





# Assessing cigarette packaging and labelling policy effects on early adolescents: results from a discrete choice experiment

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## ABSTRACT

**Introduction** Cigarette packaging is a primary channel for tobacco advertising, particularly in countries where traditional channels are restricted. The current study evaluated the independent and interactive effects of cigarette packaging and health warning label (HWL) characteristics on perceived appeal of cigarette brands for early adolescents in Mexico.

**Methods** A discrete choice experiment (DCE) was conducted with early adolescents, aged 12–14 years (n=4251). The DCE involved a 3×2<sup>5</sup> design with six attributes: brand (Marlboro, Pall Mall, Camel), tobacco flavour (regular, menthol), flavour capsule (none, 1 or 2 capsules), presence of descriptive terms, branding (vs plain packaging), HWL size (30%, 75%) and HWL content (emphysema vs mouth cancer). Participants viewed eight sets of three cigarette packs and selected a pack in each set that: (1) is most/least attractive, (2) they are most/least interested in trying or (3) is most/least harmful, with a no difference option.

**Results** Participants perceived packs as less attractive, less interesting to try and more harmful if they had plain packaging or had larger HWLs, with the effect being most pronounced when plain packaging is combined with larger HWLs. For attractiveness, plain packaging had the biggest influence on choice (43%), followed by HWL size (19%). Interest in trying was most influenced by brand name (34%), followed by plain packaging (29%). Perceived harm was most influenced by brand name (30%), followed by HWL size (29%).

**Conclusion** Increasing the size of HWLs and implementing plain packaging appear to reduce the appeal of cigarettes to early adolescents. Countries should adopt these policies to minimise the impact of tobacco marketing.

## INTRODUCTION

Cigarette packaging is a primary channel for tobacco advertising, especially when advertising has been restricted, banned or self-regulated by the industry.<sup>1–3</sup> Following guidelines from the World Health Organization's Framework Convention on Tobacco Control (FCTC), more than 100 countries have adopted prominent health warning labels (HWLs) on cigarette packaging to communicate the harms of smoking using pictorial imagery.<sup>4,5</sup> As these countries aim to optimise their tobacco control policies, it is critical to estimate the potential effects

of increasing the size of pictorial HWLs, while also considering the effects of other cigarette packaging characteristics that may make smoking appeal, or not, to youth. The current study used a discrete choice experiment (DCE) to evaluate the effects of cigarette packaging and HWL characteristics on the appeal of smoking for early adolescents. DCEs are increasingly used in tobacco research,<sup>6</sup> as they allow for assessment of the independent and potentially interactive effects of policy configurations before their implementation.

## HWL characteristics

Pictorial HWLs are more effective than text-only HWLs<sup>7,8</sup>; however, the impact of increasing the size of pictorial HWLs is less well studied. Increasing HWL size is a potentially powerful policy that may not only enhance the effectiveness of HWLs by increasing their salience, but also minimise the effectiveness of package branding elements due to the diminished space for pro-tobacco messages. Pre/post observational studies to evaluate implementation of larger HWLs with novel content, including pictorial imagery, have found evidence of greater attention to HWLs,<sup>9–13</sup> negative perceptions of cigarette packs,<sup>14</sup> stronger beliefs about smoking-related harms<sup>9,13,15–18</sup> and lower smoking rates.<sup>17</sup> The few experimental studies of youth that have systematically manipulated pictorial HWL size have found conflicting evidence of the effects of larger pictorial HWLs on risk perceptions,<sup>19–21</sup> with positive effect on attention,<sup>22</sup> no effect found for attention and willingness to try cigarettes.<sup>19–21</sup> Other studies have found that adult smokers perceive larger HWLs as more effective<sup>23</sup> and report less positive perceptions of packaging.<sup>24</sup> Research is needed on the effects of increasing HWL size in populations that are sensitised already to pictorial HWLs. Indeed, FCTC implementation guidelines<sup>25</sup> recommend adopting HWLs that 'cover more than 50% of the principal display areas and aim to cover as much of the principal display areas as possible.'

