

## Disparities in Obesity-Related Outdoor Advertising by Neighborhood Income and Race

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### INTRODUCTION

Food marketing is a leading driver of the obesity epidemic where each food advertisement serves as a prompt for automatic eating.<sup>1,2</sup> An extensive literature on television, radio, print, and Internet ads has examined the ways in which the food industry targets minority audiences.<sup>3-6</sup> However, outdoor advertising found on billboards, bus benches, bus shelters, and storefronts is understudied. One recent paper reported that for every 10 % increase in the number of outdoor advertisements for food or beverages, there was a 1.05 greater odds of an individual in that neighborhood being overweight or obese, after controlling for income, education, and race.<sup>7</sup>

Outdoor ads for unhealthy products of all types, including cigarettes and alcohol, are more likely to be in areas with a higher proportion of minorities and low-income individuals.<sup>8,9</sup> Specifically for outdoor food ads, Latino and Asian neighborhoods had as much as 6 times the outdoor food advertising and low-income African-American neighborhoods had 2–32 times the number of outdoor food ads compared to high-income white neighborhoods.<sup>7,9,10</sup> Only one published study to date has examined outdoor advertising for physical activity.<sup>10</sup> African-Americans and Latinos are more likely to be obese<sup>11</sup> and to suffer disproportionately from diabetes, heart disease, and other obesity-related conditions compared to their white counterparts.<sup>12</sup> Interventions designed to reduce disparities in obesity are more likely to succeed when environmental cues, such as outdoor advertising, are consistent with public health goals and messages.

This pilot study is part of a larger research project examining neighborhood and individual influences on nutrition information processing, food choice, and obesity. Here, we present patterns of advertising related to the two key obesity-related behaviors, diet and physical activity, in an economically and racially diverse urban area in Northern California, and investigate whether there are disparities in the distribution of these ads by neighborhood income and race.

### METHODS

*Study Area.* Sixteen zip codes in Sacramento County, CA, USA, were randomly selected from income strata above and below the California median household income of \$61,400<sup>13</sup> and were categorized as high or low income. Each zip code

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was then classified by the majority ethnic/racial group (51 %) in that zip code. These 16 zip codes had a total population of 530,000 and were aggregated to compare neighborhoods by income and race (high-income white, high-income white and Asian, low-income white, and low-income Latino and African-American), by income (high and low income), and by racial segregation (white and multiracial) (Table 1).

*Data Collection.* Following previous research,<sup>10</sup> we defined outdoor advertising as ads found on billboards, bus shelters, bus benches, and posters on storefronts large enough to be seen from the street. Observers received 3 h of training on the study purpose and logistics of data collection, with the majority of the time spent practicing field data collection and verifying practice results. Trained observers worked in pairs using a commercial smartphone application (droidSURVEY) to record the subject, language, GPS coordinates, and a photo of each health-related outdoor advertisement. The data was uploaded wirelessly to a password-protected website.

The area of each advertisement, in square feet, was determined by directly measuring ads on storefront, bus benches, and shelters. Billboard size was estimated based on the same methods used by similar studies.<sup>10</sup> Of the 186 outdoor advertisements recorded, 15 were excluded because they were outside of the study area, were duplicates, or were electronic billboards with multiple messages and so could not be coded as a single message. Ads in all languages were included in the sample. The final sample included 171 ads. *Coding and Analysis.* Two independent coders (KL and DC) reviewed and coded a photograph of each advertisement as an unhealthy food, beverage, or physical activity ad. Coding followed previously tested methods.<sup>10</sup> Briefly, food and beverage ads were coded as healthy if they promoted a food or beverage encouraged by the Dietary Guidelines for Americans<sup>14</sup> (e.g., fruits and vegetables, whole grain products) and as unhealthy if they promoted high-calorie, low-nutrition foods and beverages such as sugary beverages and fast food. Ads related to physical activity were coded as healthy if they promoted gym memberships, sports teams, athletic shoes or clothing, weight loss, or exercise and as unhealthy if they promoted sedentary activities such as television programs, movies, or cars.

