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Original quantitative research

The rural–urban gap: differences in injury characteristics

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This article has been peer reviewed.

Abstract

Background: Injuries are among the top 10 leading causes of death in Canada. However, the types and rates of injuries vary between rural versus urban settings. Injury rates increase with rurality, particularly those related to motor vehicle collisions. Factors such as type of work, hazardous environments and longer driving distances contribute to the difference in rural and urban injury rates. Further examination of injuries comparing rural and urban settings with increased granularity in the nature of injuries and severity is needed.

Methods: The study population consisted of records from the electronic Canadian Hospitals Injury Reporting and Prevention Program (eCHIRPP) from between 2011 and July 2017. Rural and urban status was determined based on postal codes as defined by Canada Post. Proportionate injury ratios (PIRs) were calculated to compare rural and urban injury rates by nature and severity of injury and sex, among other factors.

Results: Rural injuries were more likely to involve multiple injuries (PIR = 1.66 for 3 injuries) and crush injuries (PIR = 1.72). More modestly elevated PIRs for rural settings were found for animal bites (1.14), burns (1.22), eye injuries (1.32), fractures (1.20) and muscle or soft tissue injuries (1.11). Injuries in rural areas were more severe, with a higher likelihood of cases being admitted to hospital (1.97), and they were more likely to be due to a motor vehicle collision (2.12).

Conclusion: The nature of injuries in rural settings differ from those in urban settings. This suggests a need to evaluate current injury prevention efforts in rural settings with the aim to close the gap between rural and urban injury rates.

Keywords: *wounds, injuries, injury surveillance, rural, urban, eCHIRPP, epidemiology, sentinel surveillance, surveillance, Canadian Hospitals Injury Reporting and Prevention Program*

Highlights

- Rural injuries were more likely to involve multiple injuries presenting to the emergency department (ED).
- Crush injuries, animal bites, burns, eye injuries, fractures and soft tissue injuries were more likely in rural settings.
- Rural injury cases that present to the ED are more severe than urban injury cases.
- The injury mechanism with the highest proportionate injury ratio (PIR) was motor vehicle collisions involving all-terrain vehicles (ATVs) or snowmobiles.

Introduction

Injuries are among the top 10 leading causes of death and hospitalizations in Canada.[1,2] The total cost of injuries in Canada in 2010 was estimated at $26.8 billion.[3] However, injury types and rates vary between the sexes, age groups, occupations and geographical locations.

Injury rates along the rural–urban continuum were found to increase with increasing rurality.[4-9] Contributing to the difference between urban and rural/remote populations in injury types and rates are access to health care, availability of firearms and access to bodies of water, among others.[9] People living in rural/remote areas were at a higher risk of injury from motor vehicle accidents than their urban counterparts.[6,9,10] Rural motor vehicle accidents were more likely to be single vehicle accidents and to result in more severe injuries than motor vehicle accidents in urban areas. The incidence of bicycle-related injuries among children also increased with increased rurality.[11]

Lifestyle differences also contribute to the differences in injuries between rural and urban populations. First, heavy machinery, such as farming equipment, that may lead to higher rates of injuries due to crushing is more common in rural areas. Second, rural area residents tend to present with injuries at a hospital or physician when their injuries are severe because their greater remoteness affects access to health care. The longer time between sustaining an injury and presenting could also contribute to increased severity of injuries observed at health care centres. In contrast, urban residents are more likely to present to a health care centre or physician for less severe injuries.

In 2015, the differences between urban and rural work settings were significant,

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with rural workers more likely to be unskilled and employed in the agriculture, forestry, and hunting and fishing industries.[12] Several sociodemographic differences may also affect injury rates. Compared with their urban counterparts, rural injury-compensation claimants were more likely to have lower levels of formal education, have blue-collar occupations and have a diagnosed comorbidity.[13] In particular, blue-collar workers have an increased likelihood of injury due to the physical nature of manual labour and the hazardous work environments.[13] Rural compensation claimants have been found to have longer periods of work-related disability than urban claimants.[12,13]

Analyses of injuries comparing rural to urban settings using up-to-date Canadian data are lacking. There is also a need to evaluate the full spectrum of the nature of injuries, specifically drownings, poisonings and minor injuries such as burns, along with contributing factors such as injury severity, intent and location.[6]

The objective of this study was to quantify the differences between rural and urban injuries experienced by Canadians.

Methods

Study population

The electronic Canadian Hospitals Injury Reporting and Prevention Program (eCHIRPP) collects data on injuries from 17 hospitals (11 pediatric and 6 general) across Canada. We used injury records from 2011 to July 2017 as the study population. Records missing age, sex or postal codes (to determine rurality) were ineligible; otherwise, no eligibility criteria based on age or sex were applied.

The final study sample consisted of 783 597 records.

Statistical analysis

Descriptive frequency distributions for categorical variables and means and standard deviations were calculated for continuous variables by demographic and injury characteristics. Proportionate injury ratios (PIRs) and 95% confidence intervals were calculated to compare rural injuries to urban injuries by nature of injury, intent, severity and sex. A PIR of 1 indicates that the proportion of observed cases for a characteristic is the same as the expected number based on the sum of the age-specific proportions of that characteristic.

Statistical analyses were conducted using SAS Enterprise Guide version 5.1 (SAS Institute Inc., Cary, NC, USA) and Microsoft Excel 2010 (Redmond, WA, USA).

Rurality

Rurality was determined based on the first three digits of the postal code for each record. Postal codes with 0 (zero) as the second character are classified as rural delivery areas by Canada Post while the numbers 1 through 9 are urban delivery areas.

Nature of injury

The nature of injury was defined as the most serious/severe injury presented by the patient at the emergency department (ED).

Results

Initially, 788 782 injury records from 2011 to July 2017 were extracted from the eCHIRPP database. Records missing age, sex or postal codes were excluded for a final study sample of 783 597, made up of 65 483 cases from rural settings and 718 114 from urban settings.

Individuals injured in rural settings were on average 9.5 years older than their urban counterparts (Table 1). Fractures, nerve/muscle/soft tissue injuries and open wounds accounted for over 50% of injuries in both settings and were more frequent in rural settings. Unintentional injuries were by far the most common; among intentional injuries, intentional self-harm was more common among females, and maltreatment/assault injuries were more common in males in both urban and rural settings.

Compared to urban settings, crush injuries or amputations (PIR = 1.72), animal bites (1.14), burns or corrosions (1.22), eye injuries (1.32), fractures (1.20) and muscle, tendon, nerve, internal organ or soft tissue injuries (1.11) were more likely in rural settings (Table 2).

Presenting with two or three injuries per case was more likely in rural settings than in urban ones (PIR = 1.07 and 1.66, respectively). Compared to urban settings, injuries in rural settings were more likely to occur at work (1.20) and outdoors (1.17). Rural injuries were also more likely to be more severe than urban injuries, with cases more likely to be observed in the ED and require follow-up (1.07); treated in the ED (1.09); admitted to hospital (1.97); or declared dead on arrival or dying in the ED (1.91).

A sensitivity analysis was performed to determine whether the PIR calculated for multiple injuries was influenced by the severity of injuries. The findings show that urban residents more readily present for injuries, whereas rural residents decide they require medical assistance when their injuries are more severe and are more likely to also have multiple injuries. This sensitivity analysis calculated multiple injury PIRs using only severe injury cases in both rural and urban settings. Rural residents with severe injuries were more likely to experience multiple injuries than urban residents, which is in agreement with the initial findings (results not shown).

Rural injuries were more likely to be due to a motor vehicle collision (PIR = 2.12). Injury risk varied based on vehicle type; all-terrain vehicles (ATVs) / snowmobiles (PIR = 2.29), motorcycles / dirt bikes (1.10) and trucks (1.22) were more likely to be reported as involved in an injury in a rural setting than in an urban one.

Discussion

As expected, crush injuries or amputations were more likely in rural settings than urban ones. This can be attributed to rural settings being more hazardous environments. For instance, more farming equipment and heavy machinery is found in rural settings, increasing the risk of crush injuries. These more hazardous environments may also lead to the higher severity of injury as defined by the level of treatment received by rural cases. The common mechanisms of injury in rural settings are more likely to result in more severe injuries than those found in urban settings. In addition, because of the longer time between an injury occurring and access to health care services, the greater distances to hospitals may contribute to the higher severity of injuries at intake.

