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## Racial/Ethnic and Income Disparities in Child and Adolescent Exposure to Food and Beverage Television Ads across U.S. Media Markets

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### Abstract

Obesity prevalence and related health burdens are greater among U.S. racial/ethnic minority and low-income populations. Targeted advertising may contribute to disparities. Designated market area (DMA) spot television ratings were used to assess geographic differences in child/adolescent exposure to food-related advertisements based on DMA-level racial/ethnic and income characteristics. Controlling for unobserved DMA-level factors and time trends, child/adolescent exposure to food-related ads, particularly for sugar-sweetened beverages and fast-food restaurants, was significantly higher in areas with higher proportions of black children/adolescents and lower-income households. Geographically targeted TV ads are important to consider when assessing obesity-promoting influences in black and low-income neighborhoods.

### Keywords

Television advertising; Racial/ethnic disparities; Income disparities; Media markets

## 1. Background

In 2009–2010, nearly 17% of U.S. children ages 2 to 19 were classified as obese (Ogden, Carroll et al., 2012). The data indicated that obesity prevalence was 24.3% among non-Hispanic black children and 21.2% among Hispanic children, compared to 14% among non-Hispanic white children (Ogden, Carroll et al., 2012). Evidence also shows obesity

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prevalence is greater among children and adolescents living in lower-income households (Ogden, Lamb et al., 2010). Marketing of foods and beverages that are unhealthy (i.e. high in saturated fat, sugar and/or sodium) to children and adolescents has received particular attention from researchers, public health advocates, and regulatory agencies as a probable contributor to the increased prevalence of childhood obesity (Federal Trade Commission, Centers for Disease Control and Prevention et al., 2011; Kraak, Story et al., 2011; Cheyne, Gonzalez et al., 2013; Powell, Schermbeck et al., 2011; Federal Trade Commission, 2012; Institute of Medicine, 2006; Center for Science in the Public Interest, 2010). Exposure to food-related television advertising is associated with children's purchase requests, consumption patterns and adiposity (Chou, Rashad et al., 2008; Institute of Medicine, 2006; Andreyeva, Kelly et al., 2011).

Nutritional content studies show that despite industry pledges to promote only healthy products, relatively little progress has been made; the vast majority of television advertisements seen by or directed at children consist of unhealthy foods and beverages that are high in saturated fat, sugar or sodium (Harris, Schwartz et al., 2010; Harris, Schwartz et al., 2011; Harris, Schwartz et al., 2012; Powell, Schermbeck et al., 2011; Kunkel, McKinley et al., 2009; Powell, Schermbeck et al., 2013). Exposure to television ads for foods increased between 2009 and 2011 among children ages 2 to 5 and 6 to 11 years, offsetting previous declines for children, while teens' exposure further increased and steepened its upward trend (Powell, Harris et al., 2013).

“Targeted marketing” refers to the common marketing strategy of directing products and product promotions to groups of consumers or ‘segments’ with common demographic or other relevant characteristics based on their presumed likelihood of buying the product (Kotler, 1975). Targeted product advertising may involve placing relatively more advertisements in channels that reach the population segment of interest, resulting in higher exposure, as well as tailoring the content of advertisements to be particularly salient for the targeted group; these strategies are often used in combination and concern about such marketing practices arises when relatively unhealthy products are being promoted to the targeted group (Grier and Kumanyika, 2010; Grier and Lassiter, 2013). The Federal Trade Commission reported that 48 food and beverage companies spent \$1.8 billion on youth-targeted marketing in 2009, of which \$632.7 (35.4%) was on television, the largest single medium through which products are marketed to youths (Federal Trade Commission, 2012).

Targeted marketing of food and beverages that are high in fat or sugar based on race/ethnicity has been documented in studies of exposure to national TV advertisements as well as the content of those ads (Grier and Kumanyika, 2008; Harris, Schwartz et al., 2010; Harris, Schwartz et al., 2011; Powell, Szczypka et al., 2010) and may contribute to or perpetuate the higher than average risks of obesity among black and Hispanic children. The disproportionate exposure of black and Hispanic youths to targeted television advertising is compounded by the fact that on average they are more likely to have TVs in their bedrooms and watch television an hour or more longer per day compared to their white peers (Rideout, Foehr et al., 2010; Rideout, Lauricella et al., 2011). Of similar concern, low- to mid-socioeconomic status (SES) based on parents' education level is correlated with youths' viewing more TV (greater than 30 additional minutes) than their high-SES counterparts

(Rideout, Foehr et al., 2010). Further, a number of studies with multivariate analyses suggest independent associations of race/ethnicity and SES with children's and adolescents' TV viewing time (Gorely, Marshall et al., 2004; Hoyos Cillero and Jago, 2010).

