Assessing a ban on the use of UV tanning devices among adolescents in Ontario, Canada: first-year results

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Abstract

Objectives To describe the effect of the first year of a ban on UV tanning device (beds, lamps) use among those under 18 years of age in Ontario, Canada.

Methods Online questionnaires were completed by adolescents in grades 7 to 12, aged less than 18 years: one when the ban was enacted (May 2014) and a second a year later (May 2015). Questionnaires asked grade, age, sex, and about use of UV tanning devices in the previous year. Recent users were asked about length, frequency, and location of use; service refusals and reasons; awareness of signs/warning labels; and use of eye protection. Weighted estimates and confidence intervals were generated.

Results There were 1561 participants in 2014 and 2305 in 2015. No reduction was observed in UV tanning device use (6.9% vs. 7.9%) in the 12 months preceding the survey. In 2015, most respondents used UV tanning devices in beauty establishments, which was a shift away from gyms and fitness centres as seen in 2014. Non-significant increases occurred in the proportions noticing warning signs/labels (57% vs. 71%), required to wear eye protection (92% vs. 99%), and refused service (17% vs. 21%). Most adolescents who were refused service did not use tanning devices that year (72%).

Conclusion Use did not change in the year following enactment of a ban on UV tanning devices among youth in Ontario. The ban did lead to improvements in service refusal, awareness of warning signage, and use of eye protection. As service refusal deterred future use, enhanced enforcement is important.

Résumé

Objectifs Décrire les répercussions de la première année d'application d'une interdiction d'utiliser des appareils de bronzage aux UV (lits, lampes) pour les personnes de moins de 18 ans en Ontario (Canada).

Méthodes Des questionnaires en ligne ont été remplis par des élèves de la 7^e à la 12^e année, âgés de moins de 18 ans : un premier lorsque l'interdiction a été promulguée (mai 2014), et un deuxième, un an plus tard (mai 2015). Les questions portaient sur la classe, l'âge, le sexe et l'utilisation d'appareils de bronzage aux UV au cours de l'année précédente. Les jeunes ayant utilisé ces appareils récemment devaient indiquer la durée et la fréquence d'utilisation, ainsi que le lieu. Ils devaient également préciser s'ils s'étaient vus refuser l'accès aux services de bronzage et les motifs de ces refus, s'ils avaient remarqué la présence d'avis et d'étiquettes de mise en garde, et s'ils avaient porté une protection des yeux. Des estimations pondérées et des intervalles de confiance ont été produits.

Résultats On comptait 1561 participants en 2014 et 2305 participants en 2015. Aucune diminution de l'utilisation des appareils de bronzage aux UV n'a été observée (6,9 % c. 7,9 %) au cours des 12 mois précédant le questionnaire. En 2015, la plupart des répondants utilisaient des appareils de bronzage aux UV dans des salons de beauté, un changement par rapport à 2014 où ces

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appareils étaient plus utilisés dans des salles de sport et des centres de conditionnement physique. Des augmentations non significatives ont été observées dans les proportions de personnes ayant remarqué la présence d’avis et d’étiquettes de mise en garde (57 % c. 71 %), ayant dû porter une protection des yeux (92 % c. 99 %) et confrontées à des refus (17 % c. 21 %). La plupart des adolescents confrontés à un refus n’ont pas utilisé d’appareil de bronzage cette année-là (72 %).

Conclusion L’utilisation des appareils de bronzage aux UV n’a pas changé au cours de l’année suivant la promulgation de l’interdiction visant les jeunes de l’Ontario. L’interdiction a bien entraîné d’améliorations quant aux refus d’offrir des services de bronzage, à la présence d’avis et au port d’une protection des yeux. Les refus ayant découragé l’utilisation future à ces appareils, il est important de garantir une meilleure application de cette interdiction.

Keywords UV radiation · Adolescent · Tanning bed · Tanning lamp · Government legislation

Mots-clés Rayons UV; Adolescent; Lit de bronzage; Lampe de bronzage; Législation gouvernementale

Introduction

Skin cancer is an important health concern in Canada, where non-melanoma skin is the cancer most commonly diagnosed, and an estimated “7,200 new cases of melanoma were expected to be diagnosed in 2017” (Canadian Cancer Society 2015; Canadian Cancer Society 2017). Between 1992 and 2013, incidence rates of melanoma increased by about 2% per year among both females and males in Canada (Canadian Cancer Society 2017). The main cause of skin cancer of all types is exposure to ultraviolet (UV) radiation, including that from the use of tanning beds/sunlamps (UV tanning devices) (Volkovova et al. 2012). The cancer risk posed by UV tanning devices is higher among those who started using them at an earlier age and used them for a longer period of time (Boniol et al. 2012).

