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Has the introduction of plain packaging with larger graphic health warnings changed adolescents' perceptions of cigarette packs and brands?

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ABSTRACT

Objective To examine the impact of plain packaging of cigarettes with enhanced graphic health warnings on adolescents' perceptions of pack image and perceived brand differences.

Methods Cross-sectional school-based surveys conducted in 2011 (prior to introduction of new cigarette packaging) and in 2013 (7–12 months afterwards). Students aged 12–17 years (2011 n=6338; 2013 n=5915) indicated whether they had seen a cigarette pack in previous 6 months. Students rated the character of four popular cigarette brands, indicated level of agreement regarding differences between brands in ease of smoking, quitting, addictiveness, harmfulness and look of pack; and indicated positive and negative perceptions of pack image. Changes in responses of students seeing cigarette packs in the previous 6 months (2011: 60%; 2013: 65%) were examined.

Results Positive character ratings for each brand reduced significantly between 2011 and 2013. Changes were found for four of five statements reflecting brand differences. Significantly fewer students in 2013 than 2011 agreed that 'some brands have better looking packs than others' (2011: 43%; 2013: 25%, $p<0.001$), with larger decreases found among smokers (interaction $p<0.001$). Packs were rated less positively and more negatively in 2013 than in 2011 ($p<0.001$). The decrease in positive image ratings was greater among smokers.

Conclusions The introduction of standardised packaging has reduced the appeal of cigarette packs. Further research could determine if continued exposure to standardised packs creates more uncertainty or disagreement regarding brand differences in ease of smoking and quitting, perceived addictiveness and harms.

controls on packaging and labelling to better inform consumers about health risks (Article 11) as well as comprehensive bans on the promotion of tobacco products (Article 13). Australia, a FCTC signatory, became the first country to implement these elements of the guidelines, with all tobacco products sold in Australia from 1 December 2012 required to use the same 'drab dark brown' coloured packaging, with brand and variant names in a standard font and position on the pack. At the same time, through separate legislation, the size of the graphic health warnings (GHWs) on the front of cigarette packs and cartons increased from 30% to 75%, while remaining at 90% of the back (for legislated requirements and images of tobacco packaging in Australia preplain and postplain packaging see Scollo *et al*⁶ (this volume) or <http://www.cancervic.org.au/plainfacts/default.asp>).

Findings from experimental^{7–12} and qualitative studies^{4 13} suggest that removing pack design elements reduces the perceived attractiveness of cigarette packs and perceived quality of cigarettes while increasing negative perceptions of smokers using those cigarette packs, among young people. Reviews have demonstrated relative consistency in these findings.^{14–16} Most of these studies have used mocked-up versions of plain packages designed by the researchers. No study has examined adolescents' responses to cigarette packaging after plain packaging of tobacco products has become the norm in a country. It is possible that responses found in experimental studies were influenced by the novelty of the plain packs. Additionally, given the controlled environment of experimental studies, where individuals provide an immediate response to an image shown for a standard length of time,^{7 9 12 17} estimates of pack design effects on adolescents' responses from these studies may be optimal.

The specific aims of the Tobacco Plain Packaging Act are to: reduce the appeal of tobacco products; increase effectiveness of health warnings and reduce the ability of packaging to mislead consumers about the harms of smoking.¹⁸ Through the achievement of these aims and as part of a comprehensive suite of tobacco control strategies, it was intended that the legislation would contribute to efforts to reduce smoking uptake in the long term.¹⁸ Achievement of change in indicators of the legislation's specific aims in the short term would suggest that the legislation is working as intended. Studies assessing the contribution of the legislation on reduced smoking uptake would need to be conducted subsequently, using several years of postimplementation data and controlling for the effect of

INTRODUCTION

Easily purchased and frequently displayed in public, cigarette packs are powerful communication tools.^{1–3} Their combined portability and visibility allows them to function as 'badge' products with the smoker taking on characteristics associated with their preferred brand.³ The tobacco industry has investigated all aspects of pack design to ensure the messages it wants communicated are understood by consumers.² These messages have broad reach, including to children and adolescents who have been found to describe some brands as 'exclusive', 'elegant' and 'sophisticated' while others are seen as 'common' or 'cheap'.⁴

As part of a comprehensive approach to reducing death and disease caused by smoking, the WHO's Framework Convention on Tobacco Control (FCTC)⁵ requires signatory countries to implement



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other tobacco policy (eg, tax increases, smoking bans) and tobacco industry efforts to promote smoking.