Injuries involving a motor vehicle collision were more likely in rural settings. This increased risk could be attributed to

TABLE 1
Characteristics of injury events by rurality and sex, all ages, eCHIRPP, 2011–July 2017

Characteristics	Rural			Urban		
	All	Male	Female	All	Male	Female
Total number, *n* (%)	65 483 (8.36)	38 108 (58.20)	27 375 (41.80)	718 114 (91.64)	406 781 (56.65)	311 333 (43.35)
Age in years, mean (SD)	23.69 (25.73)	23.26 (24.13)	24.30 (27.80)	14.13 (18.82)	13.44 (16.61)	15.03 (21.34)
Nature of injury, *n* (%)						
Animal bite	811 (1.24)	404 (1.06)	407 (1.49)	6 783 (0.94)	3 451 (0.85)	3 332 (1.07)
Burn or corrosion	989 (1.51)	666 (1.75)	323 (1.18)	9 036 (1.26)	5 034 (1.24)	4 002 (1.29)
Crushing or amputation	495 (0.76)	380 (1.00)	115 (0.42)	2 700 (0.38)	1 699 (0.42)	1 001 (0.32)
Drowning or asphyxia	127 (0.19)	75 (0.20)	52 (0.19)	1 398 (0.19)	803 (0.20)	595 (0.19)
Electrical injury	44 (0.07)	32 (0.08)	12 (0.04)	360 (0.05)	218 (0.05)	142 (0.05)
Eye injury	1 791 (2.74)	1 384 (3.63)	407 (1.49)	12 057 (1.68)	7 920 (1.95)	4 137 (1.33)
Foreign body excluding eye	1 616 (2.47)	968 (2.54)	648 (2.37)	21 899 (3.05)	11 820 (2.91)	10 079 (3.24)
Fracture	16 513 (25.22)	9 752 (25.59)	6 761 (24.70)	145 152 (20.21)	83 955 (20.64)	61 197 (19.66)
Frostbite or heat/cold stress or systemic overexertion	42 (0.06)	31 (0.08)	11 (0.04)	315 (0.04)	210 (0.05)	105 (0.03)
Head injury including concussion	7 092 (10.83)	4 132 (10.84)	2 960 (10.81)	99 978 (13.92)	58 746 (14.44)	41 232 (13.24)
Multiple/penetrating/other/dental	688 (1.05)	449 (1.18)	239 (0.87)	8 134 (1.13)	4 988 (1.23)	3 146 (1.01)
Muscle / tendon / internal organ / soft tissue injury / nerve	12 407 (18.95)	6 665 (17.49)	5 742 (20.98)	106 983 (14.90)	57 557 (14.15)	49 426 (15.88)
Nature of injury not specified	1 187 (1.81)	665 (1.75)	522 (1.91)	17 982 (2.50)	10 155 (2.50)	7 827 (2.51)
No injury detected	1 501 (2.29)	800 (2.10)	701 (2.56)	16 882 (2.35)	8 639 (2.12)	8 243 (2.65)
Open wounds	8 828 (13.48)	6 063 (15.91)	2 765 (10.10)	113 565 (15.81)	73 657 (18.11)	39 908 (12.82)
Poisoning	1 174 (1.79)	503 (1.32)	671 (2.45)	14 035 (1.95)	5 815 (1.43)	8 220 (2.64)
Sprains/strains/dislocations	6 830 (10.43)	3 365 (8.83)	3 465 (12.66)	89 285 (12.43)	43 610 (10.72)	45 675 (14.67)
Superficial	3 348 (5.11)	1 774 (4.66)	1 574 (5.75)	51 570 (7.18)	28 504 (7.01)	23 066 (7.41)
Intent						
Intentional self-harm	704 (1.08)	244 (0.64)	460 (1.68)	6 937 (0.97)	1 886 (0.46)	5 051 (1.62)
Maltreatment or assault	775 (1.18)	521 (1.37)	254 (0.93)	6 282 (0.87)	4 283 (1.05)	1 999 (0.64)
Other/Unspecified	243 (0.37)	144 (0.38)	99 (0.36)	2 867 (0.40)	1 611 (0.40)	1 256 (0.40)
Unintentional	63 761 (97.37)	37 199 (97.61)	26 562 (97.03)	702 028 (97.76)	399 001 (98.09)	303 027 (97.33)

Abbreviations: eCHIRPP, electronic Canadian Hospitals Injury Reporting and Prevention Program; SD, standard deviation.

longer driving distances, more time spent driving and higher driving speeds in rural areas compared with urban areas. Specific vehicles such as ATVs/snowmobiles, motorcycles/dirt bikes and trucks were more likely to be involved in a collision in rural areas than in urban areas. This is likely to be due to the abundance of these vehicles in rural areas; in urban settings, buses are more common.

The higher risk of injury while working in rural settings was expected. The increased risk could be attributed to the type of work common to rural areas. Rural work is more likely to be in a primary industry where manual labour and hazardous environments are common and the risk of injury requiring medical attention is higher. In contrast, urban work settings are primarily made up of white-collar occupations where the risk of injury that requires medical attention is quite low.[12] However, due to sampling largely from pediatric hospitals, high-injury-risk urban occupations (e.g. construction workers) may be underrepresented in eCHIRPP.

The results of this study indicate that the differences in the nature of injuries, the severity and potential causes are sizable. As such, there is a need to evaluate existing rural injury prevention programs in an effort to close the gap between rural and urban injury rates.

Strengths and limitations

One of the strengths of this study was that we examined a wide range of injuries regardless of their nature, from minor superficial injuries to severe crush injuries and amputations, rather than focussing on the nature or mechanism of select injuries only. This study addresses the need for studies on minor injuries found by Kim et al.[6] in their systematic review. In addition, the study was able to compare the severity of injuries in rural and urban settings. Many studies have simply compared hospitalization or mortality data in the two settings; in our study, we determined the severity of the injury based on the level of treatment provided at the ED.

The study also has limitations that might have affected the results or the generalizability of the results. The majority of the hospitals that contribute data to eCHIRPP are pediatric hospitals located in cities.

TABLE 2
Age- and sex-adjusted proportionate injury ratios of the nature of rural injuries, by sex, all ages, eCHIRPP, 2011–July 2017

Injury characteristics	Total		Males		Females	
	PIR	95% CI	PIR	95% CI	PIR	95% CI
Nature of injury						
Animal bite	1.14	1.07–1.23	1.13	1.02–1.24	1.16	1.05–1.28
Burn or corrosion	1.22	1.14–1.30	1.41	1.31–1.52	0.95	0.85–1.06
Crush injury or amputation	1.72	1.58–1.88	1.85	1.68–2.05	1.40	1.16–1.68
Drowning or asphyxia	1.09	0.91–1.29	1.04	0.83–1.30	1.17	0.89–1.53
Electrical injury	1.25	0.93–1.68	1.35	0.95–1.90	1.05	0.59–1.84
Eye injury	1.32	1.26–1.39	1.43	1.35–1.50	1.07	0.97–1.18
Foreign body excluding eye	1.03	0.98–1.08	1.08	1.01–1.15	0.96	0.89–1.04
Fracture	1.20	1.18–1.22	1.22	1.20–1.25	1.17	1.14–1.20
Frostbite or heat/cold stress or systemic overexertion	1.24	0.92–1.68	1.31	0.92–1.86	1.08	0.60–1.96
Head injuries including concussion	0.93	0.91–0.95	0.91	0.88–0.94	0.96	0.92–0.99
Multiple/penetrating/dental/other	1.23	1.14–1.33	1.27	1.15–1.39	1.17	1.03–1.33
Muscle/tendon/internal organ/soft tissue injury	1.11	1.09–1.13	1.07	1.04–1.10	1.15	1.12–1.18
Nature of injury not specified	0.80	0.76–0.85	0.76	0.70–0.82	0.86	0.79–0.94
No injury detected	0.91	0.86–0.95	0.91	0.85–0.98	0.90	0.83–0.97
Open wounds	0.87	0.85–0.88	0.88	0.86–0.91	0.83	0.80–0.86
Poisoning	0.91	0.86–0.97	0.89	0.81–0.97	0.93	0.87–1.01
Sprains/strains/dislocations	0.84	0.82–0.86	0.81	0.78–0.84	0.88	0.85–0.91
Superficial	0.71	0.69–0.74	0.67	0.64–0.70	0.77	0.73–0.81
Multiple injuries						
0	0.92	0.79–1.07	0.93	0.76–1.13	0.92	0.73–1.16
1	0.97	0.97–0.98	0.97	0.95–0.98	0.98	0.97–1.00
2	1.07	1.04–1.10	1.08	1.05–1.12	1.05	1.01–1.09
3	1.66	1.60–1.73	1.77	1.69–1.85	1.47	1.37–1.57
Location						
Own home	1.02	1.01–1.04	1.06	1.04–1.08	0.98	0.96–1.00
Other home	1.37	1.34–1.41	1.34	1.30–1.39	1.41	1.36–1.47
Residential institution	0.61	0.55–0.67	0.50	0.42–0.59	0.68	0.60–0.77
School or public office location	0.81	0.79–0.83	0.74	0.72–0.77	0.90	0.87–0.93
Hospital or other health services	0.99	0.89–1.10	0.92	0.78–1.09	1.04	0.91–1.18
Park or sports/rec facility	0.94	0.92–0.96	0.93	0.90–0.95	0.96	0.93–1.00
Street, highway or public road	1.04	1.02–1.07	0.99	0.95–1.03	1.12	1.08–1.17
Trade and service	0.94	0.90–0.99	0.89	0.83–0.95	1.01	0.94–1.08
Other specified	1.88	1.79–1.98	1.92	1.82–2.04	1.77	1.60–1.95
Unspecified	0.99	0.98–1.01	1.01	0.99–1.03	0.96	0.93–0.98
Work						
No	0.99	0.98–1.00	0.98	0.97–0.99	0.99	0.98–1.01
Yes	1.20	1.16–1.23	1.22	1.18–1.26	1.15	1.08–1.21
Treatment/disposition						
Left without being seen or only given advice (no treatment in ED)	0.75	0.74–0.77	0.73	0.71–0.75	0.79	0.76–0.81
Treated in ED with follow-up PRN	0.94	0.93–0.95	0.91	0.90–0.93	0.98	0.96–1.00
Observation in ED, follow-up PRN	0.95	0.91–1.00	0.94	0.89–1.00	0.96	0.90–1.03

