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Exposure of 4-year to 24-year olds to tobacco imagery on prime-time Chilean television

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ABSTRACT

Introduction The extent of the population's exposure to tobacco imagery across all genres of regular TV programming and the contribution of each of these genres is unknown, except for UK broadcast channels. The objective of this study is to estimate the exposure of young people to tobacco imagery on Chilean prime-time television and the programme source contributing to such exposure.

Methods Programmes aired during 3 weeks in 2019 from the 15 highest audience channels in Chile were content-analysed for the occurrence of tobacco categorised as actual use, implied use, tobacco paraphernalia, tobacco brand appearances and whether they violated Chilean smoke-free law for each 1 min interval (92 639). The exposure of young people to tobacco content was estimated using media viewership figures.

Results Young people received 29, 11 and 4 million tobacco impressions of any type, explicit use and smoke-free violation, respectively, at a rate of 21.8, 8.0 and 2.1 thousand impressions per hour of TV viewing. The main sources of exposure to tobacco impressions were feature films and animated productions, which were almost entirely non-Chilean. Finally, young people were exposed to tobacco brand impressions primarily through films, effectively circumventing the advertising ban in Chile.

Discussion Television programming is a source of significant youth exposure to tobacco imagery, including branding impressions. To conform to the WHO FCTC, Chile should prohibit tobacco branding in any TV programme and require strong anti-tobacco advertisements prior to any TV programme portraying tobacco.

BACKGROUND

Chile has the highest prevalence of current adult smoking in the world (age-standardised 45.0%), only after Nauru and Kiribati¹ and the world's highest prevalence of current cigarette smoking among females 13–15 years of age (26.4%), on par with Palau.² The high prevalence of smoking in Chile is at odds with the relative strength of its tobacco control policies (Chile's MPOWER score ranked 14th in a list of 195 WHO Member States and territories).³ Moreover, Chile has implemented some of these policies for more than a decade, including large health graphic warnings since 2006, a steady increase in excise taxes since 2008,^{3 4} strong smoke-free policies⁵ since 2013,

which are well-enforced indoors⁶ and a ban on tobacco advertising. One unregulated element is the depiction of tobacco in audiovisual products, the focus of the present study.

Exposure to tobacco imagery in movies has been associated with smoking initiation, reinforcing tobacco use among smokers, especially adolescents and young adults, and facilitating the relapse of ex-smokers.^{7 8} We are not aware that the behaviour associations vary across channels of dissemination, for example, movie theatres versus television. However, the exposure to tobacco occurrences depends on image density and reach of the media channel. Tobacco imagery in audiovisual products like movies has the potential to reach far larger audiences through television than through theatres alone. In Chile, the exposure potential on television is considerable since two-thirds of the population watches television daily (the average time is 5.5 hours per day).⁹ While youth rely more on internet streaming and video-on-demand than adults, they still receive most of their video consumption from traditional airing channels.⁹

The present study estimates exposure of 4-year to 24-year olds to tobacco imagery on Chilean prime-time television. More specifically, it quantifies the number of onscreen tobacco occurrences and the number of tobacco impressions received by those aged 4–24 years, who are most susceptible to such imagery. The study also determines the factors associated with higher exposure to tobacco imagery on TV to prioritise the tobacco control measures that have not yet been addressed.

METHODS

Content analysis

Sample frame

We content-analysed a sample of TV programmes for 15 channels with the largest audience, including 6 national broadcast channels—Canal 13, Chilevisión, La Red, Mega, TVN and TV+—(60.3% of the audience at the time of the study's planning),¹⁰ 9 paid cable channels—A&E Mundo, AMC, AXN, Fox Channel, TNT, Cartoon Network, Discovery Kids, Disney Channel and Disney Junior. All programmes aired on each of 7 days on three randomly selected weeks (94 500 min of programming) between 11 March 2019 and 3 June 2019 were recorded during viewership peak times for youth aged 4–24 years (20:00 and

23:59 hours, prime time for adults and minors), plus from 00:00 to 00:59 hours (common among older youth), for a total of 5 hours per day.

Coding procedure

Following the methodology described by Lyons *et al*,¹¹ TV programmes were divided into 1 min intervals and coded for tobacco occurrences, consisting of presentation or representation of a tobacco product or its consumption. Tobacco occurrences were parsed into five categories.

- ▶ Explicit tobacco use: use of any tobacco product (cigarette, cigar, pipe, waterpipe or other (eg, chewing tobacco)) onscreen by a character. Electronic devices (eg, e-cigarettes) were coded as vaporisers, even if their tobacco content could not be ascertained. Occurrences in indoor places prohibited by the Chilean smoke-free law tobacco were coded as a violation of the smoke-free law.
- ▶ Implied tobacco use: any inferred tobacco use occurring without actual use onscreen (eg, a comment about going for a cigarette or smoky atmosphere) and further coded as verbal or non-verbal.
- ▶ Tobacco paraphernalia: the onscreen presence of unlit tobacco products or tobacco-related materials, coded by the type of appearance (including tobacco packs, matches, lighters, ashtrays or smoking area signs).
- ▶ Tobacco brand appearance: the presence of clear and unambiguous tobacco branding, whether sold in Chile. It included branding visuals in tobacco packs, advertisements appearing within other programmes, branded merchandise and verbal references to such brands.
- ▶ Other references to tobacco: any reference to tobacco that did not involve actual or implied use (eg, a news report of the economic performance of a tobacco company), coded as verbal or non-verbal.

