



Disparities in retail marketing for little cigars and cigarillos in Los Angeles, California

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ABSTRACT

Introduction: Evidence of a concentration of cigarette advertising in predominantly low-income, non-White neighborhoods underscores the need to examine retail marketing and promotions for novel tobacco products like little cigars and cigarillos (LCCs). We sought to investigate neighborhood racial/ethnic disparities in LCC marketing at retail, including availability, advertising, price promotions, and product placement in Los Angeles, California.

Methods: Between January 2016 and April 2017, community health workers (n = 19) conducted in-person observational audits from tobacco retail stores (n = 679) located in zip codes with a high percentage of non-Hispanic White (n = 196), Black (n = 194), Hispanic/Latino (n = 189), or Korean American (n = 100) residents. To account for clustering effect of zip codes, multilevel modeling approach for a dichotomized outcome was conducted to evaluate the association between racial/ethnic neighborhood sample and dependent variables.

Results: Stores located in zip codes with a high percentage of non-Hispanic Blacks had more than eight times higher odds of selling LCCs (OR = 8.10; 95% CI = 3.10–21.11 vs. non-Hispanic White), more than five times higher odds of selling flavored LCCs (OR = 5.20; 95% CI = 2.33–11.61 vs. non-Hispanic White), and more than six times higher odds of displaying storefront exterior LCC signage (OR = 6.03; 95% CI = 2.93–12.40 vs. non-Hispanic White). Stores in Hispanic/Latino and Korean American communities had about three times higher odds of selling LCCs (OR = 3.02; 95% CI = 1.15–7.93 vs. non-Hispanic White; OR = 2.99; 95% CI = 1.33–6.71 vs. non-Hispanic White).

Conclusions: LCCs are heavily marketed in retail establishments in Los Angeles, with disproportionate targeting of predominantly non-White neighborhoods, especially stores in neighborhoods with a higher proportion of African Americans. Local, state, and federal flavor restrictions, minimum pack size standards, preventive messages, and campaigns could counter the influence of LCC marketing in retail establishments.

1. Introduction

Popularity and sales of machine-manufactured, mass-merchandise little cigars and cigarillos (hereafter LCCs) have surged in recent years (Agaku, King, & Dube, 2014; Delnevo, Giovenco, & Miller Lo, 2017; Nyman, Sterling, Weaver, Majeed, & Eriksen, 2016). With physical characteristics similar to cigarettes (i.e., size, tobacco weight, and shape) (Truth Initiative, 2017), LCC use increases the risk of the same

adverse health consequences as cigarettes, including coronary heart disease and cancers of the mouth, lung, esophagus, and larynx (Baker et al., 2000; Kozlowski, Dollar, & Giovino, 2008; National Cancer Institute, 1998; U.S. Department of Health and Human Services, 2006). Nevertheless, some consumers view LCCs as less harmful than cigarettes (Kozlowski et al., 2008), and LCC use is higher among certain demographic groups (i.e., cigarette smokers, Blacks/African Americans, Hispanics/Latinos, and low-socioeconomic status individuals) (Agaku

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et al., 2014; Cantrell, Kreslake, Ganz, et al., 2013) that are at greater risk of tobacco-related diseases (Adler & Newman, 2002; Haiman et al., 2006; Kaplan et al., 2014).