Continued on the following page

TABLE 2 (continued)
Age- and sex-adjusted proportionate injury ratios of the nature of rural injuries, by sex, all ages, eCHIRPP, 2011–July 2017

Injury characteristics	Total		Males		Females	
	PIR	95% CI	PIR	95% CI	PIR	95% CI
Treatment/disposition (continued)						
Observation in ED, follow-up required	1.07	1.01–1.14	1.02	0.93–1.10	1.15	1.05–1.25
Treated in ED, follow-up required	1.09	1.07–1.11	1.10	1.08–1.12	1.07	1.05–1.10
Admitted to hospital	1.97	1.93–2.02	2.14	2.09–2.20	1.73	1.66–1.79
Dead on arrival or died in ED	1.91	1.46–2.48	1.83	1.34–2.50	2.12	1.30–3.46
Day of Week						
Friday	1.00	0.98–1.02	1.00	0.97–1.02	1.00	0.97–1.03
Monday	1.00	0.98–1.02	1.01	0.98–1.04	0.99	0.96–1.02
Saturday	1.07	1.05–1.09	1.06	1.04–1.09	1.08	1.05–1.11
Sunday	1.03	1.01–1.05	1.03	1.00–1.06	1.02	0.99–1.06
Thursday	0.96	0.94–0.98	0.94	0.91–0.97	0.98	0.95–1.01
Tuesday	0.97	0.95–0.99	0.98	0.96–1.01	0.96	0.93–0.99
Wednesday	0.97	0.95–0.99	0.97	0.94–0.99	0.96	0.93–0.99
Indoor vs outdoor						
Indoor	0.87	0.86–0.88	0.86	0.84–0.87	1.20	1.18–1.22
Outdoor	1.17	1.16–1.18	1.16	1.14–1.17	0.47	0.46–0.47
Intent						
Intentional self-harm	0.89	0.83–0.96	0.86	0.76–0.97	0.91	0.83–0.99
Maltreatment or assault	0.91	0.85–0.98	0.85	0.78–0.93	1.08	0.96–1.22
Other/unspecified	0.85	0.75–0.97	0.83	0.70–0.98	0.89	0.73–1.08
Unintentional	1.00	1.00–1.01	1.00	0.99–1.01	1.00	0.99–1.01
Vehicle Type						
ATV/snowmobile	2.29	2.16–2.42	2.21	2.07–2.36	2.55	2.28–2.85
Boat including jet ski	0.76	0.63–0.92	0.75	0.59–0.95	0.78	0.58–1.06
Bus	0.53	0.42–0.67	0.58	0.42–0.79	0.48	0.34–0.69
Car/van	0.76	0.73–0.79	0.67	0.63–0.71	0.86	0.81–0.91
Motorcycle/dirt bike	1.10	1.03–1.18	1.08	1.00–1.16	1.27	1.07–1.51
Truck	1.22	1.10–1.35	1.09	0.97–1.24	1.60	1.34–1.90
Unspecified	1.09	0.92–1.30	1.18	0.95–1.45	0.93	0.68–1.29
Motor vehicle collision						
No	0.96	0.95–0.96	0.95	0.94–0.96	0.96	0.95–0.98
Yes	2.12	2.06–2.17	2.29	2.21–2.37	1.89	1.81–1.97

Abbreviations: ATV, all-terrain vehicle; CI, confidence interval; eCHIRPP, electronic Canadian Hospitals Injury Reporting and Prevention Program; ED, emergency department; PIR, proportionate injury ratio.

Note: The PIR measures the deviation between the rate of injuries in rural settings and the rate of injuries in urban settings. A PIR of 1 indicates that the proportion of observed cases for a characteristic is the same as the expected number based on the sum of the age-specific proportions of that characteristic.

This means that older teenagers (18–19 years old), adults, those who present at general hospitals and individuals living in rural and remote areas are underrepresented in the eCHIRPP database. Fatal injuries are also underrepresented.

Referral bias was also a concern. It is likely that rural residents with serious injuries are transferred to urban hospitals.[14] However, eCHIRPP provides details on the nature and mechanism of injury that are not available in more representative provincial datasets.

Similarly, confounding by indication needs to be considered when interpreting the results of the study. Rural cases with serious injuries, particularly children, are more likely to be transferred from rural hospitals to urban hospitals and trauma centres, whereas less severe injuries having occurred in rural settings may not be transferred and therefore may be underrepresented in eCHIRPP. Overall, the data are more likely to capture children with more severe injuries.[14]

The true effect size may be underestimated because the population of interest—rural populations—was underrepresented. In addition, rurality is defined in the eCHIRPP database as those with a rural postal code as assigned by Canada Post. This, however, is not equivalent to the definitions of rural and urban areas established by Statistics Canada[15] used in many studies. This affects the comparability of the results of this study to those conducted based on the Statistics Canada rural area definition. In addition, eCHIRPP sites are not found in some provinces and territories (Saskatchewan, New Brunswick, Prince Edward Island, Northwest Territories or Yukon). This lack of representation also affect the wider generalizability of this study's results.

Conclusion

This study contributes to the body of knowledge regarding rural injuries, giving additional insight to the types and severity of injuries that occur in rural areas. The granular analysis of the nature of injuries provided a necessary comparison of injuries in rural and urban settings. The results of this study show that there is a need to evaluate current injury prevention strategies as a sizable difference remains between rural and urban settings in terms of the nature and rates of injuries.

Conflicts of interest

There are no conflicts of interest to declare.

Authors' contributions and statement

FB, MTD and SM were involved in the design and conceptualization of the project. FB conducted the data analyses and drafted the paper. JC conducted the data extraction and coding. All authors contributed to the interpretation of the results and revisions of the paper.

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

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Original quantitative research

Validation of a brief version of the Social Provisions Scale using Canadian national survey data

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This article has been peer reviewed.

Abstract

Introduction: The 10-item Social Provisions Scale (SPS-10) has been implemented to measure social support in a number of national surveys in Canada. The objective of this study was to reduce the SPS-10 to a brief, five-item scale (SPS-5), while maintaining adequate measurement properties.

Methods: Data from individuals aged 18 years and older who responded to the Social Provisions Scale module in the Canadian Community Health Survey 2012 Mental Health Focus cycle (CCHS 2012 MH) and the Canadian Community Health Survey 2017 Annual cycle (CCHS 2017) were analyzed. We used exploratory factor analysis and item-to-total correlations from the CCHS 2012 MH data to choose items. A correlation analysis between the SPS-5, SPS-10 and related positive mental health (PMH) constructs were used to assess the criterion-related validity of the SPS-5 compared to the SPS-10. A confirmatory factor analysis using data from the CCHS 2017 was conducted to confirm the factor structure of the SPS-5.

Results: The SPS-5 showed high internal consistency (Cronbach's alpha of 0.88) and similar correlations as the SPS-10 with related PMH constructs. The SPS-5 and SPS-10 were also very highly correlated (r = 0.97). The confirmatory factor analysis demonstrated that a single factor model of the SPS-5 fit the data well. The SPS-5 and SPS-10 yield similar estimates of high social support, of 92.7 and 91.5%, respectively.

Conclusion: The new SPS-5 demonstrated adequate measurement properties, and functioned in a similar manner to the SPS-10, supporting a reduced version of the Scale. The SPS-5 is a feasible and valid alternative to the SPS-10 that could be used to reduce respondent burden on national health surveys.

Keywords: *social support, surveys, measurement, factor analysis*

Highlights

- Population health surveys are facing increasing demands for new content related to emerging health issues, while the need for continued monitoring of existing concepts remains.
- We investigated whether the SPS-10 could be reduced to five items, and continue to have adequate measurement properties, to minimize respondent burden on population health surveys in Canada.
- The SPS-5 demonstrated criterion-related and structural validity, with similar results for men and women.
- Use of the SPS-5 can reduce respondent burden when a single factor measure of social support is required in health research.

