

New Zealand adolescents' responses to plain packaging and new pictorial warning labels: Repeat cross-sectional survey analysis

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Abstract

Objective: This article aims to examine the impact on adolescents of New Zealand's 2018 legislation introducing plain (standardised) packaging and enhanced pictorial warning labels (PWLs).

Methods: Data came from Year 10 (14–15 years old) students in the 2016 (2,884 participants) and 2018 (2,689 participants) Youth Insights Surveys conducted 2 years before and immediately after legislation implementation. We used binary and ordinal logistic regression to investigate changes in brand awareness and preference, brand and pack appeal, and PWL salience and impact.

Results: The proportion of all participants, and ever, ex/experimental and current smokers who could name one or five tobacco product brands decreased in 2018. There was a modest and nonstatistically significant decrease in the proportion of current smokers citing brand name and image, and a larger decrease in the proportion stating perceived harm to health, influenced preferred brand choice. Having a preferred brand among current smokers and pack appeal, and PWL salience and impact among ex/experimental and current smokers were largely unchanged.

Conclusions: We found preliminary evidence that plain packaging and enhanced PWLs reduced tobacco brand awareness and salience, and misperceptions about tobacco brand harmfulness. Data collection occurred shortly after implementation. Additional studies are required to assess longer term impacts of these interventions.

Public health implications: The findings complement existing evidence documenting the impact of plain packaging and PWLs on adolescents. Given limitations due to the proximity of the 2018 survey to legislation implementation, further studies with longer follow-up are required.

Key words: plain packs, standardised packs, health warnings, evaluation, youth

Introduction

Tobacco use is a major contributor to global morbidity and mortality and, directly or indirectly, causes eight million deaths globally per year.¹ As well as causing many cancers, and cardiovascular and respiratory diseases,² smoking creates health inequities because prevalence varies markedly by socioeconomic status and ethnicity. Within Aotearoa/New Zealand (A/NZ), smoking prevalence among Māori (the Indigenous peoples of A/NZ) and Pacific peoples (a substantial population in A/NZ comprising people with ancestry from multiple Pacific Island countries) is much higher than among non-Māori and non-Pacific populations, resulting in disproportionate health impacts.^{3,4}

To address disparities in smoking prevalence and the inequities that result, many interventions have focused on reducing smoking uptake

among young people. These measures address the tobacco industry's long history of targeting young people who represent potential future revenue streams.^{5,6} Marketing has created long-standing associations between brands and adolescents' concerns and desires by promoting brands as conduits to social approval, peer acceptance, autonomy, self-image and adventure seeking, among others.^{7,8} Despite measures restricting advertising and promotion, marketing to youth has persisted through in-store retailing and merchandising and, when those channels closed, via movies and on-pack branding.^{9–13}

Internal tobacco industry documents reveal how cigarette pack design affects perceptions and behaviour. For example, studies have found slim, rounded and oval packs appealed particularly to young adults who were also attracted by novel pack designs.^{14,15} Calls to reduce the impact of tobacco packaging and brand imagery were first made in the late 1980s and continued in the 1990s.^{16–18} Finally, in

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2012, Australia became the first country to introduce plain (or standardised) packaging. A further 19 countries have since implemented plain packaging, with several more due to do so in 2023 and 2024.¹⁹

Plain packaging, as set out in Australia's Tobacco Plain Packaging Act 2011, aims to decrease the appeal and acceptability of smoking, particularly for young people, thus reducing smoking uptake. It also aims to increase the impact of on-pack warnings and reduce packaging's ability to detract from smoking's harms and mislead people who smoke.^{20,21}

New Zealand's legislation introducing plain packaging came into effect on 14 March 2018; a transition period allowed sale nonstandardised packs until 6 June 2018, after which date all tobacco products had to be sold in standardised packs.²² The legislation had similar aims to Australia's Act, including a strong focus on reducing smoking's appeal.²² Regulations required new pictorial warning labels (PWLs) covering 75% of the front and 90% of the back of packs (an increase in size from 30% front), more prominent display of the Quitline number and an affirming message, which comprised the remaining 10% of the back of pack surface. The regulations also reduced pack size variety, allowing only 20 or 25 cigarette packs and limiting loose tobacco packages to 30g or 50g options.²²

Studies examining perceptions of plain packaging informed legislation in both countries.^{23,24} A systematic review of experimental studies including 15,935 adolescents found plain packaging reduced perceptions of smoking as attractive and increased on-pack warning salience.²⁵ However, although many experimental studies have explored plain packaging's potential to influence youth behaviour, relatively few studies have examined the policy's actual impact on young people,^{26–28} and no A/NZ study has examined this question.

