head were more than two times as likely to be overweight or obese as those living with a White household head. The higher the household size and household annual income were, the less likely the children were overweight or obese. Children living with a household head that had some college education or beyond had significantly lower odds of being overweight or obese than those living with a household head who had an education level of high school or less.

Our results indicate that healthier FAH expenditures were associated with reduced risk of childhood overweight and obesity, suggesting the importance of the composition of FAH expenditures in shaping children's diets and their subsequent weight outcomes. Comparing households' food expenditure shares for 24 food categories with the recommended values suggested by USDA offer clear suggestions of improvement regarding the expenditure shares of specific food categories for households with children. Specifically, American families purchased far more non-whole-grain products, bacon, sausages, and luncheon meats, fats and condiments, soft drinks, sugars, sweets, and candies, and frozen

or refrigerated entrees, but much fewer fruits and vegetables than the recommended values (Chen et al., 2016). In contrast to the prominence of FAH composition, where the FAH expenditures were spent presented less importance. None of the channel expenditure shares were associated with being overweight or obese for children.

Moreover, the recommended composition of FAH expenditures can provide potential guidelines for participants in food assistance programs, especially the Supplemental Nutrition Assistance Program (SNAP). Unlike the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) program, SNAP—the largest food assistance program in the U.S., does not restrict the food categories that participants can buy. There is evidence that SNAP participants consumed more sugar-sweetened beverages, high-fat dairy, processed meats than comparable non-participants (Leung et al., 2013). Imposing purchasing share limitations on SNAP benefits redemption can potentially help improve participants' dietary composition and reduce their risk of obesity.

## **Conclusion**

Differing from previous studies on the impact of selected foods and food access on obesity, this study not only examined the association between the composition of FAH expenditures and childhood overweight and obesity risk, but also investigated the relationship between FAH expenditure shares from multiple shopping channels and the risk of childhood overweight and obesity. Higher compliance with the USDA Food Plans (higher FAH healthy index) was associated with reduced risk of being overweight or obese for children. Given the same FAH healthy index, the sourcing channels for the foods were not significantly associated with overweight and obesity risk. In other words, where households shop for their foods were not crucial, as long as they got the right combination of foods in their shopping cart.

## References

Cai, Y., Alviola, P., Nayga, R., & Wu, X. (2008). The effect of food-away-from-home and food-at-home expenditures on obesity rates: A state-level analysis. *Journal of Agricultural and Applied Economics*, 40(2), 507-521.

Centers for Disease Control and Prevention (CDC). Defining childhood obesity. Available at: <http://www.cdc.gov/obesity/childhood/defining.html>. Accessed December 10, 2014.

Caillavet, F., et al. 2015. Does Healthy Food Access Matter in a French Urban Setting? *American Journal of Agricultural Economics* 97:1400-1416.

Courtemanche, C., and A. Carden. 2011. Supersizing supercenters? The impact of Walmart Supercenters on body mass index and obesity. *Journal of Urban Economics*, 69:165-181.

Chen, D., Jaenicke, E. C., & Volpe, R. J. (2016). Food Environments and Obesity: Household Diet Expenditure Versus Food Deserts. *American Journal of Public Health*, 106(5), 881-888.

BLS (Bureau of Labor Statistics) (2017). Consumer expenditures – 2015. <https://www.bls.gov/cex/#news> Accessed on January 10, 2017.

Gable, S., Chang, Y., & Krull, J. L. (2007). Television watching and frequency of family meals are predictive of overweight onset and persistence in a national sample of school-aged children. *Journal of the American dietetic association*, 107(1), 53-61.

Kyureghian, G., R.M. Nayga, and S. Bhattacharya. (2013). The Effect of Food Store Access and Income on Household Purchases of Fruits and Vegetables: A Mixed Effects Analysis. *Applied Economic Perspectives and Policy*, 35, 69-88.

- Leung, C. W., Blumenthal, S. J., Hoffnagle, E. E., Jensen, H. H., Foerster, S. B., Nestle, M., ... & Willett, W. C. (2013). Associations of food stamp participation with dietary quality and obesity in children. *Pediatrics*, 131(3), 463-472.
- Powell, L.M., and Y. Bao. 2009. Food prices, access to food outlets and child weight. *Economics & Human Biology*, 7, 64-72.
- Rosenkranz, R. R., & Dzewaltowski, D. A. (2008). Model of the home food environment pertaining to childhood obesity. *Nutrition reviews*, 66(3), 123-140.
- Sweitzer, M., Levin, D., Okrent, A., Muth, M. K., Brown, D., Capogrossi, K., ... & Zhen, C. (2016). *Understanding IRI Household-Based and Store-Based Scanner Data* (No. 234905). United States Department of Agriculture, Economic Research Service.
- Volpe, R., & Okrent, A. (2012). Assessing the Healthfulness of Consumers' Grocery Purchases: US Department of Agriculture. *Economic Research Service, Economic Information Bulletin* No. 102.