TC Online First, published on December 12, 2016 as 10.1136/tobaccocontrol-2016-053166

OPEN ACCESS

Australia's plain tobacco packs: anticipated and actual responses among adolescents and young adults 2010–2013

Sally Dunlop,[1,2] Donna Perez,[1] Anita Dessaix,[1] David Currow[1]

▸ Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/tobaccocontrol-2016-053166).

[1]Cancer Institute New South Wales, Sydney, New South Wales, Australia
[2]Sydney School of Public Health, University of Sydney, Sydney, New South Wales, Australia

Correspondence to
Dr Sally Dunlop, Division of Cancer Screening and Prevention, Cancer Institute NSW, Level 9, 8 Central Ave, Australian Technology Park, Eveleigh, NSW 2015, Australia; sallydunlop@gmail.com

Received 14 May 2016
Revised 6 October 2016
Accepted 25 October 2016

To cite: Dunlop S, Perez D, Dessaix A, *et al*. *Tob Control* Published Online First: [*please include* Day Month Year] doi:10.1136/tobaccocontrol-2016-053166

ABSTRACT

Background In December 2012, Australia introduced world-first legislation mandating plain packaging for all tobacco products. To date, there is very little evidence on youth responses to the changed packs.

Aim To assess attitudes towards, and responses to, tobacco plain packs preimplementation and postimplementation.

Methods The Tobacco Promotion Impact Study (TPIS) was a yearly cross-sectional telephone survey of adolescents and young adults (12–24 years) from the states of New South Wales (NSW) and Queensland, conducted at three time points preimplementation (June 2010; June 2011; June 2012) and one time point postimplementation (June 2013; total n=8820).

Results There were significant increases in support for plain packaging from preimplementation to postimplementation for: never smokers (56% in 2012 vs 63% in 2013; OR=0.77, 95% CI 0.65 to 0.90, p=0.001), experimenters/ex-smokers (55% in 2012 vs 72% in 2013; OR=0.51, 95% CI 0.38 to 0.68, p<0.001) and current smokers (35% in 2012 vs 55% in 2013; OR=0.49, 95% CI 0.32 to 0.75, p=0.001). At postimplementation, 16% of never smokers reported that plain packaging made them less likely to try smoking and 18% of experimenters/ex-smokers reported that plain packaging made them less likely to smoke again. Youth were significantly less likely to have anticipated these responses preimplementation (never smokers: 8% in 2011; OR=0.43, 95% CI 0.28 to 0.65, p<0.00; experimenters/ex-smokers: 11%; OR=0.65, 95% CI 0.52 to 0.82, p<0.001). At postimplementation, 34% of smokers reported a quitting-related response to plain packaging (tried to quit or thought about quitting); the proportion who anticipated such a response preimplementation was significantly less (14% in 2011; OR=0.33, 95% CI 0.20 to 0.53, p<0.001). 28% of smokers reported a social denormalisation response at postimplementation (hid their pack from view, used a case to cover their pack, felt embarrassed); the proportion who anticipated such a response preimplementation was significantly less (9% in 2011; OR=0.24, 95% CI 0.14 to 0.42, p<0.001).

Conclusions The actual response of youth to plain packaging was greater than anticipated prior to their introduction, and support for plain packaging increased from preimplementation to postimplementation among all groups of youth. Jurisdictions planning to implement plain tobacco packaging should be encouraged by these findings.

INTRODUCTION

The world's first legislation mandating plain packaging of tobacco products was implemented in Australia on 1 December 2012. The resulting packs are dark olive green cardboard packages with brand name and number of cigarettes written in a standardised font and location. At the same time as the introduction of the plain packaging, the on-pack graphic health warnings were updated and enlarged, so that coloured graphic health warnings now cover 90% of the back and 75% of the front of packs.

These packaging changes were intended to work in concert to improve public health by discouraging people from taking up smoking, encouraging quitting, discouraging relapse and reducing people's exposure to tobacco smoke.[1] This employed three specific mechanisms: reducing the appeal of tobacco products, increasing the effectiveness of health warnings and reducing the ability of the packaging to mislead consumers about the harmful effects of using tobacco products.[1] To date, a number of studies have assessed the impact of the packaging changes. Large population-level studies conducted with adult smokers over the implementation period demonstrated a substantial decrease in the appeal of tobacco packaging,[2 3] an increase in the noticeability of the on-pack graphic health warnings and increased emotional, cognitive and behavioural responses to the warnings.[2–4]

Given young people's responsiveness to the packaging and branding of tobacco products,[5–7] it has been proposed that plain packaging might have its greatest impact among youth.[8 9] Two studies have used the Australian Secondary Students' Alcohol and Drug (ASSAD) survey data to assess the impact of the packaging changes among school students aged 12–17 years in relation to the specific objectives of the legislation. They first found that, 7–12 months after the plain packaging implementation, the appeal of cigarette packs and brands had decreased.[10] The second study suggested that the introduction of the new packs did not induce adolescents to attend to or process the on-pack warnings to a greater extent than the previous packs.[11]

Some behaviours of smokers—avoiding smoking in front of other people, hiding or covering cigarette packs from others or feeling uncomfortable smoking in public—have been identified as markers of social denormalisation.[12 13] Following the introduction of the new tobacco plain packs, increases in pack concealing behaviours have been reported by adult smokers,[3 4 14] and observed in studies of

smoking behaviours in outdoor hospitality settings.[15 16] To date, there have been no studies investigating markers of social denormalisation as a result of the new packs among Australian youth, though experimental evidence[17–19] and qualitative data[20 21] collected from youth in other jurisdictions suggested that feelings of social disapproval and pack concealment behaviours would emerge.

There has also been some evidence of an impact of the packaging changes on quitting-related behaviours among adult smokers.[14] Compared with smokers smoking cigarettes from branded packs, smokers smoking from the new packs during the transition period were more likely to be thinking about quitting,[22] and the implementation of the new packs was associated with an increase in calls to the Quitline.[23] While no studies to date have explored the impact of the new Australian tobacco packs on cessation-related behaviours among young smokers, experimental research conducted with young smokers in other jurisdictions has suggested that reducing branding and increasing warning size could result in cessation-related behaviours and cognitions.[18 24]

As international momentum for tobacco plain packaging increases,[25 26] and the tobacco industry continues to argue that 'there is no evidence to suggest that the plain packaging of tobacco products will be effective in discouraging young people to smoke',[27] understanding the impact of plain packaging on youth is critical. In Australia, the age of tobacco use initiation is increasing from early adolescence into young adulthood,[28] a phenomenon also observed in New Zealand.[29] It is therefore prudent to monitor the impact of plain packaging on young adults as well as adolescents.