The kappa score comparing the two coders on the categories of healthy and unhealthy ads was 0.92, indicating almost perfect agreement based on established criteria by Landis and Koch.<sup>15</sup> Following other researches, two ratios were calculated to allow for comparisons across neighborhood categories: outdoor advertising area in square feet per 100,000 people and outdoor advertising area in square feet per square mile.<sup>10</sup>

## RESULTS

The final sample of 171 health-related outdoor advertisements covered 23,971 ft<sup>2</sup> of space. Forty percent of ads were on billboards and 60 % on bus shelters or benches. Only one ad was posted on a storefront window that met size requirements. Advertisements were mostly in English (90 %) with remaining ads in Spanish or both English and Spanish. One half of the ads were obesity related and addressed some aspect of physical activity or food and beverages. The remaining ads were health related, but not obesity related, and were mostly public service announcements for a *clean and safe* community, mental health services, pregnancy testing, and medical centers or clinics. Billboards were more likely to have ads classified as unhealthy for food or physical activity (51 %) compared to bus shelters (7 %) or bus benches (0 %).

**TABLE 1 Study area demographic characteristics for 16 zip codes in Sacramento County, California**

Neighborhood	Zip codes	Total population	Latino (%)	White (%)	African-American (%)	American Indian and Alaska Native (%)	Asian and Pacific Islander (%)	Median HH income <sup>a</sup>	Households receiving SNAP (%)
High-income white	8	257,156	16	51	9	0	20	\$88,468	4
High-income white and Asian	1	38,705	18	28	14	0	35	\$87,795	3
Low-income white	3	64,002	22	54	11	1	7	\$48,157	13
Low-income, Latino and African-American	4	174,883	35	22	16	1	22	\$38,049	19
High income	9	295,861	16	48	9	0	21	\$88,393	4
Low income	7	238,885	32	31	15	1	17	\$42,381	17
White	11	321,158	17	52	9	0	16	\$77,474	6
Multiracial	5	213,588	32	23	16	1	23	\$47,998	17

<sup>a</sup>Median household incomes averaged across zip codes

*Food and Beverage Advertising.* Food and beverage advertising constituted 32 % of all health-related ads and 52 % of total advertising area in square feet. National brand fast food and grocery stores dominated unhealthy food advertising, partly because most of the grocery store ad areas were devoted to images of pizza and ice cream (Fig. 1). Ad space for beverages was evenly split between unhealthy and healthy. In contrast, four times the space was devoted to unhealthy foods compared to healthy foods. About half of the healthy ad space was sponsored by the government (e.g., promoting the healthy WIC food package) or a non-profit agency's campaign that equated soda to diabetes.

Low-income Latino and African-American neighborhoods had more food and beverage advertising, with 2 to 35 times the square footage of ad space devoted to food and beverages compared to other neighborhood categories (Table 2). For food advertising, all neighborhoods except low-income white neighborhoods had more space devoted to unhealthy ads compared to healthy ads. Unhealthy food ad space was most dense in low-income Latino and African-American neighborhoods, which had five times the unhealthy food ad space compared to high-income white neighborhoods and six times that of low-income white neighborhoods. Low-income Latino and African-American neighborhoods also had 50 % more ad space devoted to unhealthy beverages than healthy beverages, in contrast to other income-race categories which had more healthy beverages. Unhealthy beverage ads were more dense in low-income neighborhoods and in multiracial neighborhoods. *Physical Activity-Related Advertising.* Ads related to physical activity made up 22 % of all health-related ads and 18 % of ad space. Ads classified as healthy promoted gym memberships and charity fundraising walks, while ads classified as unhealthy promoted television shows and motorcycles (Fig. 2). Nearly a quarter of healthy ad space was sponsored by a non-profit or government organization.