In this study, we use cross-sectional data from surveys of secondary school students conducted before (2011) and after (2013) the full implementation of the new packaging of tobacco products in Australia in December 2012, to examine whether adolescents' perceptions of cigarette packs changed. While a companion paper in this volume investigates change over time in health warning effectiveness among adolescents (the second specific aim of plain packaging),¹⁹ the current study assesses the extent to which the first and third specific aims of the Tobacco Plain Packaging Act have been achieved in the short term among adolescents who had seen a cigarette pack in the previous six months. Specifically, the study aims to determine whether there had been (1) a reduction in the perceived appeal of four of the five most popular cigarette brands; (2) a decrease in positive image, and an increase in negative image, ratings of cigarette packs and (3) decreases in the perceived differences between brands in their harmfulness, addictiveness, ease of smoking and quitting and attractiveness of their packs, 7–12 months after the introduction of the new tobacco packaging.

METHODS

Study overview and design

The current study used data from school-based surveys of adolescents conducted in two Australian states in 2011 and 2013. Both surveys had institutional ethics approval and approvals from the appropriate education authorities.

School samples

2011 Survey

Data were obtained from each state's component of a national triennial survey that aimed to determine the prevalence of substance use among a representative sample of Australian students in year levels 7–12 (age 12–17 years). The procedure for the triennial survey is explained more fully elsewhere.²⁰ In brief, within each state, schools were randomly selected from the three main Australian education sectors (government, Catholic and independent) to ensure a proportional representation of students across sectors. Principals of selected schools were approached and permission was sought to conduct the survey. If a school refused, a replacement school (the geographically closest school within the same education sector) selected at the same time as the original school was approached. In 2011, we aimed to survey students from 117 schools across two states. A total of 324 schools were approached regarding study participation and 97 agreed (30% response rate). Schools were requested to allow one class of students from each of year levels 7–10 (average age range 12–15) or two classes of students from each of years 11–12 (average age range 16 and 17). Researchers worked with school staff to ensure that selected classes provided a cross section of students (ie, special education classes were excluded). Data collection occurred between June and December 2011.

2013 Survey

We aimed to survey students from the 97 secondary schools participating in the 2011 survey. Principals of schools were approached by letter and approval for participation was sought. Fifty-eight schools agreed to participate (60%). When a school refused, a replacement school from the list of replacement schools selected for the 2011 survey was approached. Sixty-three replacement schools were approached and 24 agreed (response 38%), giving a total of 82 schools participating in the 2013 survey. Data collection occurred between June and

November 2013. The procedure for selecting students to survey was the same as in 2011.

Parental consent procedures

In both states in 2011 and in one state in 2013, parents were informed about the study and asked to let the school know if they did not want their child to participate. Owing to requirements stipulated by the education authorities governing government and Catholic schools in the second state in 2013, an active parental consent procedure was used. In this procedure, parents were informed about the study and provided written consent to the school for the student's participation. While active parental consent procedures reduce student participation numbers and increase the statistical intraclass correlation, substance use estimates are similar to those found with passive parental consent.²¹

Procedure for all surveys

On an agreed day, members of the research team attended the school to administer the pencil-and-paper questionnaire to classes of students during school time. After working through a practice survey with research staff, students were given a description of the main survey and asked for study consent. Students were told they could withdraw from the survey at any time. Consenting students completed the survey independently and anonymously.

Measures

Recency of seeing cigarette packs

Students indicated how long ago they had seen a cigarette pack by choosing a response from: in the past 6 months, more than 6 months ago but less than 12 months ago, more than 12 months ago.

Cigarette brand character ratings (appeal outcome)

In both survey years, students were presented with a photographic image of each of four brands of Australian cigarettes and asked to indicate their level of agreement with three statements about the brand and the pack ('this brand appeals to me', 'the pack looks good', 'the pack looks ugly') and three statements about people who smoke the brand ('are cool', 'are successful', 'are daggy (uncool)'). These outcomes were adapted from studies assessing branded and plain packaging appeal among adolescents or young adults.^{8–12} Responses were made on a five-point scale ranging from 'strongly agree' (1) to 'strongly disagree' (5) with 'not sure' in the middle (3). The brands assessed were the three most commonly smoked by Australian adolescents (Winfield (used by 44% of adolescent smokers); Peter Jackson (25%); Longbeach (10%) and a premium brand (Benson & Hedges) that was smoked by 8% of adolescent smokers making it the fifth most commonly smoked brand in 2011).²² All images included a GHW as mandated at that time, with the same health warning used for each pack image within a survey year (eg, 'Smoking causes mouth and throat cancer' in 2011; 'Smoking causes mouth cancer' in 2013). For each brand, responses for the six items were summed with items recoded where necessary such that higher scores indicated a positive view (range 6–30). (Cronbach's α for each brand in each year was adequate: 2011 range: 0.77–0.78; 2013 range: 0.73–0.75).