We addressed this gap by examining cross-sectional data from a large study of young people prior to and shortly after the introduction of plain packaging and enhanced PWLs. Specifically, we investigated changes in adolescents' brand awareness and preference, brand and pack appeal, and warning label salience and impact.

Methods

Survey methods and sampling

Data were sourced from the 2016 and 2018 New Zealand Youth Insights Survey (YIS), a biennial cross-sectional survey of school students in Year 10 (14–15 years old) undertaken by the Health Promotion Agency/Te Hīringa Hauora (HPA). Full details of the methods are available in methodology reports and are briefly summarised in the following sections.^{29,30}

The survey uses a two-stage cluster sample design. First, a random sample of all eligible public and private A/NZ schools with Year 10 students were invited to take part, with probability for selection proportional to mid-year roll size in the preceding year ($n = 536$ and 540 eligible schools in 2016 and 2018). Second, one Year 10 class was randomly selected in each consenting school and all students in that class were invited to participate. Participants completed a self-administered paper questionnaire in class. To ensure anonymity, no identifying information was collected from participants. Teachers were not permitted to see responses.

Data were collected by trained research fieldworkers in 2016 prior to the legislation (fieldwork dates: 26 May to 8 July) and in 2018

(fieldwork dates: 21 May to 6 July). Data collection in 2018 began after the legislation introducing the new packs came into effect on 14 March. The first 16 days (May 21 to June 6) of data collection occurred during the latter part of the transition period when nonplain packs may have still been available in some shops; during the remaining 30 days of data collection (June 7–July 6), branded packs were no longer legally available for sale.

Measures

The questionnaires are available through the HPA website (<https://www.hpa.org.nz/our-work/research/publications>).

Demographic measures

The YIS survey included questions on age, gender and ethnicity. Respondents could choose more than one ethnicity; where multiple ethnicities were specified, a prioritised ethnicity classification was used with a priority ordering of Māori, Pacific, Asian, NZ European and Other, consistent with the standard approach used in other NZ surveys.³¹ We used the decile rating of participants' school as an ecological measure of socioeconomic status (SES): decile ratings are based on the proportion of students at each school from low socioeconomic neighbourhoods as assessed by five census-based variables.³² We regrouped deciles into five categories (1–2, 3–4, 5–6, 7–8, and 9–10) where deciles 1–2 represent schools with the highest proportion of students from disadvantaged areas.

Smoking status and susceptibility

Smoking status was assessed using two questions: *Have you ever smoked, even just a few puffs?* a *no* response defined never smokers, and a *yes* response defined ever smokers. The latter were asked *How often do you smoke now?* Those who reported smoking at least monthly were classified as current smokers, and those who smoked less than monthly or who had smoked in the past were classified as ex/experimental smokers.

We classified susceptibility among never smokers only, using three questions derived from the Global Youth Tobacco Survey and adapted from Pierce et al.'s susceptibility measure.³³ We defined as nonsusceptible never smokers who answered *definitely no* to all three of the following questions: *Do you think you will try a cigarette soon?* and *If one of your best friends offered you a cigarette, would you smoke it?* and *At any time during the next year (12 months) do you think you will smoke a cigarette?* We defined all other never-smokers as susceptible to smoking.

Impact of plain packaging and new pictorial warning labels

The surveys examined brand awareness and preference, the importance of brand attributes to brand preference, pack appeal, and warning salience and impact. The surveys assessed these measures using text-based questions that did not include images or other visual prompts.