Introduction

Social support is recognized as an important determinant of health and well-being.[1] The Public Health Agency of Canada (PHAC) describes social support as "feeling loved and cared for, and having a network of family, friends, neighbours, co-workers and community members that are there in times of need."[2] Higher levels of social support are associated with higher levels of positive mental health (PMH), lower psychological distress and better quality of life.[3-5] Lower levels of social support are associated with higher rates of cardiac[6] and all-cause mortality.[7]

A number of measures of social support have been developed, such as the Medical Outcomes Study Social Support Scale,[8] the Social Support Behavior Scale[9] and the Multidimensional Scale of Perceived Social Support.[10] The Social Provisions Scale (SPS)[1] is one of the most commonly utilized. The SPS was developed and validated by Cutrona & Russell based on Weiss's model of social provisions.[1,11] This model includes six social needs that can be derived from interpersonal relationships: *guidance* (advice or information); *reliable alliance* (tangible help); *reassurance of worth* (appreciation of an individual's competence, abilities and value by others); *opportunity for nurturance* (the individual as a source of support for others); *attachment* (emotional bond from which an individual achieves a sense of security); and *social integration* (sense of belonging to a group with mutual interests, concerns and hobbies as the individual).[1,12]

The original SPS includes 24 items. The six social needs identified by Weiss[11] are

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each represented by four items, two of which are formulated negatively and two of which are formulated positively. The SPS was validated using a sample of 1183 students from introductory psychology courses,[1] 303 public school teachers[13] and 306 nurses from a military hospital.[14] The reliability of the individual social provisions subscales was adequate, with Cronbach alpha coefficients ranging from 0.65 to 0.76.[1] The factor structure of the SPS has been partially confirmed, with some items deviating from the theoretical structure depending on the sample (students or general public). Convergent and divergent validity have been demonstrated.[1,15] The 24-item SPS has also been translated into French and validated in the province of Quebec by Caron using a sample of 790 participants.[16] Among the participants in Quebec, the instrument demonstrated excellent internal consistency (α = 0.96) and Cronbach's alpha for each SPS subscale varied between 0.73 and 0.88.[16] The temporal stability of the scale was also very good (r = 0.86). Factor analyses confirmed the multidimensional structure of the scale consistent with the proposed factor structure.[16] The 24-item SPS has been used with various samples including public school teachers,[13] college students,[15,17,18] therapists[19] and spouses of cancer patients[20] as well as in several studies in Canada such as samples from the general population[21] and from a low-income population,[3,22] individuals diagnosed with schizophrenia and their families,[23-25] individuals who have attempted suicide[26] and families with a child in daycare.[27]

A 10-item version of the SPS was recently developed and validated.[4] The SPS-10 includes five of the six original SPS subscales. The *opportunity for nurturance* subscale was dropped because this subscale mostly measures the support offered by the individual rather than the support received by others. In several previous studies, this subscale had the weakest relationship with mental health, and dropping it reduced administration time.[4] The SPS-10 includes 10 items with each subscale represented by two positively worded statements.

Caron[4] demonstrated that the SPS-10 possesses excellent psychometric properties such as strong concurrent validity with the SPS-24, excellent internal consistency with Cronbach's alpha coefficients greater than 0.80 and a predictive power similar to the SPS-24.[4] However, an exploratory factor analysis did not yield the expected factor structure of this version.

In contrast, Steigen & Bergh found shortcomings in the SPS-10 related to targeting and construct validity using the polytomous Rasch model.[28] An alternate 10-item version of the SPS that measures each subscale with the two negatively worded statements has also been developed to better represent the *lack* of social support, but does not appear to be widely implemented.[29]

In this paper, we refer to the SPS-10 as the version with positively worded items developed by Caron.[4]

The SPS-10 has been implemented in the Canadian Community Health Survey (CCHS) 2012 Mental Health Focus cycle and on several subsequent cycles of the CCHS Annual cycles. It is widely used in national surveillance and research.[30]

As our understanding of health grows to encompass a wide range of behavioural and psychosocial determinants, there is increasing demand for content on national health surveys that does not increase respondent burden. One way to address this challenge is to shorten scales related to priority content while maintaining adequate measurement properties. Within this context, we aimed to reduce the SPS-10 from 10 to five items (SPS-5), and to assess the criterion-related and factorial validity of the resulting scale.

Methods

Data sources

We analyzed two secondary data sources: the CCHS 2017 Annual cycle and the 2012 Mental Health Focus cycle (CCHS 2012 MH). The CCHS 2012 MH includes a total of 25 113 Canadians aged 15 years or older living in the 10 provinces. This sample excludes Canadians living on reserves and other Aboriginal communities, full-time personnel of the Canadian Forces and individuals who are institutionalized; however, this represents less than 3% of the Canadian population. To establish satisfactory coverage by age group and sex in each province, we used a multistage sampling design derived from the Labour Force Survey. Data collection took place from January to December 2012. The national response rate was 68.9%. Interviews were conducted using computer-assisted personal interviewing (CAPI) and computer-assisted telephone interviewing (CATI), with the majority (87%) using CAPI. Proxy interviews were not conducted because of the personal nature of the questions. Sampling and bootstrap weights were provided by Statistics Canada.

The annual component of the CCHS is an ongoing household survey of Canadians aged 12 years or older living in the 10 provinces and three territories. We analyzed the 2017 cycle of this survey (CCHS 2017). This survey also excludes Canadians living on reserves and other Aboriginal communities and full-time Canadian Forces personnel as well as 12- to 17-year-old youth living in foster homes, institutionalized individuals and those living in the Quebec health regions of Région du Nunavik and Région des Terres-Cries-de-la-Baie-James; in total, this represents less than 3% of the Canadian population. In 2017, the SPS-10 was collected in British Columbia, Alberta, Prince Edward Island and Newfoundland and Labrador. Only these provinces are included in the analyses reported in this paper. For Canadians aged 18 years or older, an area frame based on the Labour Force Survey was used. A list frame based on the Canadian Child Tax Benefits files was used for Canadians aged between 12 and 17 years. Data collection took place from January to December 2017. The national response rate was 62.8%. Approximately 74% of the interviews were conducted using CATI and the rest of the interviews were conducted using CAPI. Statistics Canada calculated sample weights.

Data were obtained from Statistics Canada through a sharing agreement. Statistics Canada collects these data under the authority of the Statistics Act. Participants were asked at the time of data collection whether they agreed to share their data with PHAC and Health Canada. Only the de-identified microdata from respondents who agreed to share their data were provided by Statistics Canada to PHAC.

Respondents self-reported their sex, age, household income, marital status, primary spoken language, education and immigration status. Statistics Canada determined each respondent's population centre (urban/rural) based on their six-digit postal code. Where no data on income were collected or available from linked tax data for the

CCHS 2017 annual component, missing data on income were imputed using the nearest neighbour imputation method.[31]

Social support was measured through the 10-item SPS validated by Caron[4] based on the original 24-item SPS by Cutrona & Russell.[1] Specifically, the SPS-10 assesses five forms of social provisions: attachment (items 1 and 10), guidance (items 2 and 7), social integration (items 3 and 8), reliable alliance (items 4 and 6) and reassurance of worth (items 5 and 9). Each item is rated on a four-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). A continuous scale score is computed by summing responses to the 10 questions, with values ranging from 10 to 40. The SPS-10 summary score is not computed for respondents with data missing on any items. Higher scores can be interpreted as having higher levels of social support. In national surveillance efforts, participants are identified as having "high" social support on the SPS-10 if their score was 30 or above.[30]

Self-rated mental health was evaluated using one question: "In general, would you say that your mental health is: excellent (5), very good (4), good (3), fair (2), or poor (1)?" Self-rated mental health has been identified as a useful measure for monitoring general mental health.[32]

Life satisfaction was assessed with one question: "Using a scale of 0 to 10, where 0 means 'very dissatisfied' and 10 means 'very satisfied,' how do you feel about your life as a whole right now?" This question is considered reliable and valid for use in population surveys and is recommended by the Organisation for Economic Cooperation and Development (OECD).[33]

Sense of belonging was measured with one question: "How would you describe your sense of belonging to your local community? Would you say it is…: very strong (4), somewhat strong (3), somewhat weak (2), or very weak (1)?" Among various social constructs that this measure may tap into, this question demonstrates validity as a measure of neighbourhood social capital.[34]

The continuous score from the Mental Health Continuum–Short Form (MHC-SF) scale was included on the CCHS MH 2012 as a general measure of PMH.[35] The MHC-SF includes 14 items that measure emotional, psychological and social well-being, answered on a six-point Likert scale ranging from "Never" (0) to "Every day" (6). An overall summary score is calculated by summing responses, with scores ranging from 0 to 70. The MHC-SF has demonstrated factorial, convergent and divergent validity.[36]

Psychological distress was measured using the Kessler Psychological Distress Scale (K10) on the CCHS 2012 MH only. The K10 includes 10 items about the respondent's level of distress, on a scale of 0 to 40.[37] The K10 Psychological Distress Scale is often used as a general measure of mental ill health and includes symptoms associated with depression and anxiety. It has demonstrated good convergent and discriminant validity.[38]

Data from all respondents were analyzed for the CCHS 2012 MH, while only data from respondents in the four provinces that included the SPS-10 content were included in analyses of the CCHS 2017 data. Analyses were restricted to participants aged 18 years and older. Analyses from the CCHS 2012 MH were used to make decisions about item choice; analyses of the CCHS 2017 annual component were used to confirm these decisions. Frequencies and descriptive statistics were calculated for all variables. For the SPS-10 items, skewness and kurtosis (unweighted), and weighted item-to-total correlations (both item included in the total, and item excluded) were also calculated. Exploratory factor analysis was conducted using the CCHS 2012 MH data to identify SPS-10 variables with the highest loadings on the underlying factor, using maximum likelihood estimation. An eigenvalue of 1 was used as the criterion to determine the number of factors, as well as visual inspection of the scree plot. A factor loading of 0.45 was identified as the minimum value.[39] Cronbach's alpha of the SPS-10 and the SPS-5, and Pearson correlations between SPS-10 and SPS-5 scores and related PMH constructs were calculated. Correlation confidence intervals (CIs) were calculated using Fisher *z*-transformation. We used linear regression to examine the proportion of the variance of psychological distress, and PMH, as measured by the MHC-SF, explained by the SPS-10 and the SPS-5. All analyses were weighted unless otherwise noted, and variance was calculated using the bootstrap procedure in the SAS SURVEY suite of procedures. These analyses were conducted in SAS Enterprise Guide 5.1 (SAS Institute Inc., Cary, NC, USA).