Each 1 min interval was classified 0 or 1, depending on whether a tobacco occurrence was observed. Multiple occurrences of the same category in the same 1 min interval were considered a single occurrence. Occurrences that crossed a transition from 1 min interval to the next were recorded as two separate occurrences. Occurrences in different coding categories but the same interval were recorded as two separate occurrences. We coded partial minutes at the end of a programme interval as complete minutes if the programme content lasted > 10 s.

Each minute interval was classified according to its valence into clearly and exclusively positive or not. A tobacco occurrence was considered positive when the observer concluded that it cast tobacco use, promotion or its industry in an attractive light or as inconsequential to health, the economy or the environment and was not mixed with other messages that could detract from this valence. Negative to tobacco intervals typically contained images of no smoking signs or characters diagnosed, sick or dying from diseases explicitly linked to tobacco use in the storyline.

The study considers four independent variables hypothesised to be associated with tobacco occurrence frequency and subject to regulation.

- ▶ Programme genre: animated productions, non-animated feature films, non-animated series, reality shows, soap operas, news programmes—including documentaries—and others. The genre was identified from the programme announcement, the Internet Movie Database, the channel's web page or the researcher's discretion.
- ▶ Type of channel: the 15 channels were classified as broadcast (6 channels) or pay channels, further classified into those

targeting the general audience—5 channels—or children and youth—4 channels.

- ▶ Programme production nationality: Chilean versus non-Chilean productions.
- ▶ Protection of minors: the National Television Council of Chile requires TV channels to protect minors under 18 years from 06:00 to 22:00 hours from exposure to inappropriate content.¹² It does not explicitly include tobacco-related content as inappropriate for minors. However, it has a general provision to prevent minors from being exposed to programming and advertising that could seriously damage their health and their physical and mental development. Additionally, the tobacco control law of 2013 bans any tobacco advertising and promotion, including on TV.¹³ We considered whether tobacco occurrences differ between the emission during and outside the protection of minors' schedule during prime time and whether advertising during commercial breaks carried any tobacco advertising.

Coding implementation and reliability

A team of 10 trained observers coded each 1 min interval using a questionnaire (online supplemental file 1) on REDCap (V9.7.5).^{13 14} Three members of the research team reviewed 10% of all observed minutes. The per cent agreement between the observer and the collegiate supervisors' criteria on the five types of tobacco occurrences ranged from 98.1% for implicit use to 99.8% for branding.

Outcomes

Tobacco occurrences

When a 1 min interval contained any of the five types of tobacco occurrences, it was classified as having tobacco content. The number of total tobacco occurrences in the sample was calculated by summing all five tobacco occurrence types across all minutes. The hourly frequency is the number of occurrences divided by the total hours of programming and is presented by occurrence type.

Population exposure

Reach is the population exposure to tobacco imagery—a measure of the frequency of tobacco impressions seen by the audience aged 4–24 years. Reach was calculated by the type of occurrence, multiplying the number of tobacco occurrences in each 1 min interval by the estimated average number of people aged 4–24 years watching at that moment. Live audience viewing figures were collected and provided by Kantar IBOPE Media Chile from their peoples' meter study (<https://www.kantaribopemedia.cl/>). Their sample represents the non-institutionalised people of 4+ years of age living for longer than 6 months in households with a TV of the most populated municipalities of Chile without consideration of their nationality. It represents a total of 7 702 676 individuals or approximately 40% of the Chilean population. The sample excludes households living in extreme poverty.

Analysis

Programming airtime was summed across all 15 TV channels, along with estimated hours of exposure to the 4–24 years demographic and persons of all ages. These metrics are also reported by channel and programme characteristics. The total number of tobacco occurrences and impressions received by the population of 4-year to 24-year olds during the observation period is reported, along with the average number of impressions viewed per hour, overall and by channel and programme characteristics.

Using multivariable weighted logistic regression, we assessed the odds of exposure to tobacco impressions among 4-year to 24-year olds as a function of channel and programme characteristics. The dependent variable was whether a 1 min interval contained a tobacco occurrence. Independent variables included the type of channel the interval was broadcast on (broadcast or pay), interval programme genre, whether the programme in that interval was produced in Chile and whether the interval was broadcast during the minor's protection schedule. Type of channel and country of production were collinear because 99.9% of pay channel productions were non-Chilean, so the type of channel was dropped from the analysis. We ran four models; the four dependent variables were: any tobacco occurrence, explicit tobacco use, smoke-free violation and tobacco brand appearance. The regression used robust variance estimates to account for the clustering of tobacco occurrences within programme units, defined as self-contained content or narrative with a start and an end during the same day. The analysis was weighted to account for 4–24 viewership, so that the ORs reflect odds of exposure among 4-year to 24-year olds. ORs were considered statistically significant when the p value was <0.05. The analysis was conducted using STATA V.13.