Attraction of cigarette packs (appeal outcome)

Based on our previous research,^{23–24} students who had seen a cigarette pack in the previous 6 months indicated their level of agreement to four positive ('cool', 'good', 'interesting', 'exciting'), and four negative ('ugly', 'daggy (uncool)', 'gross',

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'disgusting') descriptions of cigarette packs using a five-point scale ((1) 'strongly disagree' to (5) 'strongly agree'). Students could also respond that they 'cannot comment' with these responses coded as missing. Positive and negative subscale scores were created by taking the average of the five-point ratings for the items on each scale. Both scales have good internal reliability²³ with internal reliability for the current study high (positive pack image scale: $\alpha=0.85$; negative pack image scale: $\alpha=0.78$).

Brand differences (harm and appeal outcomes)

Based on Hammond *et al*,¹⁰ we assessed the extent to which plain packaging may be associated with a reduction in perceived differences in brands in harm and harm-related outcomes, as well as one appeal outcome. Students indicated their level of agreement ('strongly disagree' (1) to 'strongly agree' (4)) to five statements reflecting that some brands of cigarettes are: 'easier to smoke than others', 'more addictive than others', 'easier to quit than others', 'have more harmful substances in them than others' and 'have better looking packs than others'. Students could also give a 'don't know' (5) response. Items were recoded into three categories: 'strongly agree/agree', 'strongly disagree/disagree' and 'don't know'.

Student variables

Smoking status

Students indicated their lifetime history of smoking (never smoked; smoked a few puffs; smoked less than 10 cigarettes; smoke more than 10 but less than 100 cigarettes; smoked 100 or more cigarettes), whether they had smoked in the past month (yes or no) and their intention to smoke in the next 12 months (seven-point scale ranging from certain not to smoke to certain to smoke). Students' responses to these questions were used to classify them into four smoking status groups that drew on the concept of smoking susceptibility²⁵ and stage models of smoking uptake.²⁶ *Non-susceptible never-smokers* (NSNS) had never smoked a cigarette and were certain they would not smoke in the next 12 months. *Susceptible never-smokers* (SNS) were never-smokers, who were not certain they would not smoke in the next 12 months. *Triers* (Triers) had had at least a puff of a cigarette, but had not smoked in the previous 4 weeks. *Past month smokers* (MS) were those who had had a cigarette in the previous 4 weeks.

Demographic characteristics

Students indicated their sex and age, whether their mother and father smoked (yes or no), and indicated how many of their five closest friends smoked (none through 5). The school education sector (government, Catholic and independent) was recorded.

Statistical analyses

Analyses focus on data from students aged 12–17 years as this is the typical age range for secondary students in Australia. To correct for any oversampling or undersampling of students within age, sex and education sector groups, data were weighted to reflect the number of male and female students in each age enrolled in each education section in each state in each survey year.²⁷ Stata V11.2²⁸ was used for all analyses. Analyses adjusted for clustering of students within schools and robust SEs were used.

Students who had seen a cigarette pack in the previous 6 months formed the sample for this paper. Generalised linear regression models tested the change in scores across survey years for brand character ratings and positive and negative pack image ratings. Multinomial logistic regression examined change in the distribution of responses for the three-level categorical variables

assessing brand differences. Smoking status, age, sex, school education sector and state were included as covariates in analyses examining effect of year. When the effect of year was significant, its interaction with smoking status was fitted to determine if the effect was consistent across smoking status groups. For significant interactions, means adjusted for covariates are reported in the text. Students with missing data on variables were excluded from relevant analyses.

Sensitivity testing

The analyses described above were repeated using data only from the state where there had been no change in parental consent procedures, to examine whether this change influenced findings. We also examined whether adjusting for parental and friend smoking altered the pattern of results by repeating all analyses controlling for these variables.