Extending research conducted to date on the impact of the new packs on youth in relation to the expected mechanisms of change,[10 11] the current study aimed to assess, among adolescents and young adults: (1) attitudes towards plain packaging, (2) the impact of plain packaging on never and former smokers' likelihood of smoking in the future, (3) smokers' quitting-related responses to plain packaging and (4) social denormalisation responses among young smokers. Though there have been documented increases in support for plain packaging among adult smokers using plain packs,[22 30] changes in adolescents' and young adults' attitudes or responses towards plain packaging from preimplementation to postimplementation are, as yet, unexplored. In this study, we compare responses assessed 8 months after the full implementation of the packaging changes with anticipated responses measured in the years prior to implementation.

METHOD

In this study, we use cross-sectional data from surveys of adolescents and young adults conducted before (2010, 2011, 2012) and after (2013) the implementation of the tobacco plain packaging legislation to explore a range of responses to plain packaging of tobacco products. Data for this study come from the Tobacco Promotion Impact Study (TPIS), conducted in the Australian states of New South Wales (NSW) and Queensland. The study had a repeat cross-sectional design with yearly telephone surveys conducted in June of each year from 2010 to 2013. The TPIS monitored adolescents' and young adults' (12–24 years) exposure to tobacco promotions, responses to tobacco control policies and smoking-related cognitions and behaviours. Households were recruited using random digit dialling and participants within households were recruited using random selection (selecting the nth oldest eligible person aged 12–24 years). From 2010 to 2012, recruitment was conducted using landline phone numbers only. In 2013, because of concerns about the increasing proportion of Australian homes without a landline phone number (from 17% in 2010 to 22% in 2012),[31] a supplemental sample of youth was also recruited through random digit dialling to mobile phone numbers. The use of this supplemental sample is described below. Permission was obtained from parents of 12–15-year olds before conducting interviews. Cooperation rates averaged 70% among eligible respondents; when taking into account households of unknown eligibility, response rates averaged 42% (American Association for Public Opinion Research Response Rate #3).[32] The TPIS was approved by the NSW Population and Health Services Research Ethics Committee.

Measures

Smoking status: Respondents were asked if they had ever had a puff of a cigarette, how many cigarettes they had smoked in their lifetime, if they had smoked in the past month and whether they intended to smoke in the next 12 months. Based on staged models of smoking uptake and smoking susceptibility,[33 34] they were then classified as: (1) never smokers (never taken a puff); (2) experimenters (smoked <5 cigarettes ever, or smoked 5–100 cigarettes in their lifetime but not in the past month); (3) current smokers (smoked in the past month, and smoked more than 5 cigarettes in their lifetime) or (4) ex-smokers (smoked more than 100 cigarettes in their lifetime, but not in the past month). Never smokers were further classified into: (1) non-susceptible never smokers (never taken a puff and certain they would not smoke in the next 12 months) and (2) susceptible never smokers (not certain that they would not smoke in the next 12 months). The number of ex-smokers in each year was small; therefore, experimenters and ex-smokers were combined into one group in analyses reporting outcomes by year.

Demographics: Age, sex, state of residence and year of interview were included. The number of 12–15-year olds among the samples of smokers, ex-smokers and experimenters was small; therefore, age was dichotomised (12–17 vs 18–24 years) for analyses split by smoking status. Postcodes were used with the Socioeconomic Indices for Areas (SEIFA)[35] to indicate low (quintiles 4–5) or moderate–high (quintiles 1–3) socioeconomic status (SES). Respondents reported on the number of current smokers in their household and how many of their five closest friends smoked.

Attitudes towards plain packaging: All respondents were asked to indicate agreement with the statement 'I support regulation that ensures all tobacco products are sold in plain generic packaging' (5=strongly disagree to 1=strongly agree). Responses were dichotomised to indicate support (strongly agree and agree vs not) and opposition (strongly disagree and disagree vs not) of plain packaging.[30]

Responses to plain packaging: Never smokers were asked 'What effect do you think the introduction of plain packaging will have on you? Will it…' (2011–2012) or 'Has it…' (2013): (1) made you more likely to try smoking; (2) made you less likely to try smoking or (3) not influenced you. Ex-smokers and experimenters who had not smoked in the past month were asked 'Will it/has it…' (1) made you more likely to smoke again; (2) made you less likely to smoke again or (3) not influenced you. Current smokers were asked 'As a result of plain packaging, will you' (2011–2012) or 'As a result of plain packaging, have you…' (2013): (1) tried to quit; (2) thought about quitting; (3) hid your pack from view; (4) felt embarrassed to be a smoker; (5) used a case to cover your pack or (6) smoked more (response

options=yes/no). In 2013, responses also included: (7) changed brands and (8) smoked less.

Statistical analysis

Support for and opposition to plain packaging by year of interview were investigated separately for current smokers, never smokers, experimenters and ex-smokers. In order to determine if changes in attitudes from preimplementation to postimplementation were significant when controlling for changes in sample composition, we conducted logistic regression analyses predicting support and opposition. The independent variable was year of interview (2013=postimplementation, 2010–2012=preimplementation), and covariates included demographics (age, sex, state, SES), smoking exposures (number of friends and household members who smoke) and cigarettes per day (for the smoker sample).

Logistic regression models were run to determine if non-smoking youth (never smokers and ex-smokers/experimenters) interviewed postimplementation were more likely to report that plain packaging made them less likely to smoke than those who anticipated this preimplementation. The independent variable in these models was year of interview, and covariates included demographics and smoking exposures.

We also ran the logistic regression models predicting attitudes and responses to plain packaging in the subsample of susceptible never smokers in order to explore whether any changes over the years of the survey were apparent in the group of youth most at risk of smoking initiation.

We investigated smokers' responses to plain packaging by plotting the proportions of smokers who anticipated or reported each of the responses by year. In order to assess whether any differences in anticipated and actual responses were significant when controlling for sample variation, we conducted logistic regression analyses to predict: (1) a quit-related response (thought about quitting or tried to quit); (2) a social denormalisation response (hid pack from view, felt embarrassed to be a smoker or used a case); (3) smoking more or (4) no impact. The independent variable in these models was year of interview, and covariates included demographics, smoking exposures and cigarettes per day. We also conducted a sensitivity analysis in order to test if actual responses differed from anticipated responses even among smokers who were opposed to plain packaging, whereby we reran these four logistic regression models separately for smokers who opposed the regulations.