RESULTS

Media sample

About 2% of the minutes of broadcasting could not be observed either due to recording failure or low quality of the recording. A total of 92 639 of the planned 94 500 min were analysed. The recorded broadcasting comprised 74 833 complete and 6285 part-time minutes of 2020 programming units for a total of 81 118 1 min programming intervals. There were 10 722 of these intervals in which some publicity occupied part of the screen. The recorded broadcasting minutes comprised 11 521 min devoted entirely to advertisements. There was no pro-tobacco or anti-tobacco depictions in advertising.

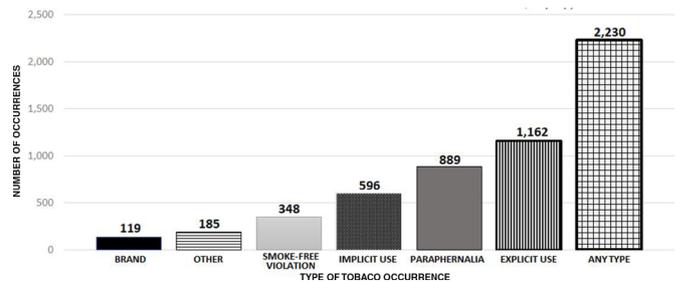


Figure 1 Number of 1 min intervals with tobacco occurrences, by type. Note: The sum of occurrences by type does not add to 2230 because some of the minute intervals had more than one impression type.

Table 1 describes the programming airtime, duration of exposure of viewers of 4–24 years and all ages, by type of channel, the programme's genre, the nationality of the production and the time of emission. Animated productions, feature films and series appeared 25.6%, 22.1% and 14.3% of the programming time, overwhelmingly non-Chilean productions. Chilean productions made up 29.7% of the programming time. Most were news programmes and other programmes, such as talk, music or humour shows, during 38.7% and 39.7% of Chilean productions' airtime.

Tobacco occurrences

There were 2230 min intervals (2.7% of total programming) containing any tobacco occurrence in 386 (19.1%) of the programming units. Of these 2230 min intervals, 21.8% contained two tobacco occurrences and 5.3% more than two. Figure 1 depicts the distribution by type of occurrence. Explicit tobacco use was the largest category, comprising 52.1% of all minutes with tobacco impressions, followed by paraphernalia

Table 1 Programming airtime, duration of exposure of viewers of 4–24 years and all ages, by type of channel, the programme's genre, the nationality of the production and the time of emission, during the observation period

	Programming airtime (in hours)		Duration of exposure of viewers of 4–24 years (in millions of hours)		Duration of exposure of viewers of all ages (in millions of hours)	
	n	%	n	%	n	%
Type of channel						
Broadcast	532.6	39.4	1480.5	76.3	10 456.7	90.6
Pay	819.3	60.6	460.6	23.7	1081.6	9.4
Genre						
Animated	346.6	25.6	309.5	15.9	607.1	5.3
Films	298.3	22.1	127.8	6.6	498.1	4.3
Series	193.5	14.3	58.1	3.0	259.7	2.3
Realities	45.8	3.4	197.3	10.2	1126.2	9.8
Soap operas	114.5	8.5	407.0	21.0	2606.2	22.6
News	164.8	12.2	429.4	22.1	3369.0	29.2
Other	188.5	13.9	411.9	21.2	3072.0	26.6
Production nationality						
Chilean	950.7	70.3	626.5	32.3	2282.2	19.8
Non-Chilean	401.3	29.7	1314.6	67.7	9256.2	80.2
Broadcast during minors protection schedule						
Yes	813.7	60.2	1156.4	59.6	6823.2	59.1
No	538.2	39.8	784.7	40.4	4715.2	40.9
Total	1352.0	100.0	1941.2	100.0	11 538.3	100.0

Table 2 Tobacco impressions (in thousands) received by the population of 4-year to 24-year olds during the observation period by type of impression, type of channel, the programme's genre, the nationality of the production and the time of emission