Confirmatory factor analysis was conducted in MPlus Version 7.3 (Muthén & Muthén, Los Angeles, CA, USA) using maximum likelihood estimation with the CCHS 2017 data. We adopted model fit criteria as suggested by Hu and Bentler:[40] 0.95 or above for the Tucker Lewis index (TLI) and the comparative fit index (CFI); 0.08 for standardized root mean square residuals (SRMR); and 0.06 for root mean square error of approximation (RMSEA).[40] The model was fit for the full sample, then separately for men and women.

Results

Descriptive statistics

Both samples comprised about equal proportions of men and women (Table 1). Most respondents were married or living with a partner, and 69% and 80% of respondents in the 2012 and 2017 surveys, respectively, had some postsecondary education. About three-quarters of respondents stated English was their primary spoken language, while approximately one in five reported French as their primary spoken language. More than 80% lived in urban settings.

Social Provisions Scale descriptive statistics

Mean scores on the items of the SPS on CCHS 2012 MH ranged from 3.45 to 3.70 (Table 2). No values for skewness or kurtosis were greater than $|3|$ (data not shown). Item to item-deleted total correlations ranged from 0.66 to 0.79. A similar pattern of means and item to item-deleted total correlations were observed with the CCHS 2017 annual data.

Exploratory factor analysis

We conducted exploratory analysis using the CCHS 2012 MH data. A single factor was identified using a minimum eigenvalue of 1 as the criterion; inspection of the scree plot supported this decision. Bartlett's test of sphericity was significant ($p < 0.001$), indicating that the data were appropriate for factor analysis. The factor loadings are shown in Table 2; all were above 0.45. No rotation was used because only one factor was identified. Loadings of items were examined on a pairwise basis; the item with the higher loading was chosen for retention. In one case

TABLE 1
Demographic characteristics of samples, CCHS 2012 MH[a] and CCHS 2017[b]

Characteristics	Per cent of sample (95% CL)	
	CCHS 2012 MH [a]	CCHS 2017 [b]
Sex		
Males	49.16 (48.99, 49.33)	49.72 (49.72, 49.72)
Females	50.84 (50.67, 51.01)	50.27 (50.27, 50.27)
Age (years)		
18–34	28.23 (27.46, 29.01)	29.57 (29.57, 29.57)
35–49	26.57 (25.57, 27.58)	25.74 (25.74, 25.74)
50–64	27.08 (26.38, 27.78)	25.52 (25.52, 25.52)
65+	18.12 (18.05, 18.18)	19.17 (19.17, 19.17)
Marital status		
Single/never married	23.13 (22.31, 23.96)	23.53 (22.69, 24.37)
Widowed/divorced/separated	13.64 (12.94, 14.35)	12.72 (11.99, 13.45)
Married/living common-law	63.23 (62.18, 64.28)	63.75 (62.71, 64.79)
Highest education level		
Less than secondary school graduation	14.87 (14.12, 15.62)	4.14 (3.75, 4.54)
Secondary school graduation	16.18 (15.38, 16.98)	15.38 (14.44, 16.33)
Some postsecondary and postsecondary graduation	68.95 (67.86, 70.05)	80.47 (79.50, 81.45)
Household income quintile (national quintile)		
Q1 (lowest quintile)	19.48 (18.53, 20.42)	17.64 (16.66, 18.62)
Q2	19.91 (18.93, 20.88)	19.42 (18.50, 20.35)
Q3	20.05 (19.16, 20.93)	20.28 (19.29, 21.28)
Q4	19.93 (18.96, 20.91)	19.38 (18.42, 20.34)
Q5 (highest quintile)	20.64 (19.60, 21.69)	23.27 (22.17, 24.37)
Immigrant		
Yes	26.10 (24.74, 27.46)	25.55 (24.36, 26.74)
No	73.91 (72.55, 75.27)	74.45 (73.26, 75.64)
Living in a population centre		
Urban	82.37 (80.86, 83.88)	85.14 (84.08, 86.21)
Rural	17.63 (16.12, 19.14)	14.86 (13.79, 15.92)
Primary spoken language		
English	76.21 (75.42, 77.00)	97.38 (96.89, 97.87)
French	21.61 (20.95, 22.28)	—[E]
Other	2.18 (1.74, 2.62)	—
Self-rated health		
Excellent	22.13 (21.13, 23.13)	22.74 (21.60, 23.88)
Very good	38.18 (37.11, 39.25)	37.77 (36.58, 38.97)
Good	29.19 (28.11, 30.27)	27.13 (26.02, 28.24)
Fair	8.22 (7.66, 8.78)	9.00 (8.33, 9.68)
Poor	2.28 (2.02, 2.55)	3.35 (2.93, 3.77)
Province		
British Columbia	13.52 (13.40, 13.63)	49.94 (49.94, 49.94)
Alberta	10.81 (10.71, 10.91)	42.91 (42.91, 42.91)
Saskatchewan	2.88 (2.85, 2.91)	NA
Manitoba	3.41 (3.38, 3.45)	NA
Ontario	38.90 (38.72, 39.08)	NA

Continued on the following page

TABLE 1 (continued)
Demographic characteristics of samples, CCHS 2012 MH[a] and CCHS 2017[b]

Characteristics	Per cent of sample (95% CL)	
	CCHS 2012 MH [a]	CCHS 2017 [b]
Province (continued)		
Quebec	23.58 (23.43, 23.74)	NA
New Brunswick	2.19 (2.17, 2.22)	NA
Prince Edward Island	0.43 (0.42, 0.43)	1.55 (1.55, 1.55)
Nova Scotia	2.76 (2.73, 2.79)	NA
Newfoundland and Labrador	1.52 (1.50, 1.54)	5.60 (5.60, 5.60)

Abbreviations: CCHS, Canadian Community Health Survey; CL: confidence limit; MH, mental health; NA, not applicable.
[a] All 10 provinces; n = 22 486.
[b] British Columbia, Alberta, Prince Edward Island and Newfoundland and Labrador; n = 15 189.
[E] Cannot release data due to high sampling variability.
— Suppressed due to sampling variability of estimate above.

(items 4 and 6), the loadings were the same. In this case, item 4 was chosen based on lower kurtosis and skewness. The following items were retained for the five-item scale: items 3, 4, 5, 7 and 10. Items 1, 2, 6, 8 and 9 were dropped.

Internal consistency and correlation analysis

Using the CCHS 2012 MH data, Cronbach's alpha for the SPS-10 was 0.93; for the SPS-5 it was 0.88. Cronbach's alpha for the SPS-5 using the CCHS 2017 data was 0.88. Reducing items by half had a modest impact on the internal consistency of the scale, and Cronbach's alpha continued to surpass guidelines for adequate internal consistency.[41] The scores for the 5- and 10-item scales correlate strongly (r = 0.97) using data from both the CCHS 2012 MH and CCHS 2017 datasets (Table 3). Correlations between the SPS-5 and PMH measures are very similar to values obtained using the SPS-10 (Table 3). For example, the correlations between sense of belonging and both the SPS-5 and the SPS-10 were r = 0.18 when using CCHS 2012 MH data. The correlations between the SPS-5 and SPS-10 scales and satisfaction with life scale were r = 0.34 and 0.33, respectively. This pattern was consistent for both men and women. The SPS-10 explained 8.1% of the variance in psychological distress

TABLE 2
Descriptive statistics, item-to-total correlations and factor loadings from exploratory factor analysis for 10-item Social Provisions Scale items, CCHS 2012 MH, and descriptive statistics and item-to-total correlations for 5-item Social Provisions Scale, CCHS 2017

