Short communication

Are excluding e-cigarettes a loophole in the smokefree public housing rule?

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1. Introduction

In 2018 the U.S. Department of Housing and Urban Development (HUD) required all Public Housing Authorities (PHAs) to prohibit the use of combustible tobacco products in all residences, common areas, and within 25 feet of building entrances (US Department of Housing and Urban Development, 2016). The rule went into effect nationwide on July 31, 2018, following an 18-month implementation period that began February 2017. The HUD rule included all combustible tobacco products; e-cigarettes were not included. This purpose of this study is to characterize e-cigarette use overall and initiation after the implementation of the smokefree rule among tobacco users living in public housing. Data were collected from 396 adult (18+) years current tobacco users at the time of rule implementation residing in the District of Columbia Housing Authority between July 2018 and November 2021. Measures include e-cigarette use, age of initiation, reasons for e-cigarette use, e-cigarette use susceptibility (among non-users), and sociodemographic characteristics. Descriptive and crosstab statistics were calculated to characterize e-cigarette use. Nearly-one-quarter of tobacco users reported lifetime use of e-cigarettes (24 %, n = 95) and 4.8 % (n = 19) indicated past 30-day e-cigarette use. Of the lifetime users, twenty-two (23.2 %) initiated their use after the smoke-free rule went into effect, with only two of those residents indicating they did so because of the rule. Of those who never used an e-cigarette, 23.5 % (n = 70) indicated being curious about e-cigarettes and 10.7 % (n = 40) said they may use e-cigarettes in the next year. Results indicate low use of e-cigarette products and low uptake due to the rule. Few tobacco users who never used e-cigarettes indicated intentions to use. Results suggest that omitting e-cigarettes from the HUD rule has not led to significant use of these products in this sample.

Results suggest that omitting e-cigarettes from the HUD rule has not led to significant use of these products in this sample. for residents who smoke (US Department of Housing and Urban Development, 2016). In response, HUD allowed local PHAs to prohibit e-cigarettes discretionarily (US Department of Housing and Urban Development, 2016).

National trends suggest that e-cigarette use may be less common among public housing residents compared to the general population given the sociodemographic makeup of public housing communities. Public housing residents in Washington, DC are more likely to be in older age groups and members of racial minority and low socioeconomic status communities have comparatively less e-cigarette knowledge, access, and use (Horn et al., 2021a,b), while e-cigarette users are more likely to be young, non-Hispanic white, higher educational level, and higher income (Wang et al., 2021; US Department of Health and Human
2. Methods

2.1. Study sample

Data were collected from 396 current tobacco users aged 18–years residing in the DCHA between July 2018 and November 2021.

2.2. Procedures

Data collection procedures followed a repeated cross-sectional, convenience sample design where individual-level surveys were administered at multiple time periods. Participants self-reported whether they currently used (past 30 day) any tobacco product at their first survey. There were three primary data collection periods: Wave 1 (July 2018 through August 2019), Wave 2 (September 2019 through February 2020), and Wave 3 (March 2020 through November 2021). Wave 1 included 511 cases with 305 (56.4 %) tobacco users and 206 (40.3 %) non-users; Wave 2 included 441 cases with 264 (59.9 %) tobacco users and 177 (40.1 %) non-users; and Wave 3 included 221 cases with 127 (57.5 %) tobacco users and 94 (42.5 %) non-users. Some participants were surveyed at multiple waves; in these participants, responses from the most recent wave in which information about e-cigarette use was provided were used for the current analysis. This procedure ensures the data set consists of one observation per resident. The analytic data set includes 172 cases from Wave 1 (43.4 %), 152 cases from Wave 2 (38.4 %), and 72 cases from Wave 3 (18.2 %). Data collection initially took place in DCHA community spaces (Waves 1 and 2) and later over the telephone due to the COVID-19 pandemic (Wave 3). Participants received a $25 gift card for their time. The George Washington University Institutional Review Board approved all study procedures.

2.3. Measures

Demographics and resident characteristics. Respondents indicated their gender, age, marital status, Hispanic/Latinx ethnicity status, and race (among American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White, and Other). Residents also reported employment status (employed/not employed) and educational attainment (indicating whether they had earned a high school diploma). Those with a General Equivalency Diploma (GED) were coded as not having a high school diploma because the health status and outcomes of those with a GED are more similar to those who have not completed high school (Zajacova, 2012). DCHA classifications were used for residents’ building type (e.g., family residences or senior/disabled residences).