Television advertising can be targeted at local as well as national levels, increasing exposure among certain segments of the population; these two levels may be complementary or mutually reinforcing. Although national television ads can be targeted based on a given population's relative viewership of certain programming, advertising directed to local geographic areas can vary according to specific demographic characteristics such as racial/ethnic composition through placement of ads (referred to as "spot ads") in local media markets known as "designated market areas" (DMAs) (Gold, 2005). DMA media market data, including data with information about racial/ethnic characteristics of the area population, are made available to marketers for use in targeting ad placement and for other business purposes (The Nielsen Company, 2013).

To understand the patterns of geographically-based food and beverage product television advertisements seen by children and adolescents, we linked Nielsen DMA-level spot television ratings data for children aged 2 to 11 and adolescents aged 12 to 17 from 2003 through 2007 to DMA-level Census data on racial, ethnic and SES characteristics across DMAs. Controlling for unobserved media market-level factors and time trends, we assessed exposure according to the racial/ethnic composition of residents in DMAs and according to DMA-level median household income.

## 2. Methods

### 2.1 Advertising Measures

Local spot food and beverage television ratings data reflecting the numbers of ads seen were licensed from Nielsen Media Research (NMR) for English language stations. Ratings were obtained for each year from 2003 through 2007 for the largest 129 DMAs in the United States. Nielsen's DMA® regions are geographic areas used when measuring local television viewing. DMAs vary in size, generally covering several counties, with some describing commonly recognized metropolitan areas. Nielsen tracks commercials either as full-disclosure markets (FDMs), which track all television advertising in the area, or automated discovery markets (ADM), which do not track commercials until they have appeared in a FDM (Szczyepka, Emery et al., 2003). Therefore, we examined the 88 DMAs that had been tracked as FDMs.

The NMR advertising data are based on individual ratings of television programs, obtained by monitoring household audiences across DMAs. Ratings are measured in units of Targeted Ratings Points (TRPs) for specific subgroups of the population within the households, which we obtained for children aged 2–11 years and adolescents aged 12–17 years. An ad with 100 TRPs in the year, for example, is estimated to have been seen an average of one time by 100 percent of the given subgroup population in households with televisions in that DMA during that year. We used the ratings data to derive exposure measured as the weekly number of television ads seen, on average, by children and adolescents in a given DMA.

## 2.2 Food Product Categories

TRPs were aggregated at the brand level and then categorized across food product categories using NMR product classification codes that define its product categories based on definitions used by the Publishers Information Bureau (PIB) (Publishers Information Bureau, 2006). Food-related products were categorized into seven mutually exclusive categories, as reported elsewhere (Powell, Szczypka et al., 2007): cereal, sweets, snacks, beverages, other food products, fast-food restaurants and full-service restaurants. Several subcategories of beverages were examined including sugar-sweetened versus non-sugar-sweetened beverages and regular versus diet soda. The sugar-sweetened beverage (SSB) category was defined as including soda, fruit drinks, bottled water with added sugar, isotonic drinks (sports drinks), and other sugar-sweetened drinks. This beverage sub-category was created using a combination of PIB product classification codes and brand-specific nutrition information in order to correctly identify relevant products (Powell, Schermbeck et al., 2011).

## 2.3 Demographic and Socioeconomic Information

We examined the association of racial/ethnic composition using four race/ethnicity categories: non-Hispanic white (white – reference category), non-Hispanic black (black), Hispanic, and non-Hispanic non-white/black (other race) (consisting mostly of non-Hispanic American Indians and Asians). The information on the percentage of children ages 2 to 11 and adolescents ages 12 to 17 in each of the four race/ethnicity categories was calculated using estimated population counts by age, year and county obtained from the 1990–2011 Bridged-Race Population Estimates produced by the U.S. Census Bureau in collaboration with the National Center for Health Statistics (United States Department of Health and Human Services, Centers for Disease Control and Prevention et al., 2013). The total population for each DMA was added up for each age category (for ages 2–11 and 12–17) within each racial/ethnic group. The racial/ethnicity distribution of children or adolescents in each DMA was then calculated by dividing the respective racial/ethnic estimated population total for all available counties in each DMA by the total population for the two age categories in that DMA. Information on median household income and population was obtained by county and year from the Small Area Income and Poverty Estimates by the U.S. Census (U.S. Census Bureau, 2013).

Because the Nielsen ratings data were measured at the DMA level, the demographic and socioeconomic information was summed for all counties within each DMA for which public information was available. Of the original 88 FDM DMAs in our sample, we were unable to obtain demographic information for one of the DMAs (Bakersfield) whose only county was split with another DMA. Additionally, small rural counties without public information on population or median household income were excluded. We also excluded 21 counties that were split across DMA borders. The resulting reduction in the representative population sample size in the DMAs was relatively small. The 87 FDM DMAs examined in this study represented 80% of U.S. population.