	CCHS 2012 MH SPS-10 [a]					CCHS 2017 SPS-5 [b]		
Item	Mean	SEM	Per cent missing	Item-to-total correlation	Factor loading	Mean	SEM	Item-to-total correlation
1 There are people I can depend on to help me if I really need it.	3.67	0.01	0.25	0.68	0.71	–	–	–
2 There are people who enjoy the same social activities I do.	3.54	0.01	0.72	0.69	0.70	–	–	–
3 I have close relationships that provide me with a sense of emotional security and well-being.	3.59	0.01	0.52	0.78	0.81	3.46	0.01	0.76
4 There is someone I could talk to about important decisions in my life.	3.65	0.01	0.41	0.78	0.83	3.56	0.01	0.76
5 I have relationships where my competence and skill are recognized.	3.53	0.01	1.15	0.73	0.74	3.40	0.01	0.70
6 There is a trustworthy person I could turn to for advice if I were having problems.	3.66	0.01	0.40	0.79	0.83	–	–	–
7 I feel part of a group of people who share my attitudes and beliefs.	3.45	0.01	0.77	0.71	0.73	3.34	0.01	0.67
8 I feel a strong emotional bond with at least one other person.	3.68	0.01	0.42	0.73	0.77	–	–	–
9 There are people who admire my talents and abilities.	3.49	0.01	1.90	0.66	0.66	–	–	–
10 There are people I can count on in an emergency.	3.70	0.01	0.36	0.77	0.80	3.59	0.01	0.71
SPS-10	36.04	0.05	3.32	–	–	–	–	–
SPS-5	17.93	0.03	1.80	–	–	17.37	0.03	–

Abbreviations: CCHS, Canadian Community Health Survey; MH, mental health; SEM, standard error of the mean; SPS, Social Provisions Scale; SPS-5, 5-item Social Provisions Scale; SPS-10, 10-item Social Provisions Scale; –, not applicable.
[a] All 10 provinces; n = 22 486.
[b] Four provinces: British Columbia, Alberta, Prince Edward Island and Newfoundland and Labrador; n = 15 189.

TABLE 3
Correlations for 10-item and 5-item Social Provisions Scale with positive mental health concepts, CCHS 2012 MH [a], by sex

	% (95% CL)	
	SPS-5	SPS-10
Total		
SPS-5	1	0.97 (0.97, 0.97)
SPS-10	0.97 (0.97, 0.97)	1
Self-rated mental health	0.30 (0.29, 0.31)	0.29 (0.28, 0.30)
Positive mental health	0.42 (0.40, 0.43)	0.40 (0.39, 0.42)
Life satisfaction	0.34 (0.32, 0.35)	0.33 (0.32, 0.34)
Sense of belonging	0.18 (0.17, 0.20)	0.18 (0.17, 0.19)
Psychological distress	−0.29 (−0.31, −0.28)	−0.28 (−0.30, −0.27)
Males		
SPS-5	1	0.97 (0.97, 0.97)
SPS-10	0.97 (0.97, 0.97)	1
Self-rated mental health	0.32 (0.30, 0.34)	0.31 (0.30, 0.33)
Positive mental health	0.41 (0.39, 0.42)	0.39 (0.38, 0.41)
Life satisfaction	0.34 (0.33, 0.36)	0.34 (0.32, 0.36)
Sense of belonging	0.19 (0.17, 0.20)	0.18 (0.16, 0.19)
Psychological distress	−0.29 (−0.31, −0.27)	−0.28 (−0.30, −0.26)
Females		
SPS-5	1	0.97 (0.97, 0.98)
SPS-10	0.97 (0.97, 0.98)	1
Self-rated mental health	0.29 (0.27, 0.30)	0.28 (0.26, 0.30)
Positive mental health	0.43 (0.41, 0.44)	0.42 (0.40, 0.43)
Life satisfaction	0.33 (0.31, 0.35)	0.32 (0.31, 0.34)
Sense of belonging	0.18 (0.16, 0.20)	0.18 (0.16, 0.20)
Psychological distress	−0.31 (−0.33, −0.30)	−0.30 (−0.32, −0.28)

Abbreviations: CCHS, Canadian Community Health Survey; CL: confidence limits; MH, mental health; SPS-5, 5-item Social Provisions Scale; SPS-10, 10-item Social Provisions Scale.
Note: $p < 0.001$, confidence intervals calculated using Fisher *z*-transformation.
[a] All 10 provinces; $n = 22\,486$.

and 16.3% of the variance in PMH (MHC-SF) using linear regression, while the SPS-5 explained 8.7% and 17.3%, respectively.

Confirmatory factor analysis

We conducted a confirmatory factor analysis using data from the CCHS 2017 to confirm a single factor model of social provisions, using the SPS-5. The model fit the data well with no modifications, except a slightly higher than acceptable RMSEA (i.e. > 0.06 [40]). All factor loadings were statistically significant, salient and substantively meaningful. Fully standardized factor loadings (standard error) were 0.826 (0.003), 0.827 (0.003), 0.733 (0.004), 0.737 (0.004) and 0.754 (0.004) for items 3, 4, 5, 7 and 10, respectively. Standardized item residuals were all less than 1.96. The model fit the data well for men and women separately, again with slightly higher than acceptable RMSEA (Table 4).

Mean and prevalence estimates

Mean scores on the SPS-10 and SPS-5 were 36.04 (95% CI: 35.96–36.12) and 17.93 (95% CI: 17.88–19.97) respectively, using the CCHS 2012 MH data (Table 2). A similar pattern of means by sociodemographic characteristics was observed for both the SPS-10 and SPS-5 (Table 5). For example, younger adults aged 18–34 years had higher mean scores on both the SPS-10 and SPS-5 compared to older adults ages 65 years and older; those with less than secondary school graduation had lower mean scores than those with some postsecondary education or postsecondary graduation; and women had higher mean scores than men. When scale scores were converted to *z*-scores, there were no differences in mean scores between the SPS-5 and SPS-10 by sociodemographic group (data not shown).

The SPS-10 scale score is currently used with a cutoff of 30 to identify participants with high levels of social support;[30] a cutoff of 15 on the SPS-5 corresponds to this. Using these cutoffs for the SPS-10 and SPS-5, data from the CCHS 2012 MH, representing Canadians in 10 provinces, yielded a prevalence for high social support of 91.5% (95% CI: 90.8–92.1) using the SPS-10 and 92.7% (95% CI: 92.1–93.3) using the SPS-5 (Table 5). A similar pattern of results is maintained when the prevalence of high social support is examined by sociodemographic groups; however, the SPS-5 yields a marginally higher prevalence of "high" social support across most groups; 97% of participants were classified as "high" using both the SPS-10

TABLE 4
Results of confirmatory factor analysis of SPS-5, CCHS 2017[a], by sex

	$\chi 2$	*df*	RMSEA (95% CL)	SRMR	CFI	TLI
Total (n = 14 807)	403.8	5	0.073 (0.067, 0.080)	0.015	0.989	0.978
Males (n = 6828)	219.3	5	0.079 (0.070, 0.088)	0.017	0.987	0.974
Females (n = 7979)	185.5	5	0.067 (0.059, 0.076)	0.014	0.991	0.982

Abbreviations: CCHS, Canadian Community Health Survey; CFI, comparative fit index; CL, confidence limits; *df*, degrees of freedom; RMSEA, root mean square error of approximation; SPS-5, 5-item Social Provisions Scale; SRMR, standardized root mean square residual; TLI, Tucker Lewis index.

[a] British Columbia, Alberta, Prince Edward Island and Newfoundland and Labrador; n = 15 189.

TABLE 5
Mean scores and proportion with level of high social support using 10-item and 5-item Social Provisions Scale, CCHS 2012 MH[a], by sociodemographic groups

