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Abstract

Objective To determine whether smokers smoking from packs required under Australia's plain packaging law had different smoking beliefs and quitting thoughts, compared to those still smoking from branded packs.

Design Cross-sectional survey during the roll-out phase of the law, analysed by timing of survey.

Setting Australian state of Victoria, November 2012.

Participants 536 cigarette smokers who had a usual brand, of whom 72.3% were smoking from a plain pack and 27.7% were smoking from a branded pack.

Primary outcome measures Perceived quality and satisfaction of cigarettes compared with one year ago, frequency of thoughts of smoking harm, perceived exaggeration of harms, frequency of thoughts of quitting, quitting priority in life from 0 (lowest) to 10 (highest), intention to quit in 30 days and 6 months, approval of large graphic health warnings and plain packaging.

Results Compared to branded pack smokers, those smoking from plain packs perceived their cigarettes to be lower in quality (AdjOR=1.66, p=0.045) and less satisfying than a year ago (AdjOR=1.70, p=0.052), were more likely to have thought about quitting at least once a day in the past week (AdjOR=1.81, p=0.013) and to rate quitting as a higher priority in their lives (F=13.11, df=1, p<0.001). Plain pack smokers were more likely to support the policy than branded pack smokers (AdjOR=1.51, p=0.049). Branded and plain pack smokers did not differ on measures of less immediate smoking intentions, frequency of thoughts about harms, or perceived exaggeration of harms. Appeal outcomes, but not other outcomes, were sensitive to the extent of roll-out, with responses from branded pack smokers approaching those of plain pack smokers, once 80% of survey respondents were smoking from plain packs.

Conclusions The early indication is that plain packaging is associated with lower smoking appeal, more support for the policy and more urgency to quit among adult smokers.

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Article summary

Article focus

- Past studies have demonstrated that plain, as opposed to branded, tobacco packaging leads smokers to perceive the packs as lower in appeal, to make health warnings more salient and to reduce misapprehensions about perceived harms of smoking.
- Since no country had implemented plain packaging prior to Australia, all the studies conducted to date have simulated plain packaging by using experimental or qualitative studies.
- We examined the early impact of plain packaging on smokers *in vivo* as policy implementation rolled out for the first time internationally in Australia in late 2012 in respect of these outcomes, and in addition, examined any potential effects on thoughts of quitting.

Key messages

- Compared to smokers smoking from branded packs, smokers who were smoking from the new plain packs were more likely to perceive their tobacco as being lower in quality and satisfaction, more likely to have greater urgency for quitting, and more likely to support the plain packaging policy.
- Appeal outcomes, but not other outcomes, were sensitive to the extent to which plain packaging had rolled-out among the smoker population over the survey period, with responses from branded pack smokers approaching those of plain pack smokers, once 80% of survey respondents were smoking from plain packs.

Strengths and limitations of this study

- The study used a representative population survey of smokers and was timed to occur over the period of introduction of plain packs into the Australian market.
- Although multivariate analysis adjusted for underlying differences between plain and branded pack smokers, these results may be partly explained by differential selection, with some smokers choosing to avoid the new plain packs for as long as possible.
- Our study is not able to tease apart the independent contributions of plain packaging and the new larger graphic health warnings, since they co-occurred.

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Introduction

From 1 September 2012, all tobacco manufactured for sale in Australia was required to be contained in plain dark brown packs, with 75% front-of-pack graphic health warnings and the brand name and variant limited to a standardized font size and type.[1] This requirement supplanted Australian legislation that had required 30% front-of-pack graphic health warnings since 2006.[2] The new plain packs with larger warnings began appearing for sale at retail outlets early in October and increasingly so during November, since from 1 December 2012, all tobacco sold at retail was required to be plainly packaged. The roll-out period of the new packs was accompanied by a nationally televised mass media campaign, promoting several serious harms of smoking that were also featured on the larger pack health warnings, including blindness, lung cancer and pregnancy-related harm. Other health warnings featured in the larger pack health warnings were peripheral vascular disease (gangrene), mouth (tongue) cancer and improvements to health from quitting.

Plain packaging aims to reduce the attractiveness and appeal of tobacco, increase the noticeability and effectiveness of health warnings, and reduce the ability of packaging to mislead consumers about smoking harms.[1] While the legislation is expected to exert effects on smoking behaviour indirectly through achievement of the above objectives, and in the long term as part of a comprehensive suite of measures, there is also interest in examining any short-run effects on adult smokers. As part of an annual population survey of adults conducted throughout November and early December 2012, we examined attitudes and intentions of smokers during this roll-out period, comparing those who were smoking cigarettes from the new plain packs with larger health warnings, with those still smoking from a branded pack with smaller warnings.

Method

Study design and participants

The Victorian Smoking and Health Survey is a cross sectional telephone survey undertaken annually with a representative sample of adults aged 18 years and over, residing in the general population of the Australian state of Victoria. Fieldwork for the 2012 survey occurred between November 1st and December 3rd inclusive.

Computer-assisted telephone interviews were conducted using a dual frame survey design incorporating samples generated by Random Digit Dialling (RDD) to landline and mobile phones. In the 45% of cases where it was possible to match landline phone numbers to residential addresses, primary approach letters were posted prior to the phone call to give notice of a 'community survey of health attitudes and behaviours'. As Australian mobile phone numbers have no geographic identifier, it was not possible to send approach letters to potential participants contacted through RDD to mobile phones. A help line number was provided to all participants as a means of verifying the survey or obtaining further information.

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After establishing contact with a verified landline sample number, up to nine call attempts were made to complete an interview. Calls to unanswered mobile phones were limited to four attempts. When calling a landline phone, interviewers asked to speak to the youngest male aged 18 or over at home at the time of the call. If no males were available, the youngest adult female in the household was selected to participate. Within the mobile RDD sample, the individual answering a call was considered to be the target for screening. A quota was applied to the landline sample to ensure that approximately 70% of interviews were conducted with metropolitan residents and 30% with rural residents, reflecting the population distribution of Victoria. Given the absence of geographic identifiers for the mobile numbers, no quota was applied to the mobile sample and state of residence was established on contact.

In total, 3126 landline and 878 mobile phone interviews were completed. Interviews were conducted in English only. Verbal consent was obtained from participants at the start of each interview. The overall response rate, defined as completed interviews as a proportion of the sample who could be contacted within the call cycle and who were identified as eligible for the survey was 63%.

Ethics approval to undertake the survey was obtained from Cancer Council Victoria's Human Research Ethics Committee (HREC: 0018).

Measures

All questions were asked within the context of a broader 12-minute population survey of attitudes and behaviours relating to smoking. Smokers were identified as individuals who currently smoked cigarettes, pipes and/or cigars daily, weekly, or less than weekly. After being further asked about types of tobacco currently consumed, current cigarette smokers were those who smoked factory-made cigarettes (FMC) or roll-your-own (RYO) cigarettes daily, weekly or less than weekly. All cigarette smokers were asked to specify their usual brand. Based on price class definitions listed in the grocery trade magazine Retail World,[3] brands were classified into three segments (value, mainstream or premium). Where a brand was not listed, price per stick was used to determine the most appropriate classification, based on the thresholds used in Retail World. All RYO cigarette smokers (n=35) were assigned to the value market segment.

To ascertain exposure to the new plain packs, current cigarette smokers who reported smoking their usual FMC or RYO brand were asked: *'Is the cigarette/tobacco pack you are currently smoking one of the new dark brown packs which has all of its logos removed and a large picture health warning on the front?'*

To assess brand appeal, all current smokers were asked: *'I'm going to read some statements about how you rate your current cigarettes compared to a year ago. I'd like you to tell me if you think that now, your cigarettes are higher, lower or about the same in terms of ...' a) 'Quality?' b)'Satisfaction?'* To assess perceived harm, smokers were asked: *'In the last week how often, if at all, did you think about the harm your smoking might be doing to you?'* with response options being 'never', 'rarely', 'sometimes', 'often' and 'very often' (and aggregated for analysis into 'often or very often' vs all others) and: *'Would you agree or*

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disagree that the dangers of smoking have been exaggerated?' with response options from strongly agree, agree, neither, disagree and strongly disagree.

To examine quitting thoughts and intentions, smokers were asked: *'Are you seriously considering quitting smoking in the next 6 months?'; 'Are you planning to quit smoking in the next 30 days?'*; and *'On a scale of 1 to 10, where 1 is lowest and 10 is highest, how would you rate quitting as a priority in your life?'*. Quitting salience was measured with the question: *'During the past week, how often have you thought about quitting?'* with responses ranging from 'not at all' to 'several times a day'. Responses were aggregated for analysis into 'once a day or more often' versus 'less often or not at all'.

Opinion about the new health warnings was determined by asking: *'In order to strengthen the impact of the health messages on packs, the Federal government requires that from December 1 2012, the size of graphic health warnings will be increased to cover 75% of the front of the cigarette pack. Do you support or oppose increasing the size of graphic health warnings to 75% of the front of the cigarette pack?'* The responses of smokers who 'strongly' or 'somewhat' supported the enlarged graphic health warnings were compared to the responses of those who opposed or had no opinion about the size increase. Plain packaging opinions were assessed by asking: *'Tobacco companies often use cigarette packaging for promotional purposes. Because of this, the Federal government requires that from December 1 2012, cigarettes will be sold in plain packaging. This will mean the packs will all look the same with the logos and colours removed. Just the brand in plain text and the graphic health warnings will remain on the packs. Do you approve or disapprove of this?'* Respondents who reported that they approved or strongly approved were compared to others.

The average number of cigarettes smoked each day was calculated for daily and weekly smokers based on their self-reported consumption. For the purposes of analyses, less than weekly smokers were classified in the lowest consumption group (<5 cigarettes per day). Smokers who had never attempted to quit were compared to smokers who had made at least one previous quit attempt, based on responses to the question: *'Approximately how many times, if any, have you tried to give up smoking?'*.

During the fieldwork period, three anti-smoking advertisements were broadcast on television as part of a national anti-smoking mass media campaign. Respondents were read a short description of each ad and smokers who recalled seeing at least one were compared to those who did not recall any ads.

Respondents were classified into three socio-economic (SES) groups using the Index of Relative Disadvantage (IRSD),[4] which ranks postal areas on a continuum of high to low disadvantage, taking into consideration characteristics including income, education, occupation and housing. The low SES (high disadvantage) group comprised people in the bottom 40% of ranked postal areas, the mid SES group included people who live in areas with an IRSD score between 41% and 80% of ranked postal areas, while the high SES (lowest disadvantage) group lived in areas with an IRSD score between 81% and 100% of ranked postal areas.

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Statistical analyses

All data were weighted by age and gender, based on the 2011 Australian census.[5] Data weights also accounted for a participant's relative chance of inclusion in the landline or mobile phone sample frame, and their chance of selection based on the number of landlines in each household and number of in-scope people per household.

Logistic regression analyses were undertaken to determine if the characteristics of smokers who reported currently smoking from a plain pack differed to those of smokers who were smoking from a branded pack. This permitted an assessment of the covariates required for inclusion in subsequent logistic regression analyses which examined whether current possession of a plain pack compared to a branded pack was associated with brand appeal, perceived harm, quitting thoughts and intentions, and support for packaging legislation. ANCOVA was undertaken to determine if smoking from a plain pack was associated with higher ratings of quitting as a life priority, adjusting for the same covariates. Ultimately, SES, recall of recent anti-smoking television ads, brand segment and having ever made a quit attempt were included as covariates in the multivariate model. A final set of models controlled for the proportion of the sample interviewed during each survey week who reported smoking from a plain pack. We did this to control for the extent to which, as the survey period progressed, smokers would have been increasingly exposed to plain packs in their social networks, even though they may not have been personally smoking from one.

Results

Of the total of 4004 interviews, 572 current cigarette smokers were identified. Of these, 9 reported that they did not smoke a usual brand, 13 did not know or refused to say what their usual brand was and 2 reported smoking unbranded cigarettes. A further 10 smokers did not know if they were currently smoking from a plain pack and 2 indicated that they did not currently possess a pack, leaving 536 current FMC or RYO smokers with a usual brand who indicated they were smoking from a plain or branded pack. Although the interviewers had scope to record if smokers responded that they had transferred their cigarettes into a case, no smokers reported having done so.