Finally, in order to identify individual characteristics of youth who were, at postimplementation, more likely to support plain packaging or report a positive response, we ran a set of logistic regression analyses using the sample of youth interviewed in 2013 only. The outcomes investigated were: support for plain packaging, less likely to smoke (non-smokers), quitting responses (smokers) and denormalisation responses (smokers).

Table 1 Sample characteristics of the Tobacco Promotion Impact Study (TPIS)

	2010 (n=2000)		2011 (n=2010)		2012 (n=2003)		2013 dual-frame (n=2807)			2013 landline (n=2001)		
	N	Per cent	N	Per cent	N	Per cent	N	Per cent	p Value	N	Per cent	p Value
Age in years									0.950			0.974
12–15	669	32	649	32	619	32	833	31		684	31	
16–19	826	31	833	30	855	30	1046	31		799	31	
20–24	505	37	528	38	529	38	928	39		518	39	
Sex									1.00			1.00
Female	975	49	990	49	992	49	1325	49		980	49	
Male	1025	51	1021	51	1011	51	1482	51		1021	51	
State									1.00			1.00
NSW	1000	50	1004	50	1000	50	1407	50		1001	50	
QLD	1000	50	1000	50	1000	50	1400	50		1000	50	
SES									0.015			0.011
Low	557	28	497	25	578	29	735	28		536	26	
Mod–high	1443	72	1514	75	1425	71	2056	72		1465	74	
Smoking status									<0.001			<0.001
Never	1178	56	1278	61	1276	61	1769	60		1376	64	
Experimenter	476	25	448	24	471	25	599	22		382	21	
Former	53	4	42	3	36	2	70	3		36	3	
Current	293	16	243	13	220	12	369	16		207	12	
Smoking susceptibility*									0.074			0.075
Non-susceptible	941	81	999	79	968	76	1383	79		1071	79	
Susceptible	237	19	279	21	308	24	386	21		305	21	
Cigarettes per day†												
<2	136	43	112	44	104	44	183	47	0.781	106	48	0.767
≥2	177	57	144	56	131	56	207	53		116	52	
Friends smoke M (SD)	1.27 (1.60)		1.10 (1.51)		1.05 (1.47)		1.11 (1.52)		<0.001	0.93 (1.41)		<0.001
House smoke M (SD)	0.52 (0.86)		0.47 (0.86)		0.49 (1.01)		0.51 (0.99)		<0.001	0.42 (0.82)		0.048

Ns unweighted, %s are weighted; p values from χ^2 tests for differences between proportions or ANOVA tests for differences between means.
*Never smokers.
†Smokers.
M, Mean; NSW, New South Wales; QLD, Queensland; SES, Socioeconomic Status (based on postal code).

Demographic and smoking characteristics were entered as the independent variables.

The supplemental mobile phone sample was added in 2013 in order to assess whether any changes in outcomes between survey years were due to changes in the characteristics of the population covered by landlines. Previous studies have found that adding a mobile component to a landline population survey gives a more representative sample,[36] but that it also has the potential to result in changes to population estimates that are a consequence of the design change, rather than a real change.[37] Comparing the landline-only and the dual-frame (landline and mobile) samples to previous years allowed this issue to be explored. Therefore, all analyses comparing years of the survey were conducted twice. The first set of analyses used the dual-frame sample for 2013; comparing differences between years while minimising the influence of the changing composition of a sample recruited via landline only. The second set of analyses used the landline sample only; comparing differences between years while minimising the impact of the sampling change. The results reported in this paper will focus on the results from the first set of analyses (using the dual-frame sample for 2013), with the landline results provided in an online supplementary table. Any differences in the pattern of results across the sampling frames are reported.

The gender distribution of this sample was relatively consistent with population parameters as defined by Australian Bureau of Statistics (ABS) data.[35] There were, however, some discrepancies in the age distribution, particularly a slight over-representation of 16–19-year olds, but under-representation of 20–24-year olds. Given these discrepancies, data were weighted separately to the NSW and Queensland populations of 12–24-year olds for age, sex and region distributions from Census data[35] using poststratification weights. In the set of analyses including the 2013 mobile phone supplement, additional weighting was used to account for telephony status (landline only, mobile-phone only or dual-user). All analyses were conducted using StataCorp, Stata V.11.1 Texas, USA, 2009.

RESULTS

The samples in each year of the survey were similar in terms of age and sex (table 1). There was a significant difference in SES, with the highest proportion of respondents from a moderate–high SES area in 2011. Across all years of the survey, most respondents were never smokers. There were significant differences in smoking status across the years of the survey, with current smoking decreasing from 16% in 2010 to 12% in 2012. In 2013, different patterns emerged for the dual-frame and landline samples: current smoking increased back to 16% in the dual-frame sample, and remained at 12% in the landline sample.

Attitudes towards plain packaging

Overall, support for plain packaging rose from 59% in 2010 to 64% in 2013. Figure 1 shows trends in support or opposition towards plain packaging among never smokers, ex-smokers and experimenters, and current smokers.

The results of the logistic regression analyses predicting support and opposition of plain packaging are shown in table 2. Current smokers interviewed preplain packaging were significantly less likely to have been supportive (35% in 2011 and 2012) than those interviewed postimplementation (55%), and more likely to have been opposed at preimplementation (55% in 2011, 48% in 2012 vs 36% in 2013). Similarly, among experimenters and ex-smokers, support for plain packaging