Characteristic	Mean (95% CL)		% (95% CL)	
	SPS-10	SPS-5	High SPS-10	High SPS-5
Total sample	36.04 (35.96, 36.12)	17.93 (17.88, 17.97)	91.47 (90.83, 92.11)	92.69 (92.08, 93.30)
Sex				
Males	35.77 (35.65, 35.89)	17.76 (17.70, 17.83)	91.20 (90.29, 92.10)	92.16 (91.22, 93.10)
Females	36.30 (36.19, 36.42)	18.09 (18.03, 18.15)	91.73 (90.91, 92.55)	93.20 (92.46, 93.94)
Age, years				
18–34	36.72 (36.59, 36.85)	18.29 (18.22, 18.36)	94.37 (93.25, 95.49)	95.30 (94.30, 96.29)
35–49	36.01 (35.83, 36.19)	17.92 (17.82, 18.01)	91.64 (90.27, 93.01)	92.39 (91.13, 93.64)
50–64	35.80 (35.63, 35.96)	17.79 (17.69, 17.88)	90.91 (89.71, 92.12)	92.06 (90.73, 93.39)
65+	35.36 (35.21, 35.51)	17.58 (17.51, 17.66)	87.54 (86.28, 88.79)	90.00 (88.85, 91.16)
Marital status				
Single/never married	35.87 (35.71, 36.03)	17.83 (17.75, 17.92)	90.11 (88.77, 91.44)	91.25 (89.99, 92.51)
Widowed/divorced/separated	34.97 (34.76, 35.17)	17.37 (17.26, 17.48)	85.58 (83.87, 87.29)	88.29 (86.79, 89.78)
Married/living common-law	36.33 (36.22, 36.44)	18.08 (18.03, 18.14)	93.27 (92.51, 94.03)	94.17 (93.40, 94.95)
Highest education level				
Less than secondary school graduation	34.81 (34.59, 35.02)	17.30 (17.19, 17.41)	84.46 (83.66, 87.25)	87.90 (86.27, 89.54)
Secondary school graduation	35.80 (35.61, 35.99)	17.82 (17.72, 17.92)	91.10 (89.57, 92.63)	93.12 (91.88, 94.37)
Some postsecondary and postsecondary graduation	36.36 (36.26, 36.46)	18.09 (18.04, 18.14)	93.14 (92.51, 93.77)	93.85 (93.18, 94.52)
Household income quintile				
Q1 (lowest quintile)	34.55 (34.34, 34.76)	17.17 (17.05, 17.28)	83.45 (81.65, 85.25)	86.25 (84.65, 87.86)
Q2	35.46 (35.27, 35.64)	17.64 (17.54, 17.74)	90.54 (89.18, 91.89)	91.64 (90.36, 92.91)
Q3	36.09 (35.92, 36.27)	17.95 (17.86, 18.04)	91.48 (89.86, 93.09)	92.70 (91.30, 94.25)
Q4	36.70 (36.54, 36.86)	18.26 (18.17, 18.34)	95.17 (94.16, 96.18)	95.97 (95.21, 96.73)
Q5 (highest quintile)	37.27 (37.11, 37.42)	18.57 (18.48, 18.65)	96.36 (95.63, 97.10)	96.52 (95.18, 97.86)
Immigrant				
Yes	35.24 (35.04, 35.45)	17.55 (17.44, 17.66)	89.35 (87.79, 90.91)	90.90 (89.48, 92.32)
No	36.32 (36.23, 36.41)	18.06 (18.01, 18.11)	92.31 (91.68, 92.94)	93.37 (92.75, 93.99)
Urban and rural status				
Urban	36.01 (35.91, 36.10)	17.91 (17.86, 17.96)	91.16 (90.43, 91.89)	92.39 (91.73, 93.06)
Rural	36.21 (36.02, 36.40)	18.02 (17.92, 18.12)	92.91 (91.56, 94.26)	94.06 (92.46, 95.66)
Primary spoken language				
English	35.97 (35.87, 36.06)	17.88 (17.83, 17.93)	91.30 (90.54, 92.05)	92.52 (91.67, 93.27)
French	36.57 (36.39, 36.75)	18.24 (18.15, 18.34)	93.12 (91.98, 94.25)	94.10 (93.17, 95.04)
Other	33.40 (32.61, 34.19)	16.62 (16.21, 17.03)	83.11 (79.95, 89.17)	85.12 (79.51, 90.74)

Abbreviations: CCHS, Canadian Community Health Survey; CL, confidence limits; MH, mental health; SPS-5, 5-item Social Provisions Scale; SPS-10, 10-item Social Provisions Scale.

[a] All 10 provinces; n = 22 486.

and the SPS-5, while the SPS-5 classifies 2% of cases as high where the SPS-10 does not.

Discussion

This paper outlines the process used to create and validate a brief version of the SPS-10, to reduce survey administration time. We used exploratory factor analysis to identify items with the highest loading from each item pair, creating a brief, five-item scale of the SPS (SPS-5). The resulting scale showed high internal consistency through Cronbach's alpha and very high correlation with the SPS-10. Indeed, the correlation of the SPS-5 with the SPS-10 exceeds that between the SPS-10 and the SPS-24, of $r = 0.93$, reported by Caron.[4] The pattern of relationships between the SPS-10 and PMH constructs such as life satisfaction, sense of belonging and self-rated mental health remained similar with the SPS-5, supporting criterion validity. Both the SPS-5 and the SPS-10 explain approximately the same amount of variance in psychological distress and PMH scores. Moreover, the SPS-5 had a lower level of missing data (6.9%) than the SPS-10 (8.3%), which may modestly improve sample size for analysis. Confirmatory factor analysis demonstrated that a single factor model of the SPS-5 fit the data well, supporting factorial validity, which was supported for men and women separately. Although the pattern of high social support by sociodemographic characteristics was maintained across the two measures, it should be noted that the prevalence of high social support is slightly higher when using the SPS-5 than when using the SPS-10. However, the threshold for "high" social support is not based on an external criterion or normative value.[30] Thus, while the reported prevalences of high social support are useful for making comparisons between populations, further research to establish more meaningful cutoffs would be useful.

Strengths and limitations

Because we reduced the SPS-10 to five items, only one item per concept is included in the measure. Previously, researchers could use the sum of two items for each of the five concepts measured by the SPS-10. With the SPS-5, only a summary score for social provisions is available and content validity may be reduced. This study does not provide support to use the single items as measures of component constructs within the SPS-5's overall construct of social provisions. The SPS-10 that we were modifying only included positively worded items, which can result in automatic responses and artifactual relationships.[42] We were unable to conduct analyses of concurrent validity with a different measure of social support, as no separate measure of social support was implemented at the same time as the SPS in the datasets we analyzed. Future research would benefit from examining the relationship between an alternate measure of social support (such as the Medical Outcomes Study Social Support Scale) and the SPS-10 and the SPS-5 to ensure that the SPS-5 maintains similar concurrent validity as the SPS-10.

The comparator outcome measures used to support construct validity were also measured through self-report survey. Thus, associations between these measures and the SPS-10 and SPS-5 may reflect shared methods variance and reporting bias. Including additional measures to further explore convergent and discriminant validity would strengthen the evidence for the SPS-5 as a measure of social provisions.

The CCHS 2017 data were used to confirm our choice of items for the SPS-5. Our data from 2017 only included residents from four provinces; this reduces the generalizability of this confirmation step. Our data are cross-sectional, and as such, we were unable to assess temporal stability. We used Cronbach's alpha to describe internal consistency as this statistic is widely reported and accepted in the literature. While Cronbach's alpha is based in classical test theory, which has limitations, classical test theory is still considered appropriate and acceptable in a wide range of applications.[43] Future research could apply item-response theory approaches to the SPS to further evaluate the functioning of each item.

Conclusion

The SPS-5 maintains good psychometric properties while supporting criterion validity. A single factor model fits the data well through confirmatory factor analysis. Reducing the number of items on the SPS-10 by half decreases respondent burden on surveys, which is particularly important as the number of topics population health surveys need to address continues to expand.

This study supports the use of the SPS-5 as a feasible and valid measure of social support on population health surveys when space for content is limited.

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Conflicts of interest

No conflicts of interest to declare.

Authors' contributions and statement

HO conceived of the project. HO and KY conducted the data analysis and wrote the paper. JL contributed to interpreting the data and critically revising the paper.

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At-a-glance

The local response to the Canadian opioid epidemic in the Kingston, Frontenac, and Lennox and Addington communities

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Abstract

Canada is facing a national opioid overdose epidemic, with deaths due to opioid overdoses continuing to rise dramatically. To that end, the opioid experiences of the Kingston, Frontenac, and Lennox and Addington communities, the regional hub for southeastern Ontario and the home of Queen's University, may provide meaningful insights. This article provides a description of recent activities to address the local opioid crisis, a rationale for their adoption and the context in which they are being undertaken.

Highlights

- In 2018, there were 200 opioid-related emergency department visits, 66 opioid-related hospitalizations, and 23 opioid-related deaths in the Kingston, Frontenac, and Lennox and Addington (KFLA) public health region. Based on an age/sex-standardized comparison, this ranked KFLA as the ninth highest for opioid-related deaths out of the 35 public health regions in Ontario.
- In response to the local opioid crisis, KFLA has upgraded or launched multiple grassroots organizations, including Street Health Centre, a community-based multidisciplinary addiction service, as well as an inpatient addiction medicine consult team.
- KFLA is rapidly developing into an academic centre of excellence for addiction medicine. The lessons learned locally will help to inform future opioid policy and curriculum design.

Introduction

Canada is facing a national opioid overdose epidemic, with deaths due to opioid overdoses continuing to rise dramatically. In 2018, there were 4460 opioid-related deaths, up from 4100 in 2017 and 3017 in 2016.[1] While British Columbia is currently experiencing the highest death rate in the country, Ontario is a close second with 1471 deaths in 2018.[1] Four out of five opioid-related deaths in Ontario were accidental, and almost two-thirds of accidental deaths occurred among individuals aged 15–45 years.[2]

Although the general epidemiology of the Canadian opioid crisis has been extensively described,[3-7] policy changes at local, provincial and national levels that effectively reduce the community opioid load are less clear. One potential avenue, however, is to learn from the specific responses taken by individual cities. The opioid experiences of the Kingston, Frontenac, and Lennox and Addington (KFLA) communities, the regional hub for southeastern Ontario and the home of Queen's University, may provide meaningful insights.

