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Are anti-smoking social norms associated with tobacco control mass media campaigns, tax and policy changes? Findings from an Australian serial cross-sectional population study of smokers

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Keywords: Tobacco control advertisements, Tobacco control policy changes, Tax, Social Norms, Population Survey, Socio-economic status, Age groups

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ABSTRACT (245 words)

Background: Anti-smoking social norms are associated with subsequent quitting behaviours. We examined if exposure to tobacco control advertisements and policy changes predict subjective (perceived disapproval of smoking among close family and friends) and internalised injunctive norms (embarrassed about telling others you are a smoker).

Methods: A serial cross-sectional population survey of Australian adult smokers (n=6,649; 2012-2015). Logistic regression analyses examined associations of social norms with exposure to different types of tobacco control advertisements, tax increases and other tobacco control policies, adjusting for key demographic, smoking and media exposure covariates. Interaction analyses examined differences by age and socio-economic status (SES).

Results: Greater past month exposure to predominantly fear-evoking advertisements was associated with increased odds of perceiving disapproval (per 1000 Gross Rating Points (GRPs): adjusted odds ratio (AOR) 2.69, 95% Confidence Intervals (CI): 1.34, 5.39), while exposure to advertisements evoking multiple negative emotions (fear, guilt, sadness) reduced perceived disapproval (AOR 0.61, 95% CI: 0.42, 0.87). Increased perceived disapproval was also associated with anticipation (AOR 1.38, 95% CI: 1.02, 1.88), and implementation of a series of annual 12.5% tobacco tax rises (AOR 1.41, 95% CI: 1.03, 1.94). Associations were consistent across age and SES. There were no associations nor subgroup interactions between advertisement exposure or policy changes and feeling embarrassed about telling others you are a smoker.

Conclusion: Smokers’ perceptions of family and friends’ disapproval of their smoking was more common after exposure to fear-evoking tobacco control campaigns and after large tobacco tax increases were announced and implemented.
INTRODUCTION

Anti-smoking mass media campaigns can motivate quitting, with the most effective advertisements across age and socio-economic (SES) groups evoking strong negative emotions.\(^{(1, 2)}\) Increases in tobacco tax reduce smoking intensity and prompt quitting,\(^{(3, 4)}\) especially among price-sensitive lower SES and younger smokers\(^{(5, 6)}\). Smoke-free policies,\(^{(7-9)}\) pack health warnings\(^{(10-13)}\) and plain packaging\(^{(14, 15)}\) also increase quitting motivation, intentions and behaviours.

In addition to these direct effects, tobacco control mass media campaigns and policy changes are thought to also influence broader social norms about smoking, with these social norm changes indirectly motivating smokers to quit and helping them to stay quit.\(^{(16-19)}\) There is good evidence to indicate smokers who perceive more negative social norms about smoking are more likely to intend,\(^{(20-24)}\) attempt to quit,\(^{(23-28)}\) and report long-term abstinence,\(^{(25, 29)}\) and that pro-smoking social norms can inhibit cessation.\(^{(21)}\) There is less evidence demonstrating which types of campaigns and policy changes can influence anti-smoking social norms.\(^{(21, 25, 28, 30, 31)}\)

Social norms can be defined as shared societal expectations that guide social behaviour, although there are many different types.\(^{(32, 33)}\) Subjective norms are perceptions about what important people expect one to do, descriptive norms are perceptions of the prevalence of a behaviour, and injunctive norms are perceived pressures to conform to avoid social sanctions.\(^{(32)}\) Recent reviews suggest social norms are most likely to influence behaviour when they are internalised as part of one’s social identity and are contextually relevant.\(^{(32, 33)}\) Social norms are thought to effect behaviour when that person perceives their actions threaten their desired social identity within a valued group. Feelings of embarrassment, anxiety, guilt and shame occur when there are transgressions of the group expectations or norms,\(^{(34, 35)}\) motivating appeasement or reparative actions.\(^{(32, 36)}\) Consistent with this,
internalised injunctive norms and important others’ subjective norms have been more strongly related to quitting behaviours than generalised injunctive norms (i.e., perceptions society disapproves of smoking) or descriptive norms.(20, 21, 24, 26, 28, 29)

Consistent with contextual theories that suggest norms can spread through ingroup communication and be responsive to population-level messaging and interventions(37, 38), there is some evidence media campaigns can influence smoking behaviour indirectly through social norms. One study found that more emotionally evocative campaigns triggered discussions(39-42) which conveyed social expectations about smoking, which increased quitting thoughts and behaviours.(43) Another study found awareness of anti-tobacco information from campaigns was associated with agreeing there are fewer places where they feel comfortable smoking.(28) Other experimental studies have found the effect of exposure to anti-smoking messages can be influenced by the accessibility and salience of social norms.(44-47)

Policy changes may also increase quitting through influencing social norms, for example through the introduction of smoking bans in workplaces and other public places.(21, 25, 31) The introduction of tobacco plain packaging with larger new graphic health warning (GHWs) in Australia led to a reduction in observed smoking and display of cigarette packs at outdoor dining venues,(48-50), potentially reflecting or leading to greater perceptions of disapproval of smoking, as was observed among adolescents in France after plain packaging was introduced.(14) Although there is extensive evidence of the direct impact of tobacco taxes on cigarette consumption and quitting,(4) we found no studies examining large tax increases and anti-smoking social norms.