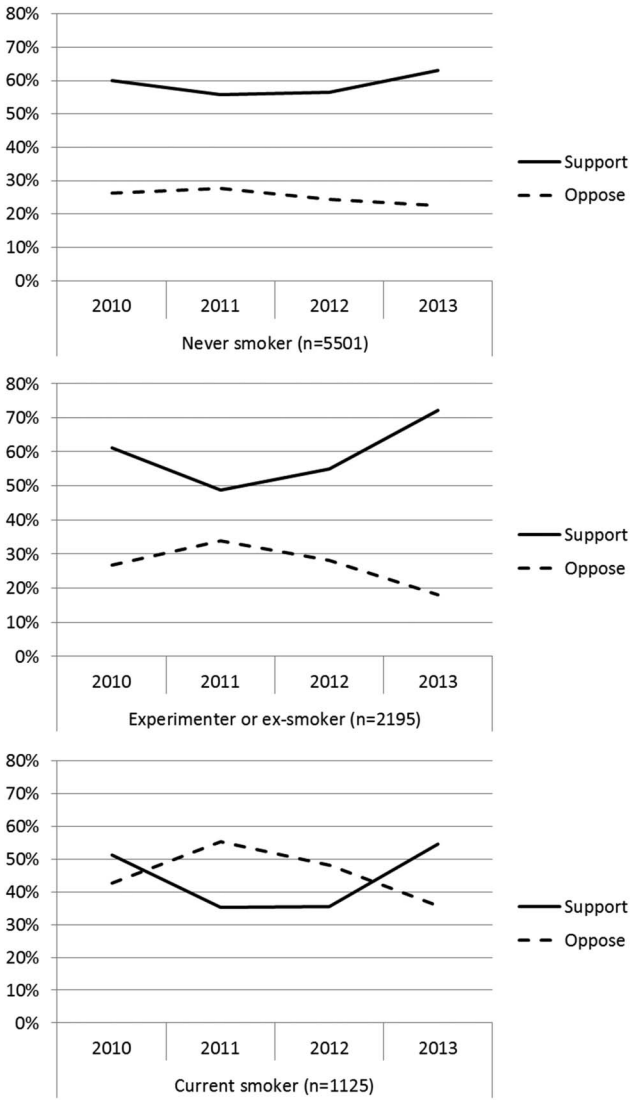

Figure 1 Adolescent and young adult attitudes towards tobacco plain packaging.

was significantly less likely at preimplementation (61% in 2010, 49% in 2011, 55% in 2012) than postimplementation (72%), and opposition was significantly more likely preimplementation (27% in 2010, 34% in 2011, 28% in 2012 vs 18% in 2013). Never smokers were significantly less likely to be supportive of plain packaging preimplementation (56% in 2011 and 2012) than postimplementation (63% in 2013), and were significantly more likely to be opposed (28% in 2011vs 23% in 2013). The logistic regression analyses conducted with the subgroup of susceptible never smokers showed a non-significant increase in support from 53% in 2011 to 62% in 2013 (2011 vs 2013: OR=0.71, 95% CI 0.50 to 1.00, p=0.052), and a significant decrease in opposition from 31% in 2011 to 23% in 2013 (2011 vs 2013: OR=1.52, 95% CI 1.02 to 2.27, p=0.038).

Table 3 shows the results of the logistic regression analyses predicting support for plain packaging among youth interviewed 8 months postimplementation. Youth who were more likely to be supportive of plain packaging were: ex-smokers/experimenters (vs current smokers), those aged 18–25 years (vs 12–17 years) or those with a fewer number of friends who smoke.

Table 2 Estimates of attitudes towards and responses to plain packaging for each survey waves, with results from logistic regression analyses predicting each outcome

		Never smokers (N=5471)				Experimenters/ex-smokers (N=2185)				Current smokers (N=1104)			
Outcome	**Year**	**Per cent**	**OR**	**95% CI**	**p Value**	**Per cent**	**OR**	**95% CI**	**p Value**	**Per cent**	**OR**	**95% CI**	**p Value**
Support for plain packaging	2010	60	0.89	0.75 to 1.06	0.172	62	0.62	0.47 to 0.81	0.001	51	0.90	0.62 to 1.29	0.559
	2011	55	0.74	0.63 to 0.87	<0.001	49	0.37	0.28 to 0.48	<0.001	36	0.48	0.32 to 0.70	<0.001
	2012	56	0.76	0.64 to 0.89	0.001	55	0.48	0.36 to 0.63	<0.001	36	0.45	0.30 to 0.68	<0.001
	2013	63	REF			70	REF			54	REF		
Opposition of plain packaging	2010	27	1.20	1.00 to 1.45	0.055	27	1.63	1.19 to 2.22	0.002	42	1.31	0.90 to 1.92	0.160
	2011	29	1.31	1.09 to 1.57	0.004	34	2.34	1.72 to 3.18	<0.001	55	2.24	1.52 to 3.30	<0.001
	2012	26	1.12	0.93 to 1.34	0.244	28	1.75	1.28 to 2.39	<0.001	48	1.71	1.15 to 2.55	0.008
	2013	22	REF			19	REF			37	REF		
Less likely to smoke due to plain packaging	2011	11	0.65	0.51 to 0.81	<0.001	8	0.43	0.28 to 0.64	<0.001	n/a			
	2012	10	0.55	0.43 to 0.70	<0.001	9	0.45	0.30 to 0.68	<0.001				
	2013	16	REF			18	REF						
Quit-related response	2011	n/a				n/a				14	0.32	0.20 to 0.52	<0.001
	2012									17	0.39	0.25 to 0.62	<0.001
	2013									34	REF		
Social denormalisation response	2011	n/a				n/a				9	0.24	0.14 to 0.42	<0.001
	2012									13	0.38	0.23 to 0.62	<0.001
	2013									28	REF		
Smoke more	2011	n/a				n/a				4	0.74	0.32 to 1.69	0.475
	2012									4	0.84	0.34 to 2.05	0.695
	2013									6	REF		
No impact	2011	n/a				n/a				67	2.13	1.44 to 3.15	<0.001
	2012									61	1.53	1.04 to 2.26	0.031
	2013									48	REF		

%s are weighted.
ORs, CIs and p values from logistic regression analyses predicting each outcome from year of interview; covariates include age, sex, state, SES, smoking among friends, household smoking and cigarettes per day (smokers).
NSW, New South Wales; QLD, Queensland; SES, Socioeconomic status (based on postal code).

Table 3 Estimates of attitudes towards plain packaging at postimplementation, with results from logistic regression analyses predicting support and opposition

	Support (N=2782)				Oppose (N=2782)			
	Per cent	**OR**	**95% CI**	**p Value**	**Per cent**	**OR**	**95% CI**	**p Value**
Smoking status								
Never smoker	63	1.42	0.98 to 2.05	0.064	22	0.61	0.41 to 0.90	0.013
Experimenter/ex-smoker	72	1.94	1.35 to 2.77	0.000	18	0.49	0.33 to 0.72	0.000
Current smoker	55	REF			36	REF		
Age in years								
12–17	60	REF			25	REF		
18–24	67	1.44	1.17 to 1.77	0.001	22	0.66	0.52 to 0.84	0.001
Sex								
Female	65	REF			22	REF		
Male	63	0.95	0.79 to 1.15	0.602	24	1.02	0.82 to 1.27	0.835
State								
NSW	66	REF			22	REF		
QLD	62	0.82	0.68 to 0.99	0.038	25	1.16	0.94 to 1.44	0.163
SES								
Low	63	REF			25	REF		
Mod–high	64	1.02	0.82 to 1.27	0.872	23	0.94	0.74 to 1.20	0.618
Friends smoke	–	0.93	0.86 to 1.00	0.044	–	1.12	1.03 to 1.22	0.007
House smoke	–	1.00	0.91 to 1.10	0.993	–	1.06	0.96 to 1.17	0.280

%s are weighted; ORs, CIs and p values from logistic regression analyses.
NSW, New South Wales; QLD, Queensland; SES, socioeconomic status (based on postal code).