Table 1 shows the characteristics of 536 usual brand cigarette smokers who were smoking from a plain pack (72.3% n=388) or a branded pack (27.7%, n=148). The proportion of usual brand cigarette smokers who were smoking from a plain pack increased from 57.2% in the first week of surveying to 85.0% in the final week.

Smokers currently smoking from a plain pack did not differ from smokers who were currently smoking from a branded pack with respect to age, sex, education or area of residence (Table 2). Smokers were significantly more likely to be smoking from a plain pack if they lived in a medium compared to a low socio-economic area (OR=1.55, p=.050), or reported having ever made a quit attempt (OR=2.61, p<0.001) and there was a trend toward being more likely to smoke from a plain pack if they recalled having seen recent anti-smoking campaign advertising on television (OR =1.45, p=0.056). Compared to smokers of value brands, smokers of mainstream (OR=2.38, p<0.001) and premium (OR=1.80, p=.021)

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brands were also more likely to currently be smoking from a plain pack. Compared to those who smoked fewer than five cigarettes per day, smokers of between five and 10 cigarettes a day (OR=1.57, *p*=0.098) tended to be more likely to be smoking from a plain pack.

After adjusting for covariates (Table 3, Model 1), plain pack smokers were more likely than branded pack smokers to perceive their cigarettes to be lower quality than a year ago (OR=1.66, *p*=0.045), and trended towards perceiving their cigarettes to be less satisfying than a year ago (OR=1.70, *p*=0.052). Plain pack smokers were slightly but not significantly more likely than branded pack smokers to have thought about the harms of smoking 'often' or 'very often' in the previous week (adjusted OR=1.43, *p*=0.115), but did not differ in belief that the dangers of smoking had been exaggerated.

Smokers with a plain pack rated quitting as being a significantly higher priority in their life (Mean =6.76) compared to those who were smoking from branded packs (Mean=5.62) (adjusted F=13.11, df=1, *p*<0.001). Smokers who were currently smoking from a plain pack were almost twice as likely to report that they had thought about quitting at least once a day over the past week (adjusted OR=1.81, *p*=0.013) when compared to smokers of branded packs. No differences between plain and branded pack smokers were found for quit intentions within 30 days or the next 6 months.

Plain and branded pack smokers did not differ in terms of their support for increasing the size of graphic health warnings, but a greater proportion of plain pack smokers approved of plain packaging than branded pack smokers (adjusted OR=1.51, *p*=0.049).

Additional adjustment for the proportion of the sample smoking from a plain pack (Table 3, Model 2) resulted in no material change in effect sizes or statistical significance for all outcomes, except for the appeal outcomes. For the measures of quality and satisfaction, this adjustment resulted in a slight reduction in effect sizes, with differences no longer being statistically significant. Figure 1 shows that early in the survey period when the overall proportion of the sample smoking from plain packs was lower, a greater proportion of plain pack smokers thought their cigarettes were lower in quality and satisfaction than branded pack smokers. As the roll-out of plain packs reached 80% or more of smokers surveyed, the responses of branded pack smokers 'caught up' with plain pack smokers.

Brand loyal cigarette smokers

Of the 536 usual brand cigarette smokers, 452 indicated they had been smoking their current brand for one year or longer. (We excluded smokers who said they had been smoking their current brand for less than a year (n=60) or who did not give a time period (n=23)). We found that 30.0% of the 329 plain pack smokers and 20.1% of 123 branded pack smokers thought the quality of their cigarettes was lower than a year ago (Adj OR=1.54, *p*=.108), and 25.1% of plain pack smokers and 16.2% of branded pack smokers thought their satisfaction was lower than a year ago (OR=1.57, *p*=.122). Thus, effect sizes eased slightly and significance levels dropped. Again, once adjustment was undertaken for the proportion of participants smoking from a plain pack during each survey week, effect sizes diminished further (lower quality OR=1.32, *p*=.318; lower satisfaction: OR=1.36, *p*=.307), but remained in the same direction. The strength and pattern of findings for all other outcomes remained the same as the main analysis.

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Discussion

Compared to branded pack smokers, smokers who were smoking from plain packs rated their cigarettes as being lower in quality and satisfaction than one year ago. These appeal outcomes were sensitive to the extent to which plain packaging had rolled-out among the smoker population over the survey period, with responses from branded pack smokers approaching those of plain pack smokers, once 80% of survey respondents were smoking from plain packs. Among the subgroup who had smoked the same brand for at least a year, effects were in the same direction but not significant. In all analyses, plain pack smokers were more likely to think often or very often about quitting in the past week and to rate quitting as a higher priority in their lives, compared to branded pack smokers. There were no significant differences in the proportion of plain and branded pack smokers who thought frequently about the harms of smoking or thought smoking harms had been exaggerated. While a similar proportion of plain and branded pack smokers supported the larger graphic health warnings, a significantly greater proportion of plain pack smokers approved of plain packaging.

Given Australia is the first nation to implement plain packaging, our study provides an early investigation of its actual effects on smokers in 'the real world', compared with past studies that have experimentally exposed smokers to a single viewing of a plain or branded pack which may or may not have been their own brand,[6-12] and studies that have mocked-up plain packs for smokers to carry around with them.[13 14]

In the period leading up to the December 1st implementation date, plain packs began to be sold at retail from early October and the timing of our survey enabled a comparison of those who were smoking from one of the new plain packs with those who were not. Our survey obviously excludes the responses of those who may have quit during this short period. Our designation of smokers as plain or branded was based on the pack from which they were currently smoking at the time of survey administration. It should not be assumed that branded pack smokers had not previously purchased and smoked from a plain pack. Indeed, this would have been increasingly likely as the survey period progressed and, even if branded pack smokers had not themselves purchased a plain pack, they would have been increasingly exposed to them via their social networks.

Our study demonstrated that responses for branded pack smokers began to approach those of plain pack smokers for the two appeal outcomes towards the end of the survey period. This could mean that around 80% of smokers represents a threshold of availability for social contagion effects, or it may reflect a point where the likelihood of not having smoked from a plain pack was approaching zero, and thus all responses were influenced by having smoked cigarettes from plain packs.

Smoking a plain as compared with branded pack could be due to differences in availability or to choice. Differences across survey week are clearly due to increased availability of plain packs and reduced availability of branded packs. In addition, brand segment and SES differences in the likelihood of smoking from a plain pack could be due to differential availability of plain packs by brand or residential area. However, the difference observed in

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past quitting behaviour is more consistent with differential choice. Although we adjusted for ever having previously tried to quit, there may have been residual confounding, so that those less interested in quitting may have been more likely to avoid the plain packs. Avoidance of plain packs by these smokers would be entirely consistent with the notion that plain packs make smokers feel uncomfortable about their smoking. Some of the relationships found between pack type and quitting outcomes could be due to those more interested in quitting being less likely to avoid, or even to seek out the plain packs. However, even if this is the case, the net effect of plain packaging for quitting remains positive.

The observed pattern of findings in relation to brand appeal and perceived harms is consistent with those of experimental studies of plain packaging conducted in Australia[6 15], the UK[7 16] and other countries [10-12 17 18] and also with the Australian government's pre-testing of mocked-up plain packs.[19] The finding that smokers smoking from a plain pack evidenced greater urgency for quitting than branded pack smokers is important, since frequency of thoughts about quitting has strong predictive validity in prospective studies for actually making a quit attempt.[20 21] Past research on graphic health warnings has found that greater size of warnings is associated with more message recall, greater perceived effectiveness and risks of smoking [22 23] and less appeal.[24] Also, noticing pictorial health warnings on others' tobacco packs reduced the risk of relapse in recent quitters in a cohort study.[25] Our study is not able to tease apart the independent contributions of plain packaging and the new larger health warnings, since they co-occurred. These responses are unlikely to be due to any media campaign effects since we adjusted for campaign recall, and in other analyses, determined that campaign recall was unrelated to frequency of thoughts of harm, and quitting intentions and importance.

We noted that the proportion who thought the harms had been exaggerated was not higher for plain pack smokers with the larger graphic warnings, than branded pack smokers. We also found similar proportions of branded and plain pack smokers who supported the larger graphic health warnings, suggesting smokers are accepting of this aspect of the legislation. Interestingly, those smoking from plain packs were more likely to approve of plain packaging than those smoking from branded packs. Given that 73% of Australian smokers intend to quit[26] and over 90% regret having started,[27] smokers may acknowledge such packaging changes as a source of motivation or reminder for quitting, and/or as being important to reduce the appeal of smoking for young people. This pattern of differences in approval is similar to the pattern of increase in public support that is observed when smoke-free laws[28 29] and display bans[30] have been implemented.

We note the initial responses observed in this study concur with news reports during November and December of smokers perceiving their cigarettes 'taste worse'[31 32] – an effect likely to be attributable to the halo effects of packaging influencing the sensory experience of smoking[33] – and with reports of increases in calls to Quitlines.[34] Overall, the introductory effects we observed are consistent with the broad objectives of the plain packaging legislation. We await further research to examine more durable effects on smokers and any effects on youth.

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Competing interest declaration

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: LH and SD had financial support from Quit Victoria for the submitted work; no authors had financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no authors had other relationships or activities that could appear to have influenced the submitted work.

Contributors

MW and LH conceived the study. MW, LH and RB designed the survey questions. LH and SD undertook data analysis, MW and LH drafted the manuscript and SD and RB revised the content. All authors approved the final submitted version. MW is the study guarantor.

Ethics approval

Ethical approval for the study was provided by the Human Research Ethics Committee of Cancer Council Victoria (HREC 0018).

Data sharing statement

There is no additional data available.

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Tables

Table 1 **Characteristics of current smokers**

	Number*	Per cent
Total	536	100
Sex		
Male	303	56.6
Female	233	43.4
Age group		
18-29 years	163	30.4
30-49 years	229	42.8
50 plus	144	26.8
Education		
Up to Year 12	333	62.0
Tertiary level and above	204	38.0
Socio-Economic Status		
Low (most disadvantaged)	129	24.1
Medium	345	64.2
High (least disadvantaged)	63	11.7
Area of Residence		
Metropolitan Victoria	387	72.1
Regional Victoria	146	27.2
Unknown	4	0.7
Current daily consumption level (average no of cigs per day)		
< 5 per day (includes <weekly smokers)	139	25.8
>5 to 10 per day	132	24.6
>10 to 15 per day	103	19.2
>15 per day	150	28.0
Unknown	13	2.4
Ever tried to quit		
No	86	16.0
Yes	446	83.2
Unknown	4	0.8
Brand segment		
Value	140	26.2
Mainstream	249	46.4
Premium	147	27.4
Exposure to anti-smoking TV campaign		
Did not recall any ads	243	45.3
Recalled at least one anti-smoking ad	293	54.7
Smoking from a plain pack		
Week 1	125	57.2
Week 2	142	66.3
Week 3	142	80.4
Week 4-5	126	85.0

* Numbers may not add to N=536 due to rounding of weighted numbers

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Table 2 **Characteristics of cigarette smokers currently smoking from a plain pack compared to a branded pack**

	N smoking from plain pack	% smoking from plain pack	Unadjusted OR (95% CI)
TOTAL (N=536)	388	72.3	
Sex			
Male (n=303)	214	70.4	1.00 (Ref)
Female (n=233)	174	74.8	OR 1.25 (0.85-1.83), *p*=0.262
Age group			*p*=0.579
18-29 years (n=163)	123	75.2	1.00 (Ref)
30-49 years (n=229)	164	71.6	OR=0.83 (0.53-1.32), *p* =0.432
50 plus (n=144)	101	70.1	OR=0.77 (0.47 -1.28), *p* =0.317
Education			
Up to Year 12 (n=333)	235	70.6	1.00 (Ref)
Tertiary level and above (n=204)	153	75.1	OR=1.26 (0.85-1.87), p=0.258
Socio-Economic Status			*p*=0.150
Low (n=129)	85	65.6	1.00 (Ref)
Medium (n=345)	257	74.7	OR=1.55 (1.00-2.40), *p* =0.050
High (n=63)	46	73.1	OR=1.42 (0.73-2.77), *p* =0.299
Area of Residence (n=532)			
Metropolitan Victoria (n=387)	279	72.1	1.00 (Ref)
Regional Victoria (n=146)	105	72.2	OR=1.00 (0.66-1.53), p=0.990
Current daily consumption level (average no of cigs per day n=523)			*p*=0.312
< 5 per day (including non-daily smokers) (n=139)	92	66.3	1.00
>5 to 10 per day (n=132)	100	75.5	OR=1.57 (0.92-2.66), *p* =0.098
>10 to 15 per day (n=103)	78	75.3	OR=1.55 (0.88- 2.74), *p* =0.133
>15 per day (n=150)	107	71.2	OR=1.26 (0.76-2.07), *p* =0.370
Ever tried to quit (n=532)			
No (n=86)	46	54.2	1.00 (Ref)