The 2009 U.S. Family Smoking Prevention and Tobacco Control Act (i.e., the FSPTCA) gives the Food and Drug Administration (FDA) the authority to regulate tobacco products and includes rules prohibiting retailers from selling single cigarettes, and manufacturers from producing cigarettes with certain flavors like fruit, candy, and clove (Family Smoking Prevention and Tobacco Control and Federal Retirement Reform, 2009). While cigarette sales steadily declined from 2008 to 2015, flavored cigar sales increased by nearly 50% (Delnevo et al., 2017). In May 2016, cigars were included under FDA regulation, limiting certain marketing and sales practices, and including rules prohibiting stores from giving away free cigar samples (Food and Drug Administration, 2016). In November 2018, FDA announced plans to ban flavored LCCs (except tobacco, menthol, and mint flavors) (<https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm625884.htm>, n.d.). Indeed, such a ban would be critical for a subsequent regulation as LCC use is disproportionately higher among racial/ethnic minorities (Agaku et al., 2014). However, FDA did not propose to implement minimum pack size restrictions (<https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm625884.htm>, n.d.). LCCs are less expensive than cigarettes, and to date, have no minimum pack size standards (Cantrell et al., 2013; Delnevo et al., 2017). They can be sold as singles and in small multi-packs, whereas cigarettes are sold in the U.S. only in packages of 20 (Cantrell et al., 2013; Delnevo et al., 2017). For example, store patrons may be able to buy a single menthol flavored little cigar for less than \$1.00. Thus, LCCs remain a possible source of smoking initiation and nicotine dependence.

Notably, a few recent studies indicate that LCCs are disproportionately advertised and sold at lower prices in stores located in racial/ethnic minority and low-income neighborhoods (Cantrell et al., 2013; Henriksen et al., 2017a). In California, Henriksen et al. (2017a) found that a flavored Swisher Sweets cigarillo, a top-selling cigarillo brand, cost significantly less in neighborhoods with a higher proportion of African American, Hispanic/Latino, and low-income residents. Almost 80% of LCC retailers near public schools in California offer LCCs for \leq \$1, and larger packs (5- and 6-packs) of LCCs are available for \leq \$1 near schools in lower-income neighborhoods (Henriksen et al., 2017b). In Washington, DC, Cantrell et al. (2013) found more retail LCC marketing in predominantly African American and low-income neighborhoods. More recently, in a national sample of 2230 tobacco retailers in the U.S., Ribisl et al. (2017) found that retailers in neighborhoods with the highest concentration of African Americans are more than twice as likely to sell flavored cigars than neighborhoods with the lowest concentration of African Americans. Such racial/ethnic disparities in LCC marketing at retail may fuel the high prevalence of LCC use among racial/ethnic minorities and low-income individuals (Agaku et al., 2014; Arrazola, Dube, & King, 2013).

To date, there are few empirical studies about LCC retail marketing, especially concerning variation across racial/ethnic neighborhoods. Thus, we sought to investigate neighborhood racial/ethnic disparities in LCC retail marketing in Los Angeles County. Although Los Angeles County is one of the most racially/ethnically diverse counties in the U.S., it is largely segregated by race/ethnicity at the neighborhood-level (PolicyLink and the Program for Environmental and Regional Equity at the University of Southern California, n.d.; Rothstein, 2017). An estimated 60% of African Americans in Los Angeles County reside in predominantly African American neighborhoods, with few non-Hispanic White neighbors (Rothstein, 2017; U.S. Census Bureau, 2013). Similarly, in a review of U.S. Census data, Logan and Turner (Logan, 2011) found that the average Mexican American in Los Angeles resides in a Hispanic/Latino neighborhood that is 18% non-Hispanic White. This concentration of racial/ethnic enclaves at the neighborhood-level persists even when comparing households of the same income, indicating

“racialized geography” (Yerger, Przewoznik, & Malone, 2007) – the dynamics between space/place, race/ethnicity, and socioeconomic status (SES). The geographical separation of individuals on the basis of race/ethnicity and SES is a fundamental cause for the tobacco industry’s targeted marketing to demographic groups (i.e., African Americans, low-income individuals) most severely impacted by combustible tobacco use (Yerger et al., 2007). To inform FDA cigar regulations, surveillance of retail marketing for LCCs in neighborhoods that have been racially targeted by tobacco marketing (Lee, Landrine, Torres, & Gregory, 2016) is warranted. Specifically, we examined LCC availability, advertising, price promotions, and product placement overall, by store type, and racial/ethnic neighborhoods (Black/African American, Hispanic/Latino, Korean American, and non-Hispanic White).

