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Perceptions About the Impact of Cigarette Filters on the Environment and Smoking-Related Behaviors

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A B S T R A C T

Purpose: Examine adolescents' and young adults' (AYAs) knowledge and perceptions about the composition and environmental harms of cigarette filters and determine how perceptions are associated with support for policy interventions.
Methods: Cross-sectional, convenience sample from 10 California schools. AYAs (N = 429; 70% < 21 years) were surveyed about tobacco use, perceptions of cigarette filters, their impact on the environment, and cigarette sales bans.
Results: Most agreed that filters are harmful to the environment and not biodegradable (89%, n = 383 respectively); fewer knew filters are made of plastic (43%, n = 185). AYAs who agreed that filters are harmful to the environment were more supportive of cigarette sales bans (OR = 2.78 [95% CI: 1.18, 6.58]).
Conclusions: Knowledge of the environmental harms of cigarettes among AYAs may strengthen support for tobacco control. More research is needed to further understand the knowledge and attitudes about the environmental impact of tobacco and to clarify how this might add support for tobacco-related policies.

IMPLICATIONS AND CONTRIBUTION

Smoking is harmful to human health and the environment. Research is needed to assess adolescents' and young adults' perceptions of cigarette filters and support for environmental policies. Few knew that filters were made of plastic; youth knowledgeable about filters' harm to the environment were more supportive of cigarette sales bans.

Cigarette butts are the leading form of litter in the United States [1,2] and are problematic because most cigarette filters are (1) composed of cellulose acetate (a plastic) which is poorly degradable, and (2) designed to absorb tobacco chemicals that may leach out into soil and water [2,3].

Most adults know that filters are toxic and not biodegradable, but fewer know that cigarette filters are made of synthetic materials (i.e., plastic) [4–6]. Misinformation may impact beliefs about filtered cigarettes. Compounding the problem further is that many may incorrectly believe that filters make cigarettes safer compared to cigarettes without filters [7–9]. No study has examined perceptions of filter composition, environmental impact, and safety among adolescents and young adults (AYA).

Given that AYAs today are very concerned about the environment and are more likely than adults and AYAs in past generations to be supportive of policies that protect the environment (e.g., contacting government officials about global warming) [10–12], coupled with data showing that cigarette butts may be harmful to the environment [3,13], tobacco control strategies that address environmental harms of smoking may be most appealing to and supported by AYAs. Recent research has shown that AYAs generally support strong tobacco policies, including

Conflicts of interest: Dr. Halpern-Felsher is a paid expert scientist in some e-cigarette litigation and an unpaid scientific advisor and expert witness regarding some tobacco-related policies. The other authors do not have any conflicts of interest.

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Table 1
Overall and cross-tabulations (differences tested using the Chi-square statistic) perceptions of the impact of cigarette filters on the environment and smoking by agreement there should be a ban on sales of cigarettes

	Overall (N = 429)	Disagree[a] there should be a ban on cigarette sales[b] (n = 99)	Agree[a] there should be a ban on cigarette sales[b] (n = 318)
	n (%)		
Cigarette butts harmful to environment			
Strongly disagree	25 (5.8)	**10 (10.1)**	**15 (4.7)**
Disagree	12 (2.8)	4 (4.0)	8 (2.5)
Agree	70 (16.3)	**26 (26.3)**	**43 (13.6)**
Strongly agree	313 (73.0)	**59 (59.6)**	**251 (79.2)**
Cigarette filters are biodegradable			
Strongly disagree	177 (41.3)	32 (32.7)	143 (45.3)
Disagree	206 (48.0)	58 (59.2)	147 (46.5)
Agree	28 (6.5)	6 (6.1)	21 (6.6)
Strongly agree	7 (1.6)	2 (2.0)	5 (1.6)
Filtered cigarettes less harmful to smoke			
Strongly disagree	144 (33.6)	24 (24.2)	117 (37.0)
Disagree	161 (37.5)	42 (42.4)	118 (37.3)
Agree	100 (23.3)	28 (28.3)	72 (22.8)
Strongly agree	14 (3.3)	5 (5.1)	9 (2.8)
Cigarette filters make it easier to smoke			
Strongly disagree	70 (16.3)	12 (12.1)	56 (17.7)
Disagree	146 (34.0)	33 (33.3)	113 (35.6)
Agree	179 (41.7)	48 (48.5)	129 (40.7)
Strongly agree	25 (5.8)	6 (6.1)	19 (6.0)
Unfiltered cigarettes are less attractive to children			
Strongly disagree	97 (22.6)	20 (20.2)	74 (23.4)
Disagree	139 (32.4)	40 (40.4)	98 (31.0)
Agree	145 (33.8)	33 (33.3)	112 (35.4)
Strongly agree	38 (8.9)	6 (6.1)	32 (10.1)
Impact of unfiltered cigarettes on quitting			
Easier to quit	56 (13.1)	15 (15.5)	40 (12.6)
Harder to quit	73 (17.0)	17 (17.5)	55 (17.4)
Same	86 (20.0)	22 (22.7)	63 (19.9)
Do not know	203 (47.3)	43 (44.3)	159 (50.2)
Believe cigarette filters are made out of:			
Natural materials (cotton, cork, or paper)	217 (50.6)	52 (52.5)	163 (51.3)
Synthetic material (plastic)	185 (43.1)	42 (42.4)	141 (44.3)
Other	17 (4.0)	5 (5.1)	12 (3.8)
No response	10 (2.3)	0 (0)	2 (1.0)