## 2.4 Analysis

Multivariate analyses were undertaken to assess DMA-level differences in children's and adolescents' exposure to local spot food and beverage product television advertising based on the racial/ethnic and socioeconomic makeup of the DMA. An empirical model of children's and adolescents' exposure to local spot food and beverage product television advertising of the following form was estimated:

$$EXP_{mt} = \beta_0 + \beta_1 BLK_{mt} + \beta_2 HIS_{mt} + \beta_3 OTH_{mt} + \beta_4 HHINC_{mt} + \mu_m + \gamma_t + \varepsilon_{mt} \quad (1)$$

where the outcome measure,  $EXP_{mt}$ , indicates the number of local food and beverage product ads seen per week in DMA  $m$  at time  $t$  for total food and beverages, and by the product and beverage sub-product categories defined above.  $BLK_{mt}$ ,  $HIS_{mt}$ , and  $OTH_{mt}$  represent the proportion of children/adolescents in the DMA that are black, Hispanic and of other race, respectively. Whites were the omitted race/ethnicity category.  $HHINC_{mt}$  measures the median household income in DMA  $m$  at time  $t$ .  $\beta$  are conformable vectors of parameters to be estimated.  $\mu_m$  is a vector of DMA fixed effects included to account for unobserved DMA media market-level heterogeneity and  $\gamma_t$  is a vector of year fixed effects to account for time trends.  $\varepsilon_{ist}$  is a standard residual term. For selected parameter estimates, we tested whether estimated exposure was significantly higher for unhealthy product categories compared to healthier counterpart categories (i.e. whether the estimated association with a higher proportion of black children/adolescents or lower median household income in DMAs was significantly higher for fast-food restaurant versus full-service restaurants, SSBs versus non-SSBs, and/or regular soda versus diet soda). Robust standard errors were computed and adjusted for clustering at the DMA level. STATA v 12.1 was used for all analyses. In addition to reporting coefficient estimates from our regression estimates, we also reported elasticity measures which express the findings in a common metric in terms of the percentage change in advertising exposure that would result from one percent change in a given independent variable.

We undertook sensitivity analyses in our empirical estimation by including the 41 additional DMAs available only as ADMs (which increased the coverage to approximately 90% from 80% of the U.S. population in 2004 when using FDM). Using the ADM sample did not significantly alter our findings. Consistent with the literature we, therefore, report only results using the FDMs which track all commercials.

## 3. Results

Table 1 shows that black and Hispanic children and adolescents together comprised slightly more than one-third of the populations in these age groups; median household income was approximately \$50,000 in the media markets studied. Children and adolescents in these media markets saw, on average, 21.1 and 32.9 food and beverage television local spot advertisements per week that aired in the DMAs in 2003 through 2007. These local spot ads represented 22.7% and 33.6% of total (local spot plus national) television food and beverage ads seen by children aged 2–11 and 12–17 in those 87 DMAs. Adolescents saw more ads than children did in every product category, particularly for fast-food restaurant ads.

Of the seven main food-related categories, fast-food restaurant ads were the most prevalent local spot ads seen both in absolute and relative terms of total exposure by product type (7.0 ads per week for children aged 2–11 years and 12.1 per week for adolescents aged 12–17 years, representing 37.6% and 44.3% of total fast-food ads seen by children and adolescents in those markets). Children and adolescents saw 2.8 and 4.5 local spot beverage ads per week, of which the majority, 2.0 and 3.2 ads per week, respectively, were for SSBs. Exposure to local spot ads for cereal was 1.9 and 2.1 ads per week among children and adolescents, respectively, which was relatively low compared to cereal ads seen that were aired nationally (exposure from local spot ads made up 10.7% and 22.0% of total cereal ad exposure for the respective age groups).

The results from the multivariate regression analyses (based on Eq. 1) are presented in Table 2. On average, children's and adolescents' exposure to local spot food and beverage ads was significantly higher in DMAs that had higher percentages of black children and adolescents and significantly lower in DMAs with higher median household incomes. Each percentage point increase in the proportion of child/adolescent black population was associated with 2.2 and 2.9 additional food and beverage ads seen, on average, per week by children and adolescents, respectively. In elasticity terms, a 10% increase in the proportion of the child and adolescent population that was black was associated with 16.4% and 14.2% higher respective exposure to food-related advertising. For each \$1000 increase in DMA-level median household income, children and adolescents saw, on average, 0.7 and 1.2 fewer local spot food-related advertisements per week. That is, a 10% increase in local area median household income was associated with 17.4% and 18.3% fewer ads seen by children and adolescents, respectively.