2. Methods

2.1. Study sample

The target sample was 700 stores with tobacco retailer licenses in Los Angeles County. Stores were classified into one of five categories: (1) small, independent convenience stores with or without a gas station; (2) beer, wine, and liquor stores; (3) small, independent grocery stores that primarily sold food; (4) tobacco-focused stores; and (5) ‘other’ such as a discount store, donut shop or gas kiosk. Excluded from this study were pharmacies, big chain markets/supermarkets, and vape shops.

Selection of stores was performed in two steps. In Step 1, zip codes with a median or below median household income for Los Angeles County were rank ordered by percentage of race/ethnicity. The number of zip codes that met the criteria for each race/ethnicity differed (non-Hispanic White = 32 zip codes, past 12-month average median household income = \$59,988; Hispanic/Latino = 14 zip codes, past 12-month average median household income = \$35,468; African American = 14 zip codes, past 12-month average median household income = \$33,934; Korean American = 7 zip codes, past 12-month average median household income = \$32,281), so we decided to select up to 15 zip codes from each racial/ethnic zip code cluster. This criterion affected the non-Hispanic White sample since there were 32 eligible zip codes. Thus, within the non-Hispanic White zip codes, we exhausted all possible stores in the first 15 zip codes and repeated that process until we reached our desired sample. In total, we collected store data from 21 zip codes for the non-Hispanic White sample.

In Step 2, stores were randomly selected from ranked zip codes using a comprehensive list of approximately 11,600 licensed tobacco retailers in Los Angeles County maintained by the California Department of Tax and Fee Administration (California Department of Tax and Fee Administration, n.d.). The number of stores selected was based in proportion to the race/ethnicity percentage ranking of each zip code. Store type was categorized using standard definitions (Henriksen et al., 2017a, b; Ribisl et al., 2017). Approximately 10,200 of the 11,600 licensed tobacco retailers were eligible under our store criteria, and 2556 of the eligible stores were in the selected zip codes for this study (22% of licensed tobacco retail stores in Los Angeles County). The sampling design process is described in detail elsewhere (Baezconde-Garbanati et al., 2017).

2.2. Data collection

To record LCC products and marketing materials, we developed a store audit checklist adapted from the Standardized Tobacco Assessment for Retail Settings (STARS) observation tool (Henriksen et al., 2016). Community health workers (n = 19) participated in training to conduct the store assessments and take digital photographs of the store’s exterior and interior. In-person training included a detailed protocol for recording exterior and interior store audits of tobacco products and marketing materials, in addition to supervised practice field work. Between January 2016 and April 2017, community

Table 1
Prevalence of LCC availability, advertising, price promotions, and product placement overall and by store type.

	Overall (n = 679)	Gas/convenience store (n = 244)	Liquor store (n = 109)	Grocery store (n = 190)	Tobacco store (n = 64)	Other (n = 72)
	(%)	(%)	(%)	(%)	(%)	(%)
Availability						
LCCs	89.0	98.0	96.3	79.0	93.8	69.4
Flavored LCCs	86.3	95.9	94.5	75.3	89.1	68.1
Single LCCs	77.3	87.7	87.2	63.2	82.8	59.7
Advertising						
LCCs < \$1	77.0	85.6	84.3	66.8	84.4	56.9
Exterior LCC advertising	16.1	19.3	13.8	7.9	35.9	12.5
Price promotions	19.3	25.8	19.4	7.4	40.6	9.7
Product placement						
LCCs within 12 in. (1 ft) of toys/sweets	25.6	20.5	42.2	29.5	12.5	19.4
Interior LCC advertising at or below 3 ft (1 m)	11.2	13.1	13.8	4.2	25.0	6.9

LCCs = little cigars/cigarillos.

health workers visited 700 stores in 56 zip codes and completed 679 observational audits (21 audits were denied by the store owner, manager or clerk) in stores located in zip codes with a high percentage of non-Hispanic White (n = 196 stores), non-Hispanic Black (n = 194 stores), Hispanic/Latino (n = 189 stores), and Korean American (n = 100 stores) residents. Store owners, managers, or clerks were consented to permit the audit and those who agreed received a \$50 gift card and a leave-behind packet (available in English, Spanish, and Korean) containing fact sheets about the FDA's tobacco regulatory authority. The University of Southern California Institutional Review Board approved the research protocol (HS#13-00647).