Set in the Australian state of Victoria over a period (2012-2015) of considerable mass media campaign variability and policy advancement, this study aimed to examine the influence of
exposure to different types of mass media campaigns and the introduction of tobacco policies on smokers’ close others’ subjective and internalised injunctive norms. Given previous evidence indicating greater impact of tax increases on lower socio-economic (SES) and younger smokers and variable evidence surrounding the effects of different types of mass media campaigns on lower SES smokers,(2, 51) we also aimed to examine SES and age interactions.

METHODS

Study design and methods

The Victorian Tracking Survey (VTS) was an ongoing cross-sectional telephone survey conducted from January-2012 to November-2015 among Victorian current smokers or recent (past year) quitters aged 18-59. Telephone interviews were conducted in English with participants who reported watching free-to-air commercial television on an average weekday. A dual-frame probability sampling design was used, with half approached via landline and half via mobile phone random digit dialling. Data collection was suspended for late December to early January holiday period. The mean monthly response rate, adjusted for potentially in-scope people who declined to be formally screened, was 42%.

Of the 9,008 participants recruited to the study, we excluded recent quitters (n=1,333) and 716 smokers interviewed during months when questions on social norms were not asked (November and early December in 2012 and 2013). Participants were further excluded if they had missing information on advertising exposure, social norm outcomes or covariates (n=310). Our analyses included 6,649 smokers (weighted N=6,658, Supplementary Figure 1).

Outcome variables: Anti-smoking social norms
Close others’ subjective norms were measured by agreement with “My closest friends and family members disapprove of my smoking”. This measure of disapproval of their smoking from important others is similar to those used in previous research on subjective norms (28, 52). This measure was found to prospectively predict quitting intentions and smoke limiting behaviours in our previous study (24). Internalised injunctive norms were measured by examining the extent of agreement with “I feel embarrassed to tell people I’m a smoker”. ‘Embarrassment to tell’ was designed to capture the extent to which smokers not only perceive that others – beyond close friends and family - believe smoking is unacceptable, but also the extent to which they identify with the social group, given embarrassment would be unlikely if the person did not identify with or care about the norms of the social group. Our previous study found baseline agreement with this item prospectively predict quitting intentions, smoke limiting behaviours and quit attempts at follow-up (24). Participants rated these statements on a five-point scale ranging from ‘strongly agree’ to ‘strongly disagree’. ‘Strongly agree’ or ‘agree’ responses were combined, and all other responses were coded as not experiencing that social norm.

**Predictor variables: Television advertisement exposure**

Data on tobacco control advertisements appearing on television between January-2012 and December-2015 were obtained from Nielsen/OzTAM Pty Ltd (North Sydney, Australia). The measure of advertisement exposure was Gross Rating Points (GRPs), reflecting average potential exposure (see notes to Tables 2 and 3 and monthly sums in Supplementary figure 2 along with policy change dates). These GRPs were configured as continuous measures of (i) past month exposure, and (ii) exposure from the two to three months immediately prior the past month. Within these two time periods, GRPs were split into separate sums according to the predominant types of emotion evoked by each advertisement.
As described previously,(53) predominant emotion responses were measured by asking samples of smokers the extent to which each advertisement made them feel hopeful, irritated, sad, fearful, and guilty. Advertisements were categorised as evoking each emotion if ≥45% of smokers agreed the advertisement made them feel the specific emotion.(54) Combined negative emotions advertisements achieved this criterion for sadness, fear and/or guilt, without any one of these emotions being endorsed by ≥10% than the others. Five combined negative emotion ads were narratives from smokers experiencing severe or graphic health effects (e.g., Terrie’s Tips, Mick), while five provided factual detail of severe health effects delivered through confronting and graphic scenes (e.g., Bronchoscopy; 16 cancers). Four advertisements predominantly evoked ‘Fear’ (≥10% higher on fear than other emotions) through depicting the way smoking leads to harm (The Sponge) or the signs or realisation of an illness, such as seeing blood on a handkerchief or sudden difficulty breathing, (e.g., Cough). Seven predominantly evoked ‘Sadness’ showing the effects of a smokers’ illness or death on others (e.g., Best Intentions, Separation), while none met the criterion for predominant ‘Irritation’ or ‘Guilt’. The ‘Hope’ evoking advertisement provided help-to-quit messages by depicting quitting strategies or the benefits of quitting for the smoker and their family (e.g., Never Give Up, Giving Up).