In 2018, there were 200 opioid-related emergency department visits, 66 opioid-related hospitalizations, and 23 opioid-related deaths, ranking KFLA as the ninth highest for opioid-related deaths out of the 35 Ontario public health regions based on an age/sex-standardized comparison (Figure 1). In 2018, KFLA had a significantly higher per capita rate of opioid prescriptions for pain (109.2 per 1000 population) compared to the provincial average (104.9 per 1000 population).[8]

While these statistics partially quantify the local experience in KFLA, a full discussion of the context for the opioid crisis includes factors such as the contributions of both prescribed and illicit opioids and the role of health professionals in recognizing and addressing opioid use disorder. In recent years, local physicians have been criticized for a perceived failure in their collective ethical responsibility to mitigate their contribution to the problem of prescription opioid misuse.[9] Health care provider factors, such as fear of causing addiction or physical harm, concerns that a patient is misrepresenting pain, insufficient skills in pain assessment and management, and concern for medication diversion, have been linked to lower rates of opioid prescribing.[10] Conversely, systemic factors increase opioid prescribing;

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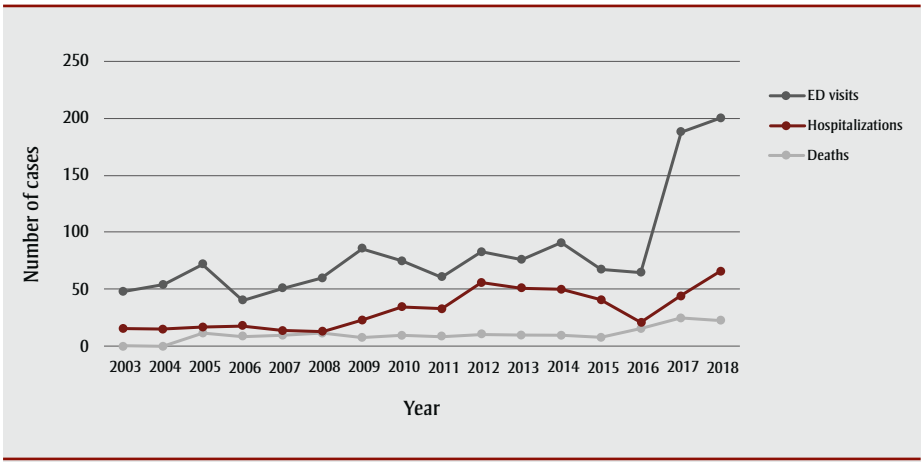
FIGURE 1
Cases of opioid-related morbidity and mortality, Kingston, Frontenac and Lennox and Addington Public Health, 2003–2018



Source: Ontario Agency for Health Protection and Promotion (Public Health Ontario). Interactive opioid tool. Toronto (ON): Queen's Printer for Ontario; 2019. Available from: https://www.publichealthontario.ca/en/data-and-analysis/substance-use/interactive-opioid-tool

Abbreviation: ED, emergency department.

these include limited access to training in pain and addiction management, lack of continuity of care and decreased availability of non-opioid analgesics.[11] Training factors, such as the academic rank and region of medical schools, have also been associated with the specific patterns of opioid prescribing by physicians working in the same specialties and clinical settings.[12]

Canada has one of the highest usage rates of prescription opioids in the world.[13] A recent national environmental scan conducted by the Association for the Faculties of Medicine of Canada in 2017 found that only one-third of medical schools met best practice standards for minimum mandatory training in pain and opioid management.[14] Specifically, none of Queen's University's residency programs outside of family medicine met best practice guidelines across undergraduate, postgraduate or continuing professional development levels.[14] The intention of the report was by no means punitive, but rather to illustrate how only a small proportion of Canadian medical schools have integrated pain courses in their curriculum (with the median number of hours spent on pain and pain management often being less than 10 hours in total across 4 years of training).[14]

Resources

In response to growing concerns, multiple grassroots efforts have taken shape in Kingston. Street Health Centre—a multidisciplinary, community-based, low-barrier resource for marginalized individuals with addiction-related needs—has enhanced their offering of addictions services.[15] Current services include primary care physicians; psychiatrists; a rapid access addiction medicine clinic that provides opioid-agonist medications like methadone and buprenorphine in a timely manner; an opioid overdose prevention site; a needle and syringe exchange program; a hepatitis and HIV treatment clinic; social work; psychology; counselling; and even an in-house pharmacy.[15]

At the hospital level, a multidisciplinary addiction medicine consult team (AMCT) consisting of physicians, social workers, case managers, residents, medical students and peers was initiated in 2017.[16] Early on, the AMCT conducted a needs assessment to identify the specific addictions concerns of inpatient physicians.[16] This needs assessment led to the current mandate of diagnosing, treating and engaging patients who are at risk for addiction-related medical concerns. To date, the AMCT has forged collaborations with Public Health Ontario, the Canadian Society for Addiction Medicine, the Canadian Centre on Substance Use and Addiction, the Canadian Research Data Centre Network, the Ontario Drug Policy Research Network, MetaPhi, Health Quality Ontario, the Centre for Addiction and Mental Health, and the Canadian Medical Association.

By partnering with these organizations, there has been a significant increase in the dissemination of opioid-relevant health policy and evidence-based recommendations categorized across the four pillars of effective opioid policy—prevention, treatment, harm reduction and enforcement-intelligence.[17,18] Several meaningful themes have emerged:

- An emphasis on documenting discussions with patients that nonpharmacological therapy and non-opioid analgesics are preferred for chronic non-cancer pain over long-term opioid therapy;[19]
- Prescribing the lowest effective dosage of opioid medication, with careful documentation and additional reassessments if the dose exceeds 50 morphine milligram equivalents (MME) per day; doses should not exceed 90 MME per day (unless there are special circumstances);[20]
- In ED settings, if opioid prescriptions must be provided—particularly to opioid-naive patients—they should be short in duration and for lower daily doses;[19]
- Developing partnerships between primary care, EDs and addictions specialists to maintain continuity of care and sharing of health information systems;
- Providing increased opportunities for physician and allied health education in opioid-related medicine;[6]
- Increasing the availability of referrals for harm reduction and addiction treatment;[21]
- Providing take-home naloxone kits and overdose prevention education liberally; and
- Documenting the risk of opioid overdose using appropriate, clinically validated evaluation tools or instruments.[22]

These guidelines seem to have been particularly well-received by busy local physicians as they are often structured algorithmically, which enables users to match a particularly challenging clinical encounter with a set of targeted best practices. For example, when a patient's total opioid dosage reaches or exceeds 50 MME/day, the guidelines describe how the risk of experiencing a fatal opioid overdose is increased by at least two-fold. In this particular example, the guidelines would then prompt the clinician to evaluate the potential for opioid tapering, to implement additional precautions, to increase the

frequency of follow-up, to dispense take-home naloxone kits and to provide additional opioid overdose prevention education to both the patient and their household members.

Challenges

Despite recent evidence suggesting that opioid stewardship programs have the potential to lower costs and improve patient outcomes and satisfaction with care,[23,24] surveys of Canadian family physicians and pharmacists have found significant gaps in their knowledge and uptake of evidence-based pain management and guidelines on safe opioid prescribing.[20,25] As well, institutional barriers have limited the implementation of best practices largely from the scarcity of physicians trained in addiction and pain management, the bottlenecking of outpatient services and a lack of dedicated educational infrastructure.[5]

The way forward

Despite these challenges, several potential strategies exist to address ongoing opioid-related problems. A persistent focus on disseminating pain and addiction management training—as well as guidelines on safe opioid prescribing—will be crucial to reducing the risk of accidental overdose and iatrogenic opioid addiction.[6] The inclusion of pain management training in medical school curricula could also mitigate some of these challenges.[26] Supporting local resources and front-line staff will play an instrumental role in providing the best care available to those who have opioid-related needs. Although opioid risk assessment tools and treatment contracts have been used to stratify patient risk and prevent opioid overuse in patients who are at risk for dependence, there is little evidence to support suggestions that they actually have an impact on opioid prescribing.[27-29]

Additional research is needed to explore the longer-term impacts of local programs on opioid culture and local resource utilization among KFLA health care providers, including physicians, allied health practitioners, front-line staff and individuals with opioid experience. For example, Queen's University launched a series of online opioid training modules that were paired with a set of pre- and post-module survey questionnaires. The effectiveness of this educational module at informing changes in prescribing attitudes via rates of opioid prescribing, will be monitored over time. Utilization of local harm reduction services—overdose prevention sites, take-home naloxone and educational interventions—is actively measured, providing the means for ongoing feedback about ways of improving resources delivery for patients and front-line staff. There also remains a great need to understand the local perspectives of patients, particularly regarding the risks of opioids, including opioid-impaired driving, the effectiveness of co-prescription of naloxone with opioid analgesics in preventing opioid overdose deaths and the impact of overdose prevention sites. Identifying—and removing—local barriers to optimal addiction care will empower Kingston-based physicians in their efforts to deliver evidence-based interventions.

Conflicts of interest

The authors have no conflicts of interest to declare.

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