Bolded values denote significant group differences for the impact of filters on environment and smoking variables of interest (rows) by an agreement that there should be a ban on sales of cigarettes (columns) per chi-square, $p < .01$.

[a] Scale was a 4-point Likert type scale, from 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. We then collapsed strongly disagree/disagree (disagree) and agree/strongly agree (agree).

[b] Cross-tabulations compared perceptions about cigarette filters by whether the participant agreed there should be a ban on the sale of cigarettes; differences were tested using the Chi-square statistic.

cigarette sales bans [14], and this support is associated with an increase in advocacy actions against tobacco use [15]. This study aimed to assess environmental and health-related knowledge and perceptions about cigarette filters among AYAs and how these might be associated with support for filtered cigarette sales bans.

Methods

Design and participants

Participants (n = 450; 66.2% female; 69.9% < 21 years old, range 16–23 years) were part of a convenience sample of AYAs participating in Wave 6 (collected from April to June 2018; 58% of the original sample) of the Tobacco Perceptions Study, a twice-yearly survey examining tobacco behaviors and perceptions. For Wave 1, July 2014–October 2015, 9th and 12th grade students from 10 large and diverse California high schools were invited to enroll. About 4,000 learned about the study and 1,299 returned consent forms; 772 completed Wave 1 [16], another 102 participants were added to the study in Wave 2, and all consented participants received the survey at each wave. Schools were representative of those in the entire state of California. Participants were surveyed every six months. The original sample is described elsewhere [16]. At baseline, all participants and their parents returned consent and assent forms except those 18 years old who completed their own consent forms. The Stanford University Institutional Review Board approved the study procedures.

Measures

Measures included participant demographics (see Supplementary Table 1), ever use of a cigarette (having smoked at least once in a lifetime), and perceptions about cigarette filters (see Table 1). Participants were asked how much they agreed on a four-point scale about whether: (1) “butts are harmful to the environment,” (2) “filters are biodegradable,” (3) “filters make cigarettes less harmful to smoke,” (4) “filters make it easier to smoke,” and (5) “unfiltered cigarettes are less likely to be

attractive to children who may be considering smoking." Participants were also asked what they believed would be the impact of switching to unfiltered cigarettes on quitting smoking and what they believed cigarette filters were made of: [(1) natural (cotton, paper, or cork), (2) synthetic (plastic), or (3) other]. Finally, participants were asked how much they agreed with the statement: "there should be a gradual ban on the sale of cigarettes."

Analysis

Cross-tabulations compared perceptions about cigarette filters by whether the participant agreed there should be a ban on the sale of cigarettes; differences were tested using the Chi-square statistic. Exploratory multivariable logistic regression was conducted to analyze the association between environmental and health-related beliefs about cigarette filters and support for a ban on cigarette sales (controlling for demographic variables). For model analyses, responses were dichotomized as disagree (strongly disagree and disagree) and agree (strongly agree and agree). The overall item nonresponse rate was less than 6% for all study variables; the final sample was n = 429.

Results

Most participants (89.3%) strongly agreed/agreed that discarded cigarette butts are harmful to the environment, and 89.3% strongly disagreed/disagreed that cigarette filters are biodegradable (Table 1). Only 43.1% correctly indicated that filters are made of plastic; 47.5% agreed that filters make cigarettes easier to smoke; 71.1% disagreed that filtered cigarettes are less harmful to smoke; 42.7% agreed that unfiltered cigarettes are less attractive to children; 20.0% reported that unfiltered cigarettes would not impact smoking cessation while 47.3% did not know. Regression analyses indicated that being female, having ever smoked a cigarette, and agreement that discarded cigarette butts are harmful to the environment were significantly related to the agreement that there should be a ban on the sale of cigarettes (Table 2).