2.3. Measures

Community health workers coded LCC marketing along four domains: (1) availability; (2) advertising; (3) price promotions; and (4) product placement. Availability was assessed with the presence or absence (yes or no) of the following inquiries: Are LCCs sold here? Are flavored LCCs sold here? Are LCC singles sold here? Flavors were defined to include any flavor except tobacco or menthol/mint, which complements FDA's Center for Tobacco Product definitions? Advertising was assessed with the presence or absence (yes or no) of the following inquiries: Are LCCs advertised for less than \$1? Are LCCs advertisements on the outside of the store? Price promotions were coded by location (interior/exterior) and were defined to include any multi-pack special ('buy five cigars, get three free') or special price ('50 cents off'). To measure youth potential exposure to LCC marketing, the coders noted the presence or absence (yes or no) of LCCs within 12 in. (1 ft) of toys, candy, gum, slushy/soda machine, or ice cream; and interior LCC advertising at or below 3 ft (1 m).

Interrater reliability was assessed in approximately 25% (n = 210) of the stores (Hispanic/Latino = 71; non-Hispanic White = 56; African American = 55; Korean American = 28). Digital photographs (n = 555) were also taken at stores in each racial/ethnic zip code cluster (African American = 165 photos; Hispanic/Latino = 156 photos; non-Hispanic White = 153 photos; Korean American = 81 photos) and were consulted to address any disagreement. Reliability for the eight dichotomously scored items was assessed using Cohen's kappa: (1) LCCs sold (k = 0.91, 98.6% agreement); (2) Flavored LCCs sold (k = 0.78, 95.2% agreement); (3) Single LCCs sold (k = 0.53, 83.5% agreement); (4) LCCs advertised for less than \$1 (k = 0.55, 85.0% agreement); (5) Exterior LCC advertising (k = 0.75, 93.7% agreement); (6) LCC price promotions (k = 0.60, 86.9% agreement); (7) LCCs within 12 in. of toys/sweets (k = 0.56, 84.0% agreement); (8) Interior LCC advertising at or below 3 ft (k = 0.34, 84.0% agreement).

2.4. Data analysis

Frequency distributions and cross tabulations were used for descriptive statistics of LCC availability, advertising, price promotions, product placement, and store type by racial/ethnic zip codes. Descriptive statistics were also computed to characterize LCC availability, advertising, price promotions, and product placement by store type. To account for clustering effects, multilevel models with dichotomized outcome were developed to evaluate the association between racial/ethnic zip codes and eight dependent variables: LCCs sold, flavored LCCs sold, LCCs sold as singles, LCCs sold for less than \$1, exterior LCC advertising, LCC price promotions, LCCs displayed within 12 in. of toys/sweets, and interior LCC advertising at or below 3 ft. Based on previous health disparities research (Santos-Lozada, 2016; Wallace et al., 2007), non-Hispanic White was selected as the reference group as the largest racial/ethnic group nationally, even though the population distribution is different in Los Angeles. All multilevel models adjusted for store type since store type distributions are often associated with neighborhood demographics (Henriksen et al., 2017b). Small, independent convenience stores with or without a gas station were treated as the reference category because they were the most prevalent store type. Odds ratio estimates, and 95% confidence intervals were used to summarize associations. Data were analyzed in 2018 using SAS software version 9.3 and PROC GLIMMIX procedure was used for model evaluation (SAS Institute, Cary, NC) (SAS, 2013).

