

Letters

RESEARCH LETTER

A Longitudinal Analysis of Electronic Cigarette Use and Smoking Cessation

Although electronic cigarettes (e-cigarettes or electronic nicotine delivery systems) are aggressively promoted as smoking cessation aids,¹ studies of their effectiveness for cessation have been unconvincing.^{2,3} One randomized trial comparing



Editor's Note

6-month quit rates.² Population-based, longitudinal studies have also not shown associations between e-cigarette use and

e-cigarettes with and without nicotine with a nicotine patch found no differences in

quitting.^{4,5} A longitudinal, international study found that, although 85% of smokers who used e-cigarettes reported using them to quit, e-cigarette users did not quit more frequently than nonusers ($P = .52$).⁴ Among US quitline callers, e-cigarette users were less likely to have quit at 7 months than nonusers.⁵ We conducted a longitudinal analysis of a national sample of current US smokers to determine whether e-cigarette use predicted successful quitting or reduced cigarette consumption.

Methods | Participants were current smokers recruited from the Knowledge Networks (now GfK)⁶ probability-based web-enabled panel who completed baseline (November 2011) and

Table. Descriptive Characteristics of Participants Who Reported Current (Past 30 d) Cigarette Smoking at Baseline and Were Retained at 1-Year Follow-up

Variable	Entire Sample (N = 949)	Baseline Non-E-cigarette Users (n = 861)	Baseline E-cigarette Users (n = 88)	Test Statistic	P Value
Quit at 1-year follow-up, %	13.5	13.8	10.2	$\chi^2 = .88$, $df = 1$.35
Variable at baseline					
Female sex, %	52.4	50.8	68.2	$\chi^2 = 9.72$, $df = 1$.002
Age, %, y				$\chi^2 = 13.33$, $df = 3$.004
18-29	9.4	8.4	19.3		
30-44	20.5	21.4	12.5		
45-59	46.4	46.5	45.5		
≥60	23.7	23.8	22.7		
Education, %				$\chi^2 = 8.02$, $df = 3$.045
Less than high school	9.2	8.8	12.5		
High school	39.6	39.0	45.5		
Some college	32.6	32.4	34.1		
College and higher	18.7	19.7	8.0		
Race/ethnicity, %				$\chi^2 = 3.18$, $df = 4$.53
White, non-Hispanic	75.3	75.0	78.4		
Black, non-Hispanic	10.4	10.3	11.4		
Other, non-Hispanic	2.6	2.8	1.1		
Hispanic	8.3	8.7	4.5		
>1 race, non-Hispanic	3.3	3.1	4.5		
Days smoked in past 30, mean (SD)	26.3 (8.6)	26.3 (8.6)	26.3 (8.6)	$t = -0.04$.98
Cigarettes smoked per day, mean (SD)	14.5 (9.7)	14.4 (9.6)	16.1 (10.4)	$t = -1.57$.41
Time to first cigarette smoked, %, min				$\chi^2 = 3.97$, $df = 1$.046
<30	59.0	57.9	69.0		
≥30	41.0	42.1	31.0		
Intention to quit, %				$\chi^2 = 6.44$, $df = 3$.09
Never expect to quit	12.4	13.1	5.7		
Will quit, but not in next 6 mo	57.0	57.3	54.5		
Will quit in next 6 mo	23.8	23.0	31.8		
Will quit in next 30 d	6.8	6.7	8.0		

Abbreviation: *df*, degrees of freedom.

follow-up (November 2012) surveys. Of the 1549 participants from the 2011 survey who remained on the panel in 2012, 1189 were smokers and 81.3% completed the follow-up survey. Respondents who provided nonsensical data were excluded, yielding 949 participants. The institutional review board of the University of California, San Francisco, approved the study; all participants provided written electronic informed consent.

Baseline e-cigarette use was measured with the yes-no question, "Other than cigarettes, have you used electronic cigarettes in the past 30 days (even once)?" Cigarettes used per day (continuous variable), time to first cigarette (<30 vs ≥30 min) and intention to quit (never, not in next 6 months, within next 6 months, within next month) were measured at baseline and follow-up. Bivariate comparisons were conducted using χ^2 tests, *t* tests, and analyses of variance. Multivariate logistic regression analyses on quit status at 1-year follow-up, and multivariate linear regression analyses on cigarettes used per day at follow-up controlling for consumption at baseline were conducted. Regression analyses including demographic variables (age, sex, education, ethnicity) found that none of these variables were significant, so they were omitted from the final models.

Results | Significantly more women, younger adults, and individuals with less education used e-cigarettes (Table). At baseline, a greater proportion of e-cigarette users reported smoking their first cigarette less than 30 minutes after waking compared with nonusers (69.0% vs 57.9%; *P* = .046). Baseline e-cigarette use was not significantly associated with greater intention to quit smoking (*P* = .09).

E-cigarette use at baseline did not significantly predict quitting 1 year later (OR, 0.71 [95% CI, 0.35-1.46]; *P* = .35). A second model including intent, consumption, and dependence covariates found that intention to quit (OR, 5.59 [95% CI, 2.41-12.98]; *P* < .001) and cigarettes smoked per day (OR, 0.97 [95% CI, 0.94-0.99]; *P* = .02) significantly predicted quit status; past 30-day e-cigarette use did not (OR, 0.76 [95% CI, 0.36-1.60]; *P* = .46).

Among participants who reported smoking at both baseline and follow-up (*n* = 821), e-cigarette use at baseline was not associated with a change in cigarette consumption (*P* = .25), controlling for baseline cigarette consumption.

Discussion | Consistent with the only other longitudinal population-level study with 1-year follow-up that we are aware of,⁴ we found that e-cigarette use by smokers was not followed by greater rates of quitting or by reduction in cigarette consumption 1 year later. We lacked detailed data on e-cigarette use characteristics, such as frequency, duration, use patterns, or motivation for use. Our smoking cessation data were self-reported. Although 13.5% of the sample quit smoking, the low numbers of e-cigarette users in this sample (*n* = 88), particularly

e-cigarette users who quit smoking (*n* = 9), may have limited our statistical power to detect a significant relationship between e-cigarette use and quitting.

Nonetheless, our data add to the current evidence that e-cigarettes may not increase rates of smoking cessation. Regulations should prohibit advertising claiming or suggesting that e-cigarettes are effective smoking cessation devices until claims are supported by scientific evidence.

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