## Tobacco flavours

Flavours in tobacco product design and marketing promotes the appeal of cigarettes, with menthol as the leading flavour.<sup>26,27</sup> The prevalence of flavoured cigarette use among youth is relatively higher than among adults.<sup>28–31</sup> Many young smokers



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initiate with menthol cigarettes,<sup>32 33</sup> which may be particularly important in early stages of tobacco use because the menthol reduces the harshness of cigarette smoke.<sup>32</sup> Perhaps because of this anaesthetic property, menthol also promotes misperceptions of reduced harm compared with non-flavoured, 'regular' cigarettes,<sup>26 27 34–36</sup> although these perceptions are not consistently found, with more recent studies finding that smokers misperceive menthol cigarettes as more harmful.<sup>37–41</sup>

A rapidly growing market segment, particularly in Latin America,<sup>42 43</sup> involves cigarettes with flavour capsules in the filter that consumers can crush at any time to release a liquid that flavours the smoke. Introduced in 2008, by 2017 flavour capsule varieties represented 36% of the cigarette market share in Chile, 34% in Peru, 32% in Guatemala and 22% in Mexico. Preference for flavour capsule cigarette varieties is most prevalent among young adults (Australia, Mexico, USA, UK),<sup>34 44–46</sup> adolescents (Mexico)<sup>47</sup> and non-smoking young adults (New Zealand).<sup>47 48</sup> Flavour capsule varieties are sold in both regular and menthol cigarettes,<sup>49</sup> with some varieties including two differently flavoured capsules in the same filter.<sup>42 43 50</sup> No research has systematically assessed the independent and potentially interactive effects of flavoured tobacco and flavour capsules, which may be particularly important for informing flavour ban policies.

### Packaging characteristics

Packaging size, shape, graphic design and use of descriptive terms can all influence consumer perceptions of a particular cigarette product,<sup>2 3 19 51–54</sup> and they may increase the appeal of smoking for youth and vulnerable groups.<sup>55–59</sup> To reduce the effectiveness of packaging as a promotional vehicle, a number of countries have introduced 'plain' packaging that bans the use of colours and symbols, while standardising the font type and size across all products. This policy was supported by evidence that youth perceive plain packages as less appealing than branded packs, have more negative expectations of cigarette taste and are less likely to have false beliefs about some brands being less harmful than others.<sup>60–63</sup> However, one study of Mexican adolescents found that harm perceptions did not differ between branded and plain cigarette packs.<sup>64</sup> Observational studies conducted after implementation of plain packaging policies indicate that it makes smoking less appealing for adolescents,<sup>14 65</sup> thereby decreasing smoking initiation.<sup>17</sup>

### Study context

Since 2010, HWLs in Mexico have included a pictorial imagery and text that cover 30% of the front of the pack and a text-only warning message on 100% of the back and 100% of one side panel.<sup>66 67</sup> Other FCTC policies have also been implemented since 2009, including smoke-free policies, tax increases and advertising restrictions (except at point of sale and print media for adults), which make packaging an important vehicle for marketing. Despite implementation of key FCTC policies, recent evidence suggests that adult smoking prevalence has not changed (16.5% in 2009 to 19% in 2016; 25.8% to 29.4% among males; 8.2% to 9.3% among females), although smoking frequency has declined.<sup>68</sup> The introduction and rapid growth of the flavour capsule market in Mexico (22% of sales in 2017, fourth highest market share in the world)<sup>42</sup> may help explain the weak effects of FCTC policies. Indeed, flavour capsule varieties are a much larger segment of the Mexican cigarette market<sup>43</sup> than traditional menthol cigarettes, which comprise only around 0.5% of the market.<sup>69</sup> Finally, although Mexico has banned the importation, distribution and sales of e-cigarettes, the prevalence of early

adolescent e-cigarette use is higher than in the USA (ie, 12% of urban middle schoolers in 2017<sup>70</sup>; 3.3% of middle schoolers in the USA in 2017<sup>71</sup>), although use in the USA has increased substantially in recent years (ie, 10.5% of middle schoolers in the USA in 2019).<sup>72</sup> E-cigarette flavours that appeal to youth are similar to those found in cigarette capsules in Mexico (eg, berry, mint, cucumber, mango).<sup>73</sup> The current study aimed to evaluate the potential effects of changes to cigarette packaging and labeling policies among early adolescents in this context.

