



Availability of tanning salons in Ontario relative to indoor tanning policy (2001–2017)

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ABSTRACT

Ultraviolet (UV) radiation from indoor tanning equipment is a known cause of skin cancer; however, little is known about how the availability of indoor tanning salons has been impacted by indoor tanning legislation, including Ontario's *Skin Cancer Prevention Act: Tanning Beds* (SCPA). Tanning salon listings were obtained from the 2001 to 2017 editions of InfoCanada's Ontario Business to Business Sales and Marketing directories. Using descriptive statistics and regression analysis, we assessed the number of tanning salons before and after: 1) the 2006 International Agency for Research on Cancer (IARC) report on indoor tanning and skin cancer; 2) the 2009 World Health Organization (WHO) reclassification of artificial UV radiation as carcinogenic; and 3) the passing and enactment of Ontario's SCPA in 2013 and 2014, respectively. There were fewer tanning salon listings in the years after vs. before the IARC report, the WHO reclassification, and the passing and enactment of the SCPA. The number of tanning salons in Ontario, Canada has been declining since 2006, which may reflect a decline in indoor tanning bed use. Key public health policy instruments, including legislation and public education, appear to be associated with this trend, suggesting they may contribute to deterring indoor tanning.

1. Introduction

Skin cancer is the most common form of cancer in Canada (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). The number of new skin cancer cases in the country is almost equal to the number of new cases of breast, colorectal, prostate, and lung cancer combined (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). Even though skin cancer is often preventable, the incidence in Canada continues to rise (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014).

Common risk factors for skin cancer include susceptible phenotype, family or personal history of the disease, history of sunburns, and number of moles (Canadian Cancer Society, n.d.-b; Canadian Cancer Society, n.d.-c). The main risk factor for skin cancer, however, is excessive ultraviolet (UV) exposure, either from the sun or from indoor tanning equipment (Canadian Cancer Society, n.d.-b; Canadian Cancer Society, n.d.-c). Indoor tanning equipment (e.g., tanning beds) emits high doses of artificial UV radiation to produce a deep tan (Gerber et al., 2002). Over 450,000 cases of skin cancer are attributable to UV indoor tanning each year in the United States, Europe, and Australia

(Wehner et al., 2014). For context, this number is higher than the number of lung cancer cases due to smoking each year (Wehner et al., 2014).

Despite the known link to skin cancer (The International Agency for Research on Cancer Working Group on Artificial UV Light, 2006), approximately 1.35 million Canadians reported using indoor tanning equipment in 2014 (Qutob et al., 2017). Of those, over 70% of the individuals were female and over half of them were between the ages of 18 to 35 (Qutob et al., 2017). This raises concern as the International Agency for Research on Cancer (IARC), the cancer research arm of the World Health Organization (WHO), noted in their 2006 report that the risk of developing skin cancer increases by 75% with the use of UV tanning equipment before the age of 35 (The International Agency for Research on Cancer Working Group on Artificial UV Light, 2006). Subsequently, the WHO/IARC reclassified artificial UV radiation and tanning devices as a Group 1 carcinogen (known human carcinogen) in 2009 (El Ghissassi et al., 2009). This international report and decision generated an increase in media coverage on tanning and skin cancer in North America (McWhirter and Hoffman-Goetz, 2015; McWhirter and Hoffman-Goetz, 2014).

Abbreviations: SCPA, Skin Cancer Prevention Act; UV, ultraviolet; WHO, World Health Organization; IARC, International Agency for Research on Cancer

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In Canada, the use of indoor tanning facilities is provincially regulated. In Ontario, indoor tanning is regulated under the *Skin Cancer Prevention Act (Tanning Beds)* (hereafter referred to as the “SCPA”), which was passed in 2013 and came into effect on May 1, 2014 (Government of Ontario, n.d.-a). Under the SCPA, the sale of tanning services is prohibited to anyone under the age of 18 and tanning bed operators must ask for age identification from any individual appearing younger than the age of 25 (Government of Ontario, n.d.-a). Other key areas of the SCPA include prohibiting advertisement to minors, posting of age and health warning signs (one at the entrance, two at point of sale, and one in the room with tanning equipment), and provision of protective eyewear (Government of Ontario, n.d.-a). Prior to 2014, the only indoor tanning legislation affecting the province was the federal *Radiation Emitting Devices Act*, which regulates the manufacture, sale, and labelling of tanning equipment itself, but not the use of the equipment (Government of Ontario, n.d.-b).

