Introduction

International studies indicate that inmates have higher rates of infectious diseases, chronic diseases, and psychiatric disorders relative to the general population.[1-6] Several factors could explain this finding. Inmates engage in more high-risk health behaviours such as intravenous drug use, tattooing, smoking, physical aggression, sexual activity with multiple partners, and alcohol abuse than members of the general population. Inmates' higher rates of brain injury also suggest a greater likelihood to be involved in activities that can result in physical injuries.[7] Other socio-economic factors known to be associated with poorer health are also more common among inmate populations, such as poverty, low educational attainment, substandard housing, and unemployment or underemployment.[8-9] In some cases, incarceration itself , with the increased exposure to individuals with higher rates of infection and continued risky behaviours while in correctional facilities, may contribute to generally poorer health status of inmates.

The Correctional Service of Canada (CSC) is responsible for all adult offenders receiving sentences of over two years. There is reason to be concerned that rates of chronic physical health conditions of federal inmates in Canada may be increasing because of demographic shifts in the incarcerated population. The proportion of older federal inmates has been increasing over the last twenty years; 21% of incarcerated federal inmates in 2011-12 were aged 50 years or older.[10] Older inmates generally require more health care services compared to younger inmates since they are more likely to suffer from chronic diseases and disabilities, and consequently have more specialised needs such as limitations in mobility and daily living.[11-12] Despite the increase in the proportion of inmates over the age of 50 years, the overall inmate population is younger than that

of the general Canadian population, based on the latest census which found that 15% of the general population are 65 years and over[13], compared to 3.5% in federal offenders.[10]

Another factor that could affect the overall prevalence of health conditions among federal offenders is the increase in the proportion of the federally-sentenced population that is of self-reported Aboriginal ancestry. Currently, Aboriginal inmates make up approximately 22% of the CSC incarcerated population, an increase from 18% in 2002.[10] Overall, Aboriginal populations in Canada face a higher prevalence of health conditions and a lower life expectancy.[14-16] Evidence suggests that many of the health conditions such as diabetes, obesity, and drug and alcohol abuse seen in the general population of Aboriginal Canadians are even more prevalent in Aboriginal inmate populations.[17] Other areas that affect the relatively lower life expectancy of Aboriginal offenders are the higher rates of youth suicide and injury from violence.[23]

Offender health status presents a challenge to those mandated to provide health services incarcerated populations. Investment in this area, however, can reap dividends for both infectious and chronic disease management. Identifying and treating offenders while they are in one location, have access to testing and treatment, and can be monitored for adherence, could improve the health outcomes for this high risk group, many of whom may have erratic contact with health services when they are in the community.[4] It has been noted that treating offenders in the criminal justice system is a public health opportunity to promote health in this vulnerable population.[18]

Canada is a signatory to the United Nations Basic Principles for the Treatment of Prisoners [19] that declares that all prisoners shall have access to the same health services available in their country without discrimination on the grounds of their legal status. The *Corrections and Conditional Release Act* legislates[20] CSC to deliver essential health care to Canadian federal

inmates. CSC policy requires that federal correctional institutions provide access to essential medical, public health, dental, and mental health services, and specifies the requirement for informed consent.

A comprehensive profile of the health needs of federal inmates in Canada was compiled in 2004[21], however, chronic disease estimates were tentative due to the significant limitations from the lack of reliable data sources. The report's recommendation to examine inmates' health data more systematically was the basis for the current study on the chronic health conditions of incoming federal inmates.

Methods

Setting

We conducted a population-based descriptive study on the health status of newly-admitted federal male inmates. The study examines prevalence of self-reported chronic conditions for the incoming population and disaggregates the results by age (over and under 50 years) and by self-reported Aboriginal ancestry. Participants included all consecutive male offenders admitted to CSC institutions who consented to a health assessment interview between April 1, 2012 and September 30, 2012.