Across all categories of neighborhoods, there were more healthy physical activity ads than unhealthy ads. The ratio of healthy to unhealthy advertising was higher in high income and white neighborhoods (Table 3). For instance, high-income white neighborhoods had 98 ft<sup>2</sup> per 100,000 of healthy ads and no unhealthy ads. There



**FIG. 1** Examples of healthy and unhealthy outdoor ads for food and beverages.

**TABLE 2 Food and beverage advertising by neighborhood demographics**

Neighborhood demographics	Total ads	Total SF	Food				Beverages				
			Healthy		Unhealthy		Healthy		Unhealthy		
			SF per 100,000	SF per square mile	SF per 100,000	SF per square mile	SF per 100,000	SF per square mile	SF per 100,000	SF per square mile	
High-income white	16	1803	0	0	576	10	117	2	8	0	0
High-income white and Asian	1	21	0	0	54	0	0	0	0	0	0
Low-income white	4	985	1070	10	469	5	0	0	0	0	0
Low-income Latino and African-American	35	9745	728	42	3129	182	686	40	1029	60	60
High income	17	1824	0	0	508	7	101	1	7	0	0
Low income	39	10,730	820	20	2416	60	502	12	754	19	19
White	20	2788	213	3	555	8	93	1	7	0	0
Multiracial	36	9766	596	14	2572	61	562	13	843	20	20
All neighborhoods	56	12,554	366	6	1360	24	281	5	341	6	6

SF square feet



**FIG. 2** Examples of healthy and unhealthy outdoor ads for physical activity.

were no unhealthy physical activity ads in neighborhoods that were high income nor in neighborhoods that were predominately white. In low-income Latino and African-American neighborhoods, there was 1.3 times the area of healthy physical activity ads compared to unhealthy ads. *Obesity-Related Advertising.* Taking a broader look at all obesity-related outdoor ads that addressed any aspect of food, beverages, or physical activity, about half (51 %) of the ad space promoted unhealthy products such as beer, soda, fast-food restaurants, television shows, and motorcycles. Among the unhealthy ads, 12 % of space was devoted to physical activity and 88 % to foods and beverages. Per square mile, low-income Latino and African-American neighborhoods had 32 times the area of unhealthy advertising compared to high-income white neighborhoods. Low-income white neighborhoods

**TABLE 3** Physical activity advertising by neighborhood demographics

Neighborhood demographics	Total ads	Total SF	Healthy		Unhealthy	
			SF per 100,000	SF per square mile	SF per 100,000	SF per square mile
High-income white	12	252	98	2	0	0
High-income white and Asian	0	0	0	0	0	0
Low-income white	6	684	1069	10	0	0
Low-income Latino and African-American	19	3468	1125	65	858	50
High income	12	252	85	1	0	0
Low income	25	4152	1110	28	628	16
White	18	936	291	4	0	0
Multiracial	19	3468	921	22	702	17
All neighborhoods	37	4404	543	9	281	5

SF square feet

had the second highest square footage devoted to obesity-related ads, with 1.5 times more unhealthy ads per square mile compared to high-income white neighborhoods.

## CONCLUSION

This study found a lower density of advertising per square mile than other published studies, but similar patterns of racial and income disparities in outdoor food and beverage advertising.<sup>10</sup> Ad density may be lower in Sacramento compared to Los Angeles because this study did not count signs along the freeways, because of Sacramento's lower population density and smaller market, or due to hundreds of unpermitted, and possibly illegal, billboards in Los Angeles.<sup>16</sup> Nevertheless, the pattern was the same: communities at highest risk of obesity, low-income Latinos and African-Americans, had the highest density of unhealthy food and beverage ads. Disparities were present also in low-income neighborhoods, regardless of race, and in multiracial neighborhoods, regardless of income.

An unexpected finding was the existence of public service announcements promoting healthier food choices and weight loss; however, it is not clear that these offset some of the effects of unhealthy advertising. Some researchers argue that a coordinated social marketing campaign with hard-hitting messages on processed snacks and sugary drinks can improve dietary behaviors.<sup>2</sup> This may be the most viable option to counteract unhealthy advertising. Banning outdoor ads for specific products is unlikely since current laws protect advertising as a form of commercial free speech.<sup>17</sup>