RESULTS

Table 1 shows the characteristics of the entire sample, the proportion of students who had seen a cigarette pack in the previous 6 months and student's smoking status for the whole sample and for those who had seen a cigarette pack in previous 6 months. Weighting the data removed differences between years in sex, age and education sector of school. Among all students, in both survey years, most of the sample were NSNS with this proportion increasing between 2011 and 2013 ($p<0.01$). In both the weighted and unweighted data, a greater proportion of students reported seeing a cigarette pack in the previous 6 months in 2013 than in 2011 ($p<0.01$). Among students seeing a cigarette pack in the previous 6 months, there was a significant increase in the proportion of NSNS and a decrease in the proportion of Triers and past MS between 2011 and 2013 (**table 1**). Weighted data are reported for the rest of the paper.

Brand character ratings

Among students seeing a cigarette pack in the previous 6 months, those with some smoking experience gave more positive ratings for each brand in both 2011 and 2013 (**table 2**). However, mean character ratings for each brand reduced significantly between 2011 and 2013 (**table 2**). The reduction in mean scores was generally similar among smoking status group for the four brands (no interaction between survey year and smoking status for Winfield, Peter Jackson, Benson and Hedges, borderline significance for Longbeach ($p=0.054$)).

Attraction of cigarette packs

Among students who had seen a cigarette pack in the previous 6 months, negative pack image ratings increased ($p<0.001$), while positive image ratings decreased between 2011 and 2013 ($p<0.001$; **table 3**). There was a significant interaction between year and smoking status for positive image ratings ($p=0.01$), with adjusted mean scores indicating that the decrease was greater for MS (2011: 2.56; 2013: 2.18) than NSNS (2011: 1.44; 2013: 1.36) and SNS (2011: 1.84; 2013: 1.78).

Brand differences

Table 4 shows, for students who had seen a pack of cigarettes in the previous 6 months, the proportion agreeing, disagreeing or indicating 'don't know' to the five brand differences statements. There was a significant change in the distribution of responses for four of the five statements between 2011 and 2013. For the statement 'some cigarette brands are easier to smoke than others', there was a significant increase in the proportion responding 'don't know' ($p=0.006$) and a significant decrease

Table 1 Characteristics of all students participating in each survey, the proportion of students seeing cigarette packs in the previous 6 months and the proportion of these students in each of the smoking status groups (unweighted and weighted data)

	Unweighted data		p Value	Weighted data		p Value
	2011	2013		2011	2013	
(Total n)	(6338)	(5915)		(6338)	(5984)	
Sex (% males)	46%	50%	<0.001	49%	51%	0.67
Age (mean)	14.6	14.5	<0.001	14.4	14.4	0.99
Attend						
Government school	68%	68%	0.016	61%	59%	0.95
Catholic school	18%	16%		23%	23%	
Independent school	14%	15%		16%	18%	
Smoking status						
NSNS	64%	70%	<0.001	66%	71%	0.009
SNS	8%	8%	0.38	8%	8%	0.82
TS	17%	14%	<0.001	16%	13%	0.01
MS	11%	8%	<0.001	10%	8%	0.08
Percentage with no friends who smoke	68%	75%	<0.001	71%	77%	0.016
Mother smokes (% yes)	22%	20%	0.07	21%	19%	0.28
Father smokers (% yes)	27%	26%	0.29	26%	24%	0.27
Saw cigarette packs in previous 6 months	61%	65%	<0.001	60%	65%	0.004
Among students who had seen a cigarette pack in previous 6 months (N)	(3838)	(3819)		(3738)	(3856)	
Smoking status						
NSNS	56%	64%	<0.001	58%	66%	<0.001
SNS	9%	9%	0.48	9%	9%	0.87
TS	21%	16%	<0.001	20%	15%	0.003
MS	14%	10%	<0.001	13%	9%	0.01

MS, past month smoker; NSNS, non-susceptible never-smoker; SNS, susceptible never-smoker; TS, tried smoking.

in the proportion 'disagreeing' ($p < 0.001$). For the statement 'some brands are more addictive than others', there was a decrease in the proportion disagreeing ($p = 0.02$). For the

statement 'some cigarette brands contain more harmful substances than others', there was a significant decrease in the proportion of students disagreeing between 2011 and 2013

Table 2 Unadjusted mean scores (SEs) on brand character ratings for students who had seen a cigarette pack in the previous 6 months in 2011 and 2013 by smoking status (weighted data)