## METHODS

### Study population

Data were collected from students in the final grade of middle school (approximately 12–14 years old) in the three largest cities in Mexico (ie, Mexico City, Guadalajara and Monterrey) between October and November 2016. Sixty schools were originally selected for a longitudinal study using a stratified-random sampling scheme that considered: (1) neighbourhood socioeconomic status, based on schools' location, and (2) city-specific tertiles of retail establishment density, which were estimated using an official database of commercial establishments likely to sell tobacco within school census tracts. A detailed description of the original school selection process can be found elsewhere.<sup>74</sup>




Students provided active consent to participate in the study with parents providing passive consent. The paper and pencil questionnaire was self-administered in Spanish, using questions based on prior, validated surveys and pretested using cognitive interviews to ensure student comprehension. The DCE was included in the surveys for a random selection of 30 schools (n=4325 students). Due to missing data on covariates, 74 (1.7%) observations were eliminated. Study protocols were approved by the Institutional Review Board at the National Institute of Public Health in Mexico.

### Experimental protocol

DCEs use fractional factorial designs to create sets of alternatives from which participants choose. A strength of DCEs is the ability to simultaneously assess the effects of specific stimulus characteristics on decision-making independent of other characteristics that are manipulated, while also providing an indication of the relative impact of each characteristic on choices.<sup>75</sup> As such, DCEs provide experimental control needed to evaluate the independent effects of specific potential policy characteristics that pre/post observational studies of packaging and labeling policy effects have not been able to assess because they are implemented together.

The DCE for this study used a  $3 \times 2^5$  within-subjects, alternative-specific, fractional factorial design,<sup>76</sup> in which the following characteristics were systematically manipulated: cigarette brand (Camel vs Marlboro vs Pall Mall); tobacco flavour (regular vs menthol); flavour capsules (0 vs 1 vs 2 capsules per cigarette); presence or absence of descriptive terms (ie, fine tobacco, aged tobacco, mild smell, flow filter) or symbols (eg, 'on' button for flavour capsules); fully branded (ie, colour and brand logos) or 'Plain' (ie, standard grey colour and font, without brand imagery); HWL size (30% vs 75%); and HWL content (emphysema vs mouth cancer). We selected brands that are both popular in Mexico (ie, control 70% of the market)<sup>69</sup> and that included flavour capsule varieties.<sup>34 77</sup> Descriptive terms were based on existing packaging in Mexico and were specific to brand varieties (eg, flavour capsule symbol differed by brand) and therefore not completely orthogonal to other attributes. The most efficient experimental DCE design involved 48 distinct choice sets, each of which included three

Para cada pregunta, marca UNA SOLA OPCIÓN en cada columna

Cajetillas y marcas para considerar:	Si fueras a fumar...					
	¿Cuál cajetilla es la MÁS atractiva?	¿Cuál cajetilla es la MENOS atractiva?	¿Cuál de estas marcas te gustaría fumar MÁS?	¿Cuál de estas marcas te gustaría fumar MENOS?	¿Cuál de estas marcas haría MÁS daño a tu salud?	¿Cuál de estas marcas haría MENOS daño a tu salud?
 <p>FUMAR CAUSA CÁNCER DE BOCA</p> <p>Camel Fresh Regular Activa</p>	A	A	A	A	A	A
 <p>FUMAR CAUSA CÁNCER DE BOCA</p> <p>Marlboro mentol con cápsula</p>	B	B	B	B	B	B
 <p>FUMAR CAUSA ENFISEMA</p> <p>PULMÓN SANO PULMÓN CON ENFISEMA</p> <p>PALL MALL / XL MENTOL FRESH</p>	C	C	C	C	C	C
2-17	D Ninguna es atractiva	D Ninguna es atractiva	D No te gustaría fumar ninguna	D No te gustaría fumar ninguna	D Todas las marcas te harían el mismo daño	D Las marcas te harían el mismo daño

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Figure 1 Example of a choice set.

contrasting packages, one from each of the three brand families studied (eg, figure 1). To reduce respondent burden, each participant was randomised to evaluate one of six blocks that included eight choice sets, each of which was printed on a separate sheet of paper. Systematic randomisation was used for the order of choice sets within blocks.