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Yes (n=446)	337	75.6	OR=2.61 (1.62-4.21), *p* <0.001
Brand segment			*p*=0.001
Value (n=140)	85	60.4	1.00 (Ref)
Mainstream (n=249)	195	78.4	OR=2.38 (1.51-3.74), *p* <0.001
Premium (n=147)	108	73.3	OR=1.80 (1.09-2.96), *p* =0.021
Exposure to anti-smoking TV campaign			
Did not recall advertising (n=243)	166	68.3	1.00 (Ref)
Recalled at least one of three anti-smoking campaign ads (n=293)	222	75.7	OR =1.45 (0.99-2.12), *p* =0.056

* Numbers may not add to N=536 due to rounding of weighted numbers

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Table 3 **Attitudes and intentions of respondents who were currently smoking from a plain pack compared to those respondents who were smoking from a branded pack*.**

	Smoking from plain pack (n=388)	Smoking from branded pack (n=148)	Unadjusted OR (95% CI), *p*-value	Model 1: Adjusted OR[a] (95% CI), *p*-value	Model 2: Adjusted OR[b] (95% CI), *p*-value
	N(%)	N (%)			
Brand appeal					
Brand quality: Lower than a year ago	119 (30.6)	27 (18.1)	OR=2.00 (1.25-3.20) *p*=0.004	OR=1.66 (1.01-2.72) *p*=0.045	OR=1.41 (0.85-2.35) *p*=0.187
Brand satisfaction: Lower than a year ago	102 (26.2)	22 (14.9)	OR=2.03 (1.22-3.36) *p*=0.006	OR=1.70 (1.00-2.89) *p*=0.052	OR=1.53 (0.88-2.63) *p*=.130
Perceived harm	N(%)	N (%)			
Thought about the harms of smoking 'often' or 'very often' in the last week[c]	178 (45.9)	53 (35.6)	OR=1.56 (1.04-2.36) *p*=0.032	OR=1.43 (0.92-2.22) *p*=0.115	OR=1.42 (0.90-2.24) *p*=.129
Believe the dangers of smoking have been exaggerated	125 (32.3)	46 (30.9)	OR=1.07 (0.71-1.61) *p*=0.753	OR=1.15 (0.75-1.78) *p*=0.526	OR=1.15 (0.73-1.80) *p*=.551
Quitting thoughts and intentions	Mean (SD), N	Mean (SD), N	Unadjusted F, df, *p*-value	Adjusted F^, df, *p*-value	Adjusted F^^, df, *p*-value
Quitting as a priority in my life [c] (0 lowest to 10 highest)	6.76 (2.85), 337	5.62 (2.99), 130	F=14.76, df=1,464 *p*<0.001	F=13.11, df=1,442 *p*<0.000	F=11.25, df=1,441 *p*=0.001
	N(%)	N (%)			
Thought about quitting at least once a day in the last week	143 (36.8)	32 (21.8)	OR=2.09 (1.35-3.25) *p*=0.001	OR=1.81 (1.13-2.89) *p*=0.013	OR=1.82 (1.13-2.95) *p*=0.014
Planning to quit in next 30 days	100 (25.8)	27 (18.1)	OR=1.58 (0.98-2.54) *p*=0.060	OR=1.31 (0.78-2.18) *p*=0. 309	OR=1.28 (0.75-2.17) *p*=.363
Seriously considering quitting in the next 6 months	267 (68.8)	85 (57.1)	OR=1.66 (1.12-2.45) *p*=0.011	OR=1.30 (0.85-1.98) *p*=0.221	OR=1.34 (0.86-2.07) *p*=.195

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Support for the new legislation					
Support for an increase in GHW size to 75% front of pack	211 (54.4)	79 (53.5)	OR=1.04 (0.71-1.52) *p*=0.841	OR=0.97 (0.64-1.46) *p*=0.882	OR=1.01 (0.66-1.55) *p*=.955
Approval for the introduction of plain packaging	203 (52.4)	63 (42.2)	OR=1.51 (1.03-2.21) *p*=0.034	OR=1.51 (1.00-2.28) *p*=0.049	OR=1.63 (1.07-2.49) *p*=.024

* Numbers may not add to N=536 due to rounding of weighted numbers
[a] Adjusted for SES, daily consumption levels, recalled TVC, brand segment, & previous quit attempts
[b] Also adjusted for covariates, and proportion of sample smoking from a plain pack each week of interview
[c] Due to skip error in questionnaire only asked of current smokers aged under 60 years.

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Figures

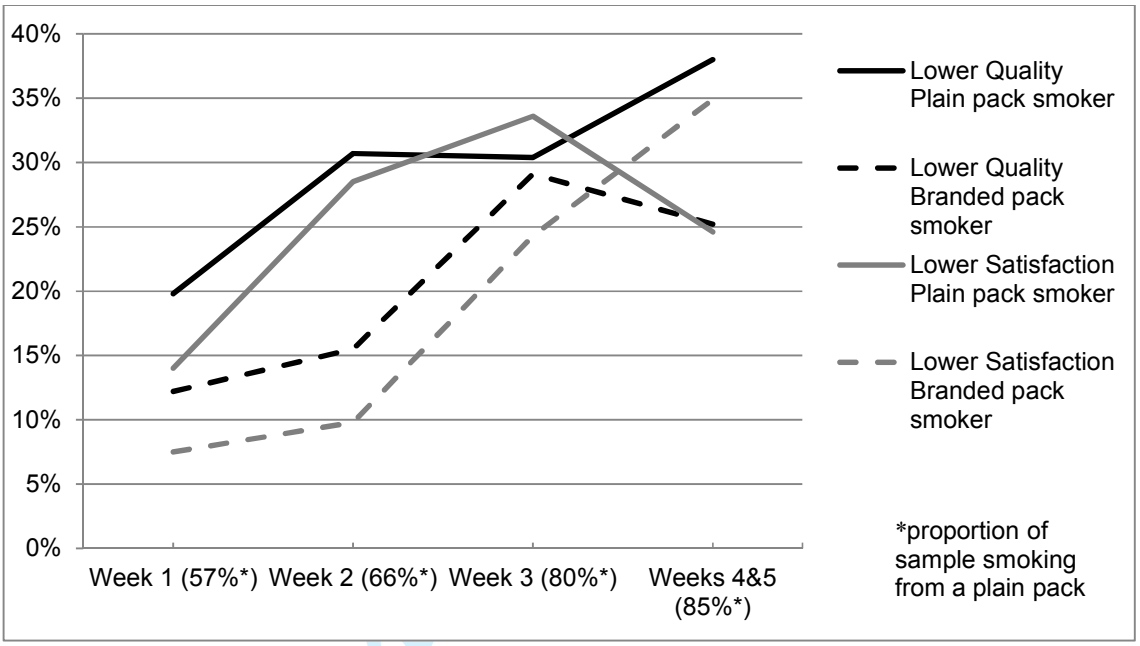

Fig 1 **Appeal outcomes by survey week for plain and branded pack smokers**

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Introduction effects of the Australian plain packaging policy on adult smokers: Cross-sectional study

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Abstract

Objective To determine whether smokers smoking from packs required under Australia's plain packaging law had different smoking beliefs and quitting thoughts, compared to those still smoking from branded packs.

Design Cross-sectional survey during the roll-out phase of the law, analysed by timing of survey.

Setting Australian state of Victoria, November 2012.

Participants 536 cigarette smokers with a usual brand, of whom 72.3% were smoking from a plain pack and 27.7% were smoking from a branded pack.

Primary outcome measures Perceived quality and satisfaction of cigarettes compared with one year ago, frequency of thoughts of smoking harm, perceived exaggeration of harms, frequency of thoughts of quitting, quitting priority in life, intention to quit, approval of large graphic health warnings and plain packaging.

Results Compared to branded pack smokers, those smoking from plain packs perceived their cigarettes to be lower in quality (AdjOR=1.66, p=0.045), tended to perceive their cigarettes as less satisfying than a year ago (AdjOR=1.70, p=0.052), were more likely to have thought about quitting at least once a day in the past week (AdjOR=1.81, p=0.013) and to rate quitting as a higher priority in their lives (F=13.11, df=1, p<0.001). Plain pack smokers were more likely to support the policy than branded pack smokers (AdjOR=1.51, p=0.049). Branded and plain pack smokers did not differ on measures of less immediate smoking intentions, frequency of thoughts about harms, or perceived exaggeration of harms. Appeal outcomes, but not other outcomes, were sensitive to the extent of roll-out, with responses from branded pack smokers approaching those of plain pack smokers, once 80% of survey respondents were smoking from plain packs 1-2 weeks before the December implementation date.

Conclusions The early indication is that plain packaging is associated with lower smoking appeal, more support for the policy and more urgency to quit among adult smokers.

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Article summary

Article focus

- Past studies have demonstrated that plain, as opposed to branded, tobacco packaging leads smokers to perceive the packs as lower in appeal, to make health warnings more salient and to reduce misapprehensions about perceived harms of smoking.
- Since no country had implemented plain packaging prior to Australia, all the studies conducted to date have simulated plain packaging.
- We examined the early impact of plain packaging on smokers *in vivo* as policy implementation rolled out for the first time in Australia in late 2012 in respect of perceived appeal and harm outcomes, and in addition, examined any potential effects on thoughts of quitting.

Key messages

- Compared to smokers smoking from branded packs, smokers who were smoking from the new plain packs were more likely to perceive their tobacco as being lower in quality and tended to be lower in satisfaction, were more likely to think about and prioritise quitting, and more likely to support the plain packaging policy.
- Appeal outcomes, but not other outcomes, were sensitive to the extent to which plain packaging had rolled-out among the smoker population over the survey period, with responses from branded pack smokers approaching those of plain pack smokers, at a time when 80% of survey respondents were smoking from plain packs 1-2 weeks before the December implementation date.

Strengths and limitations of this study

- The study used a representative population survey of smokers and was timed to occur over the period of introduction of plain packs into the Australian market.
- Although multivariate analysis adjusted for underlying differences between plain and branded pack smokers, these results may be partly explained by differential selection, with some smokers choosing to avoid the new plain packs for as long as possible.
- Some smokers of branded packs may previously have smoked from a plain pack, which would be expected to reduce differences between plain and branded pack smokers.
- Our study is not able to tease apart the independent contributions of plain packaging and the new larger graphic health warnings, since they co-occurred.

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Introduction

From 1 September 2012, all tobacco manufactured for sale in Australia was required to be contained in plain dark brown packs, with 75% front-of-pack graphic health warnings and the brand name and variant limited to a standardized font size and type.[1] This requirement supplanted Australian legislation that had required 30% front-of-pack graphic health warnings since 2006.[2] The new plain packs with larger warnings began appearing for sale at retail outlets early in October and increasingly so during November, since from 1 December 2012, all tobacco sold at retail was required to be contained in plain packs. The roll-out period of the new packs was accompanied by a nationally televised mass media campaign throughout November, promoting several serious harms of smoking that were also featured on the larger pack health warnings, including blindness, lung cancer and pregnancy-related harm. Other health warnings featured in the larger pack health warnings were peripheral vascular disease (gangrene), mouth (tongue) cancer and improvements to health from quitting.

Plain packaging aims to reduce the attractiveness and appeal of tobacco, increase the noticeability and effectiveness of health warnings, and reduce the ability of packaging to mislead consumers about smoking harms.[1] While the legislation is expected to exert effects on smoking behaviour indirectly through achievement of the above objectives, and in the long term as part of a comprehensive suite of measures, there is also interest in examining any short-run effects on adult smokers. As part of an annual population survey of adults conducted throughout November and early December 2012, we examined attitudes and intentions of smokers during this roll-out period, comparing those who were smoking cigarettes from the new plain packs with larger health warnings, with those still smoking from a branded pack with smaller warnings.