**Predictor variables: Tobacco control policies**

For a summary of policy change dates see Supplementary figure 2. The Australian government implemented annual 12.5% tobacco excise increases on 1st December 2013, then on 1st September in 2014 and 2015.(55) Tax increases have been shown to exert most influence immediately and for up to three months while consumers adjust to the new cost.(3) Our measure of the three annual 12.5% tax rises was binary: ‘1’ for the month of change and the three following months (December-2013 to March-2014; September-December in 2014 and 2015); ‘0’ for the other months.
Plain packaging with larger GHWs was implemented in Australia from the 1st October 2012. New packaging started to appear in September 2012 and roll-out was largely complete by the mandatory display date of 1st December 2012. The initial impact of plain packaging was included as a binary variable: ‘1’ represented the implementation period (September-December 2012) and for three months after mandatory plain packaging (January-March 2013); ‘0’ for other months. This is consistent with other studies showing strong early effects on quitting helpline calls and intentions and behaviours during the transition and in the months following the introduction of plain packaging.

A new series of GHWs started to appear on tobacco packaging from August 2013 and on up to 80% of packs by November 2013. This corresponded to the period when the 12.5% annual tax increases were announced and anticipated (1-August-2013 - 30-November-2013). A binary variable coded August to November 2013 as ‘1’ and the periods before and after as ‘0’. The new sets of GHWs were rotated annually and these periods were represented as ‘1’ for August to November in 2014 and 2015, and ‘0’ for other months.

During the study period, already extensive smoke-free public areas in Victoria were expanded to additional outdoor transit and recreation areas (March 2014), and near entrances of hospitals, education, play and community health centres (April 2015, see Supplementary figure 2). These outdoor smoke-free expansion policies were represented by the month of the change and the three-month period following each ban coded as ‘1’ and the period before and after coded as ‘0’.

Socio-economic and age subgroups

Subgroups for SES were based on where the individual lived (using the Socio-Economic Index for Areas (SEIFA)-Disadvantage index) and the education level they have achieved (low education = high school or less; high education = post-high school). The SEIFA-index
was developed by the Australian Bureau of Statistics based on 2011 Census data of residential areas, ranking postcodes from high to low disadvantage based on income, education, occupation and housing conditions in the area. (58) Participants in the lowest 40% of residential areas in Victoria were categorised as greater disadvantage, and participants in the top 60% of areas as lower disadvantage. For analysis, low SES was defined as those with low education who lived in a high disadvantage area, mid SES as those with either low education who lived in a low disadvantage area or those with high education who lived in a high disadvantage area, and high SES was defined as those with high education who lived in a low disadvantage area. Subgroups for age were 18-29 years, 30-44 years and 45-59 years.

Covariates

Covariates included sex, age, SES, hours per day watching commercial television, region, extent of non-television-led media ($AU). Addiction level was based on the Heaviness of Smoking Index. (59) Low addiction was defined as 0-2 points, moderate addiction as 3-4 points and high addiction as 5-6 points. (59) We also included as a covariate whether the smoker lived with another smoker in their household.

A measure representing the Average Weekly Income among Victorians (60) was included as a covariate to account for the underlying affordability of tobacco at the time of each tax increase. Average Weekly Income as a rolling average was collinear with time (month-year), so a relative change measure was calculated using the month-to-month change in the six-month rolling average. This measure represents the relative monthly increases and declines in average earnings over the period (range from -$0.45 to +$3.88).

After GRP data were obtained, a few additional tobacco control advertisements were identified as having broadcast in Victoria. The GRPs for these small number of ‘unknown emotion advertisements’ were included as covariates. Month and year of interview was also
included to account for changes that may affect social norms not captured by other variables included in the model.

Statistical analysis

As per previous research utilising GRP data aggregated to the calendar month,(61, 62) participants surveyed in the first half of a month (e.g., 1st to 15th May) were assigned GRPs/policy implementation from the previous calendar month (e.g., April), while those surveyed in the second half of a month (e.g., 16th to 31st May) were assigned GRPs/policy implementation from the month of interview (e.g., May). Prior recent advertisement exposure from the two-to-three months prior to survey date, was also assigned based on this method. This ensured that smokers’ social norms were measured in the same two-week period or after advertising exposure, and at least two-weeks after each policy was implemented.

Data were weighted to account for telephony status (landline or mobile phone), sex and age, according to estimates from a representative sample of smokers and recent quitters.(63) All analyses were conducted using Stata V14.1 using weighted data (with the svy command and ‘p’ weights).

Demographic characteristics and proportion exposed to advertisements and policies are shown in Table 1. Logistic regression analyses examined associations of advertisement exposure and tobacco control policies with each social norm outcome. The first set of univariate models included one main predictor variable only per model, and the multivariable models included all main predictor variables and covariates simultaneously.

Consistency of the associations across age and SES subgroups was examined by including each interaction term (e.g., Predominantly Fear GRPs x SES) separately in four sets of multivariable models (two outcomes by two subgroup factors (age and SES)), along with the other predictor variables and covariates. A p-value of <0.01 for the post-model interaction
test was considered a potentially relevant interaction, given 14 separate multivariable models were required to test each set of interactions.

