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Differences in Electronic Cigarette Awareness, Use History, and Advertisement Exposure between Black and White Hospitalized Cigarette Smokers

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Abstract

E-cigarette use has increased rapidly over the past decade. There is growing concern about e-cigarette use and advertising given limited regulation of these products. This cross-sectional study reports on data collected at baseline from hospitalized cigarette smokers (N = 944) recruited in monthly cohorts between December 2012 and September 2013. Participants were queried regarding e-cigarette awareness and use, and number and sources of e-cigarette advertisement exposures in the previous six months. Most Whites (99%) reported ever hearing of an e-cigarette compared to 96% of Blacks ($p < .001$). Over two-thirds (64%) of Whites reported ever using an e-cigarette compared to 30% of Blacks ($p < .001$). There were significant trends in increasing e-cigarette use for both racial groups with an average increase of 13% each month ($p < .005$) and in increasing e-cigarette advertisement exposure reported for the previous six months, with a 14% increase each month ($p < .0001$). Whites reported 56% greater advertisement exposure than Blacks (Mean = 25 vs. 8 in month 1 to 79 vs. 45 in month 9, respectively; $p < .0001$). For Blacks, advertisement exposure was significantly associated with e-cigarette use ($p < .001$). Whites reported more advertisement exposure from stores and the internet and Blacks reported more advertisement exposure from radio or television. Results suggest that e-cigarette marketing is beginning to breach the Black population who are, as a consequence, “catching up” with Whites with regard to e-cigarette use. Given the significant disparities for smoking-related morbidity and mortality between Blacks and Whites, these findings identify new areas for future research and policy.

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Introduction

With the steep rise in electronic cigarette (e-cigarette) use in the present decade, concerns have risen regarding the public health implications of e-cigarette use and the impact of e-cigarette advertising on e-cigarette uptake, especially among vulnerable populations including youth and racial minorities [1]. In 1971, tobacco advertising was banned from television and radio, allowing these media to be discounted as a source of influence on tobacco uptake. However, no such ban currently exists for e-cigarettes.

A study by the Legacy Foundation found tobacco and e-cigarette advertisements on 72% of monitored television and internet outlets[2]. Twenty four of 180 of these were unique e-cigarette advertisements. These advertisements included messages related to harm reduction, using e-cigarettes for smoking cessation, environmental issues, and use of e-cigarettes in non-smoking areas. Duke et al. found that during the period of October 2012 to September 2013, half of 18-24 year olds were exposed to an average of 35 e-cigarette advertisements[3]. Annual expenditures for e-cigarette advertisements nearly tripled from 2011 to 2012, increasing from \$6.4 million to \$18.3 million [4]. The goal of advertising is to inform an audience about a product and persuade the audience to try the product. Billions of dollars have been spent to advertise tobacco products with great success in increasing uptake, particularly among youth [5, 6]. Given the large expenditures for e-cigarette advertisements, it appears that e-cigarette manufacturers believe advertising influences e-cigarettes uptake; therefore, it is reasonable to assume that as exposure to advertising increases so will e-cigarette awareness and use.

Studies reporting on exposure to and sources of e-cigarette advertisements among adults appear to be lacking. A few studies have reported on awareness and use of e-cigarettes by race. Popova and Ling reported a similar prevalence of e-cigarette use between Blacks and Whites while Pearson et al. reported significantly more use among Whites compared to Blacks [7, 8]. Choi and Forster found that minorities (including Hispanics and Blacks) were less likely than Whites to believe that e-cigarettes could help people quit smoking tobacco cigarettes and that they are less harmful than tobacco cigarettes [9]. A 2012 assessment of e-cigarette availability at retail outlets in the U.S. found availability more likely in neighborhoods with higher median household income and a lower percentage of Black and Hispanic residents [10]. E-cigarette print advertising has been reported to be targeted to middle-aged White men with White men and women more likely to be featured in the advertisements compared to other racial groups [11]. Thus, the extant literature suggests a greater prevalence of e-cigarette availability and advertisements targeted for Whites as compared to Blacks, which may explain more use by Whites.