By food-related categories, the results show that DMAs with higher proportions of black population were associated with greater exposure to ads in all food categories except full-service restaurant ads seen by children. Larger than average associations between the prevalence of child/adolescent black population in the DMA were found for sweets, beverage, snack and fast-food restaurant product categories for children (respective elasticities of 2.2, 1.8, 1.8 and 1.7 compared to 1.6 for all food-related products) and beverages and sweets for adolescents (respective elasticities of 1.9 and 1.8 compared to 1.4 for all food-related products). Higher DMA-level median household income was particularly associated with lower exposure to ads for cereal, snacks, sweets and beverages for both children (respective elasticities of -4.4, -3.4, -2.3, and -1.9) and adolescents (respective elasticities of -3.5, -3.0, -2.6, and -2.4). There was no association between children's or adolescents' exposure to local spot food and beverage television advertisements and the percentage child/adolescent population that was Hispanic for any of the non-restaurant food or beverage categories.

Across restaurant types, the association between the proportion of the child/adolescent black population and advertisement exposure for children was significant for fast-food restaurants (elasticity of 1.7) but not for full-service restaurant ads, and among adolescents the association was larger for fast-food restaurant ads compared to full-service restaurants ads (elasticity of 1.4 versus 1.0). Further, higher DMA median household income was significantly associated with fewer local spot fast-food restaurant ads seen per week by

children and adolescents but was not found to be associated with exposure to television ads for full-service restaurants. For both children and adolescents, the associations with exposure were significantly greater at  $p < 0.05$  for fast-food versus full-service restaurants in DMAs with higher proportions of black children/adolescents and lower median household income. Lower exposure to ads for full-service restaurants among adolescents was the only statistically significant association observed for DMAs with a higher percentage of Hispanics.

Table 3 provides a detailed examination of associations of ad exposure and DMA race/ethnicity and income characteristics across subcategories of selected beverage types. Children's exposure to SSB ads but not non-SSB ads was higher in DMAs with higher proportions of black children in the population and lower in higher-income DMAs. A 10% increase in the proportion of black children in the DMA was associated with 23% higher exposure to SSB ads and a 10% increase in DMA-level median household income was associated with 27% less ad exposure. Similarly, exposure to regular soda ads but not diet soda ads was higher in DMAs with greater percentages of black children (elasticity of 2.9) and was lower in higher-income DMAs (elasticity of  $-3.1$ ). Among adolescents, DMA-level median household income was statistically significantly associated with SSB ad exposure (elasticity  $-2.9$ ) and to a lesser extent non-SSB ad exposure (elasticity  $-1.4$ ), and with regular soda ad exposure (elasticity  $-3.1$ ) but not diet soda ad exposure. The proportion of black adolescents in the DMA was associated with greater ad exposure for both SSBs and non-SSBs and regular and diet soda; the associations were larger for SSBs versus non-SSBs (elasticity of 2.2 vs. 1.2) and larger for regular soda versus diet soda (2.6 versus 1.7). The associations with exposure for both children and adolescents were significantly higher at  $p < 0.01$  for SSBs versus non-SSBs and for regular soda versus diet soda advertisements in DMAs with higher proportions of black children/adolescents and lower median household income.

#### 4. Discussion

We assessed patterns of child and adolescent exposure to local TV spot ads for seven food-related categories (cereal, beverages, sweets, snacks, other foods, and fast food and full service restaurants) and four sub-categories of beverage types according to DMA race/ethnicity (percent black or Hispanic or other race vs. white) and median household income by linking NMR media market data with Census data. Thus, we were able to examine exposure to potentially targeted ads by local geographic area rather than program viewership, as in national ratings data. Spot ads comprised a fifth to a third of the total food and beverage ads seen by children and adolescents in the 87 media markets analyzed. Geographic targeting by adds another layer of exposure over and above that based on national viewership patterns. As discussed below, this exposure may be in addition to other aspects of food marketing environments in these geographic areas, such as food access and other forms of promotion, that are skewed in an obesity promoting direction.

In the analyses that controlled for time trends over a five year period and for unmeasured sources of variation across media markets, we found that, lower income and minority racial/ethnic composition were independently associated with significantly higher levels of

exposure to food and beverage ads in total. These findings were observed for both age groups for almost all of the seven product categories examined. We did not find a pattern of significantly higher exposure to food ads overall or across specific food categories associated with the proportion of Hispanic children in the DMA.