3. Results

3.1. Study sample characteristics

Of the 679 tobacco retail stores in the sample, 35.9% were gas/convenience stores, 28% were grocery stores, and 16.1% were liquor stores, as shown in Table 1. LCCs were sold in 89% of stores, flavored LCCs were sold in 86.3% of stores, and single LCCs were sold in 77.3% of stores; all three products were widely available across store types. LCCs were sold for less than \$1 at 77% of stores, including 85.6% of gas/convenience stores, 84.4% of tobacco-focused stores, and 84.3% of liquor stores. Overall, 16.1% of stores displayed exterior advertisements, and 25.6% of stores had LCCs displayed next to toys/candy. Price promotions were present at 40.6% of tobacco-focused stores.

3.2. LCC availability, advertising, price promotions, product placement, and store type by racial/ethnic zip code cluster

As shown in Table 2, LCCs, flavored LCCs, and single LCCs were widely available in stores across racial/ethnic zip codes. LCCs were sold

Table 2
Prevalence of LCC availability, advertising, product placement, and store type by racial/ethnic zip code clusters.

	AA (n = 194)	KA (n = 100)	HL (n = 189)	NHW (n = 196)
	(%)	(%)	(%)	(%)
Availability				
LCCs	95.4	88.0	87.3	84.7
Flavored LCCs	92.3	86.0	85.7	81.1
Single LCCs	82.0	78.0	75.1	74.5
Advertising				
LCCs < \$1	83.5	78.0	75.0	71.8
Exterior LCC advertising	32.5	11.0	8.5	9.7
Price promotions	17.0	17.0	11.6	30.3
Product placement				
LCCs within 12" (1 ft) of toys/sweets	40.7	21.0	22.8	15.8
Interior LCC advertising at or below 3 ft (1 m)	20.1	9.0	7.9	6.6
Store type				
Gas/convenience store	37.6	27.0	33.3	41.3
Liquor store	12.9	20.0	12.7	20.4
Grocery store	29.4	30.0	40.2	13.8
Tobacco store	8.8	8.0	2.1	17.9
Other	11.3	15.0	11.6	6.6

AA = African American; KA = Korean American; HL = Hispanic/Latino; NHW = Non-Hispanic White; LCCs = little cigars/cigarillos.

for less than \$1 in stores in mostly African American zip codes (83.5%), followed by Korean American (78%), and Hispanic/Latino (75%) zip codes. Stores in African American zip codes displayed the most exterior LCC advertisements (32.5%), followed by stores in Korean American (11%) and non-Hispanic White (9.7%) zip codes. Price promotions were present at 30.3% of stores in non-Hispanic White zip codes, compared to 11.6% of stores in Hispanic/Latino zip codes. About 40.7% of stores in African American zip codes displayed LCCs next to toys/candy, and 20.1% displayed interior LCC advertisements at or below 3 ft. Gas/convenience stores were the most frequently observed store type across racial/ethnic zip codes. Tobacco-focused stores were the most frequently observed store type in zip codes with a higher percentage of non-Hispanic Whites (17.9%), compared to African American (8.8%), Korean American (8.0%), and Hispanic/Latino (2.1%) zip codes.

3.3. Associations of racial/ethnic zip code clusters with LCCs, flavored LCCs, and LCC singles

As shown in Table 3, stores in African American zip codes had significantly higher odds of selling LCCs (OR = 3.14, 95% CI = 1.25–7.89) and selling flavored LCCs (OR = 2.42, 95% CI = 1.15–5.11) compared to stores in non-Hispanic White zip codes.

Table 3
Racial/ethnic zip code cluster predictors of LCCs, flavored LCCs and LCC singles.