Responses to plain packaging among never smokers, ex-smokers and experimenters

In 2013, 83% of non-smoking youth reported that plain packaging had no influence on them, 16% reported that it made them less likely to try smoking and 1% reported that it made them more likely to try it. Among ex-smokers and experimenters, 81% reported that plain packaging had no influence on them, 18% reported that it made them less likely to smoke again and the remaining 1% said it made them more likely to smoke.

Table 2 shows the results of the logistic regression analyses exploring differences in anticipated and actual responses to plain packaging among never smokers, ex-smokers and experimenters. Responses reported at postimplementation were significantly greater than anticipated: never smokers were more likely to report that plain packaging made them less likely to try smoking at postimplementation than at preimplementation, and experimenters and ex-smokers were more likely to report that plain packaging made them less likely to smoke again at postimplementation (vs pre). The logistic regression analysis conducted with the susceptible never smokers showed the same pattern of results (2011 vs 2013: OR=0.60, 95% CI 0.39 to 0.94, p=0.026).

Among never smokers, experimenters and ex-smokers interviewed postimplementation, age was associated with reporting that plain packs made one less likely to smoke, with older youth less likely than younger youth to report this impact (table 4). Of the 12–17-year olds interviewed postimplementation, 31% of ex-smokers and experimenters (n=107) reported that plain packaging made them less likely to smoke again, and 18% of the never smokers (n=1033) reported that it made them less likely to try smoking.

Smokers' responses to plain packaging

Postimplementation, smokers reported that, as a result of plain packaging, they had: thought about quitting (32%), hidden their pack from view (19%), smoked less (18%), tried to quit (17%), felt embarrassed to be a smoker (12%), used a case (11%) and changed brands (11%) (figure 2). Six per cent of smokers said plain packaging made them smoke more, and 48% said it had no impact.

Table 2 shows the results of logistic regression analyses comparing smokers' actual to anticipated responses, controlling for any differences in sample composition. At postimplementation, smokers were significantly more likely to report a quitting-related or social denormalisation response than preimplementation. Conversely, smokers interviewed postimplementation were significantly less likely to report 'no impact' than those interviewed preimplementation. There were no significant differences in the likelihood of reporting 'smoking more' as a response to plain packaging over the years of the survey.

The sensitivity analyses showed that, even among smokers who were opposed to plain packaging, there were significant differences between rates of anticipated and actual quitting-related responses (7% in 2011 vs 27% in 2013: OR=0.17, 95% CI 0.07 to 0.43, p<0.001), and between anticipated and actual social denormalisation responses (5% in 2011 vs 23% in 2013: OR=0.19, 95% CI 0.07 to 0.49, p=0.001).

Among smokers interviewed postimplementation (table 4), those with more smokers in their household were more likely to report a denormalisation-related response. Youth with more smokers among their friends were more likely to report that plain packaging made them smoke more.

DISCUSSION

This study presents new and unique insights into Australian adolescents' and young adults' attitudes towards and responses to Australia's new plain tobacco packaging. For current smokers and non-smokers, attitudes and responses to the new packs were positive. Around one in three young smokers reported a quitting-related response to the plain packs in the 8 months following their introduction, and just over one-quarter reported a sense of social denormalisation. Of note, positive responses were consistently higher in the postimplementation period than anticipated before implementation, a finding which should encourage other countries considering introducing plain packaging legislation—sentiment and responses are likely to become more positive following implementation.

Youth attitudes towards tobacco plain packaging

Following the introduction of the new tobacco plain packs, youth were more likely to support plain packaging than oppose it (64%). While ex-smokers and experimenters showed the highest levels of support for the policy (over 70% supportive), current smokers and susceptible never smokers were also more likely to support than oppose it. Across all groups of youth, support for plain packaging was higher following implementation than in the years preceding. This 'implementation effect' has also been demonstrated among adult smokers,[30] as well as with other policies such as smoke-free laws[38 39] and point-of-sale display bans.[40] Increases in postimplementation policy support may relate to the extent to which smokers can adapt to the changed circumstances, the realisation that concerns held prior to implementation are unfounded, or to the experience that these new policies are helpful for quitting.[30] The consistency of these implementation effects on policy support implies that policymakers should rely on scientific evidence around the likely effectiveness of a policy rather than be concerned solely about public opinion.

Notably, among all youth, opposition of plain packaging was highest in 2011, a time of considerable tobacco industry opposition,[9] including media campaigns denouncing the policy.[41 42] The impact of media coverage on public sentiment towards plain packaging will be an important consideration for jurisdictions planning on introducing legislation.

Young people's responses to plain packaging

To the best of our knowledge, this is the first Australian study to ask young smokers directly about their behavioural, cognitive and emotional responses to plain packaging. Between 15% and 20% of ex-smokers, experimenters and never smokers reported that plain packaging made them less likely to smoke in the future. Consistent with evidence that adolescents are particularly affected by tobacco branding and packaging,[6] the group of young non-smokers for whom plain packaging had the greatest impact was adolescents aged 12–17 years. Of those adolescents who had previously smoked, 31% reported that the new packs made them less likely to smoke again. Given that the vast majority of Australians aged 12–17 years are never smokers,[28] the positive impact of plain packaging on future smoking for 18% of those adolescents translates into a considerable population-level effect, consistent with the original aims of the legislation in deterring young people from taking up smoking. The fact that this positive impact was apparent in youth susceptible to smoking should be encouraging for other jurisdictions planning to implement plain packaging as a preventive measure for youth smoking.