At the time of writing, there has been no research published regarding the number of indoor tanning facilities in Canada. Hence, we aim to provide evidence of the scope of the industry by quantifying the current number of tanning salons and, further, investigate how this has changed temporally using Ontario as a case study. The rationale for this work and the related hypotheses are as follows.

First, this research will help to provide those working in cancer prevention and health policy with basic, but currently lacking, information about the size of the indoor tanning industry in Ontario as determined by the number of indoor tanning salons. This information also serves as a proxy of the prevalence of indoor tanning use in Ontario, under the assumption that the number of facilities fluctuates with demand for and use of the service. Because access and use of indoor tanning equipment is regulated provincially, province-specific information is particularly relevant.

Second, we aim to shed light on how the number of indoor tanning facilities has changed over time, especially relative to Ontario's SCPA. This information will contribute to understanding the impact of this legislation on indoor tanning. We hypothesize that the number of indoor tanning salons will have decreased in the years after the SCPA. In an Australian study, the number of indoor tanning salon listings decreased following indoor tanning legislation and negative media coverage (Makin and Dobbinson, 2009). We may see similar trends in Ontario.

As a secondary analysis, we will determine if the number of indoor tanning salons has changed relative to two other key public health initiatives: the landmark 2006 IARC report linking indoor tanning and skin cancer and the subsequent 2009 WHO/IARC reclassification of indoor tanning beds as a known human carcinogen. We anticipate the number of indoor tanning salons has changed after, relative to before, these international public health initiatives.

Hence, this work will assess the effectiveness of regulation, as well as public education through expert exhortation and public health knowledge dissemination, as policy instruments that can impact indoor tanning use.

2. Methods

Tanning salon listings were obtained from the 2001 to 2017 editions of InfoCanada's Ontario Business to Business Sales & Marketing Directories, inclusively, accessed through Toronto Reference Library. Editions of the directory are published in March/April of each year and contain up-to-date listings for that year (personal communication, InfoCanada, July 25, 2017).

The total number of tanning salons for each year was determined by adding up all the tanning salon listings in each annual edition of the Directory. To help gauge the accuracy of the InfoCanada list, we used YellowPages.com, Google.ca, and telephone calls to develop our own list of Ontario tanning salons for 2017.

Using descriptive statistics (means, counts, percent change), we

Table 1
Number of tanning salons in Ontario relative to key public health and policy initiatives.

Key initiative	Number of tanning salons			
	Before		After	
	(mean)	(n, %)	(mean)	(n, %)
2006 IARC report ^a				
3 years (2004–2006 vs. 2007–2009)	1022.3	3067 (51.3)	969.0	2907 (48.7)
6 years (2001–2006 vs. 2007–2012)	955.5	5733 (51.6)	894.5	5367 (48.4)
2009 WHO carcinogen reclassification ^b				
3 years (2007–2009 vs. 2010–2012)	969.0	2907 (54.2)	820.0	2460 (45.8)
8 years (2002–2009 vs. 2010–2017)	974.8	7798 (61.0)	624.4	4995 (39.0)
2013 SCPA passed ^c				
3 years (2010–2012 vs. 2013–2015)	820.0	2460 (59.9)	550.0	1650 (40.1)
5 years (2008–2012 vs. 2013–2017)	875.8	4379 (63.3)	507.0	2535 (36.7)
2014 SCPA enacted ^d				
3 years (2012–2014 vs. 2015–2017)	621.0	1863 (56.8)	473.0	1419 (43.2)

IARC = International Agency for Research on Cancer; WHO = World Health Organization; SCPA = Skin Cancer Prevention Act.

^a 2006 considered a “before” year because the IARC report was published November 2006.

^b 2009 considered a “before” year because the reclassification was published August 2009.

^c 2013 considered an “after” year because the legislation was introduced March 2013 and passed October 2013.

^d 2014 considered a “before” year because the legislation was enacted May 2014.

assessed whether the number of indoor tanning salons in Ontario changed relative to the 2006 IARC report, 2009 WHO carcinogen reclassification, and the 2013 passing and 2014 enactment of the SCPA. We selected two timeframes for these comparisons: three years before and after, to reflect the minimum afforded by the data, and the maximum number of years afforded by the data for each initiative assessed (Table 1).