Measure	Racial/ethnic zip code cluster	Model 1: OR (95%CI) ^a	Model 2: OR (95%CI) ^b
LCCs	African American	3.14 (1.25–7.89)	8.10 (3.10–21.11)
	Hispanic/Latino	1.20 (0.46–3.09)	3.02 (1.15–7.93)
	Korean American	1.08 (0.51–2.31)	2.99 (1.33–6.71)
	Non-Hispanic White	Ref	Ref
Flavored LCCs	African American	2.42 (1.15–5.11)	5.20 (2.33–11.61)
	Hispanic/Latino	1.32 (0.57–3.02)	2.87 (1.20–6.91)
	Korean American	1.27 (0.65–2.47)	3.00 (1.43–6.26)
	Non-Hispanic White	Ref	Ref
LCC singles	African American	1.43 (0.81–2.53)	2.24 (1.25–4.03)
	Hispanic/Latino	1.14 (0.58–2.26)	1.86 (0.93–3.72)
	Korean American	0.96 (0.56–1.66)	1.70 (0.96–3.00)
	Non-Hispanic White	Ref	Ref

AA = African American; KA = Korean American; HL = Hispanic/Latino; NHW = Non-Hispanic White; LCCs = little cigars/cigarillos.

^a Unadjusted.

^b Adjusted for store type.

After adjusting for store type, these associations persisted (OR = 8.10, 95% CI = 3.10–21.11). Stores in Hispanic/Latino and Korean American zip codes had significantly higher odds of selling LCCs (OR = 3.02, 95% CI = 1.15–7.93; OR = 2.99, 95% CI = 1.33–6.71) and selling flavored LCCs (OR = 2.87, 95% CI = 1.20–6.91; OR = 3.00, 95% CI = 1.43–6.26) compared to stores in non-Hispanic White zip codes when store type was added to the model. Stores only located in African American zip codes had significantly higher odds of selling LCC singles (OR = 2.24, 95% CI = 1.25–4.03) than stores in non-Hispanic White zip codes after adjusting for store type.

3.4. Associations of racial/ethnic zip code clusters with LCCs priced < \$1, price promotions, exterior advertising, and product placement

The odds of selling LCCs for less than \$1 were 1.7 times higher (95% CI = 1.22–3.25) in stores located in African American zip codes than stores in non-Hispanic White zip codes after adjusting for store type (Table 4). Stores in African American, Hispanic/Latino, and Korean American zip codes had significantly lower odds of displaying price promotions (OR = 0.46, 95% CI = 0.26–0.81; OR = 0.46, 95% CI = 0.22–0.95; OR = 0.29, 95% CI = 0.16–0.50) compared to stores in non-Hispanic White zip codes. Controlling for store type, the association persisted for stores in Korean American zip codes (OR = 0.43, 95% CI = 0.23–0.80). The odds of displaying exterior LCC advertisements were 4.05 times higher (95% CI = 2.12–7.77) in stores located in African American zip codes than stores in non-Hispanic White zip codes. The association persisted (OR = 6.03, 95% CI = 2.93–12.40) after adjusting for covariates. Additionally, stores in African American zip codes had significantly higher odds of displaying LCCs within 12" (1 ft) of toys/sweets (OR = 3.46, 95% CI = 1.74–6.89) and interior LCC advertising at or below 3 ft (OR = 3.46, 95% CI = 1.74–6.89), compared to stores in non-Hispanic White zip codes. These associations persisted (OR = 3.74, 95% CI = 2.06–6.78; OR = 5.07, 95% CI = 2.46–10.45, respectively) after adjusting for store type.

4. Discussion

The present study investigated neighborhood socioeconomic and racial/ethnic disparities in retail marketing for LCCs through in-person store audits in Los Angeles County, finding that LCCs are widely available, and at a low price. These findings may pose a risk for youth who are more likely to find LCCs appealing (<https://www.fda.gov/>

Table 4
Racial/ethnic zip code cluster predictors of LCCs < \$1, price promotions, exterior advertisements, and product placement.