Although one would expect to observe greater exposure to TV ads in media markets with higher proportions of black or lower-SES children/adolescents given that these youths watch more TV, this greater exposure would presumably be similar across all advertised products if due to viewership levels only. Our findings of significantly higher exposure to food and beverage product ads in DMAs with higher proportions of black and lower income populations combined with statistically significant greater relative exposure to unhealthy variants of food and beverage products in DMAs with higher proportions of black children/adolescents and those with lower median household income are suggestive of targeted marketing. The significant differences by race and income for greater exposure to fast-food restaurants ads compared to full-service restaurant ads and, within the beverage category, to SSBs compared to non-SSBs (including to regular soda compared to diet soda), suggest differential placement of advertisements across DMAs. This is particularly noteworthy given that consumption of SSBs and fast food has been closely linked to poor diet, excess weight gain and risk of obesity, and related metabolic consequences (Malik, Pan et al., 2013; Powell and Nguyen, 2013). These results suggest that exposure to local TV spot ads may be an important aspect of the larger picture of how food and beverage marketing targeted to black communities may contribute to disparities in obesity that disproportionately affect these communities. Furthermore, the findings suggest that TV spot ads are a form of targeted marketing that affects children and adolescents in low-income households, independently of the percent of black residents.

These findings are consistent with prior evidence that black children are systematically targeted with national TV ads promoting fast food and SSBs on TV stations or shows with a high Nielsen rating for black viewership (Grier and Kumanyika, 2008; Powell, Szczypka et al., 2010). Evidence from the spot ad exposure data are also consistent with consumption data that indicate higher prevalence of fast-food consumption among black adolescents (Powell, Nguyen et al., 2012) and SSBs in black compared to non-Hispanic white children and adolescents (Park, Blanck et al., 2012; Han and Powell, 2013; Shields, Carroll et al., 2011) and higher intake from SSBs among children and adolescents in lower- versus higher-income households (Han and Powell, 2013; Ogden, Kit et al., 2011). Further, recent evidence finds that there is a greater adverse effect on diet quality from fast-food consumption among low- versus high-income children and adolescents and among black versus white adolescents (Powell and Nguyen, 2013). Evidence from California also shows that black and Hispanic students at low-income and urban schools have significantly higher associations between body weight and proximity to fast-food restaurants compared to white students at higher-income, nonurban schools (Grier and Davis, 2013).

Studies of other forms of advertising find that youth in minority racial and ethnic groups and/or low-income populations are also more likely to be exposed to ads on food packaging in stores, print ads and outdoor advertising for high-calorie, low-nutrient foods (Grier and Kumanyika, 2008; Yancey, Cole et al., 2009; Powell, Rinkus et al., 2012; Grigsby-

Toussaint, Moise et al., 2011; Harris, Schwartz et al., 2010). In addition, numerous studies have reported a more unhealthy and more obesity-promoting mix of retail food outlets in black or Hispanic neighborhoods and low-income neighborhoods; for example, relatively fewer large/chain supermarkets or grocery stores in such communities that offer healthier products at competitive prices and relatively more fast-food restaurants and smaller stores whose profits may depend on selling SSBs and high calorie snack foods (Powell, Chaloupka et al., 2007; Larson, Story et al., 2009; Bodor, Ulmer et al., 2010; Powell, Slater et al., 2007; Fleischhacker, Evenson et al., 2010). Further, research shows that children and adolescents are likely to be subjected to outdoor advertisements for unhealthy products found to cluster around child-serving institutions such as schools, libraries, and recreation centers, particularly in neighborhoods with higher minority populations (Hillier, Cole et al., 2009), and by exterior advertising promoting fast-food meals at bargain prices; exterior ads of this type including those with price promotions are relatively more common in low-income and minority areas compared to other communities (Powell, Rinkus et al., 2012).

Many findings about targeted marketing and neighborhood food availability apply to Hispanic as well as black children and adolescents. Black and Hispanic youths are attractive market segments within child-oriented food marketing because of their distinctive consumer characteristics; increasing numbers and economic impact; spending patterns; media use patterns; and influence on the broader youth culture, e.g., through hip-hop culture, (Grier and Kumanyika, 2010; Grier and Lassiter, 2013) in addition to their higher levels of TV watching and use of certain other forms of digital media (e.g., cell phones) compared with non-Hispanic white children (Grier and Kumanyika, 2010; Rideout, Lauricella et al., 2011). A key limitation of this study was that we analyzed only ratings for English language television stations. Therefore, the lack of evidence suggestive of differential ad placement according to the percent of Hispanic children in this study cannot be directly assessed with the information in our data set. However, a possible explanation relates to the fact that different channels may be used to reach ethnic groups. Targeting to Hispanic children and adolescents may occur through Spanish language TV stations (Federal Trade Commission, 2012). Another limitation was that although we were able to control for general time trends and for time-constant unobserved DMA-level heterogeneity (i.e., unmeasured differences across media markets), we were not able to account for time-varying DMA-level heterogeneity. Finally, it is important to note that our television ratings data are from 2003 through 2007 and there may have been changes in patterns of spot advertising since that time. Despite these limitations, this is the first paper to our knowledge to examine differences in children's and adolescents' exposure to advertisements placed in local media markets which may be targeted based on market-level demographic characteristics.