## Measures

### Outcomes

For each choice set of three packs, participants were asked to indicate: (1) 'Which pack is MOST attractive?' and 'Which pack is LEAST attractive;'; (2) 'If you were to smoke, which of these brands would you MOST like to smoke' and 'which would you LEAST like to smoke?'; and (3) 'If you were to smoke, which of these brands will harm your health the MOST?' and 'which would harm your health the LEAST' (see figure 1). For each question, participants had the option to indicate no difference between packs (eg, 'none are attractive;'; 'I would not like to

smoke any of them;'; 'all are equally harmful'). Participants could view each choice set for as long as they wished. The choices selected were used to construct paired comparisons for all combinations within a set (ie, pack 1 vs pack 2; pack 2 vs pack 3; pack 1 vs pack 3). Comparisons were coded as 1 if the pack was chosen as having more of the characteristic and 0 if less of the characteristic. If choices did not indicate any difference (ie, the 'no difference option' was selected), both packs within a pair were assigned a value of 0.

### Participant characteristics

Self-reported participant characteristics included sex (male/female); number of friends who smoked (none, 1, 2, 3 or more); whether any family members who lived with them smoked (yes/no); and their own smoking status (never smoker, non-susceptible; never smoker, susceptible; tried smoking but not current; current smoker). Ever smoking was assessed with a

standard question, as was smoking susceptibility (eg, ‘Do you think that you will smoke sometime in the next 12 months?’), which predicts subsequent smoking, including among Mexican youth.<sup>78–80</sup> Current smokers were those who reported smoking at least once during the prior 30 days.<sup>81</sup>

### Statistical analysis

Using  $\chi^2$  tests, we compared the characteristics of participants who indicated no difference between packs in all choice sets they evaluated for each outcome (ie, attractiveness, interest in trying, harm) with those who selected at least one pack as being different from the others for that outcome (see online supplementary appendix A, table 1A). Also, omnibus  $\chi^2$  tests were performed to test for differences in participant characteristics across the blocks of stimuli to which they were randomised. No significant differences were found (results not shown), indicating that randomisation worked and, therefore, we did not include participant characteristics as covariates.

We used conditional logistic regression, controlling for repeated measures, when estimating each outcome.<sup>76</sup> Dependent variables reflected the choice of a pack as being more attractive, generating more interest in trying it, or being more harmful. Independent variables included pack characteristics (brand variety, tobacco flavour, flavour capsule, descriptive terms/symbols, branding, HWL size and HWL content), with indicator coding used so that the reference group was current policy (ie, small HWLs; branded packaging; descriptive terms) or the dominant cigarette brand characteristics (ie, Marlboro; regular flavour; no capsules). Models also controlled for block assignment. Since brand variety was specific to each alternative and did not change over choice sets, an alternative-specific constant was incorporated for adjustment.<sup>75</sup> For these main effects models, the relative impact of each pack characteristic on choice was calculated as the difference between each characteristic’s highest and lowest estimated effect on choice, divided by the sum of all differences for a given outcome. We also tested for interactions between plain packaging and other characteristics (flavour capsules, flavours, descriptive terms/symbols and HWL size) as well as between HWL size and other characteristics (flavour capsules, flavours and descriptive terms/symbols), in order to determine the potential of these policies to dampen package-based marketing as well as to work in synergy with each other. Interactions between tobacco flavour and flavour capsules were also assessed. Each interaction was assessed by estimating a separate model that included a single block of indicators that represented the interaction of interest, as well as the main effects for other attributes in the DCE. All models were re-estimated using only data from students who indicated a difference between choices in at least one choice set (see online supplementary appendix A, tables 2 and 3). Results were consistent with the full sample in terms of their direction, strength and statistical significance. As this approach would not have changed our interpretation, we provide no further comment on them. All analyses were conducted using the choice modelling package in Stata V.16.

## RESULTS

### Sample characteristics and analytic samples

The characteristics of participating students are shown in table 1, with comparisons between those who ‘opted out’ and those who indicated preferences for at least one cigarette package presented in online supplementary appendix A, table 1A. Half the sample was male (49%), and most had never smoked and were considered not susceptible to smoke (62%). Half had at least one friend

**Table 1** Characteristics of student participants

Characteristics	Total n=4251
Sex	
Male	49%
Female	51%
Number of five best friends who smoke	
None	48%
1	19%
2	13%
3+	20%
Family member smokes	
No	37%
Yes	63%
Smoking status	
Never smoker, non-susceptible	62%
Never smoker, susceptible	13%
Tried smoking, not current	19%
Current smoker	7%

who smoked (52%), and 63% had at least one family member who smoked.