Data were analyzed using SPSS 24.0 for descriptive statistics and SAS 9.4 using the PROC MIXED procedure, a mixed linear model, to do the means and regression analyses, and to attempt to account for potential autocorrelation. Using the mixed linear model, we assessed the means, intercepts, and slopes for defined timeframes in order to show the trends. Fixed effects included treatment and year, where treatment was defined sections in time. Two models were fitted: a simple means model with treatment as the only factor; a more comprehensive model that allowed for time trends by treating year as a continuous explanatory variable and by allowing a treatment by year interaction (i.e., different slopes in year). Because the data are measured over time, we expected some sort of autocorrelation, so we tried different autocorrelation structures offered by SAS. We used an AIC to choose an error structure. The assumptions of the ANOVA were examined via residual analyses, which included formally testing the residuals for normality. All four tests computed in SAS suggest the data is normal (Shapiro-Wilk, Kolmogorov-Smirnov, Cramer-von Mises, Anderson-Darling). Also, the residuals were plotted against the predicted values and the explanatory variables used in the model. Results were considered statistically significant at $p < 0.05$.

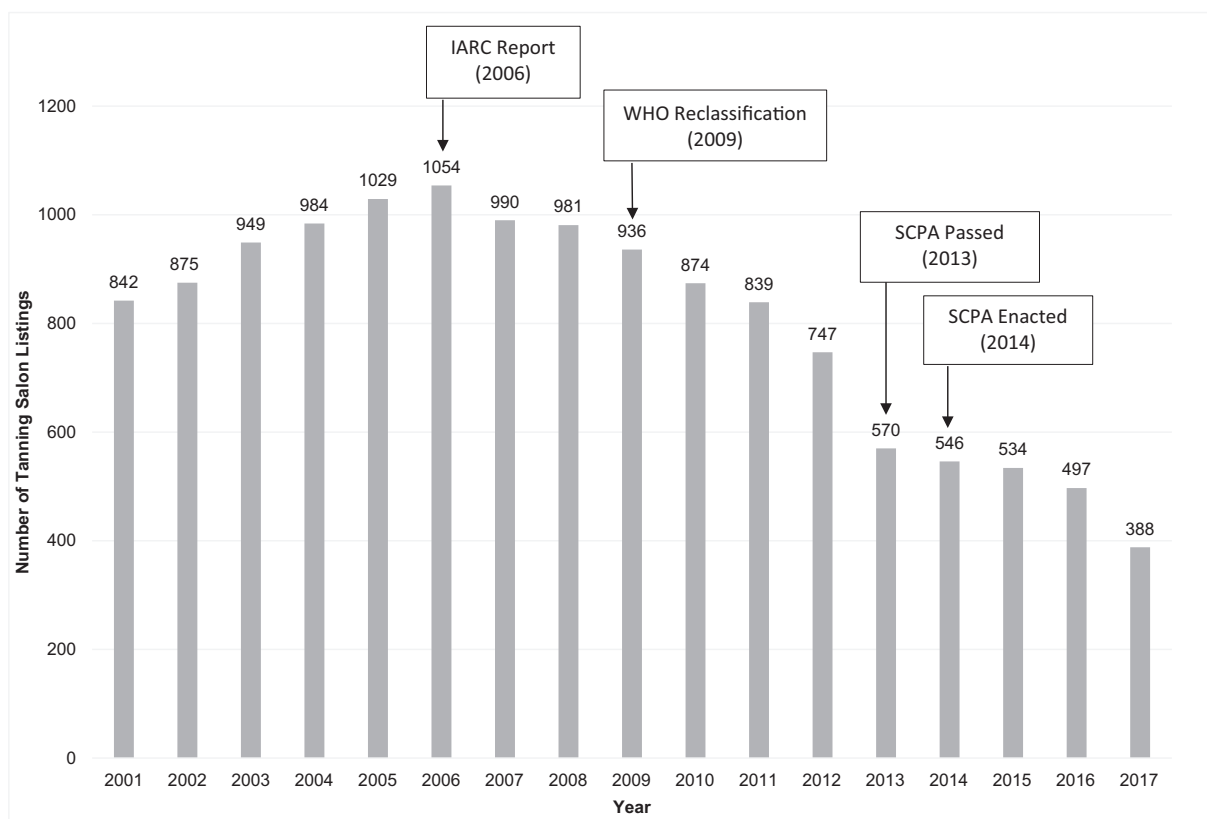


Fig. 1. Number of tanning salon listings per year in Ontario, Canada (2001–2017).

3. Results

3.1. Temporal trends in quantity of indoor tanning salons

For the year 2017 there were 388 tanning salons listed in Ontario, Canada according to InfoCanada. The number of tanning salons listed in each year between 2001 and 2017 can be seen in Fig. 1, ranging from a high of 1054 tanning salons in 2006 to a low of 388 tanning salons in 2017.

