Title
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Permalink
https://escholarship.org/uc/item/9pz9177f

Authors
Huh, Jimi
Meza, Leah
Galstyan, Ellen
et al.

Publication Date
2020-12-01

DOI
10.1016/j.abrep.2020.100299

Peer reviewed
Signs and customer behaviors at vape shops: Multivariate multilevel model analysis

Jimi Huh⁎, Leah Meza, Ellen Galstyan, Artur Galimov, Sheila Yu, Jennifer B. Unger, Lourdes Baezconde-Garbanati, Steve Sussman

Department of Preventive Medicine, Keck School of Medicine, University of Southern California, United States

ARTICLE INFO
Keywords:
Vape shop
Customer behaviors
Signage displays

ABSTRACT
Introduction: This study examined vape shop customers’ behaviors in relation to shop display practices. We hypothesized that display of signs conveying supportive attitude toward vaping at vape shops would be positively associated with customer purchasing and in-shop vaping behaviors.

Methods: We recruited vape shops throughout Southern California (N = 122). Trained teams of data collectors visited each of the consented vape shops, observed customers’ characteristics and behaviors (N = 254) and coded items in the shops that were visible and on display. We conducted a multivariate multilevel analysis to account for the data structure where customers were nested within vape shops.

Results: Male customers were more likely to purchase e-liquid at the shop than female customers (p < .001). There were no sex differences vaping at the shop (p=.353). We observed more customers vaping at shops with e-cigarette safety displays (p = .024) and more customers purchasing e-liquid at shops with quit smoking signage (p = .004). Point-of-sale displays were not associated with either customer vaping or purchasing behaviors observed at the shop. Displays of state-regulated and nonregulated (i.e., tobacco industry) age-of-sale compliance signs, Ask4ID and WeCard, were not significantly associated with customer vaping or purchase behaviors.

Conclusion: Certain display signs present at vape shops might communicate to customers that engaging in certain behaviors (e.g., vaping inside the shops) may be safe or acceptable.

1. Introduction
Vape retail shops specialize in the sale of e-cigarette devices and e-liquid. Recent studies show that vape shop customers consider the shop's physical environment characteristics (e.g., bar-like setting) and staff’s helpfulness and knowledge of e-cigarette products (Galimov et al., 2020; Kong, Unger, Baezconde-Garbanati, & Sussman, 2017; Wagener et al., 2016) as important factors when visiting a vape shop. One qualitative study has suggested that vape shop employees use specific marketing tactics to establish a shared vaper identity with the patrons (e.g., perceived belonging/likeminded-ness as vaping hobbyists) as well as providing a socializing environment and supportive advice (Ward et al., 2018). Little is known, however, whether vape shops’ indoor display practices encourage such behaviors. For instance, displays that convey vape shop owners’ or employees’ supportive attitude toward vaping may influence customers’ behaviors while they are browsing inside vape shops. These displays might include signs that promote safety of e-cigarettes or suggest vaping for cessation of combustible cigarettes (a non-evidence-based cessation method) (Kalkhoran & Glantz, 2016). Whether this attitude about the safety of e-cigarettes have direct impact on customer behavior is currently unknown.

We examined whether different signage displays are associated with customer behaviors observed within vape shops, including customers vaping inside the shop and purchasing e-liquid. While vaping in-shop vaping is often determined by state and local smoke/vape free air policies, (e.g., California imposed a statewide ban on indoor vaping as of June 2016), many vape shops are exempt from such policies (California Legislative Information). We hypothesized that display of signs conveying supportive attitudes toward vaping at vape shops would be positively associated with customer purchasing and in-shop vaping behaviors.

⁎ Corresponding author at: 2001 N Soto St, Soto Street Building I, Room 302Y, Los Angeles, CA 90032-3628, United States.
E-mail addresses: jimihuh@usc.edu (J. Huh), leahmedi@usc.edu (L. Meza), egalstya@usc.edu (E. Galstyan), galimov@usc.edu (A. Galimov), sheilayu@usc.edu (S. Yu), unger@usc.edu (J.B. Unger), baezcond@usc.edu (L. Baezconde-Garbanati), ssussma@usc.edu (S. Sussman).

https://doi.org/10.1016/j.abrep.2020.100299
Received 12 June 2020; Received in revised form 24 August 2020; Accepted 28 August 2020
Available online 04 September 2020
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2. Methods

2.1. Sample

We recruited vape shops in Southern California that specialized in the sale of e-cigarette devices and e-liquid. From the exhaustive list of eligible vape shops generated from Google Maps and Yelp, we reached out to 136 vape shops (refusal rate: 10.3%) until we reached the desired sample size (N = 122) from non-Hispanic white, Hispanic/Latino, African American, and Korean/Asian neighborhoods in the Greater Los Angeles area (Yu et al., 2018).

2.2. Data collection

Trained teams of data collectors, who were unaware of study hypotheses, visited each of the vape shops to recruit and consent them on weekdays from 10 am to 6 pm. The data collection occurred between November 2017 and December 2018. After providing verbal consent, one employee per shop completed a 35-min anonymous interview. Simultaneously, another member of the research team coded items in the shops that were visible and on display using a shop observation measure checklist (Galimov et al., 2020). Data collectors did not interfere with customer service, and the time spent inside the shop varied based on the number of customers present and shop staff available to assist customer needs. Observation data includes a checklist of print information (indoor/outdoor signage, advertisements), products offered (e-cigarettes/liquids, other items), and an assessment of the physical layout of the shop (description of shop, product selection size). A naturalistic observation of customers’ demographics (age, ethnicity) and behaviors (purchases made, vaping) was also collected and coded simultaneously during the entire duration of the data collection visit (after obtaining consent). To assess reliability, an additional data collector was used to complete reliability coding of customers’ demographics and behaviors for a random subsample (18%) of the customer observation data (Kappas = 0.80 – 0.83). Each participating employee received a $50 gift card. We observed 254 customers within 122 shops.