This study extends a preliminary report by Harrington, et al. [12] to include a larger sample and to examine racial differences between Blacks and Whites in e-cigarette awareness and use, and exposure to e-cigarette advertisements. We collected data steadily over nine months and examined trends of e-cigarette awareness and use, and e-cigarette advertisement exposures over time for Blacks and Whites. While the studies on use by race reported above had inconsistent results, our data allow for a more nuanced evaluation of this issue by including advertisement exposure and a nine-month data collection time span. Tobacco-

related health disparities are well documented as are differences in smoking patterns between Blacks and Whites [13, 14]. It is important to track e-cigarette use by race to determine if existing tobacco patterns carry over to this new tobacco product.

Methods

Sample recruitment

This cross-sectional study examines baseline data collected from hospitalized cigarette smokers who were recruited in monthly cohorts over nine months. Recruitment was based on the hospital's daily patient census and was very steady over time. Between December 2012 and September 2013, patients identified as current smokers were visited by staff providing brief smoking cessation advice. All patients who met study eligibility criteria were informed about and invited to participate in the study. Eligibility for the study included being a current tobacco cigarette smoker, English speaking, between the ages of 19 and 80, and admitted to the University of Alabama at Birmingham Hospital. Of the hospital's 43 patient care areas, participants were recruited from 27 areas. Patient care areas not included in study recruitment included maternity and palliative care units, and some intensive care and psychiatric units. Participants provided informed consent before baseline data were collected via bedside interview. The study was approved by the University of Alabama at Birmingham's Institutional Review Board.

Measures

The measures used in the current study were developed by the investigators. To assess e-cigarette awareness and use, participants were asked the following questions: "Have you ever heard of an electronic cigarette, also called an e-cigarette?" and "Have you ever used an electronic cigarette?" Response choices were "yes" or "no". Self-reported exposure to and source of e-cigarette advertisements were assessed by asking "How many advertisements about e-cigarettes have you seen, heard or read in the past six months?" and "Where did you encounter these ads?" Participants reported a numeric count of advertisements. For the source of advertisements, response choices were "yes" or "no" for seeing advertisements at stores, on the radio/TV, newspaper/magazine, internet, or other location (allowed write in); participants could choose multiple sources. Desire to quit tobacco cigarette smoking was also assessed on a 10-point scale (1: no desire to quit to 10: full desire to quit). Participants who reported e-cigarette use were asked for: their primary reason for use (help with quitting, less risky product long term, use in nonsmoking areas, or do not know), and flavor of e-cigarette (regular/nicotine, menthol, fruit/chocolate/wine, more than one kind). Information about frequency and amount of tobacco cigarette smoking was also collected. Demographic variables assessed included age, marital status (married/living with a domestic partner or single, which included never married, divorced, separated or widowed) and educational attainment (less than a high school degree, high school degree/general equivalency diploma, more than a high school degree).

Analyses

Proportions of e-cigarette awareness and use, and number and sources of advertisement exposures, were computed by month for the nine months to allow examination of trends

across time during the baseline data collection. To evaluate a potential difference in the trends of e-cigarette use between Whites and Blacks over the nine months, logistic regression analysis was performed. The model was adjusted by age, gender, marital status, education, number of tobacco cigarettes smoked per day, and desire to quit tobacco cigarette smoking, and race and recruiting month interaction. Poisson regression analysis evaluated the probability of observing a specific number of e-cigarette advertisement exposures to a given race and recruiting month interaction, age, gender, marital status, education, number of tobacco cigarettes smoked per day, and desire to quit tobacco cigarette smoking to determine if there was difference between Whites and Blacks at a given month and over months. To determine the adjusted association of number of reported e-cigarette advertisement exposures with e-cigarette use, e-cigarette use status was regressed on number of reported e-cigarette advertisement exposures with the aforementioned covariates. Fisher's exact test examined the bivariate association of race with source of advertisement exposure (stores, radio/television, newspaper/magazine, internet, or other source). Chi-square tests and t-tests were used to examine racial differences in the demographic variables, reasons for e-cigarette use, desire to quit tobacco cigarette smoking, number of tobacco cigarettes smoked per day, number of the past 30 days tobacco cigarettes were smoked, and e-cigarette flavors used.