Our own investigation indicates there were, in fact, 421 tanning salons in Ontario in 2017, suggesting InfoCanada's count is 8% lower than the true quantity.

3.2. Descriptive statistics

Between 2001 and 2006, the number of tanning salons in Ontario increased. The average increase was 4.6% (n = 42) for each year between 2001 and 2006. Between 2006 and 2017, however, the number of tanning salons decreased. Overall, from 2006 to 2017, the number of tanning salon decreased by 63.2% (n = 666). The average decrease was 8.4% (n = 62) for each year since 2006.

Pre/post comparisons of descriptive statistics are presented in Table 1. In all comparisons, there were fewer tanning salons in the years after relative to before the event.

Since the SCPA was enacted in 2014, the number of tanning salon listings in Ontario has decreased by 28.9% (n = 158) (2014 to 2017). The largest year-to-year change, however, occurred when the SCPA was passed, between 2012 (n = 747) and 2013 (n = 570) where a 23.7% (n = 177) decrease in tanning salons was observed.

We examined the means and conducted the regression analysis with three timeframes in mind: Timeframe A, before and including 2006; Timeframe B, between the 2006 IARC report and before the passing of the SCPA (2007–2012); and Timeframe C, the years in which the

legislation was present (2013–2017). We attempted to account for autocorrelation; however, in all cases the AIC was larger with an autocorrelation structure than assuming independence. We proceeded assuming independence and conducted regressions to determine whether the means, intercepts, or slopes for these timeframes differed.

3.3. Comparison of means among timeframes

We first examined the mean number of tanning salons over the years belonging to each timeframe, without regard to trends (i.e., ignoring slopes over time). When comparing among the means, the ANOVA F-test was significant (p < 0.0001). The ANOVA assumptions appeared to be adequately met. Table 2 displays the estimated mean number of tanning salons in each timeframe. Table 3 indicates where the pairwise differences occur: the difference between the means of Timeframes A and B was not significant (p = 0.2304). The differences in means between Timeframe C and each of the other timeframes (A, B) were significant (both p < 0.0001).

3.4. Regression analysis of timeframes

For the regression analysis, we modelled that each timeframe has its

Table 2
Estimates of timeframe means.

Timeframe	Mean estimate	95% CIs (lower, upper)
A	955.50	881.73, 1029.27
B	894.50	820.73, 968.27
C	507.00	426.19, 587.81

Note: Timeframe A = ≤2006; Timeframe B = 2007–2012; Timeframe C = 2013–2017.

CIs = confidence intervals.

Table 3
Pairwise multiple comparisons among the timeframe means.

Timeframes	Difference estimate	p-Value	95% CIs (lower, upper)
A vs. B	61.00	0.2304	−43.33, 165.33
A vs. C	448.50	< 0.0001	339.08, 557.92
B vs. C	387.50	< 0.0001	278.08, 496.92

Note: Timeframe A = ≤2006; Timeframe B = 2007–2012; Timeframe C = 2013–2017.

CIs = confidence intervals.

Table 4
Intercept estimates.

Timeframe	Intercept estimate	95% CIs (lower, upper)
A	799.80	750.91, 848.69
B	1356.74	1235.57, 1477.92
C	1126.50	876.29, 1376.71

Note: Timeframe A = ≤2006; Timeframe B = 2007–2012; Timeframe C = 2013–2017.

CIs = confidence intervals.

own slope and intercept. For convenience, the origin in years was chosen to be 2000. The ANOVA assumptions appeared to be adequately met.

The timeframe intercepts were significantly different ($p < 0.0001$). Tables 4 and 5 display the intercept estimates and where the differences are. The main effect of year was significant ($p = 0.0017$). The timeframe by year interaction was significant ($p < 0.0001$). See Tables 6 and 7 for the slope estimates and where the differences are.

Timeframes B and C differ from A regarding their intercepts (Table 5). Timeframe A has a different slope from B and C, and Timeframe A is significantly increasing (Tables 6 and 7). However, Timeframe B and C share the same slope (Table 7), both of which are decreasing significantly (Table 6). There is a suggestion ($p = 0.0956$), however, that the intercept for Timeframe C is lower than it is for Timeframe B, implying a drop in 2013, when the legislation was passed. Using a one-sided test, which aligns with the anticipated decline in tanning salons after legislation, this results in $p = 0.0478$, suggesting a significant drop in tanning salons in 2013. For Timeframe A, the slope estimates an average increase of 44.5 salons per year; conversely, for Timeframes B and C there is an average loss of 48.7 and 41.3 salons per year.