	Smoking status					F-statistics and p values*		
	NSNS	SNS	Triers	MS	Total	Year	Smoking status	Interaction: year and smoking status
2011 weighted n	2150	349	757	482	3738			
2013 weighted n	2558	353	586	359	3856			
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)			
Winfield								
2011	9.11 (0.10)	10.91 (0.20)	11.32 (0.16)	15.04 (0.21)	10.49 (0.09)	$F_{(1,184)}=61.09$	$F_{(3,182)}=280.43$	$F_{(3,182)}=1.79$
2013	8.25 (0.09)	10.05 (0.20)	10.45 (0.14)	14.18 (0.20)	9.30 (0.08)	$p < 0.001$	$p < 0.001$	$p = 0.150$
Peter Jackson								
2011	9.14 (0.10)	11.07 (0.22)	11.35 (0.16)	15.13 (0.22)	10.55 (0.09)	$F_{(1,184)}=49.59$	$F_{(3,182)}=245.03$	$F_{(3,183)}=1.46$
2013	8.37 (0.09)	10.30 (0.20)	10.58 (0.16)	14.36 (0.23)	9.43 (0.09)	$p < 0.001$	$p < 0.001$	$p = 0.227$
Longbeach								
2011	9.23 (0.11)	11.17 (0.19)	11.67 (0.20)	15.10 (0.23)	10.66 (0.11)	$F_{(1,184)}=56.52$	$F_{(3,182)}=238.52$	$F_{(3,182)}=2.60$
2013	8.31 (0.09)	10.25 (0.18)	10.75 (0.17)	14.17 (0.23)	9.39 (0.08)	$p < 0.001$	$p < 0.001$	$p = 0.054$
Benson & Hedges								
2011	9.34 (0.11)	11.24 (0.22)	11.63 (0.17)	14.81 (0.21)	10.69 (0.10)	$F_{(1,184)}=74.72$	$F_{(3,182)}=274.25$	$F_{(3,182)}=1.29$
2013	8.34 (0.09)	10.25 (0.21)	10.63 (0.16)	13.82 (0.22)	9.37 (0.08)	$p < 0.001$	$p < 0.001$	$p = 0.278$

Ninety-four students with missing data on smoking status excluded from analyses. Across the two surveys for the sample, missing data for brand characteristic variables never exceeded 2% (Winfield: $n=42$; Peter Jackson: $n=63$; Longbeach: $n=63$; Benson & Hedges: $n=59$).

Minimum=6 (least positive character) to maximum=30 (most positive character).

*Analyses included smoking status, sex, age, school denomination and state as covariates.

MS, past month smokers; NSNS, non-susceptible never-smokers; SNS, susceptible never-smokers; Triers, tried smoking.

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Table 3 Unadjusted mean scores (SEs) on positive and negative pack image ratings for 2011 and 2013 students by smoking status for students who have seen a pack in previous 6 months (weighted data)

	Year					F-statistics and p values*		
	NSNS Mean (SE)	SNS Mean (SE)	Triers Mean (SE)	MS Mean (SE)	Total Mean (SE)	Year	Smoking status	Interaction: year and smoking status
Negative image†								
2011	4.18 (0.02)	3.87 (0.04)	3.80 (0.03)	3.28 (0.04)	3.96 (0.02)	$F_{(1,184)}=28.80$ $p<0.001$	$F_{(3,182)}=158.83$ $p<0.001$	$F_{(3,182)}=1.01$ $p=0.39$
2013	4.31 (0.02)	4.00 (0.04)	3.93 (0.04)	3.41 (0.04)	4.15 (0.02)			
Positive image†								
2011	1.47 (0.02)	1.88 (0.03)	1.90 (0.03)	2.46 (0.05)	1.72 (0.02)	$F_{(1,184)}=40.26$ $p<0.001$	$F_{(3,182)}=160.57$ $p<0.001$	$F_{(3,182)}=3.92$ $p=0.01$
2013	1.34 (0.02)	1.75 (0.04)	1.77 (0.03)	2.33 (0.05)	1.52 (0.02)			

Ninety-four students had missing data on the smoking status variable and were excluded from analyses. Across the two survey years, 558 students had missing data (no response or response 'cannot comment') for a positive pack image items and 559 had missing data (no response or 'cannot comment') for the negative pack image items and were excluded from analyses. Therefore, analyses based on: positive image: 2001: 3553; 2013: 3484; negative image: 2011: 3555; 2013: 3479.

*Analyses included smoking status, sex, age, school denomination and state as covariates.

†Measure on scale ranging from 1 'strongly disagree' to 5 'strongly agree'.

MS, past month smokers; NSNS, non-susceptible never-smokers; SNS, susceptible never-smokers; Triers, tried smoking.