Method

Study design and participants

The Victorian Smoking and Health Survey is a cross sectional telephone survey undertaken annually with a representative sample of adults aged 18 years and over, residing in the general population of the Australian state of Victoria. Fieldwork for the 2012 survey occurred between November 1st and December 3rd inclusive.

Computer-assisted telephone interviews were conducted using a dual frame survey design incorporating samples generated by Random Digit Dialling (RDD) to landline and mobile phones. In the 45% of cases where it was possible to match landline phone numbers to residential addresses, primary approach letters were posted prior to the phone call to give notice of a ‘community survey of health attitudes and behaviours’. As Australian mobile phone numbers have no geographic identifier, it was not possible to send approach letters to potential participants contacted through RDD to mobile phones. A help line number was provided to all participants as a means of verifying the survey or obtaining further information.

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After establishing contact with a verified landline sample number, up to nine call attempts were made to complete an interview. Calls to unanswered mobile phones were limited to four attempts. When calling a landline phone, interviewers asked to speak to the youngest male aged 18 or over at home at the time of the call. If no males were available, the youngest adult female in the household was selected to participate. Within the mobile RDD sample, the individual answering a call was considered to be the target for screening. A quota was applied to the landline sample to ensure that approximately 70% of interviews were conducted with metropolitan residents and 30% with rural residents, reflecting the population distribution of Victoria. Given the absence of geographic identifiers for the mobile numbers, no quota was applied to the mobile sample and state of residence was established on contact.

In total, 3126 landline and 878 mobile phone interviews were completed. Interviews were conducted in English only. Verbal consent was obtained from participants at the start of each interview. The overall response rate, defined as completed interviews as a proportion of the sample who could be contacted within the call cycle and who were identified as eligible for the survey was 63%.

Ethics approval to undertake the survey was obtained from Cancer Council Victoria's Human Research Ethics Committee (HREC: 0018).

Measures

All questions were asked within the context of a broader 12-minute population survey of attitudes and behaviours relating to smoking. Smokers were identified as individuals who currently smoked cigarettes, pipes and/or cigars daily, weekly, or less than weekly. After being further asked about types of tobacco currently consumed, current cigarette smokers were those who smoked factory-made cigarettes (FMC) or roll-your-own (RYO) cigarettes daily, weekly or less than weekly. All cigarette smokers were asked to specify their usual brand. Based on price class definitions listed in the grocery trade magazine Retail World,[3] brands were classified into three segments (value, mainstream or premium). Where a brand was not listed, price per stick was used to determine the most appropriate classification, based on the thresholds used in Retail World. All RYO cigarette smokers (n=35) were assigned to the value market segment.

To ascertain exposure to the new plain packs, current cigarette smokers who reported smoking their usual FMC or RYO brand were asked: *'Is the cigarette/tobacco pack you are currently smoking one of the new dark brown packs which has all of its logos removed and a large picture health warning on the front?'*

To assess brand appeal, all current smokers were asked: *'I'm going to read some statements about how you rate your current cigarettes compared to a year ago. I'd like you to tell me if you think that now, your cigarettes are higher, lower or about the same in terms of …' a) 'Quality?' b)'Satisfaction?'* To assess perceived harm, smokers were asked: *'In the last week how often, if at all, did you think about the harm your smoking might be doing to you?'* with response options being 'never', 'rarely', 'sometimes', 'often' and 'very often' (and aggregated for analysis into 'often or very often' vs all others) and: *'Would you agree or*

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disagree that the dangers of smoking have been exaggerated?' with response options from strongly agree, agree, neither, disagree and strongly disagree.

To examine quitting thoughts and intentions, smokers were asked: *'Are you seriously considering quitting smoking in the next 6 months?'; 'Are you planning to quit smoking in the next 30 days?'*; and *'On a scale of 1 to 10, where 1 is lowest and 10 is highest, how would you rate quitting as a priority in your life?'*. Quitting salience was measured with the question: *'During the past week, how often have you thought about quitting?'* with responses ranging from 'not at all' to 'several times a day'. Responses were aggregated for analysis into 'once a day or more often' versus 'less often or not at all'.

Opinion about the new health warnings was determined by asking: *'In order to strengthen the impact of the health messages on packs, the Federal government requires that from December 1 2012, the size of graphic health warnings will be increased to cover 75% of the front of the cigarette pack. Do you support or oppose increasing the size of graphic health warnings to 75% of the front of the cigarette pack?'* The responses of smokers who 'strongly' or 'somewhat' supported the enlarged graphic health warnings were compared to the responses of those who opposed or had no opinion about the size increase. Plain packaging opinions were assessed by asking: *'Tobacco companies often use cigarette packaging for promotional purposes. Because of this, the Federal government requires that from December 1 2012, cigarettes will be sold in plain packaging. This will mean the packs will all look the same with the logos and colours removed. Just the brand in plain text and the graphic health warnings will remain on the packs. Do you approve or disapprove of this?'* Respondents who reported that they approved or strongly approved were compared to others.

The average number of cigarettes smoked each day was calculated for daily and weekly smokers based on their self-reported consumption. For the purposes of analyses, less than weekly smokers were classified in the lowest consumption group (<5 cigarettes per day). Smokers who had never attempted to quit were compared to smokers who had made at least one previous quit attempt, based on responses to the question: *'Approximately how many times, if any, have you tried to give up smoking?'*.

During the fieldwork period, three anti-smoking advertisements were broadcast on television as part of a national anti-smoking mass media campaign. Respondents were read a short description of each advertisement and smokers who recalled seeing at least one were compared to those who did not recall any advertisements.

Respondents were classified into three socio-economic (SES) groups using the Index of Relative Disadvantage (IRSD),[4] which ranks postal areas on a continuum of high to low disadvantage, taking into consideration characteristics including income, education, occupation and housing. The low SES (high disadvantage) group comprised people in the bottom 40% of ranked postal areas, the mid SES group included people who live in areas with an IRSD score between 41% and 80% of ranked postal areas, while the high SES (lowest disadvantage) group lived in areas with an IRSD score between 81% and 100% of ranked postal areas.

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Statistical analyses

All data were weighted by age and gender, based on the 2011 Australian census.[5] Data weights also accounted for a participant's relative chance of inclusion in the landline or mobile phone sample frame, and their chance of selection based on the number of landlines in each household and number of in-scope people per household.

We first compared the characteristics of those smoking from plain and branded packs using bivariate logistic regression for binary variables and ANOVA for continuous outcomes. Variables associated with plain or branded pack use at $p<.25$ were included as covariates in multivariate logistic regression analyses, following Hosmer and Lemeshow,[6] to examine whether current possession of a plain pack compared to a branded pack was associated with brand appeal, perceived harm, quitting thoughts and intentions, and support for packaging legislation and in ANCOVA to determine if smoking from a plain pack was associated with higher ratings of quitting as a life priority.

A third set of models additionally controlled for the proportion of the sample interviewed during each survey week who reported smoking from a plain pack. We did this to control for the extent to which, as the survey period progressed, smokers would have been increasingly exposed to plain packs in their social networks, even though they may not have been personally smoking from one. Finally, in a sensitivity analysis, we repeated all analyses for brand loyal smokers, defined as those who had been smoking the same brand for a year.

Results

Participant characteristics

Of the total of 4004 interviews, 572 current cigarette smokers were identified. Of these, 9 reported that they did not smoke a usual brand, 13 did not know or refused to say what their usual brand was and 2 reported smoking unbranded cigarettes. (Unbranded tobacco is untaxed loose tobacco without any branding, sold in unmarked plastic bags.) A further 10 smokers did not know if they were currently smoking from a plain pack and 2 indicated that they did not currently possess a pack, leaving 536 current FMC or RYO smokers with a usual brand who indicated they were smoking from a plain or branded pack. Although the interviewers had scope to record if smokers responded that they had transferred their cigarettes into a case, no smokers reported having done so.

Table 1 shows the characteristics of 536 usual brand cigarette smokers who were smoking from a plain pack (72.3% n=388) or a branded pack (27.7%, n=148). The proportion of usual brand cigarette smokers who were smoking from a plain pack increased from 57.2% in the first week of surveying to 85.0% in the final week.

Bivariate comparison of those smoking from branded and plain packs

Smokers currently smoking from a plain pack did not differ from smokers who were currently smoking from a branded pack with respect to age, sex, education or area of residence (Table 2). Smokers were significantly more likely to be smoking from a plain pack

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if they lived in a medium compared to a low socio-economic area (OR=1.55, *p*=.050), or reported having ever made a quit attempt (OR=2.61, *p*<0.001) and there was a trend toward being more likely to smoke from a plain pack if they recalled having seen recent anti-smoking campaign advertising on television (OR =1.45, *p*=0.056). Compared to smokers of value brands, smokers of mainstream (OR=2.38, *p*<0.001) and premium (OR=1.80, *p*=.021) brands were also more likely to currently be smoking from a plain pack. Compared to those who smoked fewer than five cigarettes per day, smokers of between five and 10 cigarettes a day (OR=1.57, *p*=0.098) tended to be more likely to be smoking from a plain pack. As a result of these analyses, SES, recall of recent anti-smoking television advertisements, brand segment, cigarette consumption, and having ever made a quit attempt were included as covariates in multivariate models.

Multivariate comparison of those smoking from branded and plain packs

After adjusting for covariates (Table 3, Model 1), plain pack smokers were more likely than branded pack smokers to perceive their cigarettes to be lower quality than a year ago (OR=1.66, *p*=0.045), and trended towards perceiving their cigarettes to be less satisfying than a year ago (OR=1.70, *p*=0.052). Plain pack smokers were slightly but not significantly more likely than branded pack smokers to have thought about the harms of smoking 'often' or 'very often' in the previous week (adjusted OR=1.43, *p*=0.115), but did not differ in belief that the dangers of smoking had been exaggerated.

Smokers with a plain pack rated quitting as being a significantly higher priority in their life (Mean =6.76) compared to those who were smoking from branded packs (Mean=5.62) (adjusted F=13.11, df=1, *p*<0.001). Smokers who were currently smoking from a plain pack were almost twice as likely to report that they had thought about quitting at least once a day over the past week (adjusted OR=1.81, *p*=0.013) when compared to smokers of branded packs. No differences between plain and branded pack smokers were found for quit intentions within 30 days or the next 6 months.

Plain and branded pack smokers did not differ in terms of their support for increasing the size of graphic health warnings, but a greater proportion of plain pack smokers approved of plain packaging than branded pack smokers (adjusted OR=1.51, *p*=0.049).

Additional covariate adjustment for the proportion of the sample smoking from a plain pack (Table 3, Model 2) resulted in no material change in effect sizes or statistical significance for all outcomes, except for the appeal outcomes. For the measures of quality and satisfaction, this adjustment resulted in a slight reduction in effect sizes, with differences no longer being statistically significant. Figure 1 shows that early in the survey period when the overall proportion of the sample smoking from plain packs was lower, a greater proportion of plain pack smokers thought their cigarettes were lower in quality and satisfaction than branded pack smokers. As the roll-out of plain packs reached 80% or more of smokers surveyed in the third week of November (1-2 weeks before the December implementation date), the responses of branded pack smokers approached those of plain pack smokers.

Brand loyal cigarette smokers

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Of the 536 usual brand cigarette smokers, 452 indicated they had been smoking their current brand for one year or longer. (We excluded smokers who said they had been smoking their current brand for less than a year (n=60) or who did not give a time period (n=23)). We found that 30.0% of the 329 plain pack smokers and 20.1% of 123 branded pack smokers thought the quality of their cigarettes was lower than a year ago (Adj OR=1.54, *p*=.108), and 25.1% of plain pack smokers and 16.2% of branded pack smokers thought their satisfaction was lower than a year ago (OR=1.57, *p*=.122). Thus, effect sizes eased slightly and significance levels declined. Again, once adjustment was undertaken for the proportion of participants smoking from a plain pack during each survey week, effect sizes diminished further (lower quality OR=1.32, *p*=.318; lower satisfaction: OR=1.36, *p*=.307), but remained in the same direction. The strength and pattern of findings for all other outcomes remained the same as the main analysis.