Students were asked to name up to five different brands of tobacco/cigarettes; we coded these by brand families (e.g. Rothmans). Brand variants within the same family (e.g. Rothmans Blue and Rothmans Red) were counted as a single brand. We calculated the proportions of students who could name (a) at least one brand and (b) five different brands. Students who smoked were asked to name the brand of tobacco/cigarettes they preferred. Those who provided a brand name

were coded as “has preferred brand” whilst students were coded as “no preferred brand” if they gave either of the other response options (*I don't mind what brand I smoke or I have never smoked cigarettes/I am not a smoker now*).

Students who had a preferred brand were asked how important various attributes were to their preference. Four attributes were not directly related to the appearance of the pack: *price, taste, easy to get* and *harm to my health*, while three were likely to be directly affected by pack appearance: *what the packet looks like, brand name, brand image*. Response options were: *not at all, slightly, moderately, and very important*. We report the proportion of participants who responded *moderately* or *very important* for each attribute.

We used three measures to examine the salience and impact of PWLs on cigarette packs or tobacco pouches. The first two measures assessed how often within the previous 30 days participants reported (i) reading or looking closely at the warning labels; or (ii) that the warning labels had stopped them from having a cigarette when they were about to smoke one. In 2016, the response options recorded occurrence frequency during the last month (*never, once, two or three times, about once a week, several times a week and most days*), whereas in 2018, the response options were: *never, rarely, sometimes, often, and every time*. To maximise comparability, we dichotomised responses in both surveys to *never* and any response other than *never*. Participants were also asked whether, in the last 30 days, they had made any effort to avoid the warning labels (e.g. covering warnings, keeping pack out of sight, using a cigarette case or avoiding buying packs with particular warning labels); response options were *yes* or *no*.

Finally, we assessed agreement with ten statements about the appeal and impact of cigarette packs and tobacco pouches, for example, that packages *look cool, look gross or make smoking look interesting* (response options: *agree* or *disagree*).

Statistical analysis

We compared responses to the questions on brand awareness and preference, brand and pack appeal, and warning label salience and in 2016 and 2018. For these comparisons, we present percentages weighted to represent the national Year 10 population, using weights and identifiers provided by HPA, which included poststratification weighting by gender and ethnicity.^{29,30}

For brand awareness, we included all participants in the analysis and conducted stratified analyses by smoking status. For pack appeal and the impact of pack warnings, we included all participants who identified as ever smokers. For brand preference, we included all current smokers, and for brand attribute importance to brand preference, we included all current smokers who had a preferred brand. We do not report analyses stratified by demographic factors

such as age, gender, ethnicity and school decile as small numbers result in very high imprecision in the per-stratum estimates.

For comparisons of brand awareness, brand preference, warning salience and impact, and pack appeal and impact between 2016 and 2018, we used binary logistic regression models including adjustment for demographic variables (age, gender, ethnicity and school decile) and susceptibility/smoking status where appropriate (indicated in results). For comparisons of brand attribute ratings, we carried out ordinal logistic regression analysis to account for the multiple ordered response options (from *not at all* to *very important*) as above.

We performed analysis using Stata 17 (StataCorp LP, College Station, Texas). The *svy* prefix was used for all weighted estimates (proportions and logistic regression models) to enable adjustment for the complex survey designs, including clustering by school. We used two-sided significance tests, with estimates reported with 95% confidence intervals and statistical significance set at $p < 0.05$.

Results

Response rates and sample characteristics

Response rates are based on HPA reports.^{29,30} Of the invited schools, 139 schools (74%) participated in 2016 and 126 schools (68%) in 2018. A total of 5,547 Year 10 students responded to the survey; 2,858 in 2016 and 2,689 in 2018. An average of 86% of students per selected class participated in 2016, and 85% in 2018, giving overall response rates of 64% in 2016 and 59% in 2018.

The sample characteristics are described in Table 1a in the supplementary material and were similar in 2016 and 2018. There were approximately equal proportions of males and females, and around 80% of participants were aged 14 years. The proportion of Māori students was 25% in 2016 and 23% in 2018, with 9% Pacific in both surveys. Only 5% were current smokers, with 21% in 2016 and 17% in 2018 ex/experimental smokers. Sample characteristics were very similar in gender and ethnicity to the national Year 10 student population (data not shown).²⁹ However, students from the least affluent (decile 1/2) schools were underrepresented (10% in 2016 and 6% in 2018).