### Main effects of pack characteristics

Table 2 shows that students perceived packs as less attractive, less interesting to try and more harmful if they had larger HWLs compared with the current smaller HWL ( $b=-0.747, -0.377, 0.260$ , respectively). The presence of flavour capsules and menthol-flavoured tobacco increased attractiveness and interest in trying, though perceptions of lower harm were found only for packs that included one flavour capsule. Packs with plain packaging and no descriptive terms were associated with lower attractiveness ( $b=-1.695, -0.228$ , respectively) and lower interest in trying ( $b=-0.869, -0.191$ , respectively), though no association was found with harm. Brand name and HWL content also influenced choices (see table 2).

### Relative importance of attributes

Figure 2 shows the relative importance of different packaging and HWL characteristics. For pack attractiveness, plain packaging had the biggest (43%) influence, followed by HWL size (19%), HWL content (11%) and brand name (10%). In models for students’ interest in trying cigarettes, brand name had the biggest effect (34%), followed by plain packaging (29%) and HWL size (13%). When evaluating perceptions of the relative harm of different cigarettes, brand name and HWL size had the largest effects (30% and 29%, respectively), although HWL content (17%) and flavour capsules (15%) also had meaningful impacts.

### Interactions between pack characteristics

Plain packaging significantly interacted with tobacco flavour, flavour capsules and descriptive terms/symbols (see table 3): when packs were branded normally (ie, normal brand colours and logos) these attributes had stronger, positive effects on attractiveness and interest in trying. Statistically significant interactions with HWL size indicated that large HWLs on plain packs were most effective than small HWLs in reducing attractiveness, interest in trying and misperceptions of lower harm. The larger HWL size also reduced the effects of tobacco flavour, flavour capsules and descriptive terms on choices for all outcomes



**Table 2** Main effects of cigarette pack and HWL characteristics on perceived attractiveness, interest in trying and relative harm for different cigarettes

	Attractive (n=4245)	Interested in trying (n=4251)	Relative harm (n=4234)
	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
<b>Brand variety</b>			
Marlboro	Reference	Reference	Reference
Camel	-0.379 (0.029)***	-1.030 (0.047)***	-0.104 (0.064)
Pall Mall	0.013 (0.026)	-0.029 (0.050)	-0.265 (0.063)***
<b>Flavour capsules</b>			
None	Reference	Reference	Reference
One capsule	0.226 (0.022)***	0.172 (0.028)***	-0.131 (0.043)**
Two capsules	0.329 (0.024)***	0.230 (0.033)***	-0.037 (0.049)
<b>Tobacco flavour</b>			
Regular	Reference	Reference	Reference
Menthol	0.169 (0.018)***	0.143 (0.023)***	0.030 (0.034)
<b>Descriptive terms/symbols</b>			
Present	Reference	Reference	Reference
Not present	-0.228 (0.020)***	-0.191 (0.025)***	-0.009 (0.039)
<b>Branding</b>			
Normal	Reference	Reference	Reference
Plain/generic	-1.695 (0.032)***	-0.869 (0.034)***	0.039 (0.040)
<b>HWL size</b>			
30%	Reference	Reference	Reference
75%	-0.747 (0.025)***	-0.377 (0.027)***	0.260 (0.035)***
<b>HWL content</b>			
Mouth cancer	Reference	Reference	Reference
Emphysema	0.424 (0.025)***	0.156 (0.027)***	0.151 (0.044)**

This model includes the main effects shown, block and an alternative specific constant with no interactions.

\* $p < .05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

HWL, health warning label.

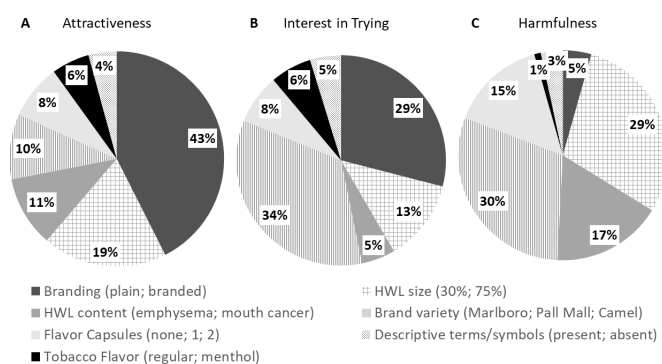
relative to their impact on choice for the packs with smaller HWLs (ie, coefficients were more similar when HWLs were larger than when they were smaller). Finally, a statistically significant interaction between tobacco flavour and flavour capsules indicated that menthol tobacco was relatively unappealing and perceived as more harmful when in cigarettes without flavour capsules; however, menthol enhanced perceived attractiveness and interest in trying cigarettes with flavour capsules.