Data sources

Within the first 24 hours of admission to CSC custody, all inmates are routinely seen by a nurse to attend to immediate medical needs, explain the health assessment process and seek informed consent for medical services. Within two weeks of admission, a comprehensive health assessment questionnaire administered by a CSC nurse is offered to consenting inmates. An inmate's responses are manually recorded along with the measurement of weight, height, and vital signs and filed on the medical chart.

Over a six-month period, data from all consecutive admissions across the five regions in CSC were recorded in Microsoft Office Excel spreadsheets. The prevalence rates of chronic health conditions and lifestyle risk factors were analysed for the newly-admitted federal inmate population, and comparisons were made by Aboriginal ancestry and two age bands (i.e., under and over 50 years), as well as to the general population of Canada. Given that a specific population of male inmates was examined rather than a sampling, results were interpreted where practical differences existed and insight into the magnitude of these differences was assessed using effect sizes (i.e., Cramer's Phi; denoted φ_c). Cramer's Phi ranges from 0 to 1.0 and is interpreted as such that values between .10 and .20 are considered to be a weak association, values between 0.20 and 0.40 are a moderate association, values between .40 and .60 are a strong association, and values above 0.60 indicate a very strong association.[22] Thus, when using a population rather than a sample, as is the case in this study, the effect size allows for the interpretation of the meaningfulness of existing differences.

Results

Health data were collected from 2,273 offenders, representing 96% of the new admissions for male offenders over this period. The average age of participating offenders was 35.5 years (*SD* = 12.0; Range = 18.2 – 82.4), and 21.9% (*n* = 496) self-identified as being of Aboriginal ancestry. The average age of Aboriginal offenders was 32.8 years while the average age for non-Aboriginal offenders was 36.3 years.

The proportion of inmates with self-reported chronic health conditions compared to the general population of Canada is presented in Table 1. Over one-third of incoming offenders reported having sustained head injuries resulting in loss of consciousness. Back pain, asthma,

hepatitis C virus (HCV), hypertension, and arthritis were the other conditions most commonly reported. Lifestyle risk factors may contribute to some of these conditions (see Table 3). For instance, 53% of inmates reported drinking alcohol, 21% reported a history of injection drug use, and 65% were overweight or obese as measured by their body mass index (BMI).

Insert Table 1

Table 2 presents the rates of self-reported chronic health conditions for male inmates younger than, and older than, age 50 years. This age analysis indicates that rates of many of the chronic health conditions were substantially higher in the group over 50 years, especially those affecting the cardiovascular system. Notably, there were meaningful differences whereby inmates over 50 years of age had higher rates of hypertension, high cholesterol, angina, arthritis, diabetes, prostate problems, and history of cancer than their younger counterparts.

Table 2 also presents the prevalence of chronic health conditions of newly-admitted inmates by self-reported Aboriginal ancestry. With the exception of head injury and hepatitis C virus being much higher among Aboriginal inmates than non-Aboriginal inmates, there were no meaningful differences in rates of chronic health conditions between Aboriginal and non-Aboriginal inmates. This unexpected result may be due in part to the higher proportion of Aboriginal inmates under the age of 50 years compared to the non-Aboriginal inmates (94.4% versus 84.6% respectively, $\varphi_c = .12$).

Lifestyle issues may contribute to Aboriginal inmates' higher rates of head injury and hepatitis C virus infection. Table 4 presents the prevalence of lifestyle risk factors that may be related to health outcomes by Aboriginal ancestry. Reported rates of alcohol use were higher in Aboriginal inmates than among non-Aboriginal inmates.