4. Discussion

There is a clear and pronounced trend showing a steady decline in indoor tanning facilities in Ontario, Canada over the past decade. The decrease in the number of tanning salon listings may serve as a proxy to suggest there has also been a decrease in use of indoor tanning. Supporting our findings is the fact that the prevalence of indoor tanning in Canada decreased from 9% in 2006 to under 5% in 2014 (Qutob et al., 2017; Marrett et al., 2010). Importantly, since the enactment of Ontario's SCPA in 2014, the number of tanning salon listings has

Table 5
Multiple pairwise comparison among the intercepts.

Timeframe	Differences	p-Value	95% CIs (lower, upper)
A vs. B	−556.94	< 0.0001	−687.61, −426.28
A vs. C	−326.70	0.0167	−581.64, −71.7584
B vs. C	230.24	0.0956	−47.7638, 508.25

Note: Timeframe A = ≤2006; Timeframe B = 2007–2012; Timeframe C = 2013–2017.

CIs = confidence intervals.

Table 6
Slope estimates.

Timeframe	Slope estimates	p-Value	95% CIs (lower, upper)
A	44.4857	< 0.0001	31.9320, 57.0394
B	−48.6571	< 0.0001	−61.2109, −36.1034
C	−41.3000	0.0002	−57.9070, −24.6930

Note: Timeframe A = ≤2006; Timeframe B = 2007–2012; Timeframe C = 2013–2017.

CIs = confidence intervals.

Table 7
Multiple pairwise comparison among the slopes.

Timeframe	Differences	p-Value	95% CIs (lower, upper)
A vs. B	93.1429	< 0.0001	75.3892, 110.90
A vs. C	85.7857	< 0.0001	64.9677, 106.60
B vs. C	−7.3571	0.4531	−28.1751, 13.4609

Note: Timeframe A = ≤2006; Timeframe B = 2007–2012; Timeframe C = 2013–2017.

CIs = confidence intervals.

decreased by over 25%. It may be that provincial indoor tanning legislation enhanced an already downward trend in tanning salons. As there were significantly fewer tanning salons after the SCPA, this suggests that the legislation, perhaps alone or in conjunction with other factors, may have contributed to the decline in the availability of tanning salons in Ontario. Our results are similar to the findings from Australia where there was a 32% decrease in tanning salon listings following the implementation of indoor tanning legislation banning minors and/or people with fair skin in Australian provinces (Makin and Dobbinson, 2009). Further, U.S. research indicates that the presence of indoor tanning state-level legislation is associated with a decrease in use of indoor tanning by minors (Guy et al., 2014). However, contradictory to our findings, the prevalence of indoor tanning in adolescents in Ontario did not decrease significantly after the SCPA (Atkinson et al., 2017). This implies that while indoor tanning may be decreasing among Canadians overall, it may not be changing among youth. It may also imply that the role of public education via the dissemination of health information leading up to legislation may have a greater impact than legislation itself. Thus, the role of public education and legislation, as well as temporal patterns in youth tanning behaviour, requires further exploration.

There was a large decline in tanning salon listings between 2012 and 2013, which may have been caused by activity around and leading up to the enactment of the SCPA. In 2012, the Ontario government committed to supporting the regulation of indoor tanning by introducing *Bill 126: An Act to enact the Skin Cancer Prevention Act, 2012* (Government of Ontario, 2012). Then, in March 2013, *Bill 30: An Act to Regulate the Selling and Marketing of Tanning Services and Ultraviolet Light Treatments*, was introduced to the provincial government for its first reading (Government of Ontario, n.d.-a). *Bill 30* was passed on October 9, 2013 and thus became the SCPA (Government of Ontario, n.d.-a). Political activity leading up to the enactment of tanning legislation, including the introduction and passing of Bills, may be related to a decline in tanning businesses given that the largest decline in listings occurred when the legislation was first introduced but before it was enacted. It is also possible that this political activity influenced consumer beliefs and behaviours around indoor tanning, leading to a reduction in use and thus listings. Or, the political activity may have influenced tanning salon owners' business decisions — they may have feared a decline in revenue, and closed their doors in advance.

Around the time of the provincial-level indoor tanning policy decisions, there was also federal-level policy activity. In February 2013, Health Canada proposed new more strict health warning labels for

tanning beds and in May 2014 the posting of those labels on new tanning beds became mandatory by law (Government of Canada, 2013; Government of Canada, 2014). It is conceivable that this federal-level labelling decision, on its own or in conjunction with the provincial-level legislation, may have contributed to the decline in tanning salon listings. However, the new federal label is only required on new and not existing equipment, which may limit its impact until more time has passed.