Results

A total of 979 participants were enrolled at baseline over nine monthly cohorts. Less than 20% of those approached refusing to participate. A majority (55.5%) of participants was White while 41.9% were Black. For this study, 944 participants who provided retrospective data at baseline and identified themselves as White or Black were included in analyses. Only Blacks and Whites were included because there was an insufficient number of other ethnicities enrolled in the study to draw meaningful conclusions. Further, the racial makeup of this study is representative of the area population.

Table 1 displays descriptive characteristics of the sample by race. There were racial differences in education, with more Whites reporting post high school education. Blacks were more likely to be single, were slightly older than Whites, and also had a greater desire to quit tobacco cigarette smoking. Whites smoked tobacco cigarettes more often during the previous 30 days and smoked more tobacco cigarettes per day compared to Blacks. Participants' primary and secondary diagnoses were obtained via medical records. For data analysis, diagnoses were grouped into 17 categories. Based on these 17 categories, the top three primary diagnoses were injury/poisoning (19.8%), diseases of the circulatory system (19.1%), and diseases of the digestive system (12.0%). Accounting for primary and secondary diagnoses, over 80% of participants had a mental disorder history, 53% had diseases of the circulatory system, and 52% had endocrine, nutritional, or metabolic diseases.

Among those who reported e-cigarette use, a larger proportion of Blacks reported using e-cigarettes as a smoking cessation aid, while more Whites reported using e-cigarettes for use in non-smoking areas. When asked about preferred flavor of e-cigarettes, a higher proportion of Blacks reported using menthol flavor compared to Whites. As shown in Table

1, a vast majority of both White and Black participants reported ever hearing about an e-cigarette in their baseline report. As Figure 1 shows, more participants recruited at later months reported having heard about e-cigarettes than those recruited at earlier months, showing an overall upward trend over time.

Whites were 5.5 times more likely than Blacks to use e-cigarettes ($p<.0001$), after adjusting for age, gender, marital status, education, number of tobacco cigarettes smoked per day, and desire to quit tobacco cigarette smoking. Also, we observed a significant increasing trend in the e-cigarette use over time during the baseline data collection, with participants recruited at a later month being 13% more likely to use e-cigarettes compared to those recruited at a previous month ($p=.0046$). There was no interaction between race and recruitment month related to e-cigarette use.

As Figure 1 shows, the mean number of e-cigarette advertisement exposures reported by Whites ranged from 25 to 79 over the nine month period, whereas the mean for Blacks ranged from 8 to 45. After adjusting for age, gender, marital status, education, number of tobacco cigarettes smoked per day, and desire to quit tobacco cigarette smoking, Whites' e-cigarette advertisement exposure was 33% higher, on average, than Blacks' exposure ($p<.0001$). Overall, an increasing trend was observed for the number of e-cigarette advertisement exposures reported for the previous six months, with an average 14% increase each month of the nine-month period. There was a significant difference in the trends for the number of e-cigarette advertisement exposures reported over time between Whites and Blacks. While the trends increased over time in both groups, the increasing rate was greater for Whites compared to Blacks ($p<0.001$).

After adjusting for age, gender, marital status, education, number of tobacco cigarettes smoked per day, and desire to quit tobacco cigarette smoking, there remained a significant interaction between race and advertisement exposure in predicting e-cigarette use: The association with e-cigarette use was significantly related to advertisement exposure for Blacks ($p=.006$) but not for Whites ($p=.061$). An increase of exposure to 10 advertisements resulted in a 6% increased likelihood of using an e-cigarette.

As Figure 2 shows, there was a significant difference between Whites and Blacks for source of advertisement exposure, with radio/television and stores being the largest source of ad exposure for both groups. More Whites than Blacks reported encountering advertisements in stores (40% vs. 34%) and the internet (13% vs. 6%). More Blacks than Whites reported exposure to advertisements on the radio or television (73% vs. 67%). Exposure to newspaper or magazine advertisements did not differ between the racial groups.

There was no statistical association between desire to quit tobacco cigarette smoking and e-cigarette use for the entire group ($p=.34$), or either race (Whites: $p=.62$; Blacks: $p=.75$).