RESULTS

Participant characteristics

Table 1 shows on average almost two-thirds (63%, monthly proportion ranged from 54% to 72%) perceived disapproval from close family and friends, and 29% (monthly proportion ranged from 21% to 35%) reported embarrassment about telling others they are a smoker. Although there was some overlap between these two social norms outcomes (22.6% perceiving both and 30.5% perceiving neither), there was a substantial proportion of the sample that perceived disapproval but not embarrassment (40.7%) and a smaller proportion that reported embarrassment but not disapproval (6.3%).
Table 1. Characteristics of smokers and recent quitters across SES and Age subgroups

<table>
<thead>
<tr>
<th></th>
<th>Total sample</th>
<th>Lower SES</th>
<th>Mid SES</th>
<th>Higher SES</th>
<th>18 – 29 years</th>
<th>30 – 44 years</th>
<th>45 – 59 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N(weighted)</td>
<td>n(weighted)</td>
<td>n(weighted)</td>
<td>n(weighted)</td>
<td>n(weighted)</td>
<td>n(weighted)</td>
<td>n(weighted)</td>
</tr>
<tr>
<td>Male</td>
<td>6,658</td>
<td>2,300</td>
<td>2,942</td>
<td>1,416</td>
<td>2,160</td>
<td>2,453</td>
<td>2,045</td>
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<tr>
<td>Female</td>
<td>4,000</td>
<td>1,100</td>
<td>1,318</td>
<td>1,032</td>
<td>1,292</td>
<td>1,363</td>
<td>1,365</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 – 29 years</td>
<td>3,327</td>
<td>1,200</td>
<td>1,704</td>
<td>823</td>
<td>1,740</td>
<td>2,033</td>
<td>1,910</td>
</tr>
<tr>
<td>30 – 44 years</td>
<td>3,331</td>
<td>1,100</td>
<td>1,632</td>
<td>699</td>
<td>1,960</td>
<td>2,453</td>
<td>1,946</td>
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<tr>
<td>45 – 59 years</td>
<td>3,300</td>
<td>800</td>
<td>1,608</td>
<td>892</td>
<td>1,665</td>
<td>1,416</td>
<td>1,211</td>
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<td>SES</td>
<td></td>
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<td>Lower SES</td>
<td>2,000</td>
<td>700</td>
<td>1,200</td>
<td>599</td>
<td>1,460</td>
<td>1,560</td>
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<tr>
<td>Mid SES</td>
<td>2,600</td>
<td>866</td>
<td>1,734</td>
<td>832</td>
<td>1,760</td>
<td>2,193</td>
<td>1,950</td>
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<td>Higher SES</td>
<td>2,050</td>
<td>534</td>
<td>1,516</td>
<td>869</td>
<td>2,410</td>
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<td>HSI</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Low addiction</td>
<td>60.8</td>
<td>53.4</td>
<td>67.1</td>
<td>73.4*</td>
<td>67.7</td>
<td>70.7</td>
<td>76.0</td>
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<td>Moderate addiction</td>
<td>31.4</td>
<td>37.5</td>
<td>32.5</td>
<td>26.4*</td>
<td>32.9</td>
<td>32.9</td>
<td>28.2</td>
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<tr>
<td>High addiction</td>
<td>7.8</td>
<td>12.5</td>
<td>9.4</td>
<td>4.3*</td>
<td>9.7</td>
<td>6.4</td>
<td>5.8</td>
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<tr>
<td>Single smoker household</td>
<td>55.7</td>
<td>53.4</td>
<td>56.7</td>
<td>61.2*</td>
<td>60.7</td>
<td>60.7</td>
<td>59.9*</td>
</tr>
<tr>
<td>Multi-smoker household</td>
<td>44.3</td>
<td>46.6</td>
<td>43.3</td>
<td>38.9*</td>
<td>39.3</td>
<td>39.3</td>
<td>40.1*</td>
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<tr>
<td>Hours spent watching commercial television</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 2 hours/day</td>
<td>66.0</td>
<td>55.7</td>
<td>64.6</td>
<td>74.1*</td>
<td>75.8</td>
<td>67.4</td>
<td>53.8*</td>
</tr>
<tr>
<td>&gt;2 to 4 hours/day</td>
<td>25.0</td>
<td>28.9</td>
<td>26.9</td>
<td>20.1*</td>
<td>18.6</td>
<td>24.4</td>
<td>32.3*</td>
</tr>
<tr>
<td>&gt;4 hours/day</td>
<td>9.0</td>
<td>15.5</td>
<td>8.6</td>
<td>5.8*</td>
<td>5.6</td>
<td>8.1</td>
<td>13.9*</td>
</tr>
<tr>
<td>Regional media region</td>
<td>19.9</td>
<td>37.3</td>
<td>20.0</td>
<td>9.1*</td>
<td>16.0</td>
<td>19.5</td>
<td>24.6*</td>
</tr>
<tr>
<td>Metropolitan media region</td>
<td>80.1</td>
<td>62.7</td>
<td>80.0</td>
<td>90.9*</td>
<td>84.0</td>
<td>80.5</td>
<td>75.4*</td>
</tr>
</tbody>
</table>