Other important patterns in the data emerged. There were fewer tanning salon listings in the years after the 2006 IARC report and after the 2009 WHO reclassification relative to before. It is possible that these international public health initiatives brought the dangers of indoor tanning to the public's attention, which may have motivated a decline in indoor tanning bed use and thus a decline in tanning salon listings. The decline in the number of tanning salons started after 2006, the year in which the IARC published their landmark report on the linkage of indoor tanning and skin cancer. Prior to the post-2006 decline in tanning salons, there had been a steady increase. The pattern in our data mirrors findings of other researchers: tanning salon listings in Australia and New Zealand also showed an increase leading up to 2006 followed by a decline after 2006 (Makin and Dobbinson, 2009; Makin et al., 2007; Jopson and Reeder, 2008). This follows trends in Australian and North American media coverage whereby the “tanned look” was conveyed as attractive in the early 2000s (McWhirter and Hoffman-Goetz, 2015; Cho et al., 2010; Dixon et al., 2008). Hence, we suspect that 2006 was a key turning point in public health efforts to deter indoor tanning.

It is not possible to determine from our results whether it was indeed the legislation and public health education initiatives that had an impact on indoor tanning facility numbers or other factors. We would be remiss if we did not consider other such potential variables, including the role of the media, the location of use of indoor tanning services, and the popularity of UV-free tanning alternatives.

The mass media is key for public education, influencing people's beliefs about health and disseminating health information. It is possible that media coverage of indoor tanning risks and legislation may have affected the public's knowledge of the health risks of indoor tanning, alone or synergistically with legislation, leading to a reduction in indoor tanning use and ultimately decreasing the number of tanning salons. After the 2006 IARC report, there were more magazine articles covering skin cancer and tanning (McWhirter and Hoffman-Goetz, 2015), with a similar increase after the 2009 WHO reclassification of UV tanning devices as carcinogenic (McWhirter and Hoffman-Goetz, 2014). Further, the role of individual “champions” of indoor tanning legislation, including media coverage of their experiences as tanners who developed skin cancer (e.g., Clare Oliver from Australia), can influence media coverage (Makin and Dobbinson, 2009; MacKenzie et al., 2008). In Ontario, one former indoor tanner who had skin cancer, Kate Neale, was an especially vocal proponent of indoor tanning legislation, regularly appearing in Canadian media throughout 2012 and 2013 (CTV Toronto, 2012), which was the time of the single greatest decline in tanning salon listings in our data.

Another possible explanation for the decline in tanning salon listings is that people may be indoor tanning in other locations, such as gyms, spas, or even at home. Gyms commonly have UV tanning equipment available. In Ontario, about 50% of gyms have indoor tanning devices available to their clients (Huang and Kirchhof, 2017); however, there is no information on how this has changed over time. Similarly, it is possible that the decline may be due to use of home tanning, whereby one might purchase a tanning bed for home use. There is limited information on home tanning, but a recent report on tanning behaviours of minors in Ontario suggests this was not influenced by legislation (Atkinson et al., 2017).

It may also be that the use of UV-free alternatives to indoor tanning, such as sunless tanning lotions or sprays, have influenced the decline in the number of tanning salons. Sunless tanning products are considered

to be a safer way to get a tan, as they do not involve UV exposure (Canadian Cancer Society, n.d.-d). Research from the US suggests an increase in the use of sunless tanning products by adolescents between 2004 and 2008 (Cokkinides et al., 2010; Quinn et al., 2015) which is further evidenced by a quadrupling in sales of sunless tanning products between 2003 and 2008 (Mahoney et al., 2012). In Ontario, there is little known about the prevalence of use of UV-free tanning products. However, the Ontario Sun Safety Working Group reports there was not a significant change in the use of UV-free tanning products by youth before compared to after the SCPA (Atkinson et al., 2017). Hence, the role of the use of UV-free tanning alternatives on the use of indoor tanning, particularly in the context of legislation changes, needs further exploration.