Discussion

Almost universal awareness of e-cigarettes was reported by both Black and White smokers hospitalized in an urban academic hospital in the southeastern US. The proportion of smokers reporting e-cigarette use increased over the nine months of this study, with Whites

reporting more use than Blacks. Moreover, the reported e-cigarette advertising exposures during the previous six months increased over the study period, with Whites reporting more advertising exposure than Blacks; however, only Blacks' increased exposure was associated with e-cigarette use. This study is the first to report on hospitalized smokers, who may be more likely to try e-cigarettes after experiencing health difficulties that required hospitalization, and a likelihood of having received smoking cessation advice as an inpatient.

We found much higher rates of awareness compared to studies of smokers and nonsmokers from the general population published just a few years ago [9, 15]. Our rates are similar to a recent report by Emery et al. who found almost universal e-cigarette awareness by U.S. adults [16]. In our study, both Blacks and Whites were found to have increasing rates of e-cigarette use, which confirms reports of the growing market share enjoyed by e-cigarettes. Given the reported White smokers being targeted by e-cigarette advertising, it is not surprising that Whites reported double the use of e-cigarettes compared to Blacks (63% vs. 30%, respectively). This may also reflect the greater availability in neighborhoods with higher median incomes and fewer Blacks [10]. Published studies have been inconsistent in reports of the difference in prevalence of e-cigarette use between Whites and Blacks with Popova and Ling [8] reporting similar prevalence of e-cigarette use among White and Black smokers (20.5% vs. 20.2%) and Pearson et al. reporting difference in e-cigarette use between Whites and Blacks (7.4% vs. 0.8%) [7]. The discrepancies may reflect differences in assessment time and sample used, and/or how data were collected, as e-cigarette use is a rapidly changing landscape.

We also found that exposure to e-cigarette advertisements is increasing with time. This finding is consistent with increasing availability (point of sale advertising) and television advertising of e-cigarettes. It is not surprising that Whites report greater exposure to advertising than Blacks as White males were the original target population for e-cigarette advertisements [11]. We were unable to identify previous studies of current smokers reporting exposure to and sources of e-cigarette advertisements among adults. However, our findings are similar to those of Pepper et al. [17], who asked about ways adults had "heard of" e-cigarettes. While the most frequent outlet was through another person, 31-40% had heard of e-cigarettes through television and 12-28% through the Internet. On the other hand, we found a much higher percentage overall who reported exposure to television or radio advertisements (up to 73%). This difference could be attributable to differences in samples, as our study had current tobacco cigarette smokers who may have noticed more e-cigarette advertisements due to their physical appearance often being cigarette-like.

Interestingly, although Whites demonstrated a higher level of advertisement exposure, advertisement exposure and e-cigarette use were not significantly associated among Whites. Conversely, this relationship was found among Blacks. Although not the original target audience, it appears that advertisements are impacting the uptake of e-cigarettes by Black tobacco cigarette smokers. Perhaps this reflects advertising becoming more common in communities with a higher prevalence of Blacks, or the demographic target for recent advertisements has changed. The lack of association found for Whites may reflect a saturation effect, whereas Blacks may be entering the range of effective advertisement

exposure frequency. Further, these associations are consistent with diffusion of innovation theory[18], with White users having more characteristics of “early adopters,” i.e., younger, more educated, having higher social status, having greater financial liquidity, and being more socially forward. Thus, Whites' uptake may have plateaued, while that for Blacks is still increasing, as suggested by the trend lines in Figure 1.

Whites and Blacks also encountered advertisements in different settings. More Blacks encountered advertisements on the radio or television while more Whites encountered advertisements on the internet and in stores. This may reflect differences in neighborhood shopping environment [10] or the “digital divide,” where more Whites have access to the internet than Blacks[19]. In addition, Blacks have been found to watch more television than their White counterparts which may be why more Blacks report television/radio as the source of advertisements. (Neilson ratings 2013).