Discussion

Compared to branded pack smokers, smokers who were smoking from plain packs rated their cigarettes as being lower in quality and as tending to be less satisfying than one year ago. These appeal outcomes were sensitive to the extent to which plain packaging had rolled-out among the smoker population over the survey period, with responses from branded pack smokers approaching those of plain pack smokers, once 80% of survey respondents were smoking from plain packs 1-2 weeks before the December implementation date. Among brand loyal smokers, effects were in the same direction but not significant. In all analyses, plain pack smokers were more likely to think often or very often about quitting in the past week and to rate quitting as a higher priority in their lives, compared to branded pack smokers. There were no significant differences in the proportion of plain and branded pack smokers who thought frequently about the harms of smoking or thought smoking harms had been exaggerated. While a similar proportion of plain and branded pack smokers supported the larger graphic health warnings, a significantly greater proportion of plain pack smokers approved of plain packaging.

Given Australia is the first nation to implement plain packaging, our study provides an early investigation of its actual effects on smokers in a market where plain packs are available to all, compared with past studies that have experimentally exposed smokers to a single viewing of a plain or branded pack which may or may not have been their own brand,[7-13] and naturalistic studies that have mocked-up plain packs for smokers to carry around with them in a trial situation.[14 15]

In the period leading up to the December 1st implementation date, plain packs began to be sold at retail from early October and the timing of our survey enabled a comparison of those who were smoking from one of the new plain packs with those who were not. Our survey obviously excludes the responses of those who may have quit during this short period. Our designation of smokers as plain or branded was based on the pack from which they were currently smoking at the time of survey administration. It should not be assumed that those smoking from branded packs had not previously purchased and smoked from a plain pack. Indeed, this would have been increasingly likely as the survey period progressed and, even if

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branded pack smokers had not themselves purchased a plain pack, they would have been increasingly exposed to them via their social networks.

Our study demonstrated that responses for branded pack smokers began to approach those of plain pack smokers for the two appeal outcomes towards the end of the survey period. This could mean that having around 80% of smokers smoking from a plain pack represents a threshold of availability for social contagion effects, or it may reflect a point where the likelihood of not having smoked from a plain pack was approaching zero, and thus all responses were influenced by having smoked cigarettes from plain packs.

Smoking from a plain as compared with branded pack could be due to differences in availability or to choice. Differences across survey week are clearly due to increased availability of plain packs and reduced availability of branded packs. In addition, brand segment and SES differences in the likelihood of smoking from a plain pack could be due to differential availability of plain packs by brand or residential area. The higher rate of recall of the mass media campaign among those with plain packs might be due to the accompanying large pack health warnings assisting the memorability or impact of the television messages, as has been found in past studies.[16 17] However, the difference observed in past quitting behaviour between those with plain and branded packs is more consistent with differential choice. Although we adjusted for ever having previously tried to quit, there may have been residual confounding, so that those less interested in quitting may have been more likely to avoid the plain packs. Avoidance of plain packs by these smokers would be entirely consistent with the notion that plain packs make smokers feel uncomfortable about their smoking, as found in two naturalistic studies.[14 15] Some of the relationships found between pack type and quitting outcomes could be due to those more interested in quitting being less likely to avoid, or even to seek out the plain packs. However, even if this is the case, the net effect of plain packaging for quitting remains positive.

The observed pattern of findings in relation to brand appeal and the direction of findings relating to perceived harms is consistent with those of experimental studies of plain packaging conducted in Australia[7 18], the UK[8 19] and other countries [11-13 20 21] and also with the Australian government's pre-testing of mocked-up plain packs.[22] The finding that smokers smoking from a plain pack evidenced more frequent thoughts about and priority for quitting than branded pack smokers is important, since frequency of thoughts about quitting has strong predictive validity in prospective studies for actually making a quit attempt.[23 24] Past research on graphic health warnings has found that greater size of warnings is associated with more message recall, greater perceived effectiveness and risks of smoking [25 26] and less appeal.[27] Also, noticing pictorial health warnings on others' tobacco packs reduced the risk of relapse in recent quitters in a cohort study.[28] Our study is not able to tease apart the independent contributions of plain packaging and the new larger health warnings, since they co-occurred. These responses are unlikely to be due to any media campaign effects since we adjusted for campaign recall, and in other analyses, determined that campaign recall was unrelated to frequency of thoughts of harm, and quitting intentions and importance.

We noted that the proportion who thought the harms had been exaggerated was not higher for plain pack smokers with the larger graphic warnings, than branded pack smokers. We also found similar proportions of branded and plain pack smokers who supported the larger

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graphic health warnings, with a majority supporting it. Interestingly, those smoking from plain packs were more likely to approve of plain packaging than those smoking from branded packs. Given that 73% of Australian smokers intend to quit[29] and over 90% regret having started,[30] smokers may acknowledge such packaging changes as a source of motivation or reminder for quitting, and/or as being important to reduce the appeal of smoking for young people. This pattern of differences in approval is similar to the pattern of increase in public support that is observed when smoke-free laws[31 32] and display bans[33] have been implemented.

We note the initial responses observed in this study concur with news reports during November and December of smokers perceiving their cigarettes 'taste worse'[34 35] – an effect likely to be attributable to the halo effects of packaging influencing the sensory experience of smoking[36] – and with reports of increases in calls to Quitlines.[37] Overall, the introductory effects we observed are consistent with the broad objectives of the plain packaging legislation. We await further research to examine more durable effects on smokers and any effects on youth.

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Competing interest declaration

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: LH and SD had financial support from Quit Victoria for the submitted work; no authors had financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no authors had other relationships or activities that could appear to have influenced the submitted work.

Contributors

MW and LH conceived the study. MW, LH and RB designed the survey questions. LH and SD undertook data analysis, MW and LH drafted the manuscript and SD and RB revised the content. All authors approved the final submitted version. MW is the study guarantor.

Ethics approval

Ethical approval for the study was provided by the Human Research Ethics Committee of Cancer Council Victoria (HREC 0018).

Data sharing statement

no additional data available.

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Tables

Table 1 **Characteristics of current smokers**

	Number*	Per cent
Total	536	100
Sex		
Male	303	56.6
Female	233	43.4
Age group		
18-29 years	163	30.4
30-49 years	229	42.8
50 plus	144	26.8
Education		
Up to Year 12	333	62.0
Tertiary level and above	204	38.0
Socio-Economic Status		
Low (most disadvantaged)	129	24.1
Medium	345	64.2
High (least disadvantaged)	63	11.7
Area of Residence		
Metropolitan Victoria	387	72.1
Regional Victoria	146	27.2
Unknown	4	0.7
Current daily consumption level (average no of cigs per day)		
< 5 per day (includes <weekly smokers)	139	25.8
>5 to 10 per day	132	24.6
>10 to 15 per day	103	19.2
>15 per day	150	28.0
Unknown	13	2.4
Ever tried to quit		
No	86	16.0
Yes	446	83.2
Unknown	4	0.8
Brand segment		
Value	140	26.2
Mainstream	249	46.4
Premium	147	27.4
Exposure to anti-smoking TV campaign		
Did not recall any advertisements	243	45.3
Recalled at least one anti-smoking advertisement	293	54.7
Smoking from a plain pack		
Week 1	125	57.2
Week 2	142	66.3
Week 3	142	80.4
Week 4-5	126	85.0

* Numbers may not add to N=536 due to rounding of weighted numbers

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Table 2 **Characteristics of cigarette smokers currently smoking from a plain pack compared to a branded pack**

	N smoking from plain pack	% smoking from plain pack	Unadjusted OR (95% CI)
TOTAL (N=536)	388	72.3	
Sex			
Male (n=303)	214	70.4	1.00 (Ref)
Female (n=233)	174	74.8	OR 1.25 (0.85-1.83), *p*=0.262
Age group			*p*=0.579
18-29 years (n=163)	123	75.2	1.00 (Ref)
30-49 years (n=229)	164	71.6	OR=0.83 (0.53-1.32), *p* =0.432
50 plus (n=144)	101	70.1	OR=0.77 (0.47 -1.28), *p* =0.317
Education			
Up to Year 12 (n=333)	235	70.6	1.00 (Ref)
Tertiary level and above (n=204)	153	75.1	OR=1.26 (0.85-1.87), p=0.258
Socio-Economic Status			*p*=0.150
Low (n=129)	85	65.6	1.00 (Ref)
Medium (n=345)	257	74.7	OR=1.55 (1.00-2.40), *p* =0.050
High (n=63)	46	73.1	OR=1.42 (0.73-2.77), *p* =0.299
Area of Residence (n=532)			
Metropolitan Victoria (n=387)	279	72.1	1.00 (Ref)
Regional Victoria (n=146)	105	72.2	OR=1.00 (0.66-1.53), p=0.990
Current daily consumption level (average no of cigs per day n=523)			*p*=0.312
< 5 per day (including non-daily smokers) (n=139)	92	66.3	1.00
>5 to 10 per day (n=132)	100	75.5	OR=1.57 (0.92-2.66), *p* =0.098
>10 to 15 per day (n=103)	78	75.3	OR=1.55 (0.88- 2.74), *p* =0.133
>15 per day (n=150)	107	71.2	OR=1.26 (0.76-2.07), *p* =0.370
Ever tried to quit (n=532)			
No (n=86)	46	54.2	1.00 (Ref)

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Yes (n=446)	337	75.6	OR=2.61 (1.62-4.21), *p* <0.001
Brand segment			*p*=0.001
Value (n=140)	85	60.4	1.00 (Ref)
Mainstream (n=249)	195	78.4	OR=2.38 (1.51-3.74), *p* <0.001
Premium (n=147)	108	73.3	OR=1.80 (1.09-2.96), *p* =0.021
Exposure to anti-smoking TV campaign			
Did not recall advertising (n=243)	166	68.3	1.00 (Ref)
Recalled at least one of three anti-smoking campaign advertisements (n=293)	222	75.7	OR =1.45 (0.99-2.12), *p* =0.056

* Numbers may not add to N=536 due to rounding of weighted numbers

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Table 3 **Attitudes and intentions of respondents who were currently smoking from a plain pack compared to those respondents who were smoking from a branded pack*.**

	Smoking from plain pack (n=388)	Smoking from branded pack (n=148)	Unadjusted OR (95% CI), *p*-value	Model 1: Adjusted OR[a] (95% CI), *p*-value	Model 2: Adjusted OR[b] (95% CI), *p*-value
	N(%)	N (%)			
Brand appeal					
Brand quality: Lower than a year ago	119 (30.6)	27 (18.1)	OR=2.00 (1.25-3.20) *p*=0.004	OR=1.66 (1.01-2.72) *p*=0.045	OR=1.41 (0.85-2.35) *p*=0.187
Brand satisfaction: Lower than a year ago	102 (26.2)	22 (14.9)	OR=2.03 (1.22-3.36) *p*=0.006	OR=1.70 (1.00-2.89) *p*=0.052	OR=1.53 (0.88-2.63) *p*=.130
Perceived harm	N(%)	N (%)			
Thought about the harms of smoking 'often' or 'very often' in the last week[c]	178 (45.9)	53 (35.6)	OR=1.56 (1.04-2.36) *p*=0.032	OR=1.43 (0.92-2.22) *p*=0.115	OR=1.42 (0.90-2.24) *p*=.129
Believe the dangers of smoking have been exaggerated	125 (32.3)	46 (30.9)	OR=1.07 (0.71-1.61) *p*=0.753	OR=1.15 (0.75-1.78) *p*=0.526	OR=1.15 (0.73-1.80) *p*=.551
Quitting thoughts and intentions	Mean (SD), N	Mean (SD), N	Unadjusted F, df, *p*-value	Adjusted F^, df, *p*-value	Adjusted F^^, df, *p*-value
Quitting as a priority in my life [c] (0 lowest to 10 highest)	6.76 (2.85), 337	5.62 (2.99), 130	F=14.76, df=1,464 *p*<0.001	F=13.11, df=1,442 *p*<0.000	F=11.25, df=1,441 *p*=0.001
	N(%)	N (%)			
Thought about quitting at least once a day in the last week	143 (36.8)	32 (21.8)	OR=2.09 (1.35-3.25) *p*=0.001	OR=1.81 (1.13-2.89) *p*=0.013	OR=1.82 (1.13-2.95) *p*=0.014
Planning to quit in next 30 days	100 (25.8)	27 (18.1)	OR=1.58 (0.98-2.54) *p*=0.060	OR=1.31 (0.78-2.18) *p*=0. 309	OR=1.28 (0.75-2.17) *p*=.363
Seriously considering quitting in the next 6 months	267 (68.8)	85 (57.1)	OR=1.66 (1.12-2.45) *p*=0.011	OR=1.30 (0.85-1.98) *p*=0.221	OR=1.34 (0.86-2.07) *p*=.195

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Support for the new legislation	N (%)	N(%)			
Support for an increase in GHW size to 75% front of pack	211 (54.4)	79 (53.5)	OR=1.04 (0.71-1.52) *p*=0.841	OR=0.97 (0.64-1.46) *p*=0.882	OR=1.01 (0.66-1.55) *p*=.955
Approval for the introduction of plain packaging	203 (52.4)	63 (42.2)	OR=1.51 (1.03-2.21) *p*=0.034	OR=1.51 (1.00-2.28) *p*=0.049	OR=1.63 (1.07-2.49) *p*=.024

* Numbers may not add to N=536 due to rounding of weighted numbers
[a] Adjusted for SES, daily consumption levels, recalled TVC, brand segment, & previous quit attempts
[b] Also adjusted for covariates, and proportion of sample smoking from a plain pack each week of interview
[c] Due to skip error in questionnaire only asked of current smokers aged under 60 years.