E-cigarettes use. Residents indicated if they used e-cigarettes in the past 30 days, their age at initiation, the number of days within the past 30 on which they used the product, average number of times they used the product per day, and the number of days they used the product in their home. Participants’ survey date, reported age, and age at which they first used e-cigarettes were used to determine the year they initiated use.

Curiosity and intentions to use e-cigarettes. Residents who reported never using e-cigarettes were asked if they were curious about trying e-cigarettes. Residents who reported no current e-cigarette use, regardless of lifetime use, were asked if they would use an e-cigarette in the next year, and if they would use an e-cigarette soon.

Tobacco use. Residents reported whether they had used any of the following tobacco products in the past 30 days: cigarettes, cigars, little cigars and cigarillos, smokeless tobacco products, pipes, hookah, and e-cigarette or other vapor products. Those who indicated they had used a tobacco product also reported age of initiation (in years), lifetime use (yes/no), and past 30-day use, comprising how many days they used the product, average number of times they used the product each day, and the number of days they used the products in their home for each product used.

2.4. Statistical analysis

The analytic sample was restricted to current tobacco users at the time of rule implementation (July 2018) based on their survey date, age at that survey date, and age of tobacco user initiation. Descriptive statistics were calculated to characterize e-cigarette use overall among tobacco users living in public housing and to examine initiation after the smokefree rule went into effect. Crosstab analysis was conducted to assess differences in selected variables across the three data collection waves. All analyses were conducted using SPSS version 25.

3. Results

3.1. Overall sample characteristics

Most respondents identified as female (56.3 %, n = 223), African American (47.7 %, n = 189), had an average age of 55.90 (SD = 12.46), and lived in a senior or disabled building (58.6 %, n = 232; see Table 1). About one-half (50.8 %, n = 201) of participants indicated they had earned at least a high school diploma and 87.1 % (n = 345) were unemployed.

Overall, 24.0 % (n = 95) of participants had ever used an e-cigarette and 4.8 % (n = 19) endorsed e-cigarette use in the past 30 days (see Table 1). There was no significant differences among those who ever used e-cigarettes across the three waves of data collection. A significant difference was found among those who currently use e-cigarettes across the waves of data collection, with 8.7 % (n = 15/172) of residents reporting current use during Wave 1, 2.0 % (n = 3/152) of residents reporting current use during Wave 2, and 1.4 % (n = 1/72) reporting current use during Wave 3 (p < 0.01). The mean age of e-cigarette initiation is 48.0 years (SD = 13.0 years). Most ever-users reported using e-cigarettes 1–10 times in their lifetime (64.9 %, n = 61) and reported using e-cigarettes in their home within the past 30 days (78.4 %, n = 13). Twenty-two (5.6 %) current tobacco users were estimated to have initiated e-cigarette use after the smokefree rule implementation date and 0.8 % (n = 3) reported initiating e-cigarettes specifically because of the rule.

3.2. Characteristics of those who initiated E-cigarette use after the rule

Of the 22 residents who started using e-cigarettes after the smokefree rule implementation, 72.7 % (n = 16) had earned at least a high school diploma and 18.2 % (n = 4) were employed and most identified as African American (31.8 %, n = 7). The average age of this group was 52.14 years (SD = 11.69). A majority of these residents reported using e-cigarettes 1–10 times in their lifetime (63.6 %, n = 14), with an average age of e-cigarette initiation of 51.41 years (SD = 11.68). Only two (9.1 %) residents said they initiated e-cigarette use specifically because of the
Table 1
Resident characteristics and tobacco use behaviors among current tobacco users at the time of rule implementation.

| Total % (N) or M(SD) | Initiated after rule implementation % (N) or M(SD) |
|---------------------|-----------------------------------------------|
| 396                 | 22                                            |

Sociodemographic characteristics

|                 | Total % (N) |
|-----------------|-------------|
| **Sex**         |             |
| Female          | 56.3 %      |
| Male            | 43.7 %      |
| **Race/Ethnicity** |          |
| African American| 47.7 %      |
| Other           | 9.8 % (39)  |
| **Missing**     | 42.4 %      |
| **Building type** |          |
| Family          | 41.4 %      |
| Senior/Disabled | 58.6 %      |
| **Education**   |             |
| Less than high school diploma | 49.0 % (194) |
| High school diploma or more | 50.8 % (201) |
| Missing         | 0.3 % (1)   |
| **Employment**  |             |
| Employed        | 12.9 % (51) |
| Not employed    | 87.1 % (345) |