Insert Table 2

Insert Table 3

Interpretation

Head injury, back pain, asthma, and hepatitis C virus were the most prevalent chronic health conditions reported by incoming federally-sentenced Canadian male inmates in 2012. Including head injury, the most common conditions affected the musculoskeletal system, with inmates frequently reporting back pain and arthritis. It is difficult to compare the inmates' rate of head injury to that of the general population since the prevalence of head injury is unknown in Canada, but is thought to disproportionately affect males aged 15- to 24-years-old.[23]

Compared to non-Aboriginal inmates, Aboriginal inmates had similar rates of many conditions but reported a hepatitis C virus infection prevalence rate twice that of non-Aboriginal inmates. Older inmates (over 50 years) reported generally higher rates of most physical health conditions than younger inmates. There were not strong differences, however, between older and younger inmates on the most frequently reported conditions (i.e., head injury, asthma, and hepatitis C virus). In the present study, the average age of Aboriginal inmates was younger and they had a lower representation among inmates aged 50 years and older than non-Aboriginal inmates, which is consistent with CSC admission data in 2011-2012.[10] This may explain why we did not find poorer health status between Aboriginal and non-Aboriginal newly-admitted inmates for many chronic conditions.

The rates of self-reported chronic health conditions in this Canadian federal inmate population do not appear to be higher than those reported for incarcerated offenders in most

other countries. Citing the Bureau of Justice Statistics, Fazel and Baillargeon[1] found that reported rates of HIV in jails and prisons in the United States (US) was around 1.5% and estimates of HCV prevalence from state prison systems in the US ranged from 23% to 34%. Reported rates of hypertension and asthma are higher in the US prisons than in this Canadian inmate population, and rates of diabetes appear to be comparable. An inmate survey among Australian inmates in New South Wales prisons using a similar methodology found much higher rates of self-reported health conditions than in our Canadian inmate population.[3] Rates of most chronic conditions, with the exception of asthma and blood-borne viruses, are not more prevalent among federal male offenders than among the adult Canadian male population according to the 2011 Canadian Community Health Survey (CCHS)[24]; indeed, rates for hypertension and arthritis are lower.

The majority of incoming inmates participated in the medical assessment at intake in this 6-month period in 2012, so our estimates of self-reported chronic health conditions are likely to be representative of the newly-incarcerated federal population. Further research could clarify the extent to which chronic health conditions among inmates are linked to lifestyle factors and, therefore, may be expected to be higher in certain subpopulations of offenders. For example, further analysis points to elevated rates of head injury and HIV and HCV infection among male offenders who report histories of injection drug use (data not shown). Aboriginal inmates report higher rates of substance abuse, particularly injection drug use, and their rates of head injury and blood-borne viruses are also higher. It should be noted that the presence of chronic health conditions for specific groups of Aboriginal inmates may differ; this study did not disaggregate Aboriginal inmates by First Nations, Métis, or Inuit ancestry. Based on recent Statistics Canada reports compiling the results of the CCHS[15,24], there is evidence that the higher rates of diabetes relative to the general Canadian population applies to First Nations people, less so to the

Métis.[15,16]

Limitations

A limitation of the present study is that height and weight were the only objectively measured health indicators; all other data were provided through the inmates' self-report. This is the same methodology that the CCHS Household Questionnaire component has used to collect its data on the Canadian population. However, incarcerated populations are known to under-utilize health services in the community[4]; some chronic health conditions may not be known to the individual until they are diagnosed while in prison (e.g., hypertension). Incoming inmates are younger on average than those who are already incarcerated; therefore rates of self-reported chronic health conditions based on their responses could under-estimate the prevalence among the total incarcerated population. The most frequently reported chronic health condition (i.e., head injury) is difficult to compare to the general population due to a surveillance gap in Canada.[25]

A substantial percentage of Canadian inmates also reported having a blood-borne virus, but it is unknown whether the self-reported rates represent reliable estimates of the true prevalence of HIV and HCV infections on admission. CSC offers HIV and HCV screening and testing to all consenting inmates at intake and upon request throughout incarceration. The latest CSC infectious disease surveillance report for the 2007-2008 period reported a 58% uptake of testing for HIV at intake and found that 1.7% of these inmates were laboratory-confirmed positive.[26] It is not clear, however, whether those who agreed to the testing are representative of the newly-admitted population, and therefore, it cannot be determined whether self-report data over- or under-estimate the true prevalence of blood-borne viