

Health Reports

Prevalence of handheld laser device use, exposure and associated injury

by Sami S. Qutob, James P. McNamee, John Than and Orly Brion

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ABSTRACT

Background

This study assessed the use of and exposure to handheld laser devices by Canadians and the potential associated health risks.

Data and methods

The 2019 Canadian Community Health Survey collected data from 12,397 Canadians on the prevalence of handheld laser exposure or use, and associated eye or skin injuries.

Results

In 2019, an estimated 12.4% (95% CI: 11.4% to 13.4%) of Canadians reported using a handheld laser device or being exposed to its beam in the previous year, and those between the ages of 12 and 17 represented 30.5% (95% CI: 26.6% to 34.4%) of users. The highest laser device use or exposure was among those with a university education (13.8%; 95% CI: 11.8% to 15.8%), and a significant trend was found over income categories ($p < 0.0001$). The highest prevalence of exposure or use involved laser pointers (69.4%; 95% CI: 65.4% to 73.4%), followed by laser toys (38.5%; 95% CI: 34.6% to 42.5%), laser torches (8.2%; 95% CI: 6.1% to 10.4%) and—lastly—search-and-rescue lasers (0.8%^E; 95% CI: 0.3% to 1.2%). Overall, 0.7%^E (95% CI: 0.2% to 1.2%) of Canadians reported discomfort or injury in the past 12 months. One-quarter (27.9%; 95% CI: 23.8% to 31.9%) of users had a laser beam intentionally directed toward their eyes or skin. Most users did not buy the device (56.3%; 95% CI: 52.1% to 60.5%), while 40.5% (95% CI: 36.2% to 44.7%) purchased it at a Canadian retail store or online (3.8%^E; 95% CI: 2.6% to 5.0%).

Interpretation

The prevalence of handheld laser device use and beam exposure was 12.4% (95% CI: 11.4% to 13.4%), representing approximately 3.9 million Canadians. While the number of reported injuries was low, ongoing surveillance helps assess the effectiveness of current risk management approaches for laser products.

Keywords

laser, handheld, pointers, eye injury, skin injury

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Conflicts of Interest

The authors declare they have no conflicts of interest related to the subject matter or materials discussed in this manuscript.

What is already known on this subject?

- According to the International Electrotechnical Commission Standard 60825-1, laser products are categorized in the following order (from lowest to highest potential risk) according to their accessible radiation properties: classes 1, 1M, 2, 2M, 3R, 3B and 4.
- Exposure to a direct or reflected high-powered (Class 3B or Class 4) laser beam has the potential to cause serious eye or skin damage and may also pose a burn hazard. To help reduce potential health risks, battery-powered handheld lasers and laser pointers should be Class 3R/IIIa or less (which usually have a power output of 5mW or less).
- Children and teens are at a higher risk of injury because of a lack of knowledge of the risks posed by laser devices and how to handle these devices safely.

What does this study add?

- This survey finds that an estimated 3.9 million Canadians use or are exposed to handheld lasers (e.g., pointers for presentations; laser tag, laser toys or novelty lasers; laser torches or flashlights; and search-and-rescue lasers). The majority of the handheld laser product types used or exposed to were laser pointers.
- Approximately one-quarter of users of or those exposed to handheld lasers had either intentionally directed the beam at their own eyes or skin or had this done to them by someone else.
- Among Canadians who use handheld laser devices, an estimated 0.7%^E had injury or discomfort to their eyes or skin.
- Because of a higher prevalence of the use of handheld laser devices or exposure to their emitted light by males and youth, these groups may be at a higher risk for handheld laser-induced injury.
- Most laser devices were not purchased but rather acquired by some other undisclosed means, followed by purchase from a retail store in Canada, then by a small fraction obtaining these devices online.

Handheld lasers include devices such as laser pointers that are widely available for demonstration and entertainment purposes and intended for directing attention to an object or place. These devices are often battery powered, portable, handheld, and available in various emission wavelengths and power outputs (e.g., colour and intensity). In this study, handheld laser devices include pointers for presentations, laser tag, toys or novelty lasers, laser torches or flashlights, and search-and-rescue lasers. Handheld lasers and laser pointers are becoming increasingly available in the Canadian marketplace and are—therefore—more accessible to the public for use. High-powered consumer handheld lasers have been identified as a danger to human health and safety.¹ Surveillance of injuries from handheld laser products was undertaken by Health Canada to assess the effectiveness of current approaches for managing the health risks of these products.

The International Electrotechnical Commission (IEC) has published a standard—IEC 60825-1—which introduces a classification system for lasers and laser products. In this standard, laser products are categorized in the following order (from lowest to highest potential risk) according to their accessible radiation properties: classes 1, 1M, 2, 2M, 3R, 3B and 4.^{2,3} Exposure to laser beams from devices with a classification of Class 3R or lower represents a minimal risk to the eye, as there are adequate safety margins ensuring that

radiation delivered to the retina remains below the threshold of harm within the aversion response (including the blink reflex) time following exposure to bright light. However, exposure to a direct or reflected high-powered (Class 3B or Class 4) laser beam has the potential to cause serious eye or skin damage (Class 4) and may also pose a burn hazard. To help protect the health and safety of Canadians as the availability of consumer handheld laser devices in Canada increases, the import, sale, manufacture and advertising of consumer handheld lasers that emit Class 3B or Class 4 accessible laser radiation has been prohibited in Canada since 2012 under the *Canada Consumer Product Safety Act*.⁴ There is an ongoing need for information on the prevalence of use or exposure among Canadians, as well as the prevalence of injuries from such devices, to ensure that any risks from these products are assessed properly and appropriate risk management strategies are implemented.

In 2014, Health Canada included questions in the Canadian Community Health Survey (CCHS) to examine the prevalence of use of and injury from various laser products. The CCHS found that 1.1%^E of respondents reported having been injured by a laser device. The majority of injuries were to the eye, often as a result of laser light exposure from someone else's use of the device. Cosmetic treatments employing lasers were the most common source of injury, followed by laser pointers and the use of lasers in entertainment (e.g., toy, game, light show).⁵

The current study is a follow-up analysis of the 2019 CCHS results. Unlike the 2014 CCHS study, this study excluded laser survey tools and laser devices used for cosmetic procedures. The 2019 CCHS focused on the prevalence of injury from handheld laser device use or exposure to the light in the previous 12 months from the following devices: handheld laser pointers; laser tag, laser toys or novelty lasers; laser torches or laser flashlights; and handheld search-and-rescue lasers. Similar to the previous study, the 2019 CCHS data captured the prevalence of laser device use or laser beam exposure, the frequency and type of injury sustained, and whether the injury was the result of personal use or someone else's use. The study also determined the type of handheld laser device being used and where the device was obtained. This information will help add to the knowledge base on handheld laser injuries and provide meaningful information to support risk assessment and support evidence-based advice and recommendations on the potential need for additional risk management strategies.

Data and methods

Data sources

Statistics Canada's CCHS collects health-related data from the Canadian population for use at the national, provincial and regional levels. The data analyzed in this article are from the CCHS rapid response component on handheld laser use, which was collected from March to June 2019. Respondents were asked about their handheld laser device use or light exposure in the previous 12 months.

The CCHS questionnaire was administered directly to respondents using computer-assisted telephone interviewing. The rapid response module of the CCHS covers the household population aged 12 and older in all Canadian provinces, but excluded the three territories. The survey also excluded people living on reserves and in other Indigenous settlements in the provinces, full-time members of the Canadian Forces, residents of institutions, and residents of the Quebec health regions of Nunavik and Terres-Criées-de-la-Baie-James. Together, these exclusions represent less than 3% of the Canadian population aged 12 and older.

Overall, 22,527 households were in scope for the 2019 CCHS module on handheld laser use, with responses obtained for 12,397 individuals, yielding a response rate of 55.0%. A detailed description of the CCHS methodology and sources used can be found on the Statistics Canada website at <https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=1208978>.

Measures

Much like the 2014 CCHS, the 2019 CCHS handheld laser use module included questions that asked respondents whether they used or were exposed to a handheld laser device (excluding laser survey tools or laser devices used for cosmetic or medical procedures) in the previous 12 months. Respondents who

responded affirmatively were then asked to identify the type of handheld laser device they used or were exposed to. Respondents were presented with the following handheld laser device options:

- laser pointer for presentations, pet toys, pen or stylus
- laser for entertainment such as laser tag, toy or novelty
- laser torch or laser flashlight
- search-and-rescue laser.

Respondents who identified themselves as having used or being exposed to a handheld laser device were next asked about any injury or discomfort they experienced and whether it required treatment by a healthcare professional. They were asked whether the injury took place to the eyes or the skin, as well as the duration of the discomfort or injury. Respondents were asked to provide answers for the worst injury or discomfort they sustained.

Lastly, questions were asked to help identify where the respondents acquired their handheld laser device (e.g., bought within or outside of Canada at a retail store, online or somewhere else, or not purchased) and whether they or someone else had ever intentionally directed the light from a handheld device at their eyes or skin. All of the questions are available on the Statistics Canada website: https://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=assembleInstr&lang=en&Item_Id=1232739.

Statistical analysis

The analyses were based on a sample of 12,397 respondents (5,665 males and 6,732 females), who were aged 12 and older and living in the 10 Canadian provinces. To be representative of the Canadian population, all data analyses were weighted. The analyses were carried out using SAS EG 7.1 (SAS Institute Inc., United States). The SAS procedure SURVEYFREQ was used to estimate percentages and coefficients of variation (CVs). Estimates with a CV from 16.6% to 33.3% were identified by an (E) and should be interpreted with caution, and estimates with a CV greater than 33.3% were suppressed (F) because of extreme sampling variability. To test differences in prevalence between sociodemographic groups, the procedure SURVEYLOGISTIC was used to calculate odds ratios and corresponding confidence intervals (CIs) with Bonferroni adjustments for pairwise comparisons. Both procedures (SURVEYFREQ and SURVEYLOGISTIC) accounted for sampling weights and estimated variance using bootstrap weights. Differences in estimates from different cycles of the CCHS (i.e., 2019 versus 2014) were tested using a two-sided Z-test. The ESTIMATE statement of the procedure SURVEYLOGISTIC was used to test for a linear trend in the log-odds of use of a handheld laser device or exposure to its laser beam across income levels. Note that, throughout the text, if not stated otherwise, all values in parentheses represent 95% CIs. If not stated in the text, the 95% CIs are provided in the accompanying tables.

Results

An estimated 12.4% of Canadians aged 12 and older (an estimated 3,932,067 [95% CI: 3,606,950 to 4,257,184]) reported using a handheld laser device or being exposed to the laser light in the previous 12 months (Table 1). A statistically significant difference was found between males and females, with the odds of using or being exposed to a handheld laser device being 1.31 times higher among males. Males made up 55.3% (50.6% to 60.0%) of those who had used or been exposed to handheld lasers. A significantly higher prevalence of laser beam exposure was reported in those aged younger than 45 compared with those aged 45 and older (Table 1). Among handheld laser device users and those who had been exposed to its laser beam, males aged younger than 35 and females in the same age group were similarly represented—29.9% (26.0% to 33.7%) versus 24.9% (21.1% to 28.6%)—and the proportion of youth (aged 12 to 17) among the users or those exposed was 17.7% (15.4% to 20.0%).

There were no significant differences in the odds of using a handheld laser device in relation to education level (Table 1). Household income was a factor associated with the use of handheld lasers or exposure to light from these devices, as a statistically significant ($p < 0.0001$) positive trend was found across income levels. Odds were significantly higher for those in the \$100,000 and above income brackets compared with those in the lower income bracket of \$39,999 or less (Table 1). Weighted percentage estimates were determined for each age group within each income level. Among the age groups, those aged 18 to 34 had the highest prevalence across income categories (36.5% [5.1% to 46.4%] at \$70,000 to \$99,999, 37.3% (4.2% to 45.5%) at \$150,000 or more, 40.1% (5.2% to 50.3%) at \$70,000 to \$99,999 and 50.7% (5.5% to 61.5%) at \$40,000 to \$69,999), except in the \$100,000 to \$149,999 income bracket, which was represented by those aged 45 and older (30.1% [4.6% to 39.3%]). The prevalence among those aged 12 to 17 was highest in the \$39,999 or less (24.1%^E [4.5% to 32.9%]) and \$150,000 or more (19.7% [2.5% to 24.7%]) income brackets. When ethnicity was examined, the prevalence of use or beam exposure was significantly higher among Caucasians (13.3%; Odds Ratio (OR): 1.44 [1.13 to 1.82]) than among non-Caucasians. The prevalence of Canadians who were exposed to or had used handheld laser devices was significantly lower (OR: 0.67 [0.48 to 0.93]) in Quebec than in the reference province of Ontario.

Users of—or those exposed to the light from—handheld laser devices were asked, in the past 12 months, which handheld laser device types they had used or been exposed to (Table 2). The most commonly reported device types were, in order from largest to smallest, handheld laser pointers (69.4%); laser tag, laser toys or novelty lasers (38.5%); laser torches or flashlights (8.2%); and search-and-rescue lasers (0.8%^E) (Table 2).

Sex differences were observed consistently across all handheld laser device types, as males had higher use and exposure in every device type category (Table 2), despite the fact that men

had a slightly lower representation than women in the survey (5,665 males and 6,732 females). It was estimated that among Canadians who used handheld laser pointers or were exposed to them, 55.8% were males and 44.2% were females, representing a significant sex difference (OR: 1.32 [1.04 to 1.69]). For laser torches or flashlights, use was also higher among males than females (OR: 1.97 [1.03 to 3.76]). However, the difference was not significant (OR: 1.33 [0.99 to 1.78]) in the prevalence of laser tag, toys or novelty lasers use or exposure to their laser beams, despite also being higher for males than females (56.2% versus 43.8%). The reported use of search-and-rescue lasers was too low to assess sex differences.

Discomfort or injury within the past 12 months was examined among Canadians who reported using or being exposed to handheld laser devices. Injuries and discomfort included those to the skin (e.g., burn, pigment change, scarring) and to the eye (e.g., visible floating objects, flash blindness, loss of sight). Less than 1%^E of users reported any discomfort or injury (Table 3). The number of reported injuries was too low to assess the duration of injury or discomfort, the occurrence of partial or complete vision loss, or whether treatment by a healthcare professional was required. Among users of—and those exposed to—the light from handheld laser devices, 27.9% indicated that they or someone else had intentionally directed the laser beam from a handheld device toward their eyes or skin (Table 3).

Lastly, users of—or those exposed to—handheld laser devices were asked where they obtained these devices. A large proportion reported obtaining the devices from within Canada at a retail store (40.5%), followed by from an online purchase (3.8%^E) (Table 3). However, the majority of respondents indicated that they did not purchase the device they used or were exposed to (56.3%).

Discussion

In 2014, Health Canada conducted a survey on the prevalence of use of laser devices or exposure to their emitted laser beams in the previous 12 months as part of the nationally representative CCHS. The purpose of the CCHS questions were to address a knowledge gap and derive meaningful information on the use of laser devices or exposure to their light by Canadians, as well as the associated injury rates, upon which risk-management decisions related to the risks posed by these devices will be based.

In the 2014 survey, an estimated 14.5 million (48.1%) Canadians aged 12 and older used or were exposed to beams from laser devices in the previous 12 months. An estimated 1.1%^E (0.7% to 1.4%) of them had experienced some form of discomfort or injury. These conditions were most commonly associated with cosmetic laser treatments and handheld lasers used for entertainment purposes (e.g., toy, game, lightshow), with handheld laser pointers representing 26.3%^E (11.7% to 40.9%) of all injured respondents. The current survey, which used data from the 2019 CCHS, focused primarily on the use of handheld laser devices or exposure to their emissions.⁵

Table 1
Prevalence and unadjusted odds ratios of handheld laser device use or exposure to its emitted laser beam in the past 12 months, by selected characteristics, household population aged 12 and older, Canada excluding the territories, 2019

Characteristic	%	95% confidence interval		Odds ratio	95% confidence interval	
		from	to		from	to
Total population						
Used a handheld laser device or was exposed to one (past 12 months)	12.4	11.4	13.4	...	...	...
Sex						
Female [†]	10.9	9.5	12.4	1.00	...	...
Male	13.9	12.2	15.5	1.31 *	1.05	1.63
Age group						
12 to 17	30.5	26.6	34.4	6.76 *	4.94	9.23
18 to 34	17.4	14.8	20.0	3.24 *	2.40	4.38
35 to 44	15.9	13.0	18.8	2.91 *	2.07	4.09
45 and older [†]	6.1	5.1	7.1	1.00	...	...
Race (ethnicity)						
Caucasian	13.3	12.0	14.5	1.44 *	1.13	1.82
Other [†]	10.3	8.6	12.1	1.00	...	...
Education						
High school diploma or equivalent or less [†]	12.8	11.5	14.2	1.00	...	...
Some postsecondary education (certificate or diploma, including trades)	10.5	8.5	12.4	0.80	0.61	1.04
University certificate, diploma or degree	13.8	11.8	15.8	1.09	0.86	1.38
Household income						
\$39,999 or less [†]	8.6	7.0	10.2	1.00	...	...
\$40,000 to \$69,999	9.0	7.0	10.9	1.04	0.69	1.57
\$70,000 to \$99,999	11.2	8.9	13.5	1.34	0.90	1.99
\$100,000 to \$149,999	15.4	12.9	18.0	1.93 *	1.32	2.83
\$150,000 or more	16.2	13.3	19.0	2.04 *	1.39	3.01
Region						
Western provinces	12.8	11.4	14.2	0.96	0.74	1.25
Quebec	9.3	7.7	10.9	0.67 *	0.48	0.93
Atlantic provinces	15.4	12.9	17.9	1.19	0.86	1.64
Ontario [†]	13.3	11.2	15.4	1.00	...	...