The implications of these findings for policy and practice are complex and require careful consideration. Theoretically, any progress in reducing marketing of unhealthy foods to children would benefit children who are disproportionately exposed to such marketing because of high viewership levels overall and program-based targeting and — as shown here — geographically-based targeting. However, proportionate reductions would not eliminate the disparities in exposure; furthermore, reductions that are less than proportionate may further contribute to disparities. A case in point is the finding that the ratio of black to white TV ad exposure to fruit drink advertisements increased during a period when overall SSB

advertising was declining and that exposure to fast-food ads increased at a greater rate for black children and teens than for their white counterparts (Powell, Szczypka et al., 2010). This may reflect greater importance of maintaining market share in certain targeted markets during a period of declining sales (Wilcox, Williams et al., 2013). Monitoring of targeted TV ads that include both national and spot ads might be helpful in drawing attention to such effects as they occur. It is also possible that decreases in TV ads might be compensated by increased targeting of black or low-income residents through other media channels such as digital media, or through community-level promotional activities — channels that are already well established at least for black children and adolescents (Grier and Lassiter, 2013). Legal approaches to restricting racial/ethnic marketing, e.g., using the argument that targeting of products known to be harmful is a form of unfair treatment, have not proven viable for tobacco or alcohol and may also be unlikely for food products (Kramer, Schwartz et al., 2013). One consideration is that targeted marketing to black Americans has evolved as a form of inclusiveness such that pulling back might appear to some to be a type of discrimination (Grier and Lassiter, 2013). In addition, such approaches may be viewed as paternalistic or rejected by the affected communities on other grounds (Creighton, 2009). For a variety of reasons, children and adolescents as well as adults in black communities may have relatively favorable attitudes towards marketing in general (Grier and Kumanyika, 2010), and marketing for products that are ubiquitous and associated with normative consumption patterns may be viewed as “business as usual”. Disinclination toward alternative products may also be a factor. Consumption of milk, plain water, and diet or unsweetened drinks is lower in black compared to white youths (Dodd, Briefel et al., 2013; Centers for Disease Control and Prevention, 2011; Fakhouri, Kit et al., 2012).

In conclusion, reducing consumption of fast food, SSBs and other high-calorie products of poor nutritional quality are important goals in efforts to prevent caloric overconsumption, obesity and related health disparities. High exposure to TV ads, particularly spot ads that may have more salience in conjunction with local availability and promotions will pose challenges for achieving this goal. Awareness of this type of geographically-based targeting among community advocates may suggest a need to further intensify efforts to improve local availability and promotion of healthier alternatives to unhealthy products such as fast food and SSBs in retail outlets accessible to black and low-income children and adolescents and their parents. Such initiatives might focus on healthy supermarket initiatives as well as efforts to improve access to healthier foods in schools and near schools (Centers for Disease Control and Prevention, 2013; Institute of Medicine, 2012). From a public policy perspective, pricing strategies to increase the competitiveness of healthful alternatives may also be beneficial (Powell, Chiqui et al., 2013; DiSantis, Grier et al., 2013). Exposure to geographically targeted TV ads is an important part of the larger picture of food and beverage marketing that targets black and low-income communities. Local ads may be particularly synergistic with other place-based forms of targeted marketing as an influence on consumption of high-calorie foods and beverages. Strong nutrition standards for foods and beverages promoted to both children and adolescents are needed to help reduce exposure to unhealthy products and increase exposure to healthy products. In addition to self-regulation among food and beverage companies, media companies could play an

important role serving as a gate keeper by imposing nutrition standards for any company that wishes to reach the public through its channels.

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## Appendix A: List of 87 Full-disclosure Designated Market Areas (DMAs)

Albany-Schenectady-Troy

Albuquerque-Santa Fe

Atlanta

Austin

Baltimore

Baton Rouge

Birmingham (Ann And Tusc)

Boston (Manchester)

Buffalo

Charleston, Sc

Charleston-Huntington

Charlotte

Chattanooga

Chicago

Cincinnati

Cleveland-Akron (Canton)

Columbus, Oh

Dallas-Ft. Worth

Dayton

Denver

Des Moines-Ames  
Detroit  
El Paso (Las Cruces)  
Flint-Saginaw-Bay City  
Fresno-Visalia  
Ft. Smith-Fay-Sprngdl-Rgrs  
Grand Rapids-Kalmzoo-B. Crk  
Green Bay-Appleton  
Greensboro-H. Point-W. Salem  
Greenvll-Spart-Ashevll-And  
Harrisburg-Lncstr-Leb-York  
Hartford & New Haven  
Honolulu  
Houston  
Indianapolis  
Jackson, Ms  
Jacksonville  
Kansas City  
Knoxville  
Las Vegas  
Lexington  
Little Rock-Pine Bluff  
Los Angeles  
Louisville  
Memphis  
Miami-Ft. Lauderdale  
Milwaukee  
Minneapolis-St. Paul  
Mobile-Pensacola (Ft Walt)  
Monterey-Salinas  
Nashville  
New Orleans