An error in computer logging of the 2016 surveys resulted in lost responses to the susceptibility questions among never smokers; nonresponse for these questions was thus much greater in 2016 (n=462 missing) than in 2018 (n=44). However, nonresponders in 2016 did not differ demographically from responders, suggesting these data were missing at random and hence should not affect parameter estimates.

	Weighted % naming ≥ 1 brand			Weighted % naming five brands		
	2016	2018	aOR ^a (95% CI)	2016	2018	aOR ^a (95% CI)
All participants (n= 2742, 2689)	22.5	17.6	0.73 (0.60, 0.88)	2.7	1.5	0.53 (0.32, 0.88)
Ever smokers (n=613, 579)	46.4	41.4	0.81 (0.61, 1.07)	10.2	5.0	0.45 (0.27, 0.74)
Ex/experimental smokers (n=467, 447)	39.0	33.3	0.79 (0.59, 1.06)	5.3	2.8	0.53 (0.25, 1.14)
Current smokers (n=124, 123)	75.1	69.5	0.84 (0.44, 1.57)	28.0	13.0	0.38 (0.18, 0.82)

^aAdjusted odds ratio (aOR) of naming ≥ 1 vs 0 or 5 brands vs ≤4 brands in 2018 compared to 2016, adjusted for age, gender, ethnicity, school decile [all strata] and also for current smoking status [‘Ever smokers’ and ‘All Participants’ strata].

Brand awareness

Table 1 compares tobacco product brand recognition (% able to name at least one or five brands) in 2016 and 2018, stratified by smoking status. Data are not presented for never smokers, as brand recognition was rarely reported.

Among all participants, and among ever smokers, ex/experimental smokers and current smokers, the proportion who could name at least one or five brands decreased in 2018 compared to 2016. The greatest relative and absolute decrease was in the proportion of current smokers who could name five brands; from 28.0% in 2016 to 13.0% in 2018 (aOR 0.38, 95% CI 0.18 to 0.82).

Brand preference and reasons for brand preference

The proportion of current smokers who reported a preferred brand increased slightly, from 39% (39/102) in 2016 to 46% (50/110) in 2018, though the change was not statistically significant (aOR = 1.36, 95% CI 0.74 to 2.51).

Table 2 outlines the proportion of current smokers that stated brand attributes were moderately or very important for their brand preferences in 2016 and 2018. Attributes related to the appearance of the pack: *Brand name*, *brand image* and *what the pack looks like* were less likely to be cited as important attributes compared to *price*, *taste*, *easy to get* and *harm to health* in both survey years. Two of the three attributes most likely to be directly affected by plain packaging and revised PWLs (brand name and brand image) decreased in importance in 2018, while the other (pack appearance) increased. Of the other attributes, *easy to get*, *price* and *taste* increased in importance, while *harm to health* decreased in importance.

The number of current smokers with a brand preference was small (<50 in each year) and confidence intervals for estimates of changes in attribute ratings between surveys overlapped the null (aOR = 1.0) except for *easy to get* (aOR 2.40: 95% CI 1.10, 5.22), which increased, and *harm to health* (aOR 0.33: 95% CI 0.13, 0.83), which decreased.

Pack appeal

Detailed analysis of the the proportion of ever smoking (current and ex/experimental smokers) and susceptible never smoker participants in 2016 and 2018 who agreed with statements about the appeal of cigarette packs is shown in the supplementary material (**Tables 2a** and **2b**).

Among current smokers, the proportions agreeing with the six positive and four negative statements were similar; 10.2–34.3% for the

positive statements and 21.0–34.3% for the negative statements. Among ex/experimental smokers and susceptible never smokers, a much higher proportion (47.7–67.5%) agreed with the negative statements than with the positive statements (2.4–21.2%).

Changes in the odds of agreement between 2016 and 2018 were small (aOR close to and overlapping the null) for all the negative and positive statements about pack appeal among current and ex/experimental smokers and susceptible never smokers, except agreement that packs *looks cool* increased from 10.2% to 19.9% (aOR 2.48, aOR 1.16–5.31) among current smokers.