2.3. Measures

The outcome variables were vaping inside the shop (yes = 1/ no = 0; in-store vaping refers to any vaping that was done inside the shop, regardless of whether it was done recreationally or to sample a product. Nicotine level of the vaping could not be assessed due to the observational nature of the data) and purchasing e-liquid (yes = 1/ no = 0)—the two most common customer behaviors observed. Predictor variables were apparent customer gender (male = 1/female = 0) and 3 shop observation variables: point-of-sale shop displays (yes = 1/no = 0), displays that convey e-cigarette “safety” (yes = 1/ no = 0) and displays promoting e-cigarette as cessation methods for combustible cigarettes (yes = 1/no = 0).

2.4. Statistical analysis

We conducted Multivariate Multilevel models (MLM) (Hox, Moerbeek, & Van de Schoot, 2010) in Mplus Version 8.3 to account for the data structure—customers were nested within vape shops—and to examine the relationship between a set of variables measured at the shop-level (Between-shops; Level-2) and another set of variables measured at the customer-level (Within-shop; Level-1). The MLR estimator used for MSEM does not require assuming multivariate normality and therefore can handle binary outcome variables (Asparouhov & Muthén, 2009).

3. Results

3.1. Descriptive statistics

Table 1

| Shop-level (level-2: N = 122) | n(%) |
|-------------------------------|------|
| Point-of-sale displays        | 52(43.0) |
| E-cigarette safety displays   | 20(16.5) |
| E-cigarette as way to quit smoking displays | 16(13.2) |
| Customer-level (level-1: N = 254) | n(%) |
| Male                          | 167(65.7) |
| Seen purchasing e-liquid       | 81(31.9) |
| Seen vaping inside shop        | 23(9.1) |

3.2. Multivariate MLM

Fig. 1 follows the MSEM path diagram convention by Preacher, Zyphur, and Zhang (2010). Male customers were significantly more likely to be seen purchasing e-liquid at the shop than female customers ($\beta_{41} = 1.25, p < .001$). Males and female customers did not differ in vaping at the shop ($p = .353$). We observed more customers vaping at vape shops with e-cigarette safety displays ($\beta_{52} = 1.25, p = .024$) and more customers purchasing e-liquid at shops with quit smoking signage ($\beta_{53} = 0.963, p = .004$). The presence of point-of-sale displays ($\beta_{61}$, $\beta_{51}$) were not associated with either of the customer behaviors observed at the shop. The effects of vape shop signage did not change when Displays of nonregulated and state-regulated age-of-sale compliance signs, WeCard (tobacco industry sponsored) and Ask4ID (California Department of Public Health STAKE Act), were not significantly associated with customer vaping or purchase behaviors ($p > .31$, results not shown). Inclusion of these compliance displays did not alter the results reported in Fig. 1. The results also remained unchanged with the inclusion of the presence of designated lounge/sampling area inside the shop or signs for deals on vape products ($p > .15$, results not shown).

4. Discussion

Our findings indicate that customer behaviors might be influenced by practices incompatible with the current regulatory authority, such as display of signage that convey perceived confidence in e-cigarette safety and e-cigarette use as a tobacco cessation aid. Male customers were more likely to be seen purchasing e-liquid at the shop than female...
customers. This finding is consistent with other studies that documented female customers reporting “not feeling confident” inside vape shops, which were viewed as a generally more “masculine” space (Ward et al., 2018). However, customers’ gender was not associated with vaping inside the shop. It was notable that the customers’ behaviors inside the shop were associated with displays of safety of e-cigarettes and claims of e-cigarettes as a cessation tool, but customers’ behaviors were not found to be associated with nonregulated and state-regulated age-of-sale compliance signs (i.e., WeCard and Ask4ID).

Our findings on the vape shops displaying safety of e-cigarette were consistent with other similar studies (e.g., 16% of vape shops in North Carolina displayed some form of e-cigarette health claims (Wagoner et al., 2019). However, our sample may not be fully representative of all vape shops or vape shop patrons. Other strengths of this study include customer observation data collected at the point-of-sale context as the customer behaviors were taking place, and the customer behaviors that we report on were ones that leave less room for ambiguity (i.e., purchasing e-liquid and vaping inside shops). However, we were not able to assess whether customers were sampling nicotine-free samples (as required by federal law) or vaping nicotine that was purchased as our findings are based on naturalistic observational data.

Future research is warranted to understand the connections between shop signage and customer behavior, especially as we approach an era of heightened protective health actions due to the COVID-19 pandemic. The present study adds to the evidence that tobacco-related health signage, whether unregulated e-cigarette safety claims or anti-tobacco may influence consumer behaviors while in the shop.

5. Role of funding sources

This research was supported by a California Tobacco-Related Disease Research Program Grant (TRDRP Grant #26IR-0016). TRDRP had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

CRediT authorship contribution statement

Jimi Huh: Conceptualization, Methodology. Leah Meza: Data curation, Writing - review & editing. Ellen Galstyan: Data curation, Writing - review & editing. Artur Galimov: Data curation, Writing - review & editing. Sheila Yu: Data curation, Writing - review & editing. Jennifer B. Unger: Supervision, Writing - review & editing. Lourdes Baezconde-Garbanati: Supervision, Writing - review & editing. Steve Sussman: Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to
influence the work reported in this paper.

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