E-cigarette use

| Total % (N)         | Baseline % (N) |
|---------------------|----------------|
| **Ever e-cigarette use** | 24.0 % (95) |
| **Current e-cigarette use** | 4.8 % (19) |
| Mean age of initiation | 48.04 (13.04) |
| **Times used e-cigarettes in lifetime** |             |
| 1-10                | 64.9 % (61) |
| 11-20               | 12.8 % (12) |
| 21-50               | 12.8 % (12) |
| 51-99               | 3.2 % (3)   |
| 100 or more         | 6.4 % (6)   |
| **Days used vapor at home, past 30 days** |             |
| 0 days              | 47.4 % (9)  |
| 1-29 days           | 57.9 % (11) |
| **Every day (30 days)** | 10.5 % (2) |
| **E-cigarette use and smokefree rule implementation** |             |
| Initiated after rule | 23.2 % (22) |
| **E-cigarette use because of the smokefree housing rule** | 9.1 % (2) |

Notes:
1. Percentage calculated on 94 ever users who provided data.
2. Percentage calculated based on those who have ever used e-cigarettes.

Table 2
E-cigarette susceptibility among non-users at the time of rule implementation.

| Total % (N) | Baseline % (N) | Wave 2 % (N) | Wave 3 % (N) | p-value |
|-------------|----------------|--------------|--------------|---------|
| Curious about using an e-cigarette or vapor product² | 5.4 % (8) | 0.0 % | 0.0 % | 0.02 |
| Very curious  | (16)           |              |              |         |
| Somewhat curious | 7.4 % (8) | 4.2 % (5) | 1.8 % | (0)    |
| A little curious | 10.7 % (16) | 11.8 % (16) | 9.1 % | (1)    |
| Not at all curious | 76.6 % (88) | 77.3 % (82) | 89.1 % | (49)   |

Plans to use an e-cigarette or vapor product in the next year²

| Definitely yes | 0.7 % (2) | 0.8 % (1) | 0.8 % | 0.0 % |
| Probabilly yes | 6.3 % (17) | 13.6 % (17) | 1.7 % | (0)    |
| Probabilly no  | 16.9 % (24) | 19.2 % (24) | 21.2 % | (2)    |
| Definitely no  | 74.4 % (83) | 66.4 % (83) | 76.3 % | (51)   |

Plans to use an e-cigarette or vapor product soon²

| Definitely yes | 1.3 % (4) | 1.7 % | 0.0 % | (0)    |
| Probabilly yes | 4.7 % (14) | 9.6 % (14) | 1.7 % | (0)    |
| Probabilly no  | 16.6 % (50) | 19.2 % (50) | 20.3 % | (2)    |
| Definitely no  | 75.7 % (228) | 69.6 % (228) | 76.3 % | (51)   |

Notes:
² Question was asked to 296 residents.

3.3. Perceptions of E-cigarettes

Of the residents who never used an e-cigarette or other nicotine vapor product before, a large majority of them were “not at all curious” about trying these products (76.6 %, n = 229), with fewer than 15 % indicating they are “very” or “somewhat curious.” Additionally, 74.4 % (n = 224) of e-cigarette never-users said they would definitely not try e-cigarettes soon, and 75.7 % (n = 228) said they would definitely not use e-cigarettes or vapor products in the next year (see Table 2). Crosstabs results indicate that the number of residents who were “not at all curious” and would “definitely not” use vapor increased in later data collection waves. A significant difference was found for residents’ curiosity about e-cigarettes across the waves of data collection, with 70.4 % (n = 88) of residents reporting they were “not at all curious” during Wave 1, 77.3 % (n = 92) of residents giving that response during Wave 2, and 89.1 % (n = 49) giving that response during Wave 3 (p = 0.02).