Warning label salience and impact

Table 3 shows warning label salience and impact in 2016 and 2018 among ever smokers. A high proportion (>70%) reported reading or examining PWLs and a substantial minority (around 40%) of current smokers reported deferring smoking as a result of the PWLs or trying to avoid the warnings.

Most differences by survey year were minor and confidence intervals of estimates overlapped the null. The largest difference was a modest but not statistically significant increase (aOR = 1.36, 95% CI 0.77–2.43) in the proportion of current smokers reporting they read or examined the PWLs in the last month.

Discussion

Shortly after the introduction of plain packs and enhanced PWLs, we found moderately reduced brand awareness (ability to name cigarette and tobacco brands) among NZ adolescents. Perceived harm to health and possibly brand name and image (but not pack appearance) were less likely to be cited as influencing preferred brand among current smokers. There was little change in pack appeal among adolescents who were current or ex-smokers. Most adolescents who currently, or had ever, smoked reported reading or examining PWLs during the previous month, with a possible small increase among current smokers after plain packs were introduced. Around 40% of current smokers reported that the PWLs led them to defer smoking or take action to avoid seeing their pack in the last month, with similar proportions before and after plain pack implementation.

Australia was the first country to introduce plain packs in 2011. White et al. found a modest reduction in the appeal of cigarette packs and brands among adolescents 7–12 months after implementation²⁷ and reported sustained reductions in proportions stating brands differed

Table 2: Importance of brand attributes to brand preference in 2016 and 2018 surveys among all current smokers with a stated brand preference.

	% Stating attribute was moderately or very important for their brand preference		
	2016	2018	aOR ^a (95% CI)
Price (n= 37, 49)	60.4	66.6	1.20 (0.42, 3.40)
Taste (n = 37, 47)	62.2	65.4	1.43 (0.53, 3.85)
Easy to get (n=38, 47)	44.8	64.1	2.40 (1.10, 5.22)
Harm to my health (n=38, 49)	64.0	33.7	0.33 (0.13, 0.83)
Brand name (n=39, 47)	37.9	24.5	0.73 (0.30, 1.78)
What the packet looks like (n= 38, 47)	14.1	20.1	1.55 (0.55, 4.41)
Brand image (n=38, 47)	24.7	19.1	0.64 (0.23, 1.81)

^aAdjusted odds ratio of naming attribute as moderately or very important for their brand preference in 2018 compared with 2016, adjusted for age, gender, ethnicity, and school decile.

Table 3: Warning label impacts among ever smokers in 2016 and 2018.

	% Read or examined warning labels in last month			% Deferred smoking in last month due to warning labels			% Reporting avoidance behaviours because of warning labels in last month		
	2016	2018	aOR ^a (95% CI)	2016	2018	aOR ^a (95% CI)	2016	2018	aOR ^a (95% CI)
Ever smokers (n=401, 363)	71.0	72.2	1.05 (0.76, 1.46)						
Ex/experimental smokers (n=265, 238)	71.3	71.6	0.93 (0.61, 1.43)						
Current smokers ^b (n=119, 119)	70.1	73.2	1.36 (0.77, 2.43)	38.7	36.5	0.94 (0.51, 1.73)	40.6	42.3	1.06 (0.55, 2.06)

^aAdjusted odds ratio for warning label impact in 2018 compared with 2016, adjusted for age, gender, ethnicity, and school decile.

^bFor Deferral of smoking: n=112, 118 for Current smokers in 2016/2018; for Reporting Avoidance: n = 105, 116 for Current smokers in 2016/201.

in harmfulness, addictiveness and pack appeal over 6 years of follow-up.²⁸ In France, the dePICT study found reductions in brand attachment, brand name appeal and reporting preferred brand was less harmful than other brands among current adolescent smokers 8–11 months after plain packaging implementation.²⁶

Our results partially align with these findings. We found a modest reduction in tobacco brand awareness, particularly among current smokers, and a possible reduction in the influence of brand name and image on brand preference immediately postimplementation. Perceptions about harmfulness were also less frequently cited as a reason for brand preference. It is possible that plain packaging eliminates associations between packaging colour and perceived harm for different brands and, in combination with larger and more salient PWLs, means brands are more likely to be viewed (correctly) as equally harmful.