Table 2
Binary logistic regression model for agreement there should be a ban on the sale of cigarettes, n = 347

	Ban on the sale of cigarettes
	OR (95% CI)
Age	
< 21 years old (reference)	1.00
≥ 21 years old	.69 (.38, 1.24)
Sex	
Male (reference)	1.00
Female	**1.95 (1.10, 3.48)**
Race	
White (reference)	1.00
Asian	.70 (.36, 1.39)
Other	.86 (.42, 1.79)
Ethnicity	
Not Hispanic or Latino (reference)	1.00
Hispanic or Latino	1.08 (.60, 1.95)
Highest level of parent education	
4-year degree or higher (reference)	1.00
Some college/2-year degree	1.01 (.49, 2.06)
High school or less	1.08 (.54, 2.18)
Has ever smoked a cigarette	
No (reference)	1.00
Yes	**.32 (.17, .60)**
Cigarette butts harmful to environment[a]	
Disagree (reference)	1.00
Agree	**2.78 (1.18, 6.58)**
Cigarette filters biodegradable[a]	
Disagree (reference)	1.00
Agree	1.51 (.52, 4.35)
Filtered cigarettes less harmful to smoke[a]	
Disagree (reference)	1.00
Agree	.68 (.36, 1.31)
Cigarette filters make it easier to smoke[a]	
Disagree (reference)	1.00
Agree	.68 (.37, 1.24)
Unfiltered cigarettes less attractive to children[a]	
Disagree (reference)	1.00
Agree	1.69 (.93, 3.08)
Impact of unfiltered cigarettes on quitting	
Easier to quit (reference)	1.00
Harder to quit	1.02 (.61, 1.68)
Same	.99 (.61, 1.59)
Do not know	1.01 (.67, 1.52)
Believe cigarette filters are made out of	
Natural materials [cotton, cork or paper] (references)	1.00
Synthetic material (plastic)	.87 (.50, 1.50)
Other material	1.50 (.52, 4.35)

CI = Confidence interval; OR = odds ratio. Bolded values are significant at $p < .05$, controlling for all other variables in the table.

[a] Scale was a 4-point Likert type scale, from 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. We then collapsed strongly disagree/disagree (1) and agree/strongly agree (2).

Discussion

We found that most AYAs agree that cigarette filters are harmful to the environment and not biodegradable, which corresponds with findings among adults [5]. Nevertheless, just over half of the AYAs believed that filters are composed of natural materials, and fewer knew that filters are made of plastic. This was again consistent with findings among adults [6]. We did not find an association between health perceptions and perceptions about environmental impacts (e.g., whether cigarette filters are biodegradable) and support for cigarette sales bans. However, we did find that general perceptions of filters' harm to the environment were associated with AYA's support for cigarette sales bans. These findings suggest that while some AYAs may know that cigarette filters are harmful to the environment, most do not know the specific environmental impacts of discarded filters. Increased youth education about these specific impacts and about other tobacco product environmental impacts are needed [17].

Limitations of this study include: data were from a school-based convenience sample; conducted only in California, a state with one of the lowest cigarette use rates; and with comparisons made for "ever smoked" and "never smokers" only. The participant recruitment rate for baseline enrollment was also low (less than 20%). Findings may differ for other AYAs, especially those not currently in school, in other areas where smoking rates and perceptions about tobacco differ, and for those who are current smokers. For the majority of items, participants were asked to select one of the responses provided; only one item had an "I do not know" response option. This may impact how participants responded. Data for the current study were cross-

sectional, and no causal relationships can be assumed in these analyses.

With an estimated 140 billion filters disposed of improperly each year [1,18], stronger tobacco policies like banning sales of cigarettes with filters may decrease the environmental harms of cigarette butt waste. Accountability of the tobacco industry for the true costs of tobacco use (including the economic cost of tobacco litter abatement) is also needed [19]. There may be some benefit to public campaigns, especially among AYA, aimed at increasing knowledge about the environmental impacts of tobacco waste, which may further help mobilize new partnerships and novel regulatory approaches. Future research should examine whether education about the true environmental impacts of cigarette filters can increase AYA support of and civic engagement in advocating for policies banning the sales of cigarettes with filters.

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Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2020.10.022.

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