($p<0.01$). There was no change over time in responses to the statement 'some cigarette brands are easier to quit than others'. The largest change was found for the statement 'Some brands have better looking packs than other brands' ($p<0.001$) with fewer students agreeing with this statement in 2013 (25%) than in 2011 (43%).

There was a significant interaction between year and smoking status for two items: 'some cigarette brands have better looking packs than others' (interaction: $p<0.001$) and 'some cigarette

brands are more addictive than others' (interaction: $p<0.003$). **Figure 1** shows the adjusted proportions by smoking status and year for these two items. For the item 'some cigarette brands have better looking packs than others', the decrease in the proportion agreeing with this statement was greatest among those involved with smoking. For the statement 'some cigarette brands are more addictive than others', change was greatest among non-smokers, with no significant change in the responses of smokers.

Table 4 Among students who have seen cigarette pack in previous 6 months, unadjusted proportions (95% CIs) agreeing*, disagreeing† or who don't know for statements regarding differences in ease of smoking, ease of quitting, addictiveness, more harmful and have better looking packs between cigarette brands by year of survey (weighted data)

Some cigarette brands are: (Weighted N)	2011 % (95% CI) (3738)	2013 % (95% CI) (3856)	χ^2 statistic and p value‡	
			Year	Interaction: year and smoking status
Easier to smoke than others				
Agree	28% (26% to 31%)	26% (23% to 28%)	$\chi^2_{(2)}=14.83$, $p<0.001$	$\chi^2_{(6)}=2.33$, $p=0.89$
Disagree	22% (20% to 24%)	19% (17% to 20%)		
Don't know	49% (47% to 52%)	56% (53% to 59%)		
More addictive than others				
Agree	33% (32% to 35%)	34% (32% to 36%)	$\chi^2_{(2)}=6.68$, $p=0.04$	$\chi^2_{(6)}=19.66$, $p=0.003$
Disagree	20% (19% to 22%)	18% (16% to 19%)		
Don't know	46% (44% to 49%)	49% (46% to 51%)		
Easier to quit than others				
Agree	18% (16% to 19%)	16% (14% to 17%)	$\chi^2_{(2)}=1.47$, $p=0.48$	NA
Disagree	32% (30% to 34%)	31% (29% to 33%)		
Don't know	51% (48% to 53%)	54% (51% to 56%)		
Contain more harmful substances				
Agree	37% (35% to 39%)	38% (36% to 41%)	$\chi^2_{(2)}=10.63$, $p=0.005$	$\chi^2_{(6)}=6.64$, $p=0.36$
Disagree	20% (18% to 22%)	17% (15% to 18%)		
Don't know	43% (41% to 45%)	45% (43% to 47%)		
Have better looking packs than others				
Agree	43% (40% to 44%)	25% (23% to 28%)	$\chi^2_{(2)}=117.41$, $p<0.001$	$\chi^2_{(6)}=28.51$, $p<0.001$
Disagree	25% (24% to 27%)	36% (34% to 38%)		
Don't know	32% (30% to 35%)	39% (36% to 41%)		