Although the patterns reported here may not generalize to all American cities, the results are consistent with other works showing disparities in outdoor obesity-related advertising found in Los Angeles, New Orleans, Philadelphia, Austin, and New York.<sup>7,9,10</sup> It is important to point out that the present study does not address the gap in the literature surrounding the causal link between unhealthy advertising and obesity and more work is needed in this area. Future research should also investigate the ways in which the broader food information environment, or *macro environments*, shapes food choice in much the same way that research has confirmed that *micro environments*, like interiors of restaurants and grocery stores, are designed to encourage unhealthy food choices and overeating.<sup>18</sup> For instance, it would be helpful to know the behavioral impact of health promotion advertising in neighborhoods with more and less unhealthy advertising. Finally, policies limiting outdoor advertising in general would have more success surviving legal challenges than attempts to target specific content such as food advertising.<sup>19</sup> Vermont, for instance, prohibits outdoor advertising everywhere in the state<sup>19</sup> and provides a model for other states and localities seeking to mitigate the health impact of outdoor advertising.

## ACKNOWLEDGMENTS

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## REFERENCES

1. Cohen DA. Obesity and the built environment: changes in environmental cues cause energy imbalances. *Int J Obes*. 2008; 32(Suppl 7): S137–42.
2. Zimmerman FJ. Using marketing muscle to sell fat: the rise of obesity in the modern economy. *Annu Rev Public Health*. 2011; 32: 285–306.

3. Abbatangelo-Gray J, Byrd-Bredbenner C, Austin SB. Health and nutrient content claims in food advertisements on Hispanic and mainstream prime-time television. *J Nutr Educ Behav.* 2008; 40(6): 348–54.
4. Bell RA, Cassady D, Culp J, Alcalay R. Frequency and types of foods advertised on Saturday morning and weekday afternoon English- and Spanish-language American television programs. *J Nutr Educ Behav.* 2009; 41(6): 406–13.
5. Henderson VR, Kelly B. Food advertising in the age of obesity: content analysis of food advertising on general market and African American television. *J Nutr Educ Behav.* 2005; 37(4): 191–6.
6. Mink M, Evans A, Moore CG, Calderon KS, Deger S. Nutritional imbalance endorsed by televised food advertisements. *J Am Diet Assoc.* 2010; 110(6): 904–10.
7. Lesser LI, Zimmerman FJ, Cohen DA. Outdoor advertising, obesity, and soda consumption: a cross-sectional study. *BMC Public Health.* 2013; 13: 20.
8. Kwate NO, Lee TH. Ghettoizing outdoor advertising: disadvantage and ad panel density in black neighborhoods. *J Urban Health: Bull N Y Acad Med.* 2007; 84(1): 21–31.
9. Lowery BC, Sloane DC. The prevalence of harmful content on outdoor advertising in Los Angeles: land use, community characteristics, and the spatial inequality of a public health nuisance. *Am J Public Health.* 2014; 104(4): 658–64.
10. Yancey AK, Cole BL, Brown R, et al. A cross-sectional prevalence study of ethnically targeted and general audience outdoor obesity-related advertising. *Milbank Quart.* 2009; 87(1): 155–84.
11. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA.* 2014; 311(8): 806–14.
12. National Center for Health Statistics. *Health, United States.* Hyattsville: With Special Feature on Death and Dying; 2010.
13. American Community Survey. [www.factfinder2.census.gov](http://www.factfinder2.census.gov).
14. U.S. Department of Agriculture and U.S. Department of Health and Human Services *Dietary Guidelines for Americans.* Washington, D.C.: Government Printing Office; 2010.
15. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977; 33(1): 159–74.
16. The Editorial Board. Close the five-year billboard loophole. *The Los Angeles Times.* 2015. <http://www.latimes.com/opinion/editorials/la-ed-billboard-law-20150204-story.html>. Accessed 6 June 2015.
17. Mermin SE, Graff SK. A legal primer for the obesity prevention movement. *Am J Public Health.* 2009; 99(10): 1799–805.
18. Wansink B. Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annu Rev Nutr.* 2004; 24: 455–79.
19. Ashe M, Bennett G, Economos C, et al. Assessing coordination of legal-based efforts across jurisdictions and sectors for obesity prevention and control. *J Law Med Ethics.* 2009; 37(Suppl 1): 45–54.