## DISCUSSION

This study supports WHO's FCTC policy initiatives to increase HWL size beyond 50% of the pack and adopt plain packaging to reduce the appeal and misperceptions of risk among early

adolescents.<sup>82 83</sup> We found that students perceived packs as less attractive and they were less interested in trying them if packs had plain packaging and large HWLs (ie, covering 75% vs 30% of the pack front). Increasing HWL size appeared more effective than plain packaging for promoting perceptions of harm. These results are consistent with other experimental and observational research on the effectiveness of each policy,<sup>13 14 17–23 61–65 84</sup> though they also provide evidence that the combination of both policies will have the greatest impact among early adolescents. In previous studies, increasing the size of HWLs on branded packs influenced pack ratings among youth<sup>60</sup> but not among adult smokers,<sup>24</sup> which may suggest that the size is more influential for adolescents than adults. Overall, our results suggest that either of these policies will reduce the impact of other promotional characteristics of packaging, including flavours, flavour capsules and the use of other descriptive terms. Hence, plain packaging and larger HWLs likely reduce the effectiveness of the pack-based marketing strategies that industry employs to generate misperceptions of harm and to appeal to youth.<sup>85 86</sup>

The appeal of package-based marketing appears to be broad, even in a sample of early adolescents like ours (12–14 years old). About three quarters (78%) of the students indicated that at least one of the packs they evaluated was more attractive than the others. More than half indicated that they were interested in trying at least one cigarette type (52%)—an independent predictor of smoking uptake among never smoking youth<sup>87</sup>—or that they perceived a difference in harm between the cigarettes they evaluated (54%). As expected, smokers were more likely than non-smokers to perceive meaningful differences between



**Figure 2** Relative importance of cigarette pack characteristics in selecting choices. HWL, health warning label.

**Table 3** Interactions between cigarette packaging and labelling characteristics on outcomes

	Attractive (n=4245)	Interested in trying (n=4251)	Relative harm (n=4234)
	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
<b>Branding × flavour capsules</b>			
Normal			
None	Reference	Reference	Reference
One capsule	0.351 (0.026)***	0.269 (0.037)***	-0.216 (0.062)***
Two capsules	0.455 (0.027)***	0.370 (0.037)***	-0.109 (0.065)
Plain/generic			
None	-1.397 (0.040)***	-0.638 (0.047)***	-0.070 (0.060)
One capsule	-1.491 (0.042)***	-0.647 (0.045)***	-0.104 (0.063)
Two capsules	-1.342 (0.043)***	-0.634 (0.053)***	-0.032 (0.068)
Overall p value	<0.001	<0.001	0.0106
<b>Branding × tobacco flavour</b>			
Normal			
Regular	Reference	Reference	Reference
Menthol	0.233 (0.021)***	0.193 (0.029)***	0.064 (0.050)
Plain/generic			
Regular	-1.592 (0.037)***	-0.803 (0.045)***	0.072 (0.052)
Menthol	-1.558 (0.037)***	-0.738 (0.040)***	0.070 (0.052)
Overall p value	<0.001	<0.001	0.442
<b>Branding × descriptive terms/symbols</b>			
Normal			
Present	Reference	Reference	Reference
Not present	-0.245 (0.023)***	-0.201 (0.033)***	0.058 (0.054)
Plain/generic			
Present	-1.722 (0.037)***	-0.881 (0.042)***	0.107 (0.055)
Not present	-1.911 (0.039)***	-1.057 (0.043)***	0.030 (0.058)
Overall p value	<0.001	<0.001	0.200
<b>Branding × HWL size</b>			
Normal			
30%	Reference	Reference	Reference
75%	-1.057 (0.027)***	-0.569 (0.030)***	0.265 (0.050)***
Plain/generic			
30%	-2.163 (0.038)***	-1.119 (0.043)***	0.044 (0.060)
75%	-2.192 (0.042)***	-1.161 (0.047)***	0.300 (0.056)***
Overall p value	<0.001	<0.001	<0.001
<b>HWL size × flavour capsules</b>			
30%			
None	Reference	Reference	Reference
One capsule	0.436 (0.028)***	0.261 (0.039)***	-0.192 (0.059)***
Two capsules	0.430 (0.030)***	0.303 (0.040)***	-0.118 (0.069)
75%			
None	-0.492 (0.038)***	-0.249 (0.044)***	0.170 (0.055)**
One capsule	-0.551 (0.037)***	-0.188 (0.043)***	0.093 (0.057)
Two capsules	-0.294 (0.038)***	-0.110 (0.051)*	0.203 (0.064)***
Overall p value	<0.001	<0.001	<0.001
<b>HWL size × tobacco flavour</b>			
30%			
Regular	Reference	Reference	Reference
Menthol	0.190 (0.024)***	0.144 (0.032)***	0.030 (0.050)
75%			
Regular	-0.722 (0.034)***	-0.375 (0.043)***	0.260 (0.053)***
Menthol	-0.579 (0.031)***	-0.235 (0.035)***	0.291 (0.050)***
Overall p value	<0.001	<0.001	<0.001
<b>HWL size × descriptive term/symbol</b>			
30%			
Present	Reference	Reference	Reference