*p<.001 for chi-square test of differences between SES and Age sub-groups
Effects of advertisement exposure and tobacco control policies on anti-smoking social norms

Past month exposure to fear-evoking advertisements (per 1000 GRPs) was associated with greater odds of perceiving close others’ disapproval (AOR=2.69, 95% Confidence Intervals (CIs): 1.34, 5.39, Table 2). Past month exposure to sadness- and hope-evoking advertisements was unrelated, but those exposed to combined negative emotion advertisements in the past month were less likely to perceive disapproval (AOR=0.61, 95% CIs: 0.42, 0.87). Exposure to all types of anti-tobacco advertisements in the prior two to three months was unrelated to perceptions of disapproval.

Those who had recently experienced a 12.5% tax rise had greater odds of perceiving disapproval (AOR=1.41, 95% CIs: 1.03, 1.94). Correspondingly, those interviewed just after the announcement and while anticipating the first of the series of 12.5% tax increases (and when refreshed GHWs were rolled-out) had greater odds of perceiving disapproval (AOR=1.38, 95% CIs: 1.02, 1.88). Perceived disapproval was not associated with the expansion of outdoor smoke-free public places, plain packaging implementation, nor with GHW rotations (Table 2).

Embarrassment about telling others they are a smoker was unrelated to any advertising exposure or policy announcement or implementation (Table 2). There were no significant interactions between advertisement exposure and policies and age and SES subgroups on either perceived disapproval or embarrassment (all interactions p-values ≥0.05; Supplementary Table 1).
Table 2. Odds ratios and 95% confidence intervals for associations of tobacco control advertisement exposure and policy changes with perception of family and friends’ disapproval of smoking, and embarrassment to tell people I smoke, N(weighted) = 6,658

<table>
<thead>
<tr>
<th>Family and Friends’ Disapproval</th>
<th>Embarrassment about being a smoker</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Univariate models</td>
</tr>
<tr>
<td>Past month anti-smoking advertisement exposure, per 1000 GRPs+</td>
<td></td>
</tr>
<tr>
<td>Predominantly fear-evoking</td>
<td>1.95 (1.09, 3.50)*</td>
</tr>
<tr>
<td>Predominantly sadness-evoking</td>
<td>1.02 (0.72, 1.43)</td>
</tr>
<tr>
<td>Combined negative emotion-evoking</td>
<td>0.94 (0.72, 1.21)</td>
</tr>
<tr>
<td>Predominantly hope-evoking</td>
<td>1.21 (0.87, 1.70)</td>
</tr>
<tr>
<td>Prior two-three month anti-smoking advertisement exposure, per 1000 GRPs+</td>
<td></td>
</tr>
<tr>
<td>Predominantly fear-evoking</td>
<td>0.81 (0.57, 1.15)</td>
</tr>
<tr>
<td>Predominantly sadness-evoking</td>
<td>1.02 (0.85, 1.23)</td>
</tr>
<tr>
<td>Combined negative emotion-evoking</td>
<td>1.11 (0.92, 1.33)</td>
</tr>
<tr>
<td>Predominantly hope-evoking</td>
<td>0.92 (0.71, 1.19)</td>
</tr>
<tr>
<td>Plain packaging and new GHWs~</td>
<td></td>
</tr>
<tr>
<td>Implementation and early post period</td>
<td>1.26 (0.95, 1.68)</td>
</tr>
<tr>
<td>Announcement and anticipation of tax rises and roll-out of refreshed Health Warnings on packs</td>
<td></td>
</tr>
<tr>
<td>No change</td>
<td>1.19 (0.95, 1.50)</td>
</tr>
<tr>
<td>Per 12.5% tax increase</td>
<td>1.12 (0.94, 1.33)</td>
</tr>
<tr>
<td>Rotation to different set of Health Warnings on packs</td>
<td></td>
</tr>
<tr>
<td>No change</td>
<td>0.98 (0.84, 1.15)</td>
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<tr>
<td>Per 12.5% tax increase</td>
<td></td>
</tr>
<tr>
<td>Outdoor smoking restrictions at public transport, sporting and recreational venues~</td>
<td>0.88 (0.73, 1.07)</td>
</tr>
<tr>
<td>Outdoor smoking restrictions at or near education, children/care services and public hospitals~</td>
<td>0.88 (0.72, 1.09)</td>
</tr>
</tbody>
</table>