While previous experimental and qualitative research with young adult smokers suggested that plain packaging could result

Table 4 Estimates of responses to plain packaging at postimplementation, with results from logistic regression analyses predicting each outcome

	Never smokers (N=1739)				Experimenters/ex-smokers (N=631)				Current smokers (N=362)							
	Less likely to smoke				Less likely to smoke				Quit response				Denormalisation response			
	Per cent	OR	95% CI	p Value	Per cent	OR	95% CI	p Value	Per cent	OR	95% CI	p Value	Per cent	OR	95% CI	p Value
Age in years																
12–17	18	REF			31	REF			41	REF			36	REF		
18–24	13	0.71	0.52 to 0.97	0.032	16	0.38	0.22 to 0.64	<0.001	33	0.63	0.32 to 1.24	0.181	28	0.66	0.31 to 1.42	0.290
Sex																
Female	15	REF			17	REF			31	REF			31	REF		
Male	18	1.29	0.96 to 1.72	0.093	19	1.10	0.68 to 1.79	0.695	36	1.37	0.75 to 2.53	0.306	27	0.89	0.47 to 1.67	0.711
State																
NSW	17	REF			18	REF			38	REF			31	REF		
QLD	16	0.86	0.64 to 1.16	0.327	18	1.17	0.72 to 1.91	0.526	31	0.70	0.41 to 1.20	0.192	26	0.78	0.43 to 1.38	0.389
SES																
Low	15	REF			19	REF			38	REF			31	REF		
Mod–high	17	1.15	0.83 to 1.59	0.404	17	0.94	0.53 to 1.67	0.845	33	0.78	0.42 to 1.44	0.429	28	0.92	0.47 to 1.78	0.798
Friends smoke	–	0.99	0.85 to 1.16	0.932	–	1.05	0.89 to 1.23	0.591	–	0.94	0.79 to 1.12	0.501	–	0.96	0.81 to 1.15	0.678
House smoke	–	1.11	0.91 to 1.34	0.315	–	1.02	0.89 to 1.18	0.758	–	0.97	0.77 to 1.24	0.823	–	1.42	1.11 to 1.83	0.005
Smoking susceptibility																
Non-susceptible	15	REF			n/a				n/a				n/a			
Susceptible	20	1.31	0.94 to 1.83	0.109												
Cigarettes per day																
<2	n/a				n/a				34	REF			31%	REF		
≥2									34	0.97	0.53 to 1.80	0.932	27%	0.67	0.35 to 1.30	0.234

%s are weighted.
ORs, CIs and p values from logistic regression analyses.
NSW, New South Wales; QLD, Queensland; SES, socioeconomic status (based on postal code).

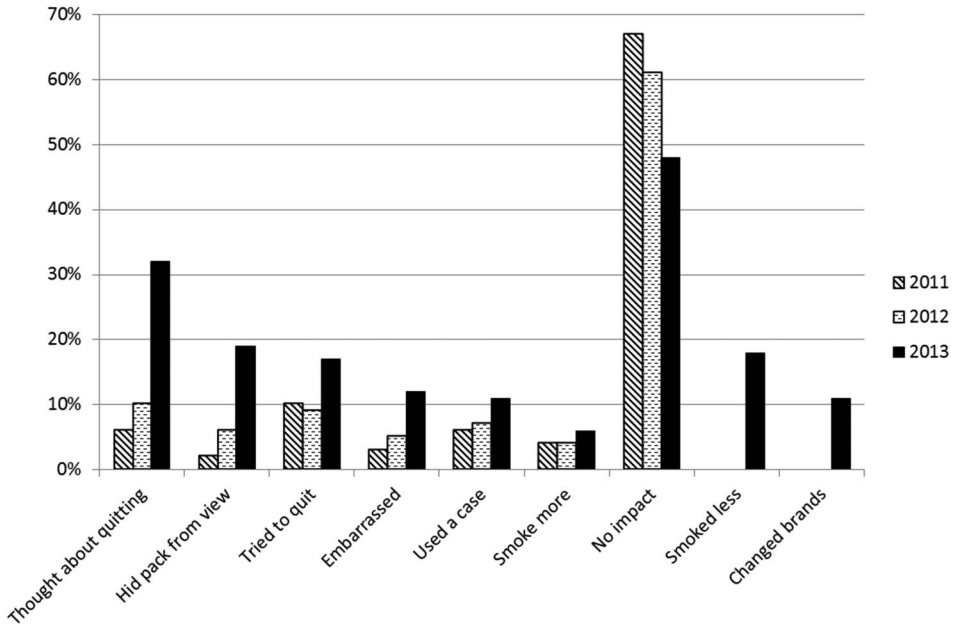

Figure 2 Adolescent and young adult smokers' anticipated and actual responses to tobacco plain packaging.

in cessation-related behaviours,[18 24] this study provides the first evidence that a considerable proportion of young smokers tried to quit or thought about quitting as a result of the new Australian tobacco packs in the period following their introduction. The proportion of young smokers reporting quitting-related responses was substantially higher than the proportion who anticipated these types of responses prior to the new packs being introduced. The level of quitting-related responses to plain packaging in this study is comparable to the levels reported by adult smokers in response to the increasing price of cigarettes after a tobacco tax increase.[43]

Previous research has indicated that stronger population-level tobacco control policies are related to a stronger sense of denormalisation among smokers.[12] This is the first study to demonstrate an impact of the Australian plain tobacco packaging on behavioural and emotional indicators of social denormalisation among young smokers. Studies of adult smokers showed that avoidant behaviours increased in the postimplementation period, such that, in the year following implementation, 23% of smokers concealed their pack in the past month,[2] and, in the month of implementation, 28% of smokers reported that the health warnings made them feel they should hide or cover their pack from view of others.[3] Consistent with these findings, 8 months after the introduction of the new packs, around one in four young smokers reported a response indicating feelings of social denormalisation. Previous research has shown that feelings of social denormalisation are independently related to cessation-related outcomes,[12] and future research should monitor whether young smokers who report such responses to plain packaging are more likely to try and quit in the future. Interestingly, smokers with a greater number of other smokers in their household were more likely to report a denormalisation response than those with fewer smokers. Qualitative research with young smokers might help to clarify whether behaviours such as using a case of hiding packs from view might be behaviours that are shared and amplified among smokers.

Strengths and limitations

The strengths of this study include the collection of data over 4 years and in two states, resulting in a large sample with no notable biases. This sample extends previous research on the impact of the new tobacco packs[10 11] by using population-level sampling (rather than being limited to school students) and by including young adults. The representativeness of the sample was strengthened by inclusion of the dual-frame sample in 2013. The fact that the results were mostly consistent in the dual-frame and landline samples suggests that the differences in anticipated and actual responses were not an artefact of the changing nature of the population available by using landline phone numbers only. The results of this study are necessarily restricted to the Australian context, in which there are comprehensive restrictions on tobacco promotion, high tobacco taxes and regular antismoking media campaigns.[44] Therefore, the generalisability of these results to other jurisdictions may be limited. Further, this study was not able to assess responses to plain packaging in the longer term, due to the TPIS being discontinued after the 2013 wave.