Measure	Racial/ethnic zip code cluster	Model 1: OR (95%CI) ^a	Model 2: OR (95%CI) ^b
LCCs < \$1	African American	1.83 (0.99–3.37)	2.74 (1.44–5.20)
	Hispanic/Latino	1.31 (0.63–2.73)	2.05 (0.96–4.37)
	Korean American	1.11 (0.62–1.99)	1.83 (0.98–3.39)
	Non-Hispanic White	Ref	Ref
LCC price promotions	African American	0.46 (0.26–0.81)	0.57 (0.33–1.01)
	Hispanic/Latino	0.46 (0.22–0.95)	0.62 (0.31–1.27)
	Korean American	0.29 (0.16–0.50)	0.43 (0.23–0.80)
	Non-Hispanic White	Ref	Ref
Exterior LCC advertising	African American	4.05 (2.12–7.77)	6.03 (2.93–12.40)
	Hispanic/Latino	1.13 (0.47–2.75)	1.65 (0.64–4.27)
	Korean American	0.84 (0.39–1.80)	1.46 (0.63–3.37)
	Non-Hispanic White	Ref	Ref
LCCs within 12" (1 ft) of toys/sweets	African American	3.46 (1.96–6.11)	3.74 (2.06–6.78)
	Hispanic/Latino	1.40 (0.68–2.89)	1.30 (0.61–2.76)
	Korean American	1.54 (0.85–2.79)	1.48 (0.79–2.77)
	Non-Hispanic White	Ref	Ref
Interior LCC advertising at or below 3 ft (1 m)	African American	3.46 (1.74–6.89)	5.07 (2.46–10.45)
	Hispanic/Latino	1.37 (0.55–3.42)	1.94 (0.76–5.00)
	Korean American	1.20 (0.54–2.66)	2.11 (0.91–4.87)
	Non-Hispanic White	Ref	Ref

AA = African American; KA = Korean American; HL = Hispanic/Latino; NHW = Non-Hispanic White; LCCs = little cigars/cigarillos.

^a Unadjusted.

^b Adjusted for store type.

[NewsEvents/Newsroom/PressAnnouncements/ucm625884.htm](https://www.sandiego.gov/news-events/newsroom/press-announcements/ucm625884.htm), n.d.). With half of U.S. youth visiting a convenience store at least once a week (Sanders-Jackson, Parikh, Schleicher, Fortmann, & Henriksen, 2015), the widespread availability, accessibility, and affordability of LCCs in the retail environment may facilitate LCC initiation among youth in Los Angeles County.

Tobacco retailers in predominantly low-income, African American neighborhoods are the most heavily saturated with LCCs, including flavored versions, singles, and exterior advertising. Our findings add to past studies (Henriksen, Schleicher, Dauphinee, & Fortmann, 2012; Seidenberg, Caughey, Rees, & Connolly, 2010; Yerger et al., 2007) documenting targeted retail marketing for menthol cigarettes in neighborhoods with higher proportions of African Americans, and suggests that widespread availability of LCCs undermines cessation, and raises concerns about potential susceptibility to LCC use, and dual use of LCCs and menthol cigarettes. Additionally, compared to non-Hispanic White neighborhoods, we found that African American neighborhoods are six times more likely to have exterior LCC marketing materials. The findings complement a previous study (Cantrell et al., 2013) in Washington, DC, showing that neighborhoods with a higher percentage of African Americans are disproportionately exposed to LCC advertising on store windows. This pattern suggests that the tobacco industry is heavily targeting African Americans with LCCs in the retail environment, which may explain why African Americans are at greater risk for LCC use. Further, compared to non-Hispanic White neighborhoods, stores in African American neighborhoods have more than three times higher odds of displaying LCCs near candy/toys, and placing interior advertisements at or below 3 ft of the floor, making them more visible to youth. Such strategies increase the likelihood that African American youth are routinely exposed to LCC marketing messages before they enter a store and during store visits.