The increased cancer risk associated with early use of UV tanning devices is a concern, because youth are frequent users of these devices, and the use of UV tanning devices can be addictive, which may create a pattern of exposure early in life (Gordon and Guenther 2009; Nadalin et al. 2016; Mosher and Danoff-Burg 2010). In recognition of the risk of early exposure, in 2003 the World Health Organization advised that those under age 18 not use UV tanning devices (World Health Organization 2003). In recent years, many jurisdictions around the world have moved to restrict the use of UV tanning devices, particularly among youth (Sinclair et al. 2014; Sinclair and Makin 2013).

In Canada, UV tanning devices themselves are regulated federally (Government of Canada 2017), but each province (and some municipalities) determines limits around their use, including age restrictions, fines, sign content, and advertising limits. In May 2014, Ontario’s legislation regulating the sale and marketing of tanning services and UV radiation treatments—the *Skin Cancer Prevention Act (Tanning Beds)*, hereafter referred to as “the Act”—came into effect (Government of Ontario 2014). The Act: prohibits the sale and advertising of tanning services to those under 18 years of age; requires that an

operator be present; requires identification from anyone who appears to be under 25 years old; states that signs be posted indicating that there is a ban on use for those under 18 years of age and that users are required to wear protective eyewear, and describing the health risks associated with tanning bed use (Government of Ontario 2014). Further, the Act requires that tanning bed operators sell or provide eyewear and advise or instruct customers as to their use; they must also register with their local public health unit, which is responsible for ensuring compliance with the Act (Government of Ontario 2014).

In order to assess the impact of the Act on UV tanning device use among adolescents one year after enactment, we conducted two surveys of Ontario adolescents: one around the time of enactment (early May 2014) and the other a year later. The two surveys employed the same methodology, were conducted by the same survey company, and included questions that were, for the most part, identical. In an earlier publication based on the pre-enactment (2014) survey, we reported that 7.1% of Ontario adolescents had ever used UV tanning devices, and that this percentage was higher for females compared to males and upper compared to lower grades (Nadalin et al. 2016).

The purpose of this publication is to report on the results of the post-enactment (2015) survey, with comparison where appropriate to the pre-enactment (2014) survey in four domains focusing on UV tanning device use in Ontario adolescents in the 12 months before the survey: first, the proportion using these devices and location of use (e.g., salon, gym, private residence); second, the percentage who tried to use them but were refused; third, the proportion of users noticing health warning signs and labels; fourth, use of eye protection.

Methods

Ethics approval was obtained from the Research Ethics Board of the University of Toronto. The post-enactment survey used the same methodology as the earlier (2014) survey, in part because adolescents, particularly those under 16, are a

challenging demographic to access; this methodology has been reported in detail elsewhere (Nadalin et al. 2016). Briefly, a commercial survey company used a pre-existing online panel of adults who regularly complete surveys for reward points. Adults who had a child in the target demographic (under 18 and in grades 7–12) were emailed a description of the survey and asked that their eligible child (specified by his/her age if more than one) complete the online questionnaire.

The questionnaire took approximately 15 min to complete, and asked about demographic characteristics (age, sex (M or F), school grade) and ways ever used to get or keep a tan (laying in the sun, being or playing outside, using tanning lotions or sprays, using spray tanning booths, using tanning beds or lamps, taking tanning pills or injections, or if they tan at all). In addition, those who reported ever having used UV tanning devices were asked if they had used them in the past 12 months. Those who responded affirmatively were asked more details about their use, such as how often in the previous 12 months and where; how long they had been using UV tanning devices; and if they had been denied the use of a UV tanning device in the past year and why, with a list of refusal reasons, including: “I would not wear eye protection,” “I am too young,” “My skin is too light,” “I had no proof of age ID,” “I was told it was against the law,” and a close-ended “other” category. They were also asked if they used eye protection when they were tanning in the past 12 months, and whether they noticed warning signs and labels, and if so what information was on these.

All percentages were weighted according to sex, age, and regional distribution of the Ontario population according to the 2011 census (Statistics Canada 2012). Estimates comparing 2014 and 2015 surveys used the Rao-Scott chi-squared test (design-adjusted Pearson chi-square); differences were statistically significant at $p < 0.05$. Where possible, estimates were made by school grade (7–12) and sex; data were analyzed by grade as opposed to age in order to reflect the behaviours and beliefs of school grade cohorts. All statistical analyses were done using SAS version 9.3.