New York  
Norfolk-Portsmouth-Newport News  
Oklahoma City  
Omaha  
Orlando-Daytona Beach-Melbourne  
Philadelphia  
Phoenix (Prescott)  
Pittsburgh  
Portland, Or  
Providence-New Bedford  
Raleigh-Durham (Fayetteville)  
Richmond-Petersburg  
Roanoke-Lynchburg  
Rochester, Ny  
Sacramento-Stokton-Modesto  
Salt Lake City  
San Antonio  
San Diego  
San Francisco-Oak-San Jose  
Seattle-Tacoma  
Shreveport  
Spokane  
St. Louis  
Syracuse  
Tampa-St. Pete (Sarasota)  
Toledo  
Tri-Cities, Tn-Va  
Tucson (Sierra Vista)  
Tulsa  
Waco-Temple-Bryan  
Washington, Dc (Hagerstown)  
West Palm Beach-Ft. Pierce

Wichita-Hutchinson Plus

Wilkes Barre-Scranton

Zanesville

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### Highlights

- Using local spot TV ratings, we assess youths' exposure to food ads.
- Youth exposure to food ads is higher in media markets with more blacks.
- Youth exposure to food ads is higher in low-income media markets.
- Soda and fast-food ad exposure, particularly, relate to market characteristics.

**Table 1**  
 Descriptive Statistics on Racial/ethnic Distribution, Income, and Exposure to Food-related Television Advertising in Designated Market Areas<sup>a</sup> by Age Group, 2003–2007

	Children Aged 2–11		Adolescents Aged 12–17	
	Mean	SD	Mean	SD
Whites (%)	57.156	(18.097)	59.187	(18.155)
Blacks (%)	15.622	(9.626)	16.375	(10.221)
Hispanics (%)	20.132	(16.568)	17.698	(15.759)
Other Race (%)	7.090	(6.808)	6.740	(7.092)
Median household income (\$1,000s)	50.040	(8.580)	50.040	(8.580)

  

	Local Spot Ads		% of Total Ads <sup>b</sup>		Local Spot Ads		% of Total Ads <sup>b</sup>	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Exposure to food and beverage ads</b>								
Total	21.073	(8.195)	22.7	32.860	(12.048)	33.6		
Cereal	1.889	(1.223)	10.7	2.100	(1.057)	22.0		
Beverages	2.826	(1.259)	28.0	4.547	(1.940)	31.8		
SSBs	2.000	(1.114)	26.8	3.164	(1.684)	31.0		
Regular soda	0.867	(0.578)	50.7	1.541	(1.027)	39.8		
Non-SSBs	0.825	(0.274)	30.6	1.383	(0.416)	33.2	3.183	
Diet soda	0.188	(0.126)	43.7	0.368	(0.241)	38.7		
Sweets	2.522	(1.273)	18.1	3.765	(1.702)	25.2		
Snacks	1.091	(0.648)	12.3	1.400	(0.744)	21.7	2.6933	
Other	3.461	(1.188)	20.7	5.250	(1.678)	31.1		
Fast food restaurants	7.041	(2.751)	37.6	12.146	(4.863)	44.3		
Full service restaurants	2.244	(0.755)	30.6	3.653	(1.205)	42.7		

Notes: Number of observations is 435. SD is standard deviation.

<sup>a</sup> Aggregated data for the 87 largest Nielsen full-disclosure Designated Market Areas for the years 2003 through 2007 (see Appendix 1)

<sup>b</sup> Local spot ads as a percentage of local spot ads and national ads combined

**Table 2**

Relationship between Racial/Ethnic Density and Median Household Income and Children's and Adolescents' Exposure to Local Food  
 Division by Food and Beverage Categories

	Total Food & Beverage	Cereal	Beverages	Sweets	Snacks	Other	Fast Food Restaurants	Full Service Restaurants
	2.211*** (0.592) [1.639]	0.199** (0.097) [1.646]	0.326*** (0.097) [1.803]	0.358*** (0.087) [2.217]	0.124*** (0.047) [1.779]	0.276*** (0.094) [1.244]	0.767*** (0.230) [1.702]	0.161 (0.088) [1.122]
	-0.222 (0.646) [-0.212]	0.094 (0.131) [1.003]	-0.051 (0.111) [-0.363]	-0.022 (0.110) [-0.176]	0.022 (0.067) [0.407]	0.018 (0.086) [0.102]	-0.200 (0.179) [-0.572]	-0.083 (0.084) [-0.743]
	2.147 (1.811) [0.722]	0.065 (0.362) [0.244]	0.388 (0.266) [0.974]	0.200 (0.330) [0.561]	0.0212 (0.203) [0.138]	0.248 (0.234) [0.508]	1.136*** (0.508) [1.144]	0.089 (0.148) [0.280]
	-0.732*** (0.237) [-0.739]	-0.164** (0.067) [-4.355]	-0.108*** (0.023) [-1.919]	-0.116** (0.046) [-2.306]	-0.074** (0.032) [-3.407]	-0.062 (0.033) [-0.892]	-0.170*** (0.065) [-1.211]	-0.037 (0.019) [-0.826]
	0.908	0.865	0.911	0.892	0.873	0.897	0.930	0.873
	2.852*** (0.899) [1.421]	0.180** (0.086) [1.403]	0.522*** (0.116) [1.879]	0.407*** (0.094) [1.772]	0.111** (0.052) [1.303]	0.347*** (0.138) [1.081]	1.061** (0.416) [1.431]	0.223** (0.105) [1.000]
	-0.728 (1.076) [-0.992]	-0.001 (0.142) [-0.008]	-0.266 (0.172) [-1.037]	-0.016 (0.179) [-0.076]	-0.035 (0.084) [-0.441]	0.129 (0.169) [0.434]	-0.305 (0.313) [-0.444]	-0.234** (0.109) [-1.132]
	3.204 (3.488) [0.671]	0.056 (0.435) [0.178]	0.991 (0.512) [1.469]	0.378 (0.594) [0.677]	0.057 (0.265) [0.274]	0.087 (0.542) [0.111]	1.618 (1.062) [0.898]	0.018 (0.314) [0.034]
	-1.204*** (0.335) [-1.834]	-0.148*** (0.048) [-3.529]	-0.219*** (0.048) [-2.411]	-0.195*** (0.061) [-2.587]	-0.085*** (0.027) [-3.037]	-0.188*** (0.064) [-1.789]	-0.319*** (0.090) [-1.314]	-0.051 (0.032) [-0.698]
	0.913	0.862	0.916	0.902	0.896	0.886	0.933	0.876

ns is 435. All regressions control for year fixed effect and designated market area (DMA) fixed effects. % white children and adolescents is the reference category. Robust DMA are reported in parentheses. Elasticities are reported in brackets.

**Table 3**

Estimated Association between Racial/Ethnic Density and Median Household Income and Children's and Adolescents' Exposure to Local Food Advertising on Television by Beverage Subcategories

	Total Beverages	SSBs	Non-SSBs	Regular Soda	Diet Soda
<b>Children Ages 2-11</b>					
% of children who are black	0.326*** (0.097) [1.803]	0.299*** (0.074) [2.334]	0.027 (0.042) [0.516]	0.163*** (0.038) [2.932]	0.018 (0.011) [1.457]
% of children who are Hispanic	-0.051 (0.111) [-0.363]	-0.045 (0.107) [-0.451]	-0.006 (0.020) [-0.149]	-0.025 (0.056) [-0.568]	-0.0001 (0.005) [-0.020]
% of children who are other	0.388 (0.266) [0.974]	0.313 (0.264) [1.110]	0.075 (0.056) [0.645]	0.247 (0.131) [2.022]	0.0195 (0.018) [0.736]
Median household Income	-0.108*** (0.023) [-1.919]	-0.106*** (0.025) [-2.664]	-0.002 (0.007) [-0.113]	-0.054*** (0.012) [-3.137]	-0.003 (0.003) [-0.809]
R Squared	0.911	0.907	0.893	0.917	0.910
<b>Adolescents Ages 12-17</b>					
% of adolescents who are black	0.522*** (0.116) [1.879]	0.421*** (0.104) [2.179]	0.101*** (0.030) [1.193]	0.246*** (0.075) [2.612]	0.038*** (0.019) [1.702]
% of adolescents who are Hispanic	-0.266 (0.172) [-1.037]	-0.257 (0.163) [-1.437]	-0.009 (0.020) [-0.121]	-0.160 (0.089) [-1.837]	-0.002 (0.011) [-0.083]
% of adolescents who are other	0.991 (0.512) [1.469]	0.985** (0.490) [2.098]	0.006 (0.086) [0.028]	0.671*** (0.270) [2.936]	0.010 (0.039) [0.187]
Median household Income	-0.219*** (0.048) [-2.411]	-0.181*** (0.043) [-2.861]	-0.038*** (0.010) [-1.380]	-0.097*** (0.024) [-3.133]	-0.006 (0.005) [-0.789]
R Squared	0.916	0.911	0.892	0.914	0.906

Notes: Number of Observations is 435. All regressions control for year fixed effect and designated market area (DMA) fixed effects. % white children and adolescents is the reference category. Robust standard errors clustered on DMA are reported in parentheses. Elasticities are reported in brackets.

\*\* p 0.05,  
 \*\*\* p 0.01