Continued

Table 3 Continued

	Attractive (n=4245)	Interested in trying (n=4251)	Relative harm (n=4234)
	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Not present	-0.325 (0.024)***	-0.261 (0.030)***	-0.033 (0.055)
75%			
Present	-0.859 (0.031)***	-0.452 (0.035)***	0.237 (0.050)***
Not present	-0.944 (0.032)***	-0.553 (0.037)***	0.251 (0.052)***
Overall p value	<0.001	<0.001	<0.001
<b>Flavour capsules × tobacco flavour</b>			
None			
Regular	Reference	Reference	Reference
Menthol	-0.141 (0.036)***	-0.003 (0.046)	0.007 (0.060)
One capsule			
Regular	-0.065 (0.032)*	0.010 (0.041)	-0.144 (0.061)*
Menthol	0.341 (0.032)***	0.307 (0.045)***	-0.111 (0.064)
Two capsules			
Regular	0.159 (0.034)***	0.166 (0.043)***	-0.060 (0.064)
Menthol	0.327 (0.034)***	0.271 (0.043)***	-0.007 (0.062)
Overall p value	<0.001	<0.001	0.043

Interactions was assessed one block at a time in separate models and all models included main effects for other attributes (results not shown), the block of interaction terms and an alternative specific constant (not shown).

\*p < .05; \*\*p<0.01; \*\*\*p<0.001.

HWL, health warning label.

cigarette products; however, the sample was mostly comprised of never smokers. The results indicate that plain packaging and large HWLs may be particularly important for reducing the appeal of package-based marketing for non-smoking youth.

Cigarettes that contained flavour capsules, which have been marketed in Mexico since 2011,<sup>34</sup> increased appeal across the outcomes evaluated, consistent with other studies.<sup>46–48 88</sup> We found that these effects are independent of menthol tobacco and provide evidence that early adolescents perceive two capsules as more appealing than one. As the market share for flavour capsules has grown, the industry has increasingly introduced a great range of flavours beyond menthol (eg, berry, citrus, cucumber, mango), including varieties with two differently flavoured capsules,<sup>43</sup> packs with sticks that have up to five different capsule flavours<sup>43</sup> and the application of this product innovation to heated tobacco products.<sup>89</sup> In Mexico, the rapid uptake of this innovation is a possible explanation for why FCTC-recommended policies have not been as effective as expected.<sup>68</sup> Unlike in other countries, Mexican smokers' preferences for flavour capsules is less skewed towards younger populations.<sup>34</sup> Hence, flavour bans that target this innovation may be important for youth and adults alike. Future research may consider why this cigarette innovation appears particularly appealing in Latin America and, in the US, among Latinos and in Texas.<sup>45 90</sup>