* p < 0.05, ** p < 0.01
<table>
<thead>
<tr>
<th>Covariates</th>
<th>0.99 (0.99, 0.99)**</th>
<th>0.98 (0.97, 0.99)**</th>
<th>1.00 (0.99, 1.00)</th>
<th>0.99 (0.98, 1.01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (month-year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in average weekly earnings</td>
<td>1.03 (0.99, 1.07)</td>
<td>1.02 (0.95, 1.08)</td>
<td>1.02 (0.98, 1.06)</td>
<td>1.00 (0.94, 1.07)</td>
</tr>
<tr>
<td>Media buy region</td>
<td>Regional</td>
<td>Metropolitan</td>
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<td>Metropolitan</td>
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<tr>
<td></td>
<td>1</td>
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<tr>
<td>Age</td>
<td>18-29 years</td>
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<td></td>
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<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30-44 years</td>
<td>1.65 (1.41, 1.91)***</td>
<td>1.66 (1.42, 1.93)***</td>
<td>1.50 (1.27, 1.76)***</td>
</tr>
<tr>
<td></td>
<td>45-59 years</td>
<td>1.65 (1.43, 1.90)***</td>
<td>1.80 (1.55, 2.10)***</td>
<td>1.30 (1.11, 1.53)***</td>
</tr>
<tr>
<td>SES</td>
<td>Higher SES</td>
<td>0.83 (0.73, 0.95)**</td>
<td>0.88 (0.76, 1.01)</td>
<td>0.73 (0.64, 0.83)**</td>
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<tr>
<td></td>
<td>Mid SES</td>
<td>0.73 (0.62, 0.86)***</td>
<td>0.84 (0.71, 1.00)</td>
<td>0.54 (0.45, 0.64)***</td>
</tr>
<tr>
<td></td>
<td>Lower SES</td>
<td>0.73 (0.62, 0.86)***</td>
<td>0.84 (0.71, 1.00)</td>
<td>0.54 (0.45, 0.64)***</td>
</tr>
<tr>
<td>Smokers in household</td>
<td>Single smoker household</td>
<td>1</td>
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<td>1</td>
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<tr>
<td></td>
<td>Multiple smokers in household</td>
<td>0.57 (0.50, 0.64)***</td>
<td>0.58 (0.51, 0.66)***</td>
<td>0.81 (0.71, 0.92)***</td>
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<td>Hours of TV watching</td>
<td>&lt;2 hours/day</td>
<td>1.02 (0.89, 1.16)</td>
<td>0.98 (0.85, 1.13)</td>
<td>0.91 (0.79, 1.04)</td>
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<td>&gt;2-4 hours</td>
<td>0.75 (0.61, 0.91)***</td>
<td>0.73 (0.59, 0.89)**</td>
<td>0.73 (0.59, 0.90)**</td>
</tr>
<tr>
<td>Addiction level</td>
<td>Low addiction</td>
<td>0.83 (0.73, 0.94)**</td>
<td>0.79 (0.69, 0.90)***</td>
<td>0.73 (0.64, 0.84)***</td>
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<tr>
<td></td>
<td>Moderate addiction</td>
<td>0.89 (0.70, 1.12)</td>
<td>0.87 (0.68, 1.11)</td>
<td>0.50 (0.38, 0.66)***</td>
</tr>
<tr>
<td></td>
<td>High addiction</td>
<td>1.07 (0.87, 1.34)***</td>
<td>0.91 (0.79, 1.03)</td>
<td>1.01 (0.80, 1.24)</td>
</tr>
<tr>
<td>Non-television led media per $50K</td>
<td>1.00 (0.98, 1.02)</td>
<td>0.98 (0.95, 1.01)</td>
<td>1.01 (0.99, 1.03)</td>
<td>1.00 (0.97, 1.03)</td>
</tr>
<tr>
<td>Past month unknown GRPs+</td>
<td>0.59 (0.11, 3.24)</td>
<td>0.47 (0.07, 3.07)</td>
<td>1.59 (0.27, 9.42)</td>
<td>1.39 (0.16, 12.13)</td>
</tr>
<tr>
<td>Past two-three month unknown GRPs+</td>
<td>1.07 (0.49, 2.34)</td>
<td>0.91 (0.37, 2.29)</td>
<td>1.04 (0.47, 2.29)</td>
<td>1.16 (0.42, 3.18)</td>
</tr>
</tbody>
</table>

***p<.001, **p<.01, *p<.05. ~ Modelled impact of month of change + up to three months post change. ~ GHW=Graphic Health Warnings. + GRPs, gross rating points. GRPs are calculated as the product of the percentage of audience exposed to an advertisement (reach) and the average number of times the audience is exposed (frequency). For example, 1000 GRPs per month represents an average of 100% of the audience within a media market being reached ten times. As detailed elsewhere(53) to create a population-level indicator of predominant emotions evoked by each advertisement, smoker responses were used to indicate whether-or-not each advertisement evoked each emotion in ≥45% of smokers. Advertisements were coded as predominantly fear-evoking, predominantly sadness-evoking or predominantly hope-evoking. Advertisements that evoked multiple negative emotions, but not any specific negative emotion ≥10% higher than other negative emotions, were coded as 'Combined negative emotion-evoking advertisements'.
DISCUSSION

Our findings indicate past month exposure to fear-evoking advertisements and the anticipation and implementation of large tobacco tax rises was associated with stronger close others’ disapproval of their smoking, and that these effects were consistent across age and SES groups. In contrast to the fear-evoking advertisements, recent exposure to combined negative emotion advertisements was associated with reduced close others’ disapproval. None of the advertisement types nor policy changes were associated with embarrassment to tell others they are a smoker.