These findings have several implications for public health research and practice. First, public health campaigns can assume their target audience will know what e-cigarettes are. Second, use appears to be high in both Blacks and Whites, suggesting that counter-advertising, if conducted, should target both populations. Third, exposure to advertising is increasing and may continue to impact uptake of e-cigarettes. Fourth, as Whites and Blacks reported e-cigarette advertisement exposures from different outlets, public health counter advertising campaigns can be tailored for the audience and the outlet. If e-cigarette use is found hazardous to health, these findings suggest quick action for regulations banning e-cigarette advertising as was done with cigarette advertising 40 years ago. Additional research examining e-cigarette advertising exposure and use among Blacks would provide information on whether Blacks just lag behind Whites in their trajectories or if they are on a different path.

This study has several limitations. The findings here may be limited to hospitalized Black and White tobacco cigarette smokers in the southeast U. S. and may not be generalizable to other populations. E-cigarette use in this study was defined as ever using an e-cigarette. Therefore, the results may not apply to just recent or regular e-cigarette users. The data were self-reported and therefore are subject to reporting bias. The number of advertisement exposures relies on recall and so may be an unreliable measure; however, its use is consistent with other studies of cigarette advertising [17, 20, 21]. Social desirability of smoking behaviors may have contributed to under-reporting of smoking amounts in this study. Finally, as these data are cross-sectional, the causal relations between e-cigarette advertisement exposure and e-cigarette use could not be determined.

In conclusion, findings from this study suggest that use of e-cigarettes and exposure to e-cigarette advertisements are increasing over time. Whites and Blacks are also encountering advertisements in different settings. More research is needed to evaluate the role of advertising, including racially-targeted advertisements, in the uptake of e-cigarettes. Although White males were the original target population of e-cigarette advertising, it appears that Black smokers are currently more influenced by e-cigarette advertisements. It is possible that e-cigarette marketing campaigns resemble cigarette marketing campaigns in that advertisements targeted other sub-populations as the majority population adopted use of

the product. These are questions for future study. With little regulation of e-cigarettes and advertising, more research is needed to support future regulations.

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Figure 1. E-cigarette Ad Exposure (n*) and Reported Use by Whites and Blacks

Figure 2. Sources of e-cigarette advertisements over past six months, reported by Whites and Blacks

Table 1
Study Sample Characteristics by Race

	n (%)		Bivariate
	White N=538	Black N=406	p value
Gender			
Male	306 (57)	216 (53)	.262
Female	232 (43)	190 (47)	
Relationship status ^a			
Married/domestic partner	209 (39)	83 (20)	<.0001
Single	328 (61)	323 (80)	
Education ^a			
< High school	125 (23)	86 (21)	.008
High school grad or GED	182 (34)	177 (44)	
>High school	230 (43)	143 (35)	
Type of Health Insurance			
Self Pay/None	161 (30)	111 (27)	<.0001
Medicare	120 (22)	115 (28)	
Medicaid	99 (18)	107 (26)	
VA	2 (0.37)	3 (1)	
Other Public	16 (3)	18 (5)	
Private	137 (25)	52 (13)	
Unknown	3 (1)	0 (0)	
Ever heard of e-cigarette	536 (99)	389 (96)	<.0001
Ever used an e-cigarette	341 (64)	123 (30)	<.0001
Reason for e-cigarette use ^b			
Help to quit smoking	181 (53)	76 (62)	.031
Use in nonsmoking area	104 (31)	22 (18)	
Less risky product long term	41 (12)	15 (12)	
Don't know	15 (4)	10 (8)	
What kind of flavor do you use? ^b			
Regular or tobacco	81 (61)	1 (3)	<.0001
Menthol	33 (24)	25 (71)	
Fruit, chocolate, or wine	7 (5)	5 (14)	
More than one kind	13 (10)	3 (9)	
	Mean (SD)		
Age	44.7 (13.2)	46.8 (12.4)	.010

	n (%)		Bivariate
	White N=538	Black N=406	<i>p</i> value
Desire to quit smoking	8.1 (2.5)	8.5 (2.3)	.019
# of days smoked in past 30 days	26.1 (5.9)	25.0 (7.2)	.014
# of cigarettes smoked per day	16.0 (10.1)	10.2 (8.5)	<.001

^a data missing for one case;

^b only for those reporting e-cigarette use;

SD=standard deviation;