Results

In 2014, there were 1561 participants (10% response rate), and in 2015, 2305 participants (14% response rate). Table 1 shows the unweighted demographics of the respondents to the 2015 survey; they are very similar to those of the 2014 survey (Nadalin et al. 2016).

Table 2 shows the use of tanning beds or lamps in the 12 months before each survey by sex and school grade. Between years, there was no significant difference in the percentage of the total sample who reported using UV tanning

Table 1 Respondents: grade and sex of survey respondents^a, Ontario, Canada–2015

Grade	2015 Total % (n)	2015 Male % (n)	2015 Female % (n)
7	17.5 (403)	17.2 (205)	17.7 (198)
8	18.4 (425)	20.8 (247)	15.6 (178)
9	17.1 (395)	16.2 (192)	18.2 (203)
10	18.4 (424)	15.9 (189)	21.1 (235)
11	19.2 (443)	19.8 (235)	18.6 (208)
12	9.3 (215)	10.2 (121)	8.4 (94)
Total	100 (2305)	100 (1189)	100 (1116)

^a Unweighted data

devices in the previous 12 months (6.9% in 2014 and 7.9% in 2015). To more fully explore the use of UV tanning devices over time, and to more accurately capture changes with full enactment of the Act, seasonal use was compared between years (e.g., use in the winters of 2014 and 2015 when recall would be expected to be most accurate), and no significant differences were found (data not shown). There were no significant differences in UV tanning device use between years for males, females, or any individual grade (Table 2). In both 2014 and 2015, UV tanning devices were more commonly used by respondents in later relative to earlier grades (in 2014, 14% in grade 12 vs. 3% in grade 7; in 2015, 13% in grade 12 vs. 3% in grade 7) and by females relative to males (in 2014, 10% of females vs. 4% of males; in 2015, 10% of females vs. 5% of males). Of those who reported ever having used UV tanning devices, a larger proportion reported that they had “just started” tanning or been tanning for “about a year” in 2015 (78%) than in 2014 (68%), although the difference was not statistically significant (data not shown). With respect to the number of times in the previous 12 months that UV tanning devices were used, in both years respondents used them an average of 11 times (data not shown).

Table 2 Percentage^a of adolescents who used UV tanning device in the previous 12 months, Ontario, Canada–2014 and 2015

Category	2014 % (unweighted n)	2015 % (unweighted n)
Overall	6.9 (104)	7.9 (171)
Male	3.9 (29)	5.4 (62)
Female	9.8 (75)	10.4 (109)
Grade 7	2.5 (6)	2.7 (14)
Grade 8	2.6 (7)	2.8 (17)
Grade 9	5.9 (18)	6.1 (26)
Grade 10	8.9 (27)	11.0 (45)
Grade 11	7.5 (20)	9.0 (43)
Grade 12	13.9 (26)	12.9 (26)

^a All percentages are weighted

Among those who used UV tanning devices in the 12 months prior to the 2015 survey, the most common location of use was beauty establishments (i.e., salons, spas, or tanning studios) (Table 3). A significantly higher percentage of the UV tanning device users reported in 2015 that they had tanned at least once in this type of location during the previous 12 months (Table 3) compared to 2014 (data not shown, see Nadalin et al. 2016) (86.6%, 95% CI 81.6–91.5 vs. 65.8%, 95% CI 56.8–74.8 respectively); a corresponding decline was noted for tanning in a gym or fitness centre (2015, Table 3, 23.6%, 95% CI 17.4–29.7; 2014, data not shown, 35.2%, 95% CI 26.1–44.2). Similar proportions reported residential use in the two surveys.

Although not statistically significant, more tanners reported being refused the use of UV tanning devices in the last 12 months in 2015 compared to 2014 (21% vs. 17%, data not shown). Refusals were more common in earlier than in later grades for both years (in 2014, 10% in grade 12 vs. 31% in grade 7; in 2015, 13% in grade 12 vs. 36% in grade 7) (Table 4). In 2015, of all the respondents refused the use of UV tanning devices in the previous 12 months, 74% did not go on to use the devices that year (data not shown).

Among tanners who were refused the use of UV tanning devices ($n=16$ in 2014, $n=36$ in 2015), the largest change was observed for the response option “I had no proof of age.” In 2014, it was the reason given by 5% of those refused compared to 46% of those refused in 2015. No respondents chose the option “I would not wear eye protection” as a refusal reason in 2014, while 12% gave this response in 2015 (Fig. 1). About 15% of tanners in 2015 who had been refused service in the previous 12 months chose the option “I was told it was against the law.”