To our knowledge, the widespread availability of LCCs in predominantly low-income, Korean American neighborhoods, has not been previously documented. We found that flavored LCCs are heavily saturated in Hispanic/Latino and Korean American neighborhoods compared to non-Hispanic White neighborhoods, even after adjusting for store type. These findings are a cause for concern and suggest that Korean American, Hispanic/Latino, and African American youth in Los Angeles County, are disproportionately at risk for becoming susceptible to using LCCs. Additionally, smoking prevention programs are less obtainable for residents in low-income neighborhoods (Kaestle & Wiles,

2010), which has the potential to influence youths' susceptibility to smoking LCCs. Moreover, this study differs from past studies (Ribisl et al., 2017; Siahpush, Jones, Singh, Timsina, & Martin, 2010; Widome, Brock, Noble, & Forster, 2013) that have found no association between patterns of combustible tobacco marketing and store location in Hispanic/Latino neighborhoods, suggesting that the tobacco industry is not targeting Hispanic/Latino youth in the retail environment. By contrast, our findings indicate that in Los Angeles County, the odds of selling LCCs are three times higher in Hispanic/Latino neighborhoods compared to non-Hispanic White neighborhoods.

To date, retail marketing for LCCs has been largely understudied, despite increasing sales (Delnevo et al., 2017) and popularity among younger smokers (Delnevo, Giovenco, Ambrose, Corey, & Conway, 2015; King, Dube, & Tynan, 2013). Our findings suggest that the FDA build upon its recent announcement to ban the marketing and sales of flavored LCCs (except tobacco, menthol, and mint flavors) by imposing additional regulations that match those already applied to cigarettes, such as pack size restrictions. Additionally, our findings suggest that more state and local-level strategies, including zoning laws (Luke, Ribisl, Smith, & Sorg, 2011; Myers, Hall, Isgett, & Ribisl, 2015), may be vital to counteract disparities in retail marketing for LCCs.

Study findings indicate that LCC marketing in the retail environment is a public health concern. Ample evidence (Henriksen et al., 2008; Henriksen, Schleicher, Feighery, & Fortmann, 2010; Peterson, Lowe, & Reid, 2005) has documented the association between exposure to tobacco marketing at retail and combustible tobacco use among vulnerable populations, including adolescents. Past research (Reitzel et al., 2011) has also captured how living in proximity to tobacco retail stores is a barrier to smoking cessation. Future observational studies should examine the association between real-time exposure to LCC marketing at retail, attitudes toward LCC marketing at retail, and LCC use among adolescents and young adults residing in neighborhoods with disproportionate retail marketing for LCCs.

There are limitations to this study that need to be considered. Although zip codes represent reasonably accurate racial/ethnic boundaries due to the high level of segregation in Los Angeles County, they do not always represent exact neighborhood boundaries and provide less granularity than census tracts. Study findings are also limited to select zip codes in Los Angeles County, and may not be generalizable to the county as a whole or to other urban areas in the U.S., and to rural areas. Nonetheless, strengths of this study include a large representative

sample of licensed tobacco retailers in Los Angeles County, and a standardized data collection protocol (Henriksen et al., 2016).

4.1. Conclusions

Our results raise concern that Los Angeles County residents in predominantly low-income, non-White neighborhoods live in an environment with a greater presence of LCC marketing in retail establishments, compared to residents in predominantly White neighborhoods. Disproportionate retail marketing of LCCs, including flavored versions, low prices, and storefront advertising puts African American, Hispanic/Latino, and Korean American residents at greater risk of tobacco-related diseases. Flavor restrictions, minimum pack size standards, preventive messages and campaigns are needed to counter the influence of pro-LCC promotions in neighborhood stores, based on monitoring the types of promotions and sales practices found in varied neighborhoods. Such knowledge will be critical to develop culturally-specific, counter-marketing and intervention strategies.

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Contributions

S.L.S. conceived of the study, and participated in its design, data analysis, interpretation, and wrote the first draft of the manuscript. N.K. participated in study design, data analysis, interpretation, and helped revise the manuscript. Y.L.R. participated in study design, data collection, data analysis, and helped revise the manuscript. R.B. participated in study design, data collection, and helped revise the manuscript. S.S., T.B.C., C-P.C., M.A.P., J.M.S., and L.B.G. participated in study design and helped revise the manuscript. All authors read and approved the final manuscript.

Conflicts of interests

All authors declare that they have no conflicts of interest.

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