... not applicable

* significantly different from reference category (p < 0.05)

[†]reference category

Source: Statistics Canada, 2019 Canadian Community Health Survey.

The research findings of the 2014 survey found that laser pointers (11.1%) and lasers for entertainment purposes (9.7%) made up the majority of handheld laser products (excluding medical and cosmetic lasers) that respondents had reported using or been exposed to.⁵ While the current study excluded cosmetic and medical laser use or light exposure (which makes it difficult to make direct comparisons between studies), laser pointers were similarly found to make up the majority (69.4%) of all handheld laser devices that respondents had used or been exposed to. A significant positive trend (p < 0.0001) was found in the odds of use of or exposure to handheld lasers across income levels, such that the higher the household income, the higher the odds of using or being exposed to these devices. The increased use of handheld laser devices or exposure to their emitted light among individuals with higher incomes may be related to the affordability of these devices. One may assume that, with more disposable household income, the potential for youth to be in possession of a handheld laser would be higher. However, the proportion of those aged 12 to 17 was equally represented in both the lowest and highest household income brackets. This may be a result of the manufacturing cost of these

devices becoming cheaper, making them more affordable for purchase by an increasing number of Canadians.^{6,7} This is of concern because an increase in the prevalence of handheld laser devices may pose an increased risk to the health of Canadians if high-powered laser products are being presented for sale. To help protect against the health risks of high-powered consumer laser products, the import, sale, manufacture and advertising of high-powered handheld lasers was prohibited in Canada.⁴

In 2014, the prevalence of laser device use or beam exposure in certain laser device categories, such as lasers for entertainment or measurement, displayed significant sex differences, with males reporting a higher prevalence than females.⁸ Similarly, the current study found that males made up the majority of handheld laser device users. Age was also found to be a factor when it came to the use of or light exposure to all types of handheld lasers, and to laser pointers specifically. For all handheld lasers, teens (aged 12 to 17) had a higher prevalence of use than all other age groups (Table 1). When only laser pointers were examined, the use and exposure among teens (15.4% [12.2% to 18.6%]) was higher than among those aged 35 and older. In the 2014 survey, the use of and exposure to

Table 2
Weighted distribution of respondents who have used a handheld laser device or been exposed to its emitted laser beam in the past 12 months, by product type, for selected characteristics, household population aged 12 and older, Canada excluding the territories, 2019

Product type used or exposed to	Total			Males			Females			Males versus Females [†]			p-value
	%	95% confidence interval		%	95% confidence interval		%	95% confidence interval		Odds ratio	95% confidence interval		
Handheld laser pointers for presentations	69.4	65.4	73.4	55.8	50.4	61.3	44.2	38.7	49.6	1.32 *	1.04	1.69	0.022
Laser tag, laser toys or novelty lasers	38.5	34.6	42.5	56.2	49.3	63.1	43.8	36.9	50.7	1.33	0.99	1.78	0.060
Laser torches or laser flashlights	8.2	6.1	10.4	65.6	51.8	79.5	34.4 ^E	20.5	48.2	1.97 *	1.03	3.76	0.040
Search-and-rescue lasers	0.8 ^E	0.3	1.2	F	...	...	F	...	...	F	...	...	...

... not applicable

^E use with caution

F too unreliable to be published

* significant difference between males and females (p < 0.05)

[†] reference category

Notes: Coefficient of variation is from 16.6% to 33.3% when used with the symbol ^E. Coefficient of variation is greater than 33.3% when used with the symbol F.

Source: Statistics Canada, 2019 Canadian Community Health Survey.

Table 3
Weighted distribution of respondents who used a handheld laser or were exposed to its emitted laser beam over the past 12 months and who experienced discomfort or injury involving a laser product, household population aged 12 and older, Canada excluding the territories, 2019

Factor	%	95% confidence interval	
		from	to
Discomfort or injury to eyes or skin involving handheld laser			
Yes	0.7 ^E	0.2	1.2
No	99.3	98.8	99.8
Laser light intentionally directed at respondent's eyes or skin			
Yes	27.9	23.8	31.9
No	71.6	67.6	75.7
Acquisition of handheld laser			
Retail store in Canada	40.5	36.2	44.7
Retail store outside of Canada	F	...	...
Online	3.8 ^E	2.6	5.0
Bought somewhere else	F	...	...
Did not buy	56.3	52.1	60.5

... not applicable

^E use with caution

F too unreliable to be published

Notes: Coefficient of variation is from 16.6% to 33.3% when used with the symbol ^E. Coefficient of variation is greater than 33.3% when used with the symbol F.