		Type of impression			
		Any tobacco	Explicit use	Smoke-free violation	Tobacco brand
Type of channel					
Broadcast	n*	17 356.6	5741.0	1136.0	1008.0
	Average/hour	32.6	10.8	2.1	1.9
Pay	n	12 101.1	5117.4	1762.0	96.2
	Average/hour	14.8	6.2	2.2	0.1
Genre					
Animated	n	8730.0	3985.0	1389.0	84.0
	Average/hour	25.2	11.5	4.0	0.2
Films	n	3196.0	1212.0	385.9	15.2
	Average/hour	10.7	4.1	1.3	0.1
Series	n	769.2	206.4	86.6	5.8
	Average/hour	4.0	1.1	0.4	0.0
Realities	n	2724.0	401.6	0.0	39.3
	Average/hour	59.5	8.8	0.0	0.9
Soap operas	n	6372.0	3106.0	801.9	0.0
	Average/hour	55.7	27.1	7.0	0.0
News	n	6848.0	1801.0	235.4	959.4
	Average/hour	41.5	10.9	1.4	5.8
Other	n	818.7	146.4	0.0	0.3
	Average/hour	4.3	0.8	0.0	0.0
Production nationality					
Chilean	n	15 723.4	5051.0	1001.0	999.0
	Average/hour	39.2	12.6	2.5	2.5
Non-Chilean	n	13 734.3	5807.0	1898.0	105.0
	Average/hour	14.4	6.1	2.0	0.1
Broadcast during minors protection schedule					
Yes	n	15 560.8	5841.0	1628.0	965.5
	Average/hour	28.9	10.9	3.0	1.8
No	n	13 896.9	5017.0	1271.0	138.5
	Average/hour	17.1	6.2	1.6	0.2
Total	n	29 457.7	10 858.1	2899.0	1104.0
	Average/hour	21.8	8.0	2.1	0.8

*Sum of all impressions received by 4-year to 24-year olds demographic group.

†Average number of impressions received per hour of programming by the 4-year to 24-year olds demographic group.

(39.9%) and implicit use (27.7%). About 16% of tobacco occurrences depicted violations of the smoke-free law. Brand appearances were relatively rare at only 5.2% of occurrences. Of the 1162 min intervals with explicit tobacco use occurrences, 781 (67.2%) portrayed cigarette use (763 only cigarettes and 18 cigarettes and other products). Cigars were portrayed in 296 (25.5%) min intervals with explicit use (273 only cigars and 23 cigars and other products).

Fifty-two (2.3%) of the intervals with at least one tobacco occurrence had a negative valence. Most of these intervals (75%) contained occurrences classified as 'other'. None of the intervals with explicit use, smoke-free violations and branding occurrences had a negative valence.

Table 2 presents the total number of impressions received (reach) by the 4-year to 24-year olds during the 3 weeks of broadcast observed by type of impression, type of channel, the programme's genre, the nationality of the production and the time of emission. During the observed period, young people received >29 million tobacco impressions, of which almost 11 million involved explicit use of tobacco (mean 8000 impressions per hour of programming). Youths saw almost 3 million smoke-free violation impressions (mean 2100 per hour of programming)

and 1 million tobacco brand impressions (mean 800 per hour of programming).

In a multivariable analysis, the adjusted ORs presented in table 3 indicate that the exposure to any tobacco, explicit tobacco use and smoke-free violation impressions were notably more likely in non-Chilean productions, particularly during the broadcasting of animated productions and feature films. Exposure to tobacco branding was associated only with watching feature films. Sparse data prevented some genres from being analysed in the regression models with smoke-free violations and tobacco branding as dependent variables. Also, production nationality was dropped from the regression model since all branding occurrences in news programmes were of Chilean production, while all branding occurrences in films were not.

DISCUSSION

Exposure magnitude

Our results show considerable youth exposure to tobacco imagery in Chilean TV. Young people received millions of impressions during the observation period at hourly exposures in the tens of thousands. A relatively small number of tobacco occurrences

Table 3 Variables associated with tobacco impressions received by people aged 4–24 years by type

Independent variables	Dependent variables											
	Any tobacco impression			Explicit use			Smoke-free violation			Tobacco brand		
	aOR†	95% CI	P value	aOR	95% CI	P value	aOR	95% CI	P value	aOR	95% CI	P value
Programme genre‡												
Animated	3.2	1.1 to 3.2	*	4.8	1.1 to 22.0	*	25.6	3.5 to 187.3	**	-§	-	
Film	4.1	1.3 to 12.7	*	5.3	1.1 to 27.1	*	28.0	3.8 to 205.0	**	1.8	1.2 to 2.8	**
Series	1.5	0.5 to 4.5		1.4	0.3 to 5.5		8.8	1.2 to 65.7	*	-§	-	
Reality show	1.1	0.3 to 4.2		0.3	0.1 to 1.6		-§	-		-§	-	
Soap opera	1.3	0.5 to 3.3		1.8	0.7 to 4.5		3.4	1.2 to 9.7	*	-§	-	
News-documentary	Reference			Reference			Reference			Reference		
Production nationality												
Non-Chilean	2.3	1.4 to 3.3	**	2.9	1.7 to 4.7	**	3.5	1.9 to 6.6	**	-¶	-	
Chilean	Reference			Reference			Reference			-		
Broadcast during minors protection schedule												
Yes	1.5	0.8 to 2.7		1.6	0.8 to 3.1		1.7	0.8 to 3.7		3.3	0.4 to 28.1	
No	Reference			Reference			Reference			Reference		

*P<0.05; **P<0.001.