Previous analyses of the same study sample (plus recent quitters) indicated exposure to fear-evoking campaigns in the prior two-three months increased the likelihood of quit attempts. However, in this study only past month exposure increased perceived disapproval. More cumulation of advertisement exposure and time is likely required to help smokers build up to making a quit attempt, whereas campaign effects on changing perceptions of social norms may be more immediate and transient. Similar to previous findings, our study of a sub-set of this sample indicated baseline perceptions of close others’ disapproval increased the likelihood of having set a firm date to quit and of engaging in smoking limiting behaviours at follow-up. This set of findings support a potential indirect effect of fear-evoking mass media campaigns on quitting behaviours via anti-smoking social norms, in addition to the direct effects.

These findings also suggest that recent exposure to combined negative emotion advertisements (i.e., evoking sadness, fear and guilt to a similar degree) may reduce perceptions of disapproval, but not feelings of embarrassment, with effects similar across SES and age subgroups. In contrast to the fear-evoking advertisements which tended to depict warning signs which all smokers and their family and friends may dread (e.g., blood on a
handkerchief when coughing, sudden breathlessness), the combined emotion advertisements
were more likely to feature smokers with already obvious and severe physical consequences
(e.g., covering up a tracheotomy, a tumour blocking an airway, requiring an oxygen tank at
time).(53) Depicting people with these graphic and severe physical consequences may
increase the likelihood of smokers’ avoidance of these advertisements by changing the
channel, looking away, or walking out of the room when the advertisement is playing. This
may allow the smoker to avoid the feelings of pressure, disapproval or scrutiny from their
family and friends. However, other research has demonstrated that avoidance of graphic
depictions of the health effects of smoking on tobacco packaging has been positively related
to subsequent quitting motivation and attempts.(64, 65) Potentially, avoidance of these
advertisements may allow smokers to escape the social norms pressures, but not the urgency
to quit. Consistent with this our recent study(53) found exposure to combined negative
emotion advertisements two to three months earlier motivated quit attempts, especially
among lower SES groups. Therefore, the net effect of these combined negative emotion
advertisements on smokers’ motivation seems to outweigh any attenuation in effects due to
reducing perceptions of close others’ disapproval.

Although in the expected direction, we found no significant effect of the implementation
period of plain packaging with larger new GHWs on perceptions of disapproval or
embarrassment. It is likely that this policy will exert greater long-term effects on social norms
among younger people via the reduced display and modelling of smoking.(48-50) Pre-post
studies with younger samples that include non-smokers in countries that implement plain
packaging are needed to examine if the social norm effects found in France(14) can also be
detected elsewhere.
This study is the first to our knowledge to demonstrate a direct association between large
tobacco tax increases and smokers’ perceptions of close others’ disapproval of their smoking.
This is likely due to tobacco consuming a greater proportion of the household budget leading
to increased financial pressure, which may be subtly perceived by smokers, or overtly
expressed to smokers as disapproval. As these effects were observed up to three months after
implementation it is possible that this pressure may build or be triggered at various points in
the months after the price increase, depending on the capacity of the household to absorb
these increases.

We also found that during the period between the announcement and the first of these tax
increases, smokers were more likely to perceive close others’ disapproval of their smoking.
Previous studies have demonstrated tax rise anticipation effects(66, 67) and this anticipation
may have also increased smokers’ perceptions of close others’ disapproval of their smoking.
Given the introduction of plain packaging with a new set of GHWs was not associated with
greater perceptions of disapproval, it seems unlikely the simultaneous roll-out of the
refreshed set would have contributed a great deal to the observed association.

In contrast to previous studies,(21, 25, 31) we found no effect of extensions of outdoor
smoke-free policies on social norms. This may be because comprehensive indoor and partial
outdoor bans had already been implemented, limiting the ability of this patchwork of new
outdoor bans to further reduce the social acceptability of smoking. The longer-term effects of
these policies will likely reinforce the already strong anti-smoking social norms across the
broader Victorian community, as well as contribute to protecting Victorians from exposure to
secondhand smoke.

This study measured potential population tobacco control advertising exposure via GRPs
rather than individual self-reported exposure, however self-reported advertisement recall has
been found to closely mirror GRPs levels and as GRPs are an exogenous measure of exposure they not subject to selective attention like self-reported exposure.\(^{(68, 69)}\) One limitation is that there were only four advertisements predominantly evoking fear. Future research is required to examine if these findings can be replicated with other examples of fear-evoking ads. Future real world campaign evaluations and social network studies could also examine if these effects are found among those within the smoker’s social groups, and if effects persist among groups with greater pro-smoking norms, given some experimental studies indicate pro-smoking ingroup norms may undermine campaign effects.\(^{(44-47)}\) Given this was an examination of the effects of exposure to real-world advertising and policy implementation occurring across an entire state, it was not possible to have an unexposed comparison group, limiting our ability to draw causal conclusions. However, we did adjust for demographic, addiction, location, media use and other potential contextual confounders increasing confidence in these findings.