This study investigated respondents' self-reported responses to plain packaging. Asking directly about responses to the new packs may limit the likelihood that the feelings and behaviours reported here are due to other concurrent changes in the tobacco control landscape such as tax increases or antismoking media campaigns. However, this mode of investigation relies on youth to be able to correctly attribute their responses to the changes in packaging. Some individuals may have avoided attributing their behaviours or feelings to the packaging changes, leading to an underestimation of the true impact of the policy. Others might have over-reported the impact of the changes on their behaviour due to social desirability concerns, as has been found with some smoking-related behaviours for youth surveyed over the phone.[45] Nonetheless, the findings of this study are congruent with other research showing decreases in smoking prevalence during this period among students aged 12–17 years.[10 11 46] We note that ex-smokers were not asked whether plain packaging had influenced their decision to quit, as the number of youth who had quit smoking in that 8-month postimplementation period was anticipated to be too few to provide reliable insights.

CONCLUSIONS

There has been great interest in evaluating the impact of Australia's plain tobacco packaging legislation on young Australians. This study adds to the evidence by demonstrating a

considerable positive response to plain packaging among Australian adolescents and young adults, including quitting-related behaviours and thoughts, behavioural and emotional indicators of social denormalisation and high levels of support for the policy. Importantly, support for the policy increased following implementation, and, across all groups of youth, positive responses were greater than anticipated. These findings are consistent with observed decreases in smoking among Australian youth in the postplain packaging period.[10 11 46] Countries considering introducing plain packaging legislation should be encouraged by these findings.

What this paper adds

- Among Australian adolescents and young adults, attitudes and responses to the new packs (measured 6 months postimplementation) were positive.
- Following the introduction of the new packs, current smokers, never smokers and ex-smokers or experimenters were more likely to support plain packaging than oppose it.
- Non-smokers, ex-smokers and experimenters were asked directly if plain packaging made them less likely to smoke in the future, and, consistent with the aims of the legislation, 15–20% reported that it was a deterrent.
- This study provides the first evidence that a considerable proportion (34%) of young smokers tried to quit or thought about quitting as a result of the new Australian tobacco packs in the period following their introduction. Additionally, around one in four young smokers reported behaviours and feelings indicating a sense of denormalisation of smoking.
- Positive responses to plain packaging were consistently higher in the postimplementation period than anticipated before implementation, a finding which should encourage other countries considering introducing plain packaging legislation—sentiment and responses are likely to become more positive following implementation.

Correction notice This article has been corrected since it was published Online First. In the Abstract, 16% was changed to 18% and vice versa in the sentence: "At postimplementation, 16% of never smokers reported that plain packaging made them less likely to try smoking and 18% of experimenters/ex-smokers reported that plain packaging made them less likely to smoke again."

Acknowledgements The authors thank Trish Cotter for her work in developing the Tobacco Promotion Impact Study, and they thank all members of the Tobacco Promotion Impact Study Advisory Committee for their advice in the development of the study. The authors also thank the Social Research Centre for conducting the survey.

Contributors SD, DP and AD conceived the study and SD analysed the data. All authors contributed to drafting the manuscript and critically revised the final manuscript.

Funding The TPIS was funded by the Cancer Institute NSW.

Competing interests None declared.

Ethics approval NSW Population and Health Services Research Ethics Committee.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement For further information on the TPIS data, please contact the authors.

REFERENCES

1 Australian Commonwealth Government. Tobacco Plain Packaging Act 2011 (No. 148, 2011). http://www.austlii.edu.au/au/legis/cth/num_act/tppa2011180/ (accessed 28 Apr 2016).
2 Wakefield M, Coomber K, Zacher M, *et al*. Australian adult smokers' responses to plain packaging with larger graphic health warnings 1 year after implementation: results from a national cross-sectional tracking survey. *Tob Control* 2015;24:ii17–25.
3 Dunlop SM, Dobbins T, Young JM, *et al*. Impact of Australia's introduction of tobacco plain packs on adult smokers' pack-related perceptions and responses: results from a continuous tracking survey. *BMJ Open* 2014;4:e005836.
4 Yong HH, Borland R, Hammond D, *et al*. Smokers' reactions to the new larger health warning labels on plain cigarette packs in Australia: findings from the ITC Australia project. *Tob Control* 2016;25:181–7.
5 Moodie C, Ford A, Mackintosh AM, *et al*. Young people's perceptions of cigarette packaging and plain packaging: an online survey. *Nicotine Tob Res* 2012;14:98–105.
6 Germain D, Wakefield MA, Durkin SJ. Adolescents' perceptions of cigarette brand image: does plain packaging make a difference? *J Adolesc Health* 2010;46:385–92.
7 Hammond D, Daniel S, White CM. The effect of cigarette branding and plain packaging on female youth in the United Kingdom. *J Adolesc Health* 2013;52:151–7.
8 Hammond D. 'Plain packaging' regulations for tobacco products: the impact of standardizing the color and design of cigarette packs. *Salud Publica Mex* 2010;52 (Suppl 2):S226–32.
9 Chapman S, Freeman B. *Removing the emperor's clothes: Australia and tobacco plain packaging*. Sydney, Australia: Sydney University Press, 2014.
10 White V, Williams T, Wakefield M. Has the introduction of plain packaging with larger graphic health warnings changed adolescents' perceptions of cigarette packs and brands? *Tob Control* 2015;24:ii42–9.
11 White V, Williams T, Faulkner A, *et al*. Do larger graphic health warnings on standardised cigarette packs increase adolescents' cognitive processing of consumer health information and beliefs about smoking-related harms? *Tob Control* 2015;24:ii50–7.
12 Hammond D, Fong GT, Zanna MP, *et al*. Tobacco denormalization and industry beliefs among smokers from four countries. *Am J Prev Med* 2006;31:225–32.
13 Bell K, McCullough L, Salmon A, *et al*. 'Every space is claimed': smokers' experiences of tobacco denormalisation. *Sociol Health Illn* 2010;32:914–29.
14 Durkin S, Brennan E, Coomber K, *et al*. Short-term changes in quitting-related cognitions and behaviours after the implementation of plain packaging with larger health warnings: findings from a national cohort study with Australian adult smokers. *Tob Control* 2015;24:ii26–32.
15 Zacher M, Bayly M, Brennan E, *et al*. Personal tobacco pack display before and after the introduction of plain packaging with larger pictorial health warnings in Australia: an observational study of outdoor café strips. *Addiction* 2014;109:653–62.
16 Zacher M, Bayly M, Brennan E, *et al*. Personal pack display and active smoking at outdoor café strips: assessing the impact of plain packaging 1 year post-implementation. *Tob Control* 2015;24:ii94–7.
17 Moodie C, Mackintosh A. Young adult women smokers' response to using plain cigarette packaging: a naturalistic approach. *BMJ Open* 2013;3:e002402.
18 Moodie C, Mackintosh A, Hastings G, *et al*. Young adult smokers' perceptions of plain packaging: a pilot naturalistic study. *Tob Control* 2011;20:367–73.
19 Moodie C, Bauld L, Ford A, *et al*. Young women smokers' response to using plain cigarette packaging: qualitative findings from a naturalistic study. *BMC Public Health* 2014;14:812.
20 Hoek J, Healey B, Gendall P, *et al*. How do adolescents perceive plain packaging? *N Z Med J* 2013;126:100–3.
21 Hoek J, Gendall P, Gifford H, *et al*. Tobacco branding, plain packaging, pictorial warnings, and symbolic consumption. *Qual Health Res* 2012;22:630–9.
22 Wakefield M, Hayes L, Durkin S, *et al*. Introduction effects of the Australian plain packaging policy on adult smokers: a cross-sectional study. *BMJ Open* 2013;3: e003175.
23 Young J, Stacey I, Dobbins T, *et al*. The association between tobacco plain packaging and Quitline calls: a population-based, interrupted time series analysis. *Med J Aust* 2014;200:29–32.
24 Hoek J, Wong C, Gendall P, *et al*. Effects of dissuasive packaging on young adult smokers. *Tob Control* 2010;20:183–8.
25 McKee M, Daube M. Europe's governments must implement standardised tobacco packaging now. *Eur J Public Health* 2015;25:551–2.
26 Hoek J, Edwards R, Daube AOM. Standardised (plain) packaging: the time for implementation has come. *N Z Med J* 2015;128:47–51.
27 British American Tobacco (BAT). Plain packaging: stripping our branding strips our rights. http://www.bat.com/plainpackaging (accessed 15 Apr 2016).
28 Australian Institute of Health and Welfare. National Drug Strategy Household Survey 2013: Tobacco Smoking. http://aihw.gov.au/alcohol-and-other-drugs/ndshs/2013/data-and-references/ (accessed 29 Mar 2016).
29 Edwards R, Carter K, Peace J, *et al*. An examination of smoking initiation rates by age: results from a large longitudinal study in New Zealand. *Aust N Z J Public Health* 2013;37:516–19.