†Adjusted for all the variables in the table.

‡The analysis included a category with all programmes of other genres. It is not reported in the table due to the great variety of programmes included that makes interpretation impossible.

§Genre category was eliminated from the analysis because there were no tobacco occurrences of this type in that category.

¶Production nationality was eliminated from the analysis because of collinearity with film genre.

aOR, adjusted OR.

within 2.7% of the total broadcast minutes is responsible for this large exposure. TV is, therefore, a powerful means of promoting tobacco use that presently is largely unregulated in Chile.

It is difficult to compare the magnitude of young people's exposure in our study to other countries because of the paucity of comparable studies. We identified 22 studies that have analysed the tobacco imagery content of TV programmes.^{11 15–35} Of these, only four have measured the population's exposure to TV tobacco imagery, mostly in specific programming genres, such as films or reality shows.^{11 33–35} Of these, only one has assessed the population's exposure to tobacco imagery across all genres of regular programming.

This study¹¹ indicates that in the UK, in 2010, 3.2% of the prime-time programming 1 min intervals on broadcast channels contained at least one tobacco occurrence, and 1.1% contained an explicit use occurrence. Branding occurrences were 0.1% of the programming time. The equivalent figures in Chilean broadcast channels were 1.6%, 0.8% and 0.1%. Therefore, the prevalence of tobacco occurrences in broadcast channels was slightly lower in Chile than in the UK, except for tobacco brand appearances.

These occurrences in the UK delivered 59 million of any type of tobacco impressions, 19 million of explicit use and 3 million brand impressions to people under 18 years of age.¹¹ Although these figures are not strictly comparable to that of our study, primarily due to differences in the size of the studied exposed population, TV exposes young people to millions of tobacco impressions in both countries.

Source of exposure

The primary sources of young people's exposure to tobacco impressions in Chile were feature films and animated productions, most (>99%) being non-Chilean productions. Whether films and animated productions are the primary sources of exposure in other countries' TV broadcasting is challenging to discern because we did not find any comparable analysis to ascertain their role. Lyons *et al*¹¹ reported that in the UK, tobacco content of any type and explicit use was significantly higher in films than in other genres, except reality shows. However, they did not

relate the extent of the exposure from films among its viewership, even though they assumed it would be substantial.

Nevertheless, the importance of feature films as a source of TV exposure to tobacco imagery can be assessed considering that feature films are not made specifically for TV, and their tobacco content has been analysed when released for theatrical or other showings. The existing evidence shows that films are a critical source of tobacco imagery in the European^{36–38} and Latin American^{39–41} continents and countries like India,^{42 43} New Zealand,⁴⁴ Nigeria⁴⁵ and the USA.^{46–48} It is not surprising, therefore, that films are a means for delivering tobacco impressions when broadcast on TV. What is revealing is that in Chile, they play such a fundamental role in TV compared with other genres. Watching films on TV increases the odds of being exposed to any tobacco, explicit use and smoke-free violations by 4, 5 and 28 times, respectively, compared with watching a news programme, given the genre programming patterns in Chile.

A few studies have estimated the reach of movies to young audiences. In the UK, 572 movies delivered 1.09 billion tobacco impressions in theatres to youth 7–17 years between 2001 and 2006.⁴⁹ In the USA, 534 movies delivered 13.9 billion tobacco impressions in all venues to youth 10–14 years of age since the film's release till 2003.⁵⁰ However, to compare the reach of movies in theatres and TV, we would need exposure rates by person/time for the same age groups, which are not available.

Animated production increased the odds of exposure to explicit use (5 times) and smoke-free violations (26 times) compared with news programmes, during the observation period and given the genre programming time patterns at the time in Chile. The role of cartoons as a primary source of TV tobacco impressions has not been documented so far. However, the G-rated animated feature films released in the USA during most of the 20th century have been documented as a source of tobacco imagery, although not as significant as non-animated feature films.^{51 52}

In Chile, the pre-eminence of cartoons as a source of tobacco imagery seems to be driven by a single show: The Simpsons. Indeed, The Simpsons are featured as intended for adults, but children and youngsters watch this series frequently. In Chile, this series has been broadcast for several decades. Although at

the beginning it was shown after midnight, it ended up being showed during the period when children are supposed to be protected,⁵³ despite being very appealing to youth.⁵⁴ The role of the Simpsons in Chile is not surprising as it has been documented as a prominent source of harmful messages,⁵⁵ including tobacco imagery in several countries.^{28 33 56 57}

The role of reality shows in exhibiting tobacco imagery appears to be different in Chile and the UK. While our analysis does not attribute any significant role to this genre as a source of exposure, Lyons pointed to reality shows as a notable source of tobacco occurrences in the UK, mainly tobacco branding. A possible explanation is that in Chile, 76.3% of the programming minutes of reality shows were Chilean productions and these are associated with less tobacco depiction.