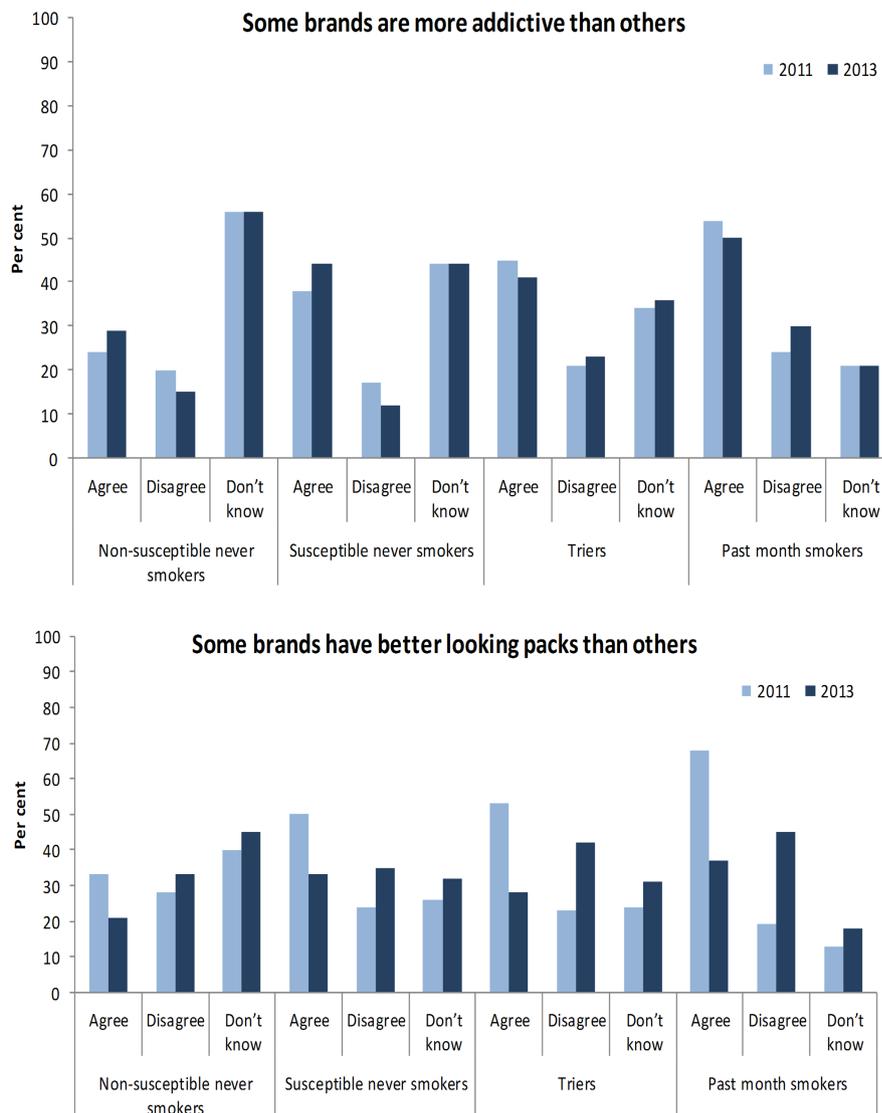
Ninety-four students had missing data on the smoking status variable and were excluded from analyses. Students with missing data on a statement excluded for that analysis. The number of students with missing data for the different variables ranged from 129 to 161.

*Agree or strongly agree combined.

†Disagree or strongly disagree combined.

‡Analyses included smoking status, sex, age, school denomination and state as covariates. NA, not applicable: as there was no main effect of year, the interaction between year and smoking status was not investigated.

Figure 1 Adjusted proportions of students agreeing, disagreeing or who 'don't know' if 'some brands are more addictive than others' (above) or 'some brands have better looking packs than others' (below) in 2011 and 2013 by smoking status (proportions adjusted for age, sex, education sector and state).



Sensitivity analyses

The pattern of results reported above was replicated in both sets of sensitivity analyses.

DISCUSSION

Ours is the first 'real-world' study to investigate the impact of standardised packaging of tobacco products on the perceptions of the image of cigarette packs and brands among adolescents. Seven to 12 months after the introduction of standardised packaging in Australia, the appeal of cigarette packs and brands to adolescents who had seen packs in the previous 6 months had decreased significantly, albeit modestly. Additionally, among students who had seen cigarette packs in the past 6 months, more were unsure as to whether brands differed in terms of *their ease of being smoked* in 2013 than 2011 and there was a large increase in the proportion disagreeing that *some brands have better looking packs than others*. The study suggests that 7–12 months after its introduction, the new controls on the cigarette packaging in Australia were starting to reduce the appeal of cigarette packs to adolescents and were beginning to reduce the pack's ability to communicate messages regarding differences in ease of smoking between brands among adolescents.

Although the reductions found in our study were relatively modest, the pattern of results are consistent with those from

experimental and qualitative research showing that removing design elements from cigarette packs reduces their appeal to adolescents.^{4 11 12 29} We found that among students who had seen a cigarette pack in the previous 6 months, fewer agreed that some brands have better looking packs than other brands in 2013 than in 2011. We also found reductions in positive perceptions of brand character for all four brands assessed. Encouragingly, reductions were found among all smoking status groups.

Among students who had seen a cigarette pack in the previous 6 months, there was a significant increase in negative pack image ratings between 2011 and 2013 which was consistent across smoking groups. We also found a decrease in positive pack image ratings. Although the absolute change was modest, this decrease is encouraging as our previous study found that although positive image ratings declined when GHWs covering 30% of the front of fully branded packs were introduced in 2006, they had rebounded to pre-2006 GHW levels by 2011.²⁴ The current study suggests that the introduction of the new cigarette packaging has again disrupted the positive image associated with cigarette packs.