Source: Statistics Canada, 2019 Canadian Community Health Survey.

laser pointers (21.8% [18.9% to 24.8%]) were also highest among teens. In both surveys, the 18-to-34 age group comprised the largest proportion of users of handheld laser devices and exposure to their light, and of laser pointers specifically (2014; 40.3% [37.1% to 43.4%] versus 2019; 41.8% [36.8% to 46.8%]).

When assessing the prevalence of handheld laser-induced injuries, only 0.7%^E of users in the current study reported any discomfort or injury. The low prevalence of laser-induced

discomfort or injury prevented the analysis of age and sex differences. However, a 2018 survey of Canadian eye healthcare specialists found that the number of laser-induced eye injuries reported by respondents increased each year between 2013 and 2017. The survey findings found that the prevalence of injuries was higher among males (82.5%) and the prevalence of eye injury from handheld lasers in children (aged 2 to 14) and young adults (aged 15 to 29) was overrepresented relative to the distribution of the Canadian population.⁸ This is

consistent with many of the published cases of laser eye injuries involving young males and children.^{2,7,9-26} However, the prevalence of handheld laser-induced injuries may be underrepresented, as most case reports may have been misdiagnosed as another type of ocular disease or attributable to a lack of exposure history, particularly among children. Fortunately, new methods for diagnosing retinal laser damage may show the true prevalence of harm by helping distinguish laser retinal injuries from other retinal disorders.²⁷ Taken together, these findings suggest that young males in Canada in particular may be at a higher risk for injury from handheld laser devices.

Limitations

There are a number of limitations that need to be considered when interpreting the findings of this study. One limitation of the study is that, despite it providing a list of the different types of handheld laser devices available, the categorization of handheld devices by respondents is dependent on the respondent's awareness and possible false advertising of the product as a laser device. For example, a device advertised as a "laser" torch or flashlight may contain a light-emitted diode rather than a laser diode. However, respondents were able to ask the interviewer for clarification as to what is considered a handheld laser device. Direct comparisons between the 2014 and 2019 CCHS data are difficult to make because of a change in focus from documenting the use of laser devices and laser beam exposure from these devices (including cosmetic) in 2014 to only handheld laser devices in 2019. Furthermore, because of the redesign of the CCHS in 2015, sample allocation strategies have changed, including the selection of new time frames, sample allocations, weighting and estimation methodologies.²⁸ Similar to the 2014 study, discomfort and injury were put into the same category, which may not help determine the specific type of injury incurred to each tissue type (e.g., loss of sight) or skin (e.g., burns, pigment change, scarring). To circumvent this limitation, questions were asked about injury to either the eyes or the skin that required treatment by a healthcare professional.

However, reported cases of discomfort and injury must be interpreted with caution because of the small number of responses. The strength of this study is that it has a large sample size—12,397 respondents—representing an overall response rate of 55.0%, and it provides nationally representative data.

Conclusion

It was estimated that almost 4 million Canadians had used or been exposed to handheld laser devices, with the majority of these devices being laser pointers. Young Canadians (aged 12 to 17) were found to have the highest prevalence of handheld laser device use or exposure to their light emissions. Among users, males were significantly more likely than females to be users across handheld laser device types, with the exception of laser tag, toys or novelty lasers, as the differences were not statistically significant. It was estimated that approximately one-quarter of Canadians who used or were exposed to handheld laser devices had a laser beam intentionally directed to their eyes or skin by someone else or while the device was under their control. This high prevalence of misuse is concerning, as intentional, prolonged exposure to the emitted laser beams—either to one self or by anyone else—greatly increases the potential for injury by circumventing normal aversion responses, thereby exceeding radiation dose limits, especially if users have access to high-powered laser devices. However, user reports of discomfort or injury involving laser beams from handheld laser devices to eyes or skin were rare. Most handheld laser devices were not purchased, but obtained by other means (e.g., as a gift) or, if they were purchased, they were bought in Canada at a retail store. A small fraction of users indicated that they purchased these devices online. While the number of respondents reporting injuries from handheld laser devices was low, ongoing surveillance seems prudent to assess the continued effectiveness of current risk management approaches for these laser products.

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