Finally, although non-commercial tobacco branding occurrences are not frequent, they generate >1 million impressions among 4-year to 24-year olds. The odds of exposure to branding in films almost doubled that of news programmes. This finding indicates how the advertising ban in Chile might be circumvented.

Strengths and limitations

A significant limitation is that our results underestimate the real impact of tobacco appearance on the Chilean population during the prime time of the selected channels. The reason is that the audience data available from the Kantar Ibope People Meter survey extrapolates audience data to approximately only 40% of the Chilean population. Therefore, if the rest of the Chilean population were to have the same TV viewing patterns as in the People Meter sample, the number of impressions received by young people could double our estimates. Another possible limitation is that our TV programme sample is susceptible to seasonal influences on television content and news stories. However, it is unlikely that this has distorted our findings because the primary sources of tobacco content were programmes that are shown throughout the year. Finally, our analysis does not include the exposure to tobacco imagery on streaming platforms, the internet and other entertainment venues.

The study's strength is that it analysed considerably more broadcasting time than any other published study. The median of the minutes sampled in existing content analysis TV studies is 6825.0 (IQR 4072.3–9498.0), with the maximum sample standing at 27 083 min²⁸ compared with our sample of 92 639 min.

CONCLUSIONS

In conclusion, our study points to the need to protect youth from tobacco imagery on TV. To this end, new legislation should prohibit depicting identifiable tobacco brands or images in any TV programme content. Additionally, it should prescribe strong anti-tobacco advertisements at the beginning of any TV programme that depicts tobacco content. We also recommend implementing a mechanism requiring a no-pay-off certification to depict tobacco imagery of any type in a TV programme as suggested by the implementation guidelines of article 13 of the WHO FCTC, to which Chile is a party. Finally, to discourage tobacco imagery in Chilean productions, Chilean media productions with tobacco imagery should be ineligible for public subsidies. Policies favouring media producers, whether for cultural conservation or commercial competition, should be harmonised with the fundamental public health imperative to protect the public's health from tobacco promotion.

What this paper adds

- ▶ Exposure to audiovisual tobacco content in films is a risk factor for smoking in young people; however, few studies have measured young people's exposure to TV tobacco imagery, and none has assessed this exposure across all genres of regular programming of both broadcast and paid channels, as we do in this study.
- ▶ Our study reveals that, in Chile, prime-time television broadcast a relatively small number of tobacco occurrences but delivered millions of tobacco impressions to 4-year to 24-year olds during the observation period with hourly exposures in the tens of thousands.
- ▶ The study confirms that feature films are a significant source of this exposure as are in other media, but reveals that animated productions theoretically geared towards adults, are a substantial source in TV.
- ▶ Exposure to tobacco imagery came almost entirely from non-Chilean produced programmes.
- ▶ Although commercial breaks did not contain any tobacco advertising, young people watching TV were exposed to tobacco brand impressions from regular TV programming, effectively circumventing the advertising ban in Chile.
- ▶ Our study calls into question the efficacy of the few existing regulations related to tobacco imagery on TV in Chile.

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Contributors AP designed the study. AP and JS led the writing of the manuscript. OU, XM, CC and IM supervised the survey design and implementation and contributed to data analysis and writing of the manuscript. ID and IM undertook the data analysis and contributed to the preparation of the manuscript. MH, AO, CG and XM contributed to the writing of the manuscript. All authors contributed to the revision of the manuscript.

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Patient consent for publication Not required.