4.1. Limitations

This project was conducted using one business directory as the source of data and thus our findings should be interpreted with caution. While InfoCanada indicates that it compiles data from multiple databases and conducts telephone calls to ensure accuracy, we found it may underestimate the number of tanning salons. Nevertheless, in working with university and reference librarians, it was determined that this was the best source of historical business listing data in Ontario. It is also a limitation that we did not include beauty salons, spas, or gyms in our analyses, as they also have indoor tanning. Listings for such facilities were excluded because we could not verify whether they did or did not have indoor tanning services for past years. However, tanning salons are a primary location for accessing tanning beds (Nadalin et al., 2016). Further, our results focus on the count of the number of tanning salons, but owing to the nature of the data and it being historical, we were not able to determine the service capacity at the salons (i.e., number of tanning beds within each facility). As such, we do not know if the number of tanning beds increased or decreased over the study time-frame. Future research should investigate trends in the quantity of tanning beds manufactured over time. Lastly, the data was limited to Ontario. The number of tanning salons in other provinces needs to be determined, especially given legislative requirements vary provincially.

5. Conclusions

The number of tanning salons in Ontario has been decreasing since 2006. Our results suggest the two key policy instruments employed within the SCPA – legislation to ban minors and to inform the public of risks through warning signs – as well as public education achieved through the landmark report and carcinogen classification by the WHO's IARC may have contributed to these changes as there were significantly fewer salons in the years after relative to before these initiatives. We suspect that the contributing factors to this decline may reflect both a tightening of public health measures and policies, broad and effective communication of risks, and changes in public demand for indoor tanning. In future research, scholars and practitioners should seek to determine if other variables may have influenced this trend to inform future policy actions and, importantly, whether the decline in tanning salon listings reflects a decline in indoor tanning use. Given the importance of deterring artificial UV exposure for skin cancer prevention, ongoing monitoring of the number of tanning salons is encouraged.

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Conflict of interest

None.