One aim of plain packaging was to reduce cigarette packaging's ability to mislead consumers regarding the harmful effects of smoking. Experimental studies have shown that adolescents

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perceive cigarettes from plain packs as 'tasting cheap' compared with cigarettes from fully branded packs.^{10 12} In these studies, ratings were elicited after showing specific fully branded or plain pack images to participants. In our study, adolescents were asked whether they agreed or disagreed with a number of general statements regarding whether brands differed on a number of factors including ease of smoking, addictiveness, harmfulness and ease of quitting. Responses to these questions were mixed.

The proportion of students disagreeing with the statements 'some brands are easier to smoke than others' and 'some brands are more addictive than others' decreased, while the proportion reporting 'don't know' regarding the ease of smoking some brands increased. The pattern of results found suggests that 7–12 months after their introduction, the new packs were creating uncertainty regarding whether there were differences between cigarette brands' addictive qualities and their ease of being smoked. However, for the statement 'some cigarette brands contain more harmful substances than others' slightly more students agreed with this statement in 2013 than 2011. Further research is needed to determine whether, with continued exposure to the new packs, adolescents develop stronger disagreement regarding differences between brands in the harmfulness, addictiveness and ease of smoking. This is particularly important since plain packaging did not limit the use of variant names (eg, 'Distinct' or 'Fine'), which are independently associated with misperceptions of harm.^{10 11} With the implementation of plain packaging in Australia, there has been greater use of longer and more evocative variant names on tobacco products.³⁰

Several study limitations need to be noted. First, because plain packaging was introduced at the same time as the introduction of larger GHWs on the front of cigarette packs, we cannot determine whether the changes we found in adolescents' perceptions of cigarette packs are the result of plain packaging alone. For this reason, we must conclude that changes we have found are the result of the combination of the cigarette packaging changes and not just the introduction of plain packaging. Change in consent procedures in one state meant that some schools surveyed only a small number of students and this could have introduced some bias. In a study examining the impact of active parental consent on students' responses to surveys about substance use, while prevalence estimates were generally the same, there was greater similarity in the students surveyed at a particular school.²¹ Furthermore, sensitivity analyses suggested that the change in consent procedures in one state had minimal influence on our results.

Despite these limitations, the present study provides new information on the immediate response of adolescents to the introduction of plain packaging of cigarettes coupled with larger front of pack GHWs. Our data suggest that these changes have reduced the appeal of cigarette packs to adolescents, increased negative perceptions of packs and reduced positive perceptions regarding brand characteristics, although we note that the changes found were modest. While our data do not show that the introduction of the new cigarette packs immediately corrected adolescents' misbeliefs about differences in the ease of smoking, harmfulness and addictiveness of cigarettes from different brands, the pattern of findings does suggest that the new packs may be disrupting these beliefs and increasing uncertainty among adolescents about the effects of smoking. Future studies of adolescents' responses to the new tobacco packaging after longer exposure to the new packaging are needed to determine whether the effects we have found increase or diminish in size and whether misbeliefs about the harms of

smoking are corrected. Additionally, future studies need to determine whether the new packaging has reduced smoking uptake among adolescents, as is the long-term goal of the policy.

What this paper adds

- ▶ Cigarette packs are powerful communication tools with broad reach including to children and adolescents.
- ▶ Experimental and qualitative studies suggest that packaging cigarettes in plain or standardised packs reduces perceived attractiveness of packs and perceived quality of cigarettes and corrects misperceptions about harms among adolescents. However, no study has examined adolescents' responses to plain packaging of cigarettes in a community where plain packaging is the norm.
- ▶ Seven to 12 months after the introduction of plain packaging of cigarettes with large front-of-pack graphic health warnings in Australia, this study suggests that the appeal of cigarette packs and brands to Australian adolescents had decreased significantly.

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Contributors VW and MW designed study. VW analysed data and drafted manuscript. TW coordinated data collection in 2013 and oversaw data processing. TW also contributed to data analysis. The final version of the paper has been approved by all authors.

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Competing interests The authors wish to advise that MW was a member of the Tobacco Working Group of the Australian National Preventive Health Task Force and the Expert Advisory Committee on Plain Packaging that advised the Australian Department of Health on research pertaining to the plain packaging legislation. VW holds competitive grant funding from the Victorian Cancer Agency and the National Breast Cancer Foundation, VW and MW hold such funding from the Australian National Health and Medical Research Council and MW holds such funding from the US National Institutes of Health, Australian National Preventive Health Agency and BUPA Health Foundation.

Ethics approval Both the 2011 and 2013 study had ethical approval from the lead author's institution. In both years, the survey was approved by educational authorities in both states.

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