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Figure legend

Fig 1 **Appeal outcomes by survey week for plain and branded pack smoker**

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Introduction effects of the Australian plain packaging policy on adult smokers: Cross-sectional study

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Abstract

Objective To determine whether smokers smoking from packs required under Australia's plain packaging law had different smoking beliefs and quitting thoughts, compared to those still smoking from branded packs.

Design Cross-sectional survey during the roll-out phase of the law, analysed by timing of survey.

Setting Australian state of Victoria, November 2012.

Participants 536 cigarette smokers with~~who had~~ a usual brand, of whom 72.3% were smoking from a plain pack and 27.7% were smoking from a branded pack.

Primary outcome measures Perceived quality and satisfaction of cigarettes compared with one year ago, frequency of thoughts of smoking harm, perceived exaggeration of harms, frequency of thoughts of quitting, quitting priority in life~~ from 0 (lowest) to 10 (highest)~~, intention to quit~~ in 30 days and 6 months~~, approval of large graphic health warnings and plain packaging.

Results Compared to branded pack smokers, those smoking from plain packs perceived their cigarettes to be lower in quality (AdjOR=1.66, p=0.045),~~ and~~ tended to perceive their cigarettes as less satisfying than a year ago (AdjOR=1.70, p=0.052), were more likely to have thought about quitting at least once a day in the past week (AdjOR=1.81, p=0.013) and to rate quitting as a higher priority in their lives (F=13.11, df=1, p<0.001). Plain pack smokers were more likely to support the policy than branded pack smokers (AdjOR=1.51, p=0.049). Branded and plain pack smokers did not differ on measures of less immediate smoking intentions, frequency of thoughts about harms, or perceived exaggeration of harms. Appeal outcomes, but not other outcomes, were sensitive to the extent of roll-out, with responses from branded pack smokers approaching those of plain pack smokers, once 80% of survey respondents were smoking from plain packs 1-2 weeks before the December implementation date.

Conclusions The early indication is that plain packaging is associated with lower smoking appeal, more support for the policy and more urgency to quit among adult smokers.

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Article summary

Article focus

- Past studies have demonstrated that plain, as opposed to branded, tobacco packaging leads smokers to perceive the packs as lower in appeal, to make health warnings more salient and to reduce misapprehensions about perceived harms of smoking.
- Since no country had implemented plain packaging prior to Australia, all the studies conducted to date have simulated plain packaging~~ by using experimental or qualitative studies~~.
- We examined the early impact of plain packaging on smokers *in vivo* as policy implementation rolled out for the first time ~~internationally~~ in Australia in late 2012 in respect of perceived appeal and harm~~these~~ outcomes, and in addition, examined any potential effects on thoughts of quitting.

Key messages

- Compared to smokers smoking from branded packs, smokers who were smoking from the new plain packs were more likely to perceive their tobacco as being lower in quality and tended to be lower in satisfaction, were more likely to think about and prioritise~~have greater urgency for~~ quitting, and more likely to support the plain packaging policy.
- Appeal outcomes, but not other outcomes, were sensitive to the extent to which plain packaging had rolled-out among the smoker population over the survey period, with responses from branded pack smokers approaching those of plain pack smokers, at a time when~~once~~ 80% of survey respondents were smoking from plain packs 1-2 weeks before the December implementation date.

Strengths and limitations of this study

- The study used a representative population survey of smokers and was timed to occur over the period of introduction of plain packs into the Australian market.
- Although multivariate analysis adjusted for underlying differences between plain and branded pack smokers, these results may be partly explained by differential selection, with some smokers choosing to avoid the new plain packs for as long as possible.
- Some smokers of branded packs may previously have smoked from a plain pack, which would be expected to reduce differences between plain and branded pack smokers.
- Our study is not able to tease apart the independent contributions of plain packaging and the new larger graphic health warnings, since they co-occurred.

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Introduction

From 1 September 2012, all tobacco manufactured for sale in Australia was required to be contained in plain dark brown packs, with 75% front-of-pack graphic health warnings and the brand name and variant limited to a standardized font size and type.[1] This requirement supplanted Australian legislation that had required 30% front-of-pack graphic health warnings since 2006.[2] The new plain packs with larger warnings began appearing for sale at retail outlets early in October and increasingly so during November, since from 1 December 2012, all tobacco sold at retail was required to be contained in plain~~ly~~ pack~~s~~~~aged~~. The roll-out period of the new packs was accompanied by a nationally televised mass media campaign throughout November, promoting several serious harms of smoking that were also featured on the larger pack health warnings, including blindness, lung cancer and pregnancy-related harm. Other health warnings featured in the larger pack health warnings were peripheral vascular disease (gangrene), mouth (tongue) cancer and improvements to health from quitting.

Plain packaging aims to reduce the attractiveness and appeal of tobacco, increase the noticeability and effectiveness of health warnings, and reduce the ability of packaging to mislead consumers about smoking harms.[1] While the legislation is expected to exert effects on smoking behaviour indirectly through achievement of the above objectives, and in the long term as part of a comprehensive suite of measures, there is also interest in examining any short-run effects on adult smokers. As part of an annual population survey of adults conducted throughout November and early December 2012, we examined attitudes and intentions of smokers during this roll-out period, comparing those who were smoking cigarettes from the new plain packs with larger health warnings, with those still smoking from a branded pack with smaller warnings.

Method

Study design and participants

The Victorian Smoking and Health Survey is a cross sectional telephone survey undertaken annually with a representative sample of adults aged 18 years and over, residing in the general population of the Australian state of Victoria. Fieldwork for the 2012 survey occurred between November 1st and December 3rd inclusive.

Computer-assisted telephone interviews were conducted using a dual frame survey design incorporating samples generated by Random Digit Dialling (RDD) to landline and mobile phones. In the 45% of cases where it was possible to match landline phone numbers to residential addresses, primary approach letters were posted prior to the phone call to give notice of a 'community survey of health attitudes and behaviours'. As Australian mobile phone numbers have no geographic identifier, it was not possible to send approach letters to potential participants contacted through RDD to mobile phones. A help line number was provided to all participants as a means of verifying the survey or obtaining further information.

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After establishing contact with a verified landline sample number, up to nine call attempts were made to complete an interview. Calls to unanswered mobile phones were limited to four attempts. When calling a landline phone, interviewers asked to speak to the youngest male aged 18 or over at home at the time of the call. If no males were available, the youngest adult female in the household was selected to participate. Within the mobile RDD sample, the individual answering a call was considered to be the target for screening. A quota was applied to the landline sample to ensure that approximately 70% of interviews were conducted with metropolitan residents and 30% with rural residents, reflecting the population distribution of Victoria. Given the absence of geographic identifiers for the mobile numbers, no quota was applied to the mobile sample and state of residence was established on contact.

In total, 3126 landline and 878 mobile phone interviews were completed. Interviews were conducted in English only. Verbal consent was obtained from participants at the start of each interview. The overall response rate, defined as completed interviews as a proportion of the sample who could be contacted within the call cycle and who were identified as eligible for the survey was 63%.

Ethics approval to undertake the survey was obtained from Cancer Council Victoria's Human Research Ethics Committee (HREC: 0018).

<u>Measures</u>

All questions were asked within the context of a broader 12-minute population survey of attitudes and behaviours relating to smoking. Smokers were identified as individuals who currently smoked cigarettes, pipes and/or cigars daily, weekly, or less than weekly. After being further asked about types of tobacco currently consumed, current cigarette smokers were those who smoked factory-made cigarettes (FMC) or roll-your-own (RYO) cigarettes daily, weekly or less than weekly. All cigarette smokers were asked to specify their usual brand. Based on price class definitions listed in the grocery trade magazine Retail World,[3] brands were classified into three segments (value, mainstream or premium). Where a brand was not listed, price per stick was used to determine the most appropriate classification, based on the thresholds used in Retail World. All RYO cigarette smokers (n=35) were assigned to the value market segment.

To ascertain exposure to the new plain packs, current cigarette smokers who reported smoking their usual FMC or RYO brand were asked: *'Is the cigarette/tobacco pack you are currently smoking one of the new dark brown packs which has all of its logos removed and a large picture health warning on the front?'*

To assess brand appeal, all current smokers were asked: *'I'm going to read some statements about how you rate your current cigarettes compared to a year ago. I'd like you to tell me if you think that now, your cigarettes are higher, lower or about the same in terms of …' a) 'Quality?' b)'Satisfaction?'* To assess perceived harm, smokers were asked: *'In the last week how often, if at all, did you think about the harm your smoking might be doing to you?'* with response options being 'never', 'rarely', 'sometimes', 'often' and 'very often' (and aggregated for analysis into 'often or very often' vs all others) and: *'Would you agree or*

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disagree that the dangers of smoking have been exaggerated?' with response options from strongly agree, agree, neither, disagree and strongly disagree.

To examine quitting thoughts and intentions, smokers were asked: *'Are you seriously considering quitting smoking in the next 6 months?'; 'Are you planning to quit smoking in the next 30 days?'*; and *'On a scale of 1 to 10, where 1 is lowest and 10 is highest, how would you rate quitting as a priority in your life?'*. Quitting salience was measured with the question: *'During the past week, how often have you thought about quitting?'* with responses ranging from 'not at all' to 'several times a day'. Responses were aggregated for analysis into 'once a day or more often' versus 'less often or not at all'.

Opinion about the new health warnings was determined by asking: *'In order to strengthen the impact of the health messages on packs, the Federal government requires that from December 1 2012, the size of graphic health warnings will be increased to cover 75% of the front of the cigarette pack. Do you support or oppose increasing the size of graphic health warnings to 75% of the front of the cigarette pack?'* The responses of smokers who 'strongly' or 'somewhat' supported the enlarged graphic health warnings were compared to the responses of those who opposed or had no opinion about the size increase. Plain packaging opinions were assessed by asking: *'Tobacco companies often use cigarette packaging for promotional purposes. Because of this, the Federal government requires that from December 1 2012, cigarettes will be sold in plain packaging. This will mean the packs will all look the same with the logos and colours removed. Just the brand in plain text and the graphic health warnings will remain on the packs. Do you approve or disapprove of this?'* Respondents who reported that they approved or strongly approved were compared to others.

The average number of cigarettes smoked each day was calculated for daily and weekly smokers based on their self-reported consumption. For the purposes of analyses, less than weekly smokers were classified in the lowest consumption group (<5 cigarettes per day). Smokers who had never attempted to quit were compared to smokers who had made at least one previous quit attempt, based on responses to the question: *'Approximately how many times, if any, have you tried to give up smoking?'*.

During the fieldwork period, three anti-smoking advertisements were broadcast on television as part of a national anti-smoking mass media campaign. Respondents were read a short description of each advertisement and smokers who recalled seeing at least one were compared to those who did not recall any advertisements.

Respondents were classified into three socio-economic (SES) groups using the Index of Relative Disadvantage (IRSD),[4] which ranks postal areas on a continuum of high to low disadvantage, taking into consideration characteristics including income, education, occupation and housing. The low SES (high disadvantage) group comprised people in the bottom 40% of ranked postal areas, the mid SES group included people who live in areas with an IRSD score between 41% and 80% of ranked postal areas, while the high SES (lowest disadvantage) group lived in areas with an IRSD score between 81% and 100% of ranked postal areas.