References

- Atkinson, J., Cawley, C., Marrett, L., et al., 2017. An Assessment of the First Year of a Ban on Tanning Beds and Lamps Among Adolescents in Ontario, Canada. Ontario Sun Safety Working Group Available at: <https://www.uvontario.ca/> (Accessed August 1, 2017).
- Canadian Cancer Society Sunless Tanning Products. Available at: <http://www.cancer.ca/en/prevention-and-screening/live-well/sun-and-uv/indoor-tanning/sunless-tanning-products/?region=on> (Accessed August 1, 2017).
- Canadian Cancer Society Non-melanoma Skin Cancer. Available at: <http://www.cancer.ca/en/cancer-information/cancer-type/skin-non-melanoma/non-melanoma-skin-cancer/?region=on> (Accessed May 2, 2017).
- Canadian Cancer Society Melanoma. Available at: <http://www.cancer.ca/en/cancer-information/cancer-type/skin-melanoma/melanoma/?region=on> (Accessed May 2, 2017).
- Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014. Canadian Cancer Statistics 2014. Canadian Cancer Society, Toronto, ON Available at: <http://www.cancer.ca/~media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2014-EN.pdf> (Accessed May 2, 2017).
- Cho, H., Hall, J.G., Kosmoski, C., Fox, R.L., Mastin, T., 2010. Tanning, skin cancer risk, and prevention: a content analysis of eight popular magazines that target female readers, 1997–2006. *Health Commun.* 25, 1):1–10.
- Cokkinides, V.E., Bandi, P., Weinstock, M.A., Ward, E., 2010. Use of sunless tanning products among US adolescents aged 11 to 18 years. *Arch. Dermatol.* 146 (9), 987–992.
- CTV Toronto, 2012. Skin cancer survivor applauds teen tanning bed ban. In: CTV News, Aug 12. Available at: <http://toronto.ctvnews.ca/skin-cancer-survivor-applauds-teen-tanning-bed-ban-1.914516> (Accessed August 1, 2017).
- Dixon, H., Dobbins, S., Wakefield, M., Jansen, K., McLeod, K., 2008. Portrayal of tanning, clothing fashion and shade use in Australia women's magazines, 1987–2005. *Health Educ. Res.* 23 (5), 791–802.
- El Ghissassi, F., Baan, R., Straif, K., et al., 2009. A review of human carcinogens — part D: radiation. *Lancet Oncol.* 19 (8), 751–752.
- Gerber, B., Mathys, P., Moser, M., Bressoud, D., Braun-Fahrlander, C., 2002. Ultraviolet emission spectra of sunbeds. *Photochem. Photobiol.* 76 (6), 664–668.
- Government of Canada, 2013. Harper Government Introduces Stronger Health Warnings on Tanning Beds. Government of Canada, Ottawa, ON Available at: <https://www.canada.ca/en/news/archive/2013/02/harper-government-introduces-stronger-health-warnings-tanning-beds.html> (Accessed August 25, 2017).
- Government of Canada, 2014. Government of Canada Announces Stronger Labelling Requirements for Tanning Beds — Warning Labels Remind Users About Skin Cancer Risk. Government of Canada, Ottawa, ON Available at: <https://www.canada.ca/en/news/archive/2014/02/government-canada-announces-stronger-labelling-requirements-tanning-beds-warning-labels-remind-users-about-skin-cancer-risk.html?=&wbdisable=true> (Accessed August 25, 2017).
- Government of Ontario, 2012. Bill 126 an Act to Enact the Skin Cancer Prevention Act. Available at: http://www.ontla.on.ca/web/bills/bills_detail.do?locale=en&Intranet=&BillID=2696 (Accessed October 10, 2017).
- Government of Ontario Skin Cancer Prevention Act (Tanning Beds). Available at: <https://www.ontario.ca/laws/statute/13s05> (Accessed May 3, 2017).
- Government of Ontario Radiation Emitting Devices Act. Available at: <http://laws-lois.justice.gc.ca/eng/acts/R-1/> (Accessed Aug 1, 2017).
- Guy, G.P., Berkowitz, Z., Everett Jones, S., et al., 2014. State indoor tanning laws and adolescent indoor tanning. *Am. J. Public Health* 104 (4), e69–e74.
- Huang, C.M., Kirchoff, M.G., 2017. A cross-sectional study of indoor tanning in fitness centres. *J. Cutan. Med. Surg.* 1–7.
- Jopson, J.A., Reeder, A.I., 2008. An audit of Yellow Pages telephone directory listings of indoor tanning facilities and services in New Zealand, 1992–2006. *Aust. N. Z. J. Public Health* 32 (4), 372–377.
- MacKenzie, R., Imison, M., Chapman, S., Holding, S., 2008. Mixed messages and a missed opportunity: Australian news coverage of Clare Oliver's campaign against solarium. *Med. J. Aust.* 189 (7), 371–374.
- Mahoney, A., Swetter, S.M., Brooks Biello, K., 2012. Attitudes toward indoor tanning among users of sunless tanning products. *Arch. Dermatol.* 148 (1), 124–126.
- Makin, J.K., Dobbins, S.J., 2009. Changes in solarium numbers in Australia following negative media legislation. *Aust. N. Z. J. Public Health* 33 (5), 491–494.
- Makin, J.K., Dobbins, S.J., Herd, N.L., 2007. The increase in solariums in Australia, 1992–2006. *Aust. N. Z. J. Public Health* 31 (2), 191–192.
- Marrett, L., Northrup, D., Pichora, E., Spinks, M., Rosen, C., 2010. The Second National Sun Survey: overview and methods. *Can. J. Public Health* 101 (4), I10–I13.
- McWhirter, J.E., Hoffman-Goetz, L., 2014. North American magazine coverage of skin cancer and recreational tanning before and after the WHO/IARC 2009 classification of indoor tanning devices as carcinogenic. *J. Cancer Educ.* 30 (3), 477–481.
- McWhirter, J.E., Hoffman-Goetz, L., 2015. Coverage of skin cancer and recreational tanning in North American magazines before and after the landmark 2006 International Agency for Research on Cancer report. *BMC Public Health* 15 (169), 1–11.
- Nadalin, V., Marrett, L., Atkinson, J., Tenkate, T., Rosen, C.F., 2016. Tanning among Ontario adolescents pre-legislation: prevalence and beliefs. *Prev. Med.* 91, 244–249.
- Quinn, M., Alamian, A., Hillhouse, J., Scott, C., Turrisi, R., Baker, K., 2015. Prevalence and correlates of indoor tanning and sunless tanning product use among female teens in the United States. *Prev. Med.* 2, 40–43.
- Qutob, S.S., O'Brien, M., Feder, K., McNamee, J., Guay, M., Than, J., 2017. Tanning equipment use: 2014 Canadian Community Health Survey. *Health Rep. Stat. Canada* 28 (1), 12–16 (Catalogue 82-00). (Accessed May 2, 2017).
- The International Agency for Research on Cancer Working Group on Artificial UV Light, 2006. The association of use of sunbeams with cutaneous malignant melanoma and other skin cancers: a systematic review. *Int. J. Cancer* 120 (5), 1116–1122.
- Wehner, M.R., Chren, M.M., Nameth, D., et al., 2014. International prevalence of indoor tanning. A systematic review and meta-analysis. *JAMA Dermatol.* 150 (4), 390–400.