Most respondents who used UV tanning devices in the previous 12 months at a non-residential facility (business outside of a home or apartment building) used eye protection. While numbers are small, the percentage of tanners who were not required to use eye protection decreased from 8% in 2014 to 1% in 2015 (data not shown). In the 2015 survey, 27% of grade seven students who used UV tanning devices in the previous 12 months reported having noticed signage about the health risks of tanning, compared to 83% of grade 12 students (Fig. 2). Overall, a higher proportion of tanners noticed warning signage in 2015 (68%) than in 2014 (57%) but this difference was not statistically significant (data not shown).

Table 3 Percentage^a of adolescents who used UV tanning devices in the previous 12 months by location of use, Ontario, Canada–2015

Location	% ^b (95% CI)
Salon, spa, or studio	86.6 (81.6–91.5)
Gym or fitness centre	23.6 (17.4–29.7)
Residential location	26.8 (20.3–33.2)

^a Weighted percentage of UV tanning device users

^b Percentages do not add to 100 because multiple responses were possible

Table 4 Percentage^a of adolescent tanners refused use of UV tanning devices in the previous 12 months by grade, Ontario, Canada–2014 and 2015

Grade	2014 % (95% CI)	2015 % (95% CI)
Overall	17 (10–25)	21 (15–26)
Grades 7–8	31 (5.6–55)	36 (18–54)
Grades 9–10	24 (10–37)	24 (14–34)
Grades 11–12	10 (1.9–18)	13 (5.6–20)

^a Weighted percentage of UV tanning device users

There were no notable differences in perceptions of tanning safety or attitudes towards the attractiveness of tanning between years (data not shown). The percentages of all respondents who believed that tanning is not harmful to their health (in 2014, 13%; in 2015, 15%) and that tanning devices will not age their skin as much as the sun (in 2014, 13%; in 2015, 15%) were relatively constant. Near identical percentages in the two surveys agreed that people with a tan are more attractive (40%) and look healthy (39–40%) (2015 data not shown; for 2014 data see Nadalin et al. 2016). For some additional results, see Atkinson et al. (2017).

Discussion

This study presents information from two surveys of the UV tanning device use of adolescents in Ontario, Canada, in the 12 months preceding and 12 months following enactment of an Act banning UV tanning device use among those under 18 years of age. This study found that the proportion of adolescents who used UV tanning devices in the past 12 months did not change significantly in the 12 months following the Act relative to the 12 months before (6.9% in 2014 and 7.9% in 2015). We also found that a higher percentage of users of UV tanning devices reported in 2015 that they had either just started tanning or been tanning for about a year (68% in 2014 and 78% in 2015).

The lack of change in the proportion of adolescent users immediately after the Act is a concern, as the youth ban was the primary purpose of the Act. Other studies that have conducted pre-post legislation comparisons of adolescent indoor-tanning prevalence have found no change or small decreases (Simmons et al. 2014; Coups et al. 2016; Blashill and Pagoto 2017). Two of these studies found no statistically significant change (Simmons et al. 2014; Coups et al. 2016) though it decreased slightly, and one found a significant 4% decrease (Blashill and Pagoto 2017).

There may be a number of reasons for the lack of significant change in the use of UV tanning devices between the two years. First, we must consider our findings in the broader context of tanning in Ontario. The use of UV tanning devices reported here is lower than what has been previously reported in Ontario

Fig. 1 Percentage^a of adolescent tanners^b refused use of UV tanning device in previous 12 months by reason, Ontario, Canada—2014 and 2015. ^aAll percentages are weighted. ^bRestricted to those who tanned in a commercial facility. “I was told it was against the law” only applicable in 2015

(Gordon and Guenther 2009; Ipsos Reid 2012), and there is evidence to suggest that indoor tanning, at least as measured by the proxy of tanning salon quantity, has been on the decline in Ontario since 2006 (McWhirter et al. 2018). It is possible that this background trend affected our ability to detect any impact of the Act.

Second, the period of data collection, i.e., just before and one year following enactment, may not have allowed enough time to observe a difference; subsequent years post-enactment may show greater effect. To explore this possibility, UV tanning device use was analyzed by season, under the theory that the winter following passage of the Act would show a greater decrease because it was furthest from the time of enactment. We did not, however, find between-year differences for any season. Previous research on age-related compliance with indoor-tanning legislation from the US suggests there is a trend towards greater compliance with greater time lapse between implementation and evaluation (Reimann et al. 2018). Should this study be repeated further out from when the legislation was enacted, our findings might be different.