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Statistical analyses

All data were weighted by age and gender, based on the 2011 Australian census.[5] Data weights also accounted for a participant's relative chance of inclusion in the landline or mobile phone sample frame, and their chance of selection based on the number of landlines in each household and number of in-scope people per household.

We first compared the characteristics of those smoking from plain and branded packs using bivariate logistic regression for binary variables and ANOVA for continuous outcomes. Variables associated with plain or branded pack use at p<.25 were included as covariates in multivariate logistic regression analyses, following Hosmer and Lemeshow,[6] ~~to Logistic regression analyses were undertaken to determine if the characteristics of smokers who reported currently smoking from a plain pack differed to those of smokers who were smoking from a branded pack. This permitted an assessment of the covariates required for inclusion in subsequent logistic regression analyses which~~ to examine~~d~~ whether current possession of a plain pack compared to a branded pack was associated with brand appeal, perceived harm, quitting thoughts and intentions, and support for packaging legislation and in~~.~~ ANCOVA ~~was undertaken~~ to determine if smoking from a plain pack was associated with higher ratings of quitting as a life priority~~, adjusting for the same covariates. Ultimately, SES, recall of recent anti-smoking television ads, brand segment and having ever made a quit attempt were included as covariates in the multivariate model.~~

A third~~final~~ set of models additionally controlled for the proportion of the sample interviewed during each survey week who reported smoking from a plain pack. We did this to control for the extent to which, as the survey period progressed, smokers would have been increasingly exposed to plain packs in their social networks, even though they may not have been personally smoking from one. Finally, in a sensitivity analysis, we repeated all analyses for brand loyal smokers, defined as those who had been smoking the same brand for a year.

Results

Participant characteristics

Of the total of 4004 interviews, 572 current cigarette smokers were identified. Of these, 9 reported that they did not smoke a usual brand, 13 did not know or refused to say what their usual brand was and 2 reported smoking unbranded cigarettes. (Unbranded tobacco is untaxed loose tobacco without any branding, sold in unmarked plastic bags.) A further 10 smokers did not know if they were currently smoking from a plain pack and 2 indicated that they did not currently possess a pack, leaving 536 current FMC or RYO smokers with a usual brand who indicated they were smoking from a plain or branded pack. Although the interviewers had scope to record if smokers responded that they had transferred their cigarettes into a case, no smokers reported having done so.

Table 1 shows the characteristics of 536 usual brand cigarette smokers who were smoking from a plain pack (72.3% n=388) or a branded pack (27.7%, n=148). The proportion of usual

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brand cigarette smokers who were smoking from a plain pack increased from 57.2% in the first week of surveying to 85.0% in the final week.

Bivariate comparison of those smoking from branded and plain packs

Smokers currently smoking from a plain pack did not differ from smokers who were currently smoking from a branded pack with respect to age, sex, education or area of residence (Table 2). Smokers were significantly more likely to be smoking from a plain pack if they lived in a medium compared to a low socio-economic area (OR=1.55, p=.050), or reported having ever made a quit attempt (OR=2.61, p<0.001) and there was a trend toward being more likely to smoke from a plain pack if they recalled having seen recent anti-smoking campaign advertising on television (OR =1.45, p=0.056). Compared to smokers of value brands, smokers of mainstream (OR=2.38, p<0.001) and premium (OR=1.80, p=.021) brands were also more likely to currently be smoking from a plain pack. Compared to those who smoked fewer than five cigarettes per day, smokers of between five and 10 cigarettes a day (OR=1.57, p=0.098) tended to be more likely to be smoking from a plain pack. As a result of these analyses, SES, recall of recent anti-smoking television advertisements, brand segment, cigarette consumption, and having ever made a quit attempt were included as covariates in multivariate models.

Multivariate comparison of those smoking from branded and plain packs

After adjusting for covariates (Table 3, Model 1), plain pack smokers were more likely than branded pack smokers to perceive their cigarettes to be lower quality than a year ago (OR=1.66, p=0.045), and trended towards perceiving their cigarettes to be less satisfying than a year ago (OR=1.70, p=0.052). Plain pack smokers were slightly but not significantly more likely than branded pack smokers to have thought about the harms of smoking 'often' or 'very often' in the previous week (adjusted OR=1.43, p=0.115), but did not differ in belief that the dangers of smoking had been exaggerated.

Smokers with a plain pack rated quitting as being a significantly higher priority in their life (Mean =6.76) compared to those who were smoking from branded packs (Mean=5.62) (adjusted F=13.11, df=1, p<0.001). Smokers who were currently smoking from a plain pack were almost twice as likely to report that they had thought about quitting at least once a day over the past week (adjusted OR=1.81, p=0.013) when compared to smokers of branded packs. No differences between plain and branded pack smokers were found for quit intentions within 30 days or the next 6 months.

Plain and branded pack smokers did not differ in terms of their support for increasing the size of graphic health warnings, but a greater proportion of plain pack smokers approved of plain packaging than branded pack smokers (adjusted OR=1.51, p=0.049).

Additional covariate adjustment for the proportion of the sample smoking from a plain pack (Table 3, Model 2) resulted in no material change in effect sizes or statistical significance for all outcomes, except for the appeal outcomes. For the measures of quality and satisfaction, this adjustment resulted in a slight reduction in effect sizes, with differences no longer being statistically significant. Figure 1 shows that early in the survey period when the overall proportion of the sample smoking from plain packs was lower, a greater proportion of plain

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pack smokers thought their cigarettes were lower in quality and satisfaction than branded pack smokers. As the roll-out of plain packs reached 80% or more of smokers surveyed in the third week of November (1-2 weeks before the December implementation date), the responses of branded pack smokers approached those~~'caught up' with~~ of plain pack smokers.

Brand loyal cigarette smokers

Of the 536 usual brand cigarette smokers, 452 indicated they had been smoking their current brand for one year or longer. (We excluded smokers who said they had been smoking their current brand for less than a year (n=60) or who did not give a time period (n=23)). We found that 30.0% of the 329 plain pack smokers and 20.1% of 123 branded pack smokers thought the quality of their cigarettes was lower than a year ago (Adj OR=1.54, *p*=.108), and 25.1% of plain pack smokers and 16.2% of branded pack smokers thought their satisfaction was lower than a year ago (OR=1.57, *p*=.122). Thus, effect sizes eased slightly and significance levels d~~ropped~~eclined. Again, once adjustment was undertaken for the proportion of participants smoking from a plain pack during each survey week, effect sizes diminished further (lower quality OR=1.32, *p*=.318; lower satisfaction: OR=1.36, *p*=.307), but remained in the same direction. The strength and pattern of findings for all other outcomes remained the same as the main analysis.

Discussion

Compared to branded pack smokers, smokers who were smoking from plain packs rated their cigarettes as being lower in quality and as tending to be less satisfying~~satisfaction~~ than one year ago. These appeal outcomes were sensitive to the extent to which plain packaging had rolled-out among the smoker population over the survey period, with responses from branded pack smokers approaching those of plain pack smokers, once 80% of survey respondents were smoking from plain packs 1-2 weeks before the December implementation date. Among brand loyal smokers~~the subgroup who had smoked the same brand for at least a year~~, effects were in the same direction but not significant. In all analyses, plain pack smokers were more likely to think often or very often about quitting in the past week and to rate quitting as a higher priority in their lives, compared to branded pack smokers. There were no significant differences in the proportion of plain and branded pack smokers who thought frequently about the harms of smoking or thought smoking harms had been exaggerated. While a similar proportion of plain and branded pack smokers supported the larger graphic health warnings, a significantly greater proportion of plain pack smokers approved of plain packaging.

Given Australia is the first nation to implement plain packaging, our study provides an early investigation of its actual effects on smokers in a market where plain packs are available to all~~'the real world'~~, compared with past studies that have experimentally exposed smokers to a single viewing of a plain or branded pack which may or may not have been their own brand,[7-13] and naturalistic studies that have mocked-up plain packs for smokers to carry around with them in a trial situation.[14 15]

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In the period leading up to the December 1st implementation date, plain packs began to be sold at retail from early October and the timing of our survey enabled a comparison of those who were smoking from one of the new plain packs with those who were not. Our survey obviously excludes the responses of those who may have quit during this short period. Our designation of smokers as plain or branded was based on the pack from which they were currently smoking at the time of survey administration. It should not be assumed that those smoking from branded packs ~~smokers~~ had not previously purchased and smoked from a plain pack. Indeed, this would have been increasingly likely as the survey period progressed and, even if branded pack smokers had not themselves purchased a plain pack, they would have been increasingly exposed to them via their social networks.

Our study demonstrated that responses for branded pack smokers began to approach those of plain pack smokers for the two appeal outcomes towards the end of the survey period. This could mean that having around 80% of smokers smoking from a plain pack represents a threshold of availability for social contagion effects, or it may reflect a point where the likelihood of not having smoked from a plain pack was approaching zero, and thus all responses were influenced by having smoked cigarettes from plain packs.

Smoking from a plain as compared with branded pack could be due to differences in availability or to choice. Differences across survey week are clearly due to increased availability of plain packs and reduced availability of branded packs. In addition, brand segment and SES differences in the likelihood of smoking from a plain pack could be due to differential availability of plain packs by brand or residential area. The higher rate of recall of the mass media campaign among those with plain packs might be due to the accompanying large pack health warnings assisting the memorability or impact of the television messages, as has been found in past studies.[16 17] However, the difference observed in past quitting behaviour between those with plain and branded packs is more consistent with differential choice. Although we adjusted for ever having previously tried to quit, there may have been residual confounding, so that those less interested in quitting may have been more likely to avoid the plain packs. Avoidance of plain packs by these smokers would be entirely consistent with the notion that plain packs make smokers feel uncomfortable about their smoking, as found in two naturalistic studies.[14 15] Some of the relationships found between pack type and quitting outcomes could be due to those more interested in quitting being less likely to avoid, or even to seek out the plain packs. However, even if this is the case, the net effect of plain packaging for quitting remains positive.

The observed pattern of findings in relation to brand appeal and the direction of findings relating to perceived harms is consistent with those of experimental studies of plain packaging conducted in Australia[7 18], the UK[8 19] and other countries [11-13 20 21] and also with the Australian government's pre-testing of mocked-up plain packs.[22] The finding that smokers smoking from a plain pack evidenced more frequent thoughts about and priority for ~~greater urgency for~~ quitting than branded pack smokers is important, since frequency of thoughts about quitting has strong predictive validity in prospective studies for actually making a quit attempt.[23 24] Past research on graphic health warnings has found that greater size of warnings is associated with more message recall, greater perceived effectiveness and risks of smoking [25 26] and less appeal.[27] Also, noticing pictorial health warnings on others' tobacco packs

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reduced the risk of relapse in recent quitters in a cohort study.[28] Our study is not able to tease apart the independent contributions of plain packaging and the new larger health warnings, since they co-occurred. These responses are unlikely to be due to any media campaign effects since we adjusted for campaign recall, and in other analyses, determined that campaign recall was unrelated to frequency of thoughts of harm, and quitting intentions and importance.

We noted that the proportion who thought the harms had been exaggerated was not higher for plain pack smokers with the larger graphic warnings, than branded pack smokers. We also found similar proportions of branded and plain pack smokers who supported the larger graphic health warnings, with a majority supporting it~~suggesting smokers are accepting of this aspect of the legislation~~. Interestingly, those smoking from plain packs were more likely to approve of plain packaging than those smoking from branded packs. Given that 73% of Australian smokers intend to quit[29] and over 90% regret having started,[30] smokers may acknowledge such packaging changes as a source of motivation or reminder for quitting, and/or as being important to reduce the appeal of smoking for young people. This pattern of differences in approval is similar to the pattern of increase in public support that is observed when smoke-free laws[31 32] and display bans[33] have been implemented.

We note the initial responses observed in this study concur with news reports during November and December of smokers perceiving their cigarettes 'taste worse'[34 35] – an effect likely to be attributable to the halo effects of packaging influencing the sensory experience of smoking[36] – and with reports of increases in calls to Quitlines.[37] Overall, the introductory effects we observed are consistent with the broad objectives of the plain packaging legislation. We await further research to examine more durable effects on smokers and any effects on youth.