We found that menthol cigarettes increased the attractiveness of packs and interest in trying cigarettes but did not influence perceived harm. The null effect on harm perceptions is consistent with some previous studies,<sup>37 38 40 41</sup> although it is counter to other studies reporting that menthol cigarettes were historically perceived and promoted as less harmful than non-menthol cigarettes.<sup>26 27 35 36 91–93</sup> Also, we found that the positive effects of menthol tobacco on perceptions of pack attractiveness and interest in trying the product were limited to packs that included flavour capsules. This is consistent with aforementioned findings regarding the greater appeal of two compared with one capsule, where more flavours are perceived as better. That menthol is less appealing when other flavours are present is also consistent with

results from another DCE study among US young adults, which includes both cigarettes and e-cigarettes, finding that menthol was not preferred over tobacco flavour, but fruit and candy flavours were.<sup>94</sup> Nevertheless, the lack of appeal for menthol tobacco may be due to the relatively low percentage of adults who use menthol in Mexico, as non-capsule menthol cigarettes only comprise about 0.5% of the market there.<sup>69</sup>

Finally, brand was the characteristic that had the biggest impact on students' interest in trying and perceptions of relative harm. Other DCE research among US smokers and Canadian youth have also found that harm perception and trial intent vary by cigarette brand.<sup>19 95 96</sup> This may reflect differing histories of brand building and market share, creating an 'umbrella effect' for distinct varieties that carry the brand name.<sup>97–99</sup> For example, Marlboro and Pall Mall, which are the top two brands in Mexico, were perceived as the more attractive and of greatest interest for trial.<sup>100</sup> Pall Mall was perceived as the least harmful, which may be related to their large offering of capsules containing varieties.<sup>77 100</sup> Similarly, while we were less interested in the effects of HWL content, the imagery and message about mouth cancer was more effective than that focused on emphysema. This result is consistent with previous experimental studies to determine the most effective HWL content across countries<sup>101</sup> and in Mexico.<sup>102 103</sup>

This study has several limitations. The DCE stimuli were somewhat hypothetical, although characteristics were based on real Mexican packaging. While DCEs are artificial scenarios, the tobacco industry uses DCEs in premarket research<sup>104–107</sup>; and, in international litigation to halt plain packaging and challenge efforts to increase label size, tobacco industry experts highlight how DCEs are less biased (eg, reduced demand effects) than the other methods that public health researchers have used to study tobacco packaging and labelling.<sup>108</sup> Despite the industry's public claims about their validity, DCEs are a stated preference method that may be subject to report biases. However, the external validity of DCEs has been shown in medical decision-making and patient preference research,<sup>109–111</sup> including in

meta-analyses.<sup>112</sup> We used cognitive interviews to pretest student understanding of the DCE task, finding no reason for concern, and when fielding the survey, many students reported that it was the most enjoyable part of the survey. Students evaluated all three outcomes on the same pencil and paper sheet, so they may have calibrated their responses across outcomes rather than evaluating each outcome independently. Still, the order of choice set presentation was randomised to minimise ordering effects across choice sets. Our sample may not adequately represent the broader population, since only urban public schools were randomly sampled from three large cities. Nevertheless, 83% of the middle schools in Mexico are public schools with similar characteristics to those of our sample, and three-quarters of all Mexicans live in urban areas. While generalisability of our results may be limited to the Mexican context, the Mexican market and tobacco control environment is similar to other Latin American countries, which mostly do not have plain packaging or HWLs that cover more than 50% of the pack.<sup>5</sup> Furthermore, our results around the appeal of flavour capsules and how plain packaging and increasing HWLs can reduce smoking's appeal for youth are consistent with studies across a variety of countries. Despite its limitations, DCEs allow estimating the simultaneous impact of different attributes on consumer behaviour, providing insights necessary for the evaluation of different policy options.

## CONCLUSION

Despite its limitations, this DCE study provides new insights about the potential impact of tobacco packaging design, labelling and policy among early adolescents. Our results suggest that increasing the size of HWLs and implementing plain packaging are likely to have the greatest effect on reducing the appeal of smoking among early adolescents.

## What this paper adds

- Our study evaluates the independent and interactive effects of the different elements of cigarette packaging, including health warning labels, on perceived appeal on early adolescents of a medium income country, Mexico. Based on discrete choice experiment, this paper addresses the relative importance of the distinct elements of the packaging in how attractive it is, how much it invites you to smoke and how much it makes you think about the harm to health. We analyse how elements as the presence of branding on the package, size of the HWL or the brand variety impacts in the attractiveness, the interest of trying and the harm perception. Finally, we look on how the interaction of elements, like flavour capsules and tobacco flavours, can change the perception around a brand from harmful and unappealing to attractive and interesting.

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