4. Discussion

While e-cigarettes are not prohibited by the DCHA’s implementation of the HUD smokefree rule, the reported prevalence of e-cigarette use among public housing residents who used tobacco was 5.6 % after the implementation of the smoke-free policy. The frequency of e-cigarette use in the current findings are lower than comparable frequencies of nationally representative adults. Current results indicate 24.0 % (n = 95) of adult residents ever used an e-cigarette and 4.8 % (n = 19) were current e-cigarette users. Current results also suggest that the number of current users may be declining as the rule is implemented for longer. However, estimates from the Behavioral Risk Factor Surveillance System between 2017 and 2020 show that between 13.7 % and 15.5 % of adults
aged over 18 who currently smoke cigarettes currently use e-cigarettes (Boakye et al., 2022). Additionally, estimates from the National Health Interview Survey show that 49.4 % of current adult cigarette smokers ever used an e-cigarette and 9.7 % of current cigarette smokers were also current e-cigarette users (Villarroel et al., 2020).

Results also indicated that susceptibility to e-cigarette new initiation was low in tobacco users living in DCHA. Few tobacco users who never used an e-cigarette showed interest in initiating e-cigarette use, with about 70 % of residents indicating they were not curious about e-cigarettes and would definitely not use the product. Results suggest that this susceptibility is declining as the smoke-free rule is implemented for longer. This may be due to the fact that most residents were older and beyond the average age of initiation of e-cigarette use, which is estimated to be between 17 and 21 (Chen et al., 2017; Nicksic et al., 2017).

Additionally, public housing residents have lower overall income and educational attainment than the general population (Eggers, 2020; US Census Bureau, 2022), which may reduce the likelihood of e-cigarette initiation (Wang et al., 2021; US Department of Health and Human Services, 2020; Hooper and Kolar, 2017). This may also be due to low exposure to e-cigarette advertisements that has been shown to increase susceptibility for use (Nicksic et al., 2017).

Taken together, these results suggest that omitting e-cigarette use from the smoke-free rule had little effect on DC public housing residents’ e-cigarette use behavior. Results indicating few ever e-cigarette users are current users and most residents use e-cigarettes fewer than 10 times in their lives suggest residents use e-cigarette products a few times but do not adopt their use as a consistent behavior. Low interest and uptake among residents may be due to high cost and low availability of e-cigarettes (Cheng et al., 2021), and the sample primarily consisting of respondents with lower levels of knowledge, access, and use of e-cigarettes (Horn et al., 2021a,b).

Future studies should continue to monitor the uptake of e-cigarettes in this population. While current results suggest interest and use of e-cigarettes are declining in this population since the rule went into effect, external factors may influence that trend. Current evidence suggests e-cigarettes are becoming less expensive and more widely available (Cantrell et al., 2020). Additionally, the vapor product landscape continues to evolve as cannabis products, caffeine, and essential oils can now be consumed this way, which may expand use in this population. An increase in use may adversely impact the health of residents as e-cigarettes are harmful to users and may carry unique health risks despite being less harmful than combustible cigarettes (US Department of Health and Human Services, 2020; National Academies of Sciences, Engineering, and Medicine et al., 2018), and secondhand e-cigarette aerosol exposure can impact the health of other residents (Visser et al., 2019). If this is the case, the update to the rule should involve a community input to improve low levels of trust associated with implementing the rule to date (Horn et al., 2021b; Wray et al., 2021).

Results should be interpreted with respect to two primary limitations. The first is that the study examined a small sample of residents. The sample represented one housing authority with a primarily African American population, which may not generalize to other US public housing residents. Additionally, the small sample size limited comparisons by age, which is an important part of assessing e-cigarette use. The sample did not include youth under 18 years of age, and so analyses could not assess the impact of e-cigarette use among adults on youth in their households and communities. If e-cigarette use increases, future studies should assess the impact of adult use on youth uptake.

The second is that these behaviors were based on self-reported survey data and could be affected by recall or self-report biases.

In summary results indicated low use of e-cigarette products in this sample of public housing residents, and low uptake following the rule. In addition, few tobacco users who never used e-cigarettes indicated intentions to use in the next year. Results suggested that omitting e-cigarettes from the HUD rule has not led to significant use of these products and thus does not appear to be a substantial loophole during the period examined by this study.

CRediT authorship contribution statement

Craig T. Dearfield: Conceptualization, Methodology, Software, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing.
Kelvin Choi: Conceptualization, Writing – original draft, Writing – review & editing.
Anthony Vivino: Investigation, Data curation, Writing – original draft, Writing – review & editing.
Kimberly Horn: Conceptualization, Methodology, Writing – review & editing, Supervision, Project administration, Funding acquisition.
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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.

Data availability

Data will be made available on request.

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