**Conclusions**

This is the first study to indicate large tobacco tax increases and fear-evoking campaigns may be associated with the subjective social norms previously found to predict greater quitting intentions and behaviours. We also found that embarrassment about telling others you are a smoker was not associated with any of the advertisements or policies examined. Changing perceptions of close others’ social norms may be an important pathway through which emotive tobacco control campaigns and policies can help support smokers to change their behaviour.
Acknowledgements: We thank the Social Research Centre for the development of the weighting variables, advice on questionnaire design and rigorous survey field methods for the Victorian Tracking Survey.

Author contributions: SD, DS, EB and MW designed the analysis; SD and DS performed the statistical analysis; SD and DS interpreted the results and wrote the manuscript; EB, MB and MW contributed to interpretation of the results and critical revision of the manuscript. MB and SD led the study design and contributed to questionnaire development for the Victorian Tracking Survey.

Ethics approval: The study was approved by the Human Research Ethics Committee of Cancer Council Victoria (HREC 1104). The data were analysed anonymously.

Data sharing: No additional data are available.

Competing Interests: None of the authors have any competing interests to declare.

Funding: The study was funded by an Australian National Health and Medical Research Council Partnership Project grant (#1016419) with VicHealth. The Victorian Tracking Survey was auspiced by Quit Victoria, with funding from VicHealth, the Victorian Department of Health and Human Services and Cancer Council Victoria.
What this paper adds

What is already known on this subject:

- Greater perceptions of close others’ disapproval of smoking (subjective norms) and embarrassment about smoking (internalised injunctive norms) leads to greater quitting motivation, intentions and cessation behaviours.

What important gaps in knowledge exist on this topic:

- There is relatively little research examining which types of tobacco control campaigns and policies influence these anti-smoking social norms.

What this study adds:

- This is the first study to demonstrate that the announcement and implementation of large tobacco tax rises and recent exposure to fear-evoking campaigns can increase perceptions of close others’ disapproval of smoking.
REFERENCES


https://mc.manuscriptcentral.com/tobaccocontrol


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Supplementary Figure 1. Flow diagram of unweighted participants included and excluded for the current analysis.
Supplementary Figure 2. Quarterly sums of gross ratings points (GRPs), timing of tax rises indicated by increases in the rate of excise duty on cigarettes in 2012, and dates of policy change implementation from 2012 to 2015.
Supplementary Table 1. Interaction terms for SES and age with main predictors for associations with perception of family and friends’ disapproval of smoking, and embarrassment about being a smoker, N(weighted) = 6,658

<table>
<thead>
<tr>
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<th>Family and Friends’ Disapproval</th>
<th>Embarrassment about being a smoker</th>
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<tr>
<td></td>
<td>SES interaction p-value</td>
<td>SES interaction p-value</td>
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<tr>
<td>Past month anti-smoking advertisement exposure, per 1000 GRPs+</td>
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<tr>
<td>Predominantly fear-evoking</td>
<td>0.00</td>
<td>.998</td>
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<tr>
<td>Predominantly sadness-evoking</td>
<td>2.09</td>
<td>.123</td>
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<tr>
<td>Combined negative emotion-evoking</td>
<td>0.48</td>
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<td>Predominantly hope-evoking</td>
<td>0.96</td>
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<td>Past two-three month anti-smoking advertisement exposure, per 1000 GRPs+</td>
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<td>Predominantly fear-evoking</td>
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<td>Predominantly sadness-evoking</td>
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<td>Predominantly hope-evoking</td>
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<td>Plain packaging and new GHWs~</td>
<td>0.41</td>
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<td>Announcement and anticipation of tax rises and rollout of refreshed GHWs on packs</td>
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<td>Tax rises^^</td>
<td>0.41</td>
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<td>Rotation to different set of GHWs on packs</td>
<td>0.16</td>
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<tr>
<td>Outdoor smoking restrictions at public transport, sporting and recreational venues^^</td>
<td>1.14</td>
<td>0.320</td>
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<tr>
<td>Outdoor smoking restrictions at or near education, children/care services and public hospitals^^</td>
<td>1.09</td>
<td>0.338</td>
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</table>

~ GHW=Graphic Health Warnings. + GRPs, gross rating points. ^^Month of change + three months post change.
Covariates: age, sex, socioeconomic status, hours spent watching television per day, addiction level, other smokers in household, past month and past 2-3 months of unknown emotion advertisement exposure, non-TV led media costs, media region, and month and year of interview.

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Supplementary Figure 1. Flow diagram of unweighted participants included and excluded for the current analysis.

1 Social norm questions were not included during November and December in 2012 and 2013.