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REFERENCES

- WHO. Appendix 10.1 Comparable estimates of prevalence of tobacco use 2017. In: *WHO report on the global tobacco epidemic 2019: offer help to quit tobacco use*. 1st ed. Geneva, Switzerland: World Health Organization, 2019: 1–209. https://www.who.int/docs/default-source/tobacco-hq/global-tobacco-report-2019/table-10-1-comparable-estimates-of-prevalence-of-tobacco-use-2017.xls?sfvrsn=f599aeef_4
- WHO. Appendix 11.3 Youth surveys tobacco use and smoking. In: *WHO report on the global tobacco epidemic 2019: offer help to quit tobacco use*. 1st ed. Geneva, Switzerland: World Health Organization, 2019: 1–209. https://www.who.int/docs/default-source/tobacco-hq/global-tobacco-report-2019/table-11-3-youth-surveys-tobacco-use-and-smoking.xls?sfvrsn=136e8e48_4
- WHO. *WHO report on the global tobacco epidemic, 2019*. 1st ed. Geneva, Switzerland: World Health Organization, 2019. <https://apps.who.int/iris/rest/bitstreams/1239531/retrieve>
- WHO. *WHO report on the global tobacco epidemic, 2019: online appendix IX table 9.6 affordability*. 1st ed. Geneva: World Health Organization, 2020.
- Levy DT, Yuan Z, Luo Y, et al. Seven years of progress in tobacco control: an evaluation of the effect of nations meeting the highest level MPOWER measures between 2007 and 2014. *Tob Control* 2018;27:50–7.
- Peruga A, Molina X, Delgado I, et al. Compliance with the smoking ban in enclosed, semiopen and open areas of workplaces and public places in Chile. *Tob Control* 2021;30:tobaccocontrol-2020-055632
- Surgeon General. *Preventing tobacco use among youth and young adults*. 1st ed. Atlanta, Ga: U.S. Dept. of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2012.
- Glantz S, Polansky J, Thrasher J. *Smoke-free movies: from evidence to action* [Internet]. 3rd ed. Geneva, Switzerland: World Health Organization, 2015. <https://www.who.int/publications/i/item/9789241509596>
- CNTV. Anuario Estadístico: Oferta y Consumo de Televisión 2019 [Internet]. 1st ed. Santiago, Chile: Consejo Nacional de Televisión, 2020. Available: http://prontus.cntv.cl/cntv/site/artic/20200511/asocfile/20200511102141/anuario_estadistico_de_oferta_y_consumo_2019_.pdf [Accessed cited 30 December 2020].
- Overview TV Abierta 2016 | AAM. Aam.cl, 2017. Available: <http://www.aam.cl/estudios/overview-tv-abierta-2016/> [Accessed 15 Mar 2018].
- Lyons A, McNeill A, Britton J. Tobacco imagery on prime time UK television. *Tob Control* 2014;23:257–63.
- Consejo Nacional de Televisión. Normas generales sobre contenidos de las emisiones de televisión. Acuerdo S/N de 21 de abril [Ebook] (p. 4). Biblioteca del Congreso Nacional de Chile, 2016. Available: <http://bcn.cl/2h4it> [Accessed 27 Nov 2020].
- Biblioteca del Congreso Nacional de Chile. *Ley 20660 de 01-marzo-2013 que modifica La Ley N° 19.419*. Valparaíso, Chile, 2013.
- Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377–81.
- McEwen WJ, Hanneman GJ. The Depiction of drug use in television programming. *J Drug Educ* 1974;4:281–93.
- Greenberg BS, Fernandez-Collado C, Graef D, et al. Trends in use of alcohol and other substances on television. *J Drug Educ* 1979;9:243–53.
- Cruz J, Wallack L. Trends in tobacco use on television. *Am J Public Health* 1986;76:698–9.
- DuRant RH, Rome ES, Rich M, et al. Tobacco and alcohol use behaviors portrayed in music videos: a content analysis. *Am J Public Health* 1997;87:1131–5.
- Sone T. Tobacco-Related scenes in television Dramas for young Japanese audiences. *Tob Control* 1999;8:350.
- Christenson P, Henriksen L, Roberts D. Substance Use. In: *Popular Prime-Time television*. 43. 1st ed. Washington DC: Office of National Drug Control Policy, 2000. <http://library.stmarytx.edu/acadlib/edocs/supptt.pdf>
- Kanda H, Okamura T, Turin TC, et al. Smoking scenes in popular Japanese serial television Dramas: descriptive analysis during the same 3-month period in two consecutive years. *Health Promot Int* 2006;21:98–103.
- Blair NA, Yue SK, Singh R, et al. Depictions of substance use in reality television: a content analysis of the Osbournes. *BMJ* 2005;331:1517–9.
- McGee R, Ketchel J. Tobacco imagery on New Zealand television 2002–2004. *Tob Control* 2006;15:412–4.
- Cumberbatch G, Gauntlett S. *Smoking, alcohol, and drugs on television: a content analysis*. 32. 1st ed. London, UK: OfCom, 2005. https://www.ofcom.org.uk/_data/assets/pdf_file/0024/23946/smoking.pdf
- Hanewinkel R, Wiborg G. Smoking in contemporary German television programming. *Int J Public Health* 2007;52:308–12.
- Verma T, Adams J, White M. Portrayal of health-related behaviours in popular UK television soap operas. *J Epidemiol Community Health* 2007;61:575–7.
- Blake KD, Kaufman AR, Lorenzo J, et al. A descriptive study of television news coverage of tobacco in the United States: frequency of topics, frames, exemplars, and efficacy. *J Health Commun* 2015;20:1415–21.