We did not find substantial changes in pack appeal or PWL salience and impact, and on some measures (e.g. “packs look cool”), there was some evidence of increased pack appeal in the 2018 survey. Our findings contrast with those for adults who smoke,³⁴ including a A/NZ study,³⁵ and in experimental studies with adolescents.³⁶ This difference could reflect low pack appeal and high warning salience present preimplementation, given PWLs have been in place in A/NZ since 2008. Finally, data collection very shortly after implementation of plain packaging in 2018 in our study may also have contributed to differences in findings from other studies.

Our study has some important limitations, including data collection occurring soon after policy implementation and, for some respondents, prior to full roll-out of plain packs. This timing could have resulted in an underestimate of the policy’s impacts on adolescents, particularly for noncurrent smokers who would have been least likely to have seen the new packs. We were unable to complete a sensitivity analysis to investigate the impact of excluding respondents who completed the survey at the end of the transition period because time of survey completion was not recorded in the dataset (and not held by the data owners).

We were limited by the sample size of the YIS, which restricted the precision of our estimates, particularly because of the small number of current smokers. Small sample size also precluded meaningful subgroup analyses, such as by ethnicity or SES. The loss of responses to the susceptibility questions in 2016 further reduced the effective sample size for some analyses. However, the risk of bias from this data loss is low as it appears to have occurred randomly.

Finally, we did not assess changes in smoking prevalence and smoking susceptibility. Such an analysis would have been inappropriate given that data collection occurred immediately after implementation.

Annual smoking prevalence data from the ASH Year 10 snapshot survey of 14–15 year olds shows that after a long-standing and dramatic fall in daily smoking prevalence (e.g. from over 15% in 1999 to 2.8% in 2014) smoking has subsequently declined more slowly, with a similar rate before and after implementation of plain packs; daily smoking was 2.8% in 2014, reducing to 1.9% by 2018 and 1.3% in 2021.^{37–39} Other evidence from the annual New Zealand Health Survey shows that daily and current smoking prevalence among 15–17 year olds reduced from 7.9% in 2013–2014 to 3.3% in 2016–2017, and plateaued at around that level until 2019–2020, before reducing again to 1.1% in 2020–2021.⁴ These data do not provide clear evidence for whether plain packaging and enhanced PWLs impacted on smoking prevalence among adolescents. However, drawing conclusions about the impact of individual policy interventions from changes in prevalence over time in a single population risks attributing changes to an intervention that may be due to confounding influences at a policy or societal level, such as the annual above-inflation tobacco excise tax increases implemented between 2011 and 2021^{40,41} and the increase in vaping from around 2015.^{4,39}

In conclusion, our study provides preliminary evidence that plain packaging and enhanced PWLs in A/NZ were associated with decreased brand awareness, possible reduced impacts of brand name and image, and less (erroneous) differentiation in harmfulness between brands; but there was no clear evidence of changes in reported pack appeal or the impact of PWLs. These findings need confirming through studies conducted over a longer period following policy implementation. Unfortunately, the lack of planned policy evaluations and subsequent discontinuation of the YIS means such evidence is unlikely to be forthcoming from A/NZ.⁴²

The findings add to evidence that eliminating on-pack marketing and replacing tobacco branding with enhanced PWLs has positive impacts on adolescents and may help reduce the appeal of tobacco products and branding and hence contribute to minimising smoking initiation. The study limitations, largely inherent due to limited data availability and the timing of the surveys, underline the importance of countries proactively planning to evaluate major tobacco control policy interventions and establishing comprehensive monitoring and surveillance infrastructure.

Ethics and consent

School principals completed consent forms for participating schools. Children in each selected class decided whether to participate. Given the survey anonymity and minimal risk of harm, individual parental consent was not sought, but information about the survey, including advice that students could choose not to participate if they wished,

was provided in school newsletters. The HPA reported they had never received requests from parents asking for their child to opt out of the survey. Ethical approval was granted by the Ministry of Health's Multiregional Ethics Group in 2007 and has been granted on an annual basis from the Health and Disability Ethics Committee.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.anzjph.2023.100066>.