30 Swift E, Borland R, Cummings KM, *et al*. Australian smokers' support for plain or standardised packs before and after implementation: findings from the ITC Four Country Survey. *Tob Control* 2015;24:616–21.
31 Australian Communications and Media Authority (ACMA). *Communications Report 2010–11 Series: Report 2—Converging communications channels: Preferences and Behaviours of Australian Communications Users*. ACMA, 2011. http://www.acma.gov.au/webwr/_assets/main/lib410148/report2-convergent_comms.pdf
32 American Association for Public Opinion Research. *Standard definitions: final dispositions of case codes and outcome rates for surveys*. Lenexa, KS: AAPOR, 2008.
33 Mayhew KP, Flay BR, Mott JA. Stages in the development of adolescent smoking. *Drug Alcohol Depend* 2000;59(Suppl 1):S61–81.
34 Pierce JP, Choi WS, Gilpin EA, *et al*. Validation of susceptibility as a predictor of which adolescents take up smoking in the United States. *Health Psychol* 1996;15:355–61.
35 Australian Bureau of Statistics. *2006 Census of Population and Housing: Socio-Economic Indexes for Area's (SEIFA)*. Canberra, Australia: Commonwealth of Australia, 2008. http://www.abs.gov.au/ausstats/abs@.nsf/mf/2033.0.55.001
36 Barr ML, van Ritten JJ, Steel DG, *et al*. Inclusion of mobile phone numbers into an ongoing population health survey in New South Wales, Australia: design, methods, call outcomes, costs and sample representativeness. *BMC Med Res Methodol* 2012;12:177.
37 Barr ML, Ferguson RA, Steel DG. Inclusion of mobile telephone numbers into an ongoing population health survey in New South Wales, Australia, using an overlapping dual-frame design: impact on the time series. *BMC Res Notes* 2014;7:517.
38 Borland R, Owen N, Hill D, *et al*. Changes in acceptance of workplace smoking bans following their implementation: a prospective study. *Prev Med* 1990;19:314–22.
39 Fong GT, Hyland A, Borland R, *et al*. Reductions in tobacco smoke pollution and increases in support for smoke-free public places following the implementation of comprehensive smoke-free workplace legislation in the Republic of Ireland: findings from the ITC Ireland/UK Survey. *Tob Control* 2006;15(Suppl 3):iii51–8.
40 McNeill A, Lewis S, Quinn C, *et al*. Evaluation of the removal of point-of-sale tobacco displays in Ireland. *Tob Control* 2011;20:137–43.
41 No Nanny State. https://www.youtube.com/watch?v=gNnyLi5qLBs (accessed 10 Aug 2016).
42 It won't work, so why do it. https://www.youtube.com/watch?v=hjqeiNvBSqw (accessed 10 Aug 2016).
43 Dunlop SM, Perez D, Cotter T. Australian smokers' and recent quitters' responses to the increasing price of cigarettes in the context of a tobacco tax increase. *Addiction* 2011;106:1687–95.
44 Scollo M, Bayly M, Wakefield M. Plain packaging: a logical progression for tobacco control in one of the world's 'darkest markets'. *Tob Control* 2015;24:ii3–8.
45 Moskowitz JM. Assessment of cigarette smoking and smoking susceptibility among youth: Telephone Computer-Assisted Self-Interviews versus Computer-Assisted Telephone Interviews. *Public Opin Q* 2004;68:565–87.
46 White V, Williams T. *Australian secondary school students' use of tobacco in 2014*. Canberra: Australian Government Department of Health, 2015. http://www.nationaldrugstrategy.gov.au/internet/drugstrategy/Publishing.nsf/content/BCBF6B2C638E1202CA257ACD0020E35C/$File/Tobacco%20Report%202014.PDF (accessed 1 Aug 2016)

Australia's plain tobacco packs: anticipated and actual responses among adolescents and young adults 2010–2013

Sally Dunlop, Donna Perez, Anita Dessaix and David Currow

Tob Control published online November 15, 2016