Another possible reason for the continuing use of UV tanning device by Ontario adolescents may be related to a lack of or inconsistent enforcement of the Act, especially in relation to

age. While laws regulating access have the potential to change adolescent behaviour, enforcement of legislation is often inadequate (Pan and Geller 2015). At this time, in Ontario, enforcement of the legislation is complaints-based. Future study needs to examine the enforcement of the Act in Ontario.

Changes were observed regarding the setting where adolescents were obtaining tans with UV tanning devices. Fewer adolescents were tanning in gyms or fitness centres and more were tanning at beauty establishments, i.e., salons, spas, or tanning studios, which may indicate a lack of enforcement related to age in some of these places of use. While our earlier work theorized that following the Act, adolescents would be more likely to tan in home settings, which are not covered by the Act, this was not found to be the case (Nadalin et al. 2016).

There were also some positive changes noted after the Act came into effect. It is promising that the number of adolescents reporting service refusal due to the lack of identification increased and this appears to have effectively prevented many from using UV tanning devices the year following the Act. The Act's requirement for posting new signage about the age ban and health effects did not go unnoticed: more adolescents noticed the signs and warning labels after the legislation. Also

Fig. 2 Percentage^a of adolescent users of UV tanning devices^b in the previous 12 months who noticed signage warning of health risks by grade, Ontario, Canada—2015. ^aAll percentages are weighted. ^bRestricted to those who tanned in a commercial facility

important is the finding that protective eyewear was used more after the Act came into effect.

With respect to knowledge and beliefs about tanning and UV tanning devices, our study found little difference after the Act relative to before. Of note, a substantial proportion (40%) of Ontario adolescents continue to agree that a tan is attractive and looks healthy. As has been noted in the previous research, knowledge of health risks does not necessarily change adolescent behaviour; as such, focusing preventive efforts on the negative long-term cosmetic effects (e.g., aging skin) of UV radiation exposure may be a good approach with this age group and their caregivers (Nadalin et al. 2016; Holman et al. 2013; Mayer et al. 2011). Some limitations to the survey methodology have been previously described in some detail (Nadalin et al. 2016). In brief, we know little about the demographic characteristics either of survey respondents (only age, sex, and region of residence) or of the online panel itself and response rates are low. These collectively mean that we cannot confidently generalize findings from either survey. We know, for example, that in the population as a whole, the use of UV tanning devices is greater in those with higher income (Qutob et al. 2017). We also know that estimates of tanning bed use presented in this report are higher than in other similarly timed surveys in Ontario or in Canada as a whole. For example, Qutob et al. analyzed the data in the 2014 Canadian Community Health Survey and found that only 1.7% of 12–17 year olds had used a tanning bed in the previous 12 months Canada-wide (Qutob et al. 2017), and a school-based survey conducted in 2015 reported that 2.7% of Ontario students in grades 10 and 11 had recently used such a device (Nadalin et al. 2018); these suggest that our sample may not be representative of Ontario students. While it is possible that some adolescents may have participated in both surveys, we have no way of knowing to what extent this might have happened. Panels are continually refreshed by the data collection company, and of course some individuals would only have been eligible for the survey in one year or the other. Repeat participation would result in some correlation between the two years of data and the confidence limits shown would be too narrow. Future studies should address all of these limitations.

A strength of this work is that it got completed at all, given the challenges associated with this type of policy analysis. In the 7 months between the bill's passing into law (October 2013) and its enactment in May 2014, the Ontario Sun Safety Working Group managed to secure funding from within its member organizations and use these organizations' contacts and expertise to get a survey into the field within a demographic group that is very difficult to reach. While the ideal place to survey adolescents may be at school, getting a survey into the schools requires years rather than months.

Despite the limitations of the survey, consistent application of the same methodology in the two surveys likely means that findings from them can reasonably be compared and therefore

contribute to our knowledge about the effectiveness of the Act in its first year.

Conclusion

Adolescents continued to use UV tanning devices in the year after a ban, and the prevalence of use remained unchanged from a year earlier, indicating that the Act was not yet fully effective. A full and formal evaluation of the Act is needed, including reviewing enforcement practices and repeating surveys of youth around compliance. Personal compliance with the Act would likely be enhanced with more education of adolescents and their caregivers, given that having a caregiver who uses such devices is a strong predictor of use among adolescents (Mayer et al. 2011; Pan and Geller 2015). Further, since UV tanning device use is primarily appearance-motivated, a focus on the skin-aging effects such as wrinkling may be more effective. As this study showed, refusal of service does deter use. As such, education of providers and enhanced enforcement may likely lead to increased service refusals and decreased use among adolescents.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

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