- Barker AB, Whittamore K, Britton J, et al. Content analysis of tobacco content in UK television. *Tob Control* 2019;28:381–5.
- Keller-Hamilton B, Muff J, Blue T, et al. Tobacco and alcohol on television: a content analysis of male adolescents' favorite shows. *Prev Chronic Dis* 2018;15:E134.
- Breed W, De Foe JR, Foe J. Drinking and smoking on television, 1950–1982. *J Public Health Policy* 1984;5:257.
- Hanewinkel R, Wiborg G. Smoking in a popular German television crime series 1985–2004. *Prev Med* 2008;46:596–8.
- Gabrielli J, Traore A, Stoolmiller M, et al. Industry television ratings for violence, sex, and substance use. *Pediatrics* 2016;138:e20160487.
- Cullen J, Sokol NA, Slawek D, et al. Depictions of tobacco use in 2007 broadcast television programming popular among US youth. *Arch Pediatr Adolesc Med* 2011;165:147–51.
- Barker A, Opazo Breton M, Cranwell J. Population exposure to smoking and tobacco branding in the UK reality show 'Love Island'. *Tob Control* 2018:tobaccocontrol-2017-054125.
- Barker AB, Britton J, Thomson E, et al. A content analysis of tobacco and alcohol audio-visual content in a sample of UK reality TV programmes. *J Public Health* 2020;42:561–9.
- Morgenstern M, Poelen EAP, Scholte R, et al. Smoking in movies and adolescent smoking: cross-cultural study in six European countries. *Thorax* 2011;66:875–83.
- Hanewinkel R, Sargent JD. Exposure to smoking in internationally distributed American movies and youth smoking in Germany: a cross-cultural cohort study. *Pediatrics* 2008;121:e108–17.
- Barrientos-Gutiérrez I, Kollath-Cattano C, Mejía R, et al. Comparison of tobacco and alcohol use in films produced in Europe, Latin America, and the United States. *BMC Public Health* 2015;15.
- Kollath-Cattano C, Abad-Vivero EN, Mejía R, et al. Portrayals of character smoking and drinking in Argentine-, Mexican- and US-produced films. *Prev Med* 2016;90:143–7.
- Barrientos-Gutiérrez I, Mejía R, Pérez-Hernández R, et al. Time trends for tobacco and alcohol use in youth-rated films popular in Mexico and Argentina, from 2004–2012. *Salud Publica Mex* 2017;59:76.
- Thrasher JF, Sargent JD, Huang L, et al. Does film smoking promote youth smoking in middle-income countries?: a longitudinal study among Mexican adolescents. *Cancer Epidemiol Biomarkers Prev* 2009;18:3444–50.
- Arora M, Mathur N, Gupta VK, et al. Tobacco use in Bollywood movies, tobacco promotional activities and their association with tobacco use among Indian adolescents. *Tob Control* 2012;21:482–7.
- Nazar GP, Gupta VK, Millett C, et al. Tobacco imagery in Bollywood films: 2006–2008. *Heart Asia* 2013;5:44–6.
- Gale J, Fry B, Smith T, et al. Smoking in film in New Zealand: measuring risk exposure. *BMC Public Health* 2006;6.
- Aina OF, Olorunshola DA. Alcohol and substance use Portrayals in Nigerian video Tapes: an analysis of 479 films and implications for public drug education. *Int J Community Health Educ* 2008;28:63–71.
- Glantz SA, Iaccopucci A, Titus K, et al. Smoking in top-grossing us movies, 2011. *Prev Chronic Dis* 2012;9:120170.
- Sargent JD, Tickle JJ, Beach ML, et al. Brand appearances in contemporary cinema films and contribution to global marketing of cigarettes. *The Lancet* 2001;357:29–32.
- Sargent JD, Heatherton TF. Comparison of trends for adolescent smoking and smoking in movies, 1990–2007. *JAMA* 2009;301:2211.
- Anderson SJ, Millett C, Polansky JR, et al. Exposure to smoking in movies among British adolescents 2001–2006. *Tob Control* 2010;19:197–200.
- Sargent JD, Tanski SE, Gibson J. Exposure to movie smoking among US adolescents aged 10 to 14 years: a population estimate. *Pediatrics* 2007;119:e1167–76.
- Goldstein AO, Sobel R, Newman G. Tobacco and Alcohol Use in G-Rated Children's Animated Films. *JAMA* 1999;281:1131.
- Thompson KM, Yokota F, Alcohol Dof. Depiction of alcohol, tobacco, and other substances in G-rated animated feature films. *Pediatrics* 2001;107:1369–74.
- Muñoz-González B. *La pérdida de la programación infantil en Los canales de televisión abierta en Chile. Memoria para optar al título de periodista*. Instituto de la Comunicación e Imagen: Escuela de Periodismo Universidad de Chile, 2017.
- Marta Lazo C, Tovar Lasheras A, Simpson L. Los Simpson, un fenómeno social Con 20 años de permanencia en La programación televisiva. *Revista Mediterránea de Comunicación* 2011;2:125–39.
- Byrd-Bredbenner C. An internationally shared health frame of reference created by a television program: *The Simpsons*, a content analysis of health messages. *Health Educ* 2004;104:18–24.

56 Eslick GD, Eslick MG. Smoking and the Simpsons. *Med J Aust* 2009;190:637–9.

57 McGee R, Ketchel J. Tobacco imagery on New Zealand television 2002–2004. *Tob Control* 2006;15:412–4.