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Competing interest declaration

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: LH and SD had financial support from Quit Victoria for the submitted work; no authors had financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no authors had other relationships or activities that could appear to have influenced the submitted work.

Contributors

MW and LH conceived the study. MW, LH and RB designed the survey questions. LH and SD undertook data analysis, MW and LH drafted the manuscript and SD and RB revised the content. All authors approved the final submitted version. MW is the study guarantor.

Ethics approval

Ethical approval for the study was provided by the Human Research Ethics Committee of Cancer Council Victoria (HREC 0018).

Data sharing statement

There is no additional data available.

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Tables

Table 1 **Characteristics of current smokers**

	Number*	Per cent
Total	536	100
Sex		
Male	303	56.6
Female	233	43.4
Age group		
18-29 years	163	30.4
30-49 years	229	42.8
50 plus	144	26.8
Education		
Up to Year 12	333	62.0
Tertiary level and above	204	38.0
Socio-Economic Status		
Low (most disadvantaged)	129	24.1
Medium	345	64.2
High (least disadvantaged)	63	11.7
Area of Residence		
Metropolitan Victoria	387	72.1
Regional Victoria	146	27.2
Unknown	4	0.7
Current daily consumption level (average no of cigs per day)		
< 5 per day (includes <weekly smokers)	139	25.8
>5 to 10 per day	132	24.6
>10 to 15 per day	103	19.2
>15 per day	150	28.0
Unknown	13	2.4
Ever tried to quit		
No	86	16.0
Yes	446	83.2
Unknown	4	0.8
Brand segment		
Value	140	26.2
Mainstream	249	46.4
Premium	147	27.4
Exposure to anti-smoking TV campaign		
Did not recall any advertisements	243	45.3
Recalled at least one anti-smoking advertisement	293	54.7
Smoking from a plain pack		
Week 1	125	57.2
Week 2	142	66.3
Week 3	142	80.4
Week 4-5	126	85.0

* Numbers may not add to N=536 due to rounding of weighted numbers

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Table 2 **Characteristics of cigarette smokers currently smoking from a plain pack compared to a branded pack**

	N smoking from plain pack	% smoking from plain pack	Unadjusted OR (95% CI)
TOTAL (N=536)	388	72.3	
Sex			
Male (n=303)	214	70.4	1.00 (Ref)
Female (n=233)	174	74.8	OR 1.25 (0.85-1.83), *p*=0.262
Age group			*p*=0.579
18-29 years (n=163)	123	75.2	1.00 (Ref)
30-49 years (n=229)	164	71.6	OR=0.83 (0.53-1.32), *p* =0.432
50 plus (n=144)	101	70.1	OR=0.77 (0.47 -1.28), *p* =0.317
Education			
Up to Year 12 (n=333)	235	70.6	1.00 (Ref)
Tertiary level and above (n=204)	153	75.1	OR=1.26 (0.85-1.87), p=0.258
Socio-Economic Status			*p*=0.150
Low (n=129)	85	65.6	1.00 (Ref)
Medium (n=345)	257	74.7	OR=1.55 (1.00-2.40), *p* =0.050
High (n=63)	46	73.1	OR=1.42 (0.73-2.77), *p* =0.299
Area of Residence (n=532)			
Metropolitan Victoria (n=387)	279	72.1	1.00 (Ref)
Regional Victoria (n=146)	105	72.2	OR=1.00 (0.66-1.53), p=0.990
Current daily consumption level (average no of cigs per day n=523)			*p*=0.312
< 5 per day (including non-daily smokers) (n=139)	92	66.3	1.00
>5 to 10 per day (n=132)	100	75.5	OR=1.57 (0.92-2.66), *p* =0.098
>10 to 15 per day (n=103)	78	75.3	OR=1.55 (0.88- 2.74), *p* =0.133
>15 per day (n=150)	107	71.2	OR=1.26 (0.76-2.07), *p* =0.370
Ever tried to quit (n=532)			
No (n=86)	46	54.2	1.00 (Ref)

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Yes (n=446)	337	75.6	OR=2.61 (1.62-4.21), *p* <0.001
Brand segment			*p*=0.001
Value (n=140)	85	60.4	1.00 (Ref)
Mainstream (n=249)	195	78.4	OR=2.38 (1.51-3.74), *p* <0.001
Premium (n=147)	108	73.3	OR=1.80 (1.09-2.96), *p* =0.021
Exposure to anti-smoking TV campaign			
Did not recall advertising (n=243)	166	68.3	1.00 (Ref)
Recalled at least one of three anti-smoking campaign advertisements (n=293)	222	75.7	OR =1.45 (0.99-2.12), *p* =0.056

* Numbers may not add to N=536 due to rounding of weighted numbers

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Table 3 **Attitudes and intentions of respondents who were currently smoking from a plain pack compared to those respondents who were smoking from a branded pack*.**

	Smoking from plain pack (n=388)	Smoking from branded pack (n=148)	Unadjusted OR (95% CI), *p*-value	Model 1: Adjusted OR[a] (95% CI), *p*-value	Model 2: Adjusted OR[b] (95% CI), *p*-value
	N(%)	N (%)			
Brand appeal					
Brand quality: Lower than a year ago	119 (30.6)	27 (18.1)	OR=2.00 (1.25-3.20) *p*=0.004	OR=1.66 (1.01-2.72) *p*=0.045	OR=1.41 (0.85-2.35) *p*=0.187
Brand satisfaction: Lower than a year ago	102 (26.2)	22 (14.9)	OR=2.03 (1.22-3.36) *p*=0.006	OR=1.70 (1.00-2.89) *p*=0.052	OR=1.53 (0.88-2.63) *p*=.130
Perceived harm	N(%)	N (%)			
Thought about the harms of smoking 'often' or 'very often' in the last week[c]	178 (45.9)	53 (35.6)	OR=1.56 (1.04-2.36) *p*=0.032	OR=1.43 (0.92-2.22) *p*=0.115	OR=1.42 (0.90-2.24) *p*=.129
Believe the dangers of smoking have been exaggerated	125 (32.3)	46 (30.9)	OR=1.07 (0.71-1.61) *p*=0.753	OR=1.15 (0.75-1.78) *p*=0.526	OR=1.15 (0.73-1.80) *p*=.551
Quitting thoughts and intentions	Mean (SD), N	Mean (SD), N	Unadjusted F, df, *p*-value	Adjusted F^, df, *p*-value	Adjusted F^^, df, *p*-value
Quitting as a priority in my life [c] (0 lowest to 10 highest)	6.76 (2.85), 337	5.62 (2.99), 130	F=14.76, df=1,464 *p*<0.001	F=13.11, df=1,442 *p*<0.000	F=11.25, df=1,441 *p*=0.001
	N(%)	N (%)			
Thought about quitting at least once a day in the last week	143 (36.8)	32 (21.8)	OR=2.09 (1.35-3.25) *p*=0.001	OR=1.81 (1.13-2.89) *p*=0.013	OR=1.82 (1.13-2.95) *p*=0.014
Planning to quit in next 30 days	100 (25.8)	27 (18.1)	OR=1.58 (0.98-2.54) *p*=0.060	OR=1.31 (0.78-2.18) *p*=0. 309	OR=1.28 (0.75-2.17) *p*=.363
Seriously considering quitting in the next 6 months	267 (68.8)	85 (57.1)	OR=1.66 (1.12-2.45) *p*=0.011	OR=1.30 (0.85-1.98) *p*=0.221	OR=1.34 (0.86-2.07) *p*=.195

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Support for the new legislation	N (%)	N(%)			
Support for an increase in GHW size to 75% front of pack	211 (54.4)	79 (53.5)	OR=1.04 (0.71-1.52) *p*=0.841	OR=0.97 (0.64-1.46) *p*=0.882	OR=1.01 (0.66-1.55) *p*=.955
Approval for the introduction of plain packaging	203 (52.4)	63 (42.2)	OR=1.51 (1.03-2.21) *p*=0.034	OR=1.51 (1.00-2.28) *p*=0.049	OR=1.63 (1.07-2.49) *p*=.024

* Numbers may not add to N=536 due to rounding of weighted numbers
[a] Adjusted for SES, daily consumption levels, recalled TVC, brand segment, & previous quit attempts
[b] Also adjusted for covariates, and proportion of sample smoking from a plain pack each week of interview
[c] Due to skip error in questionnaire only asked of current smokers aged under 60 years.

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Figures

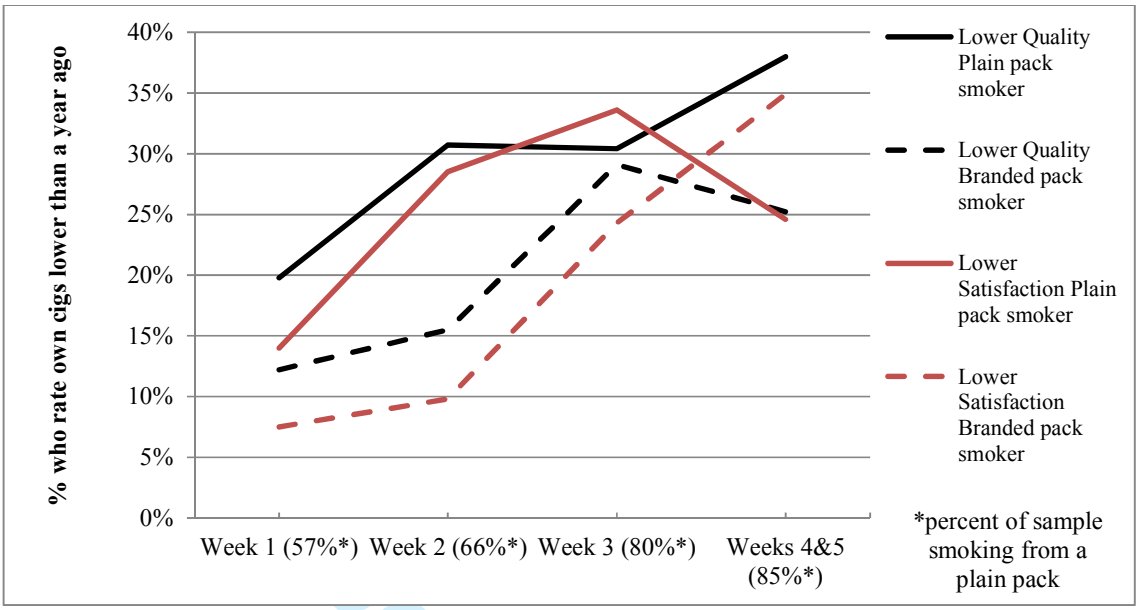

Fig 1 **Appeal outcomes by survey week for plain and branded pack smokers**

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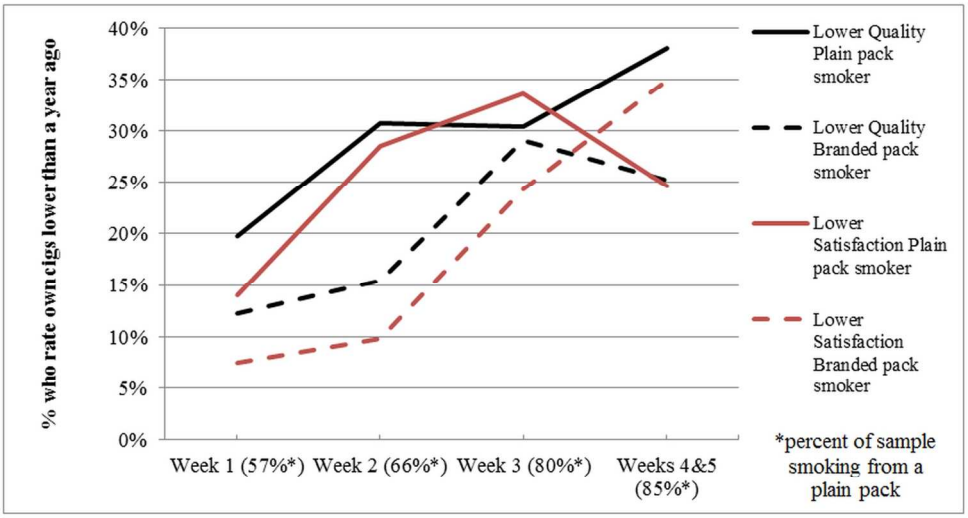

Fig 1 **Appeal outcomes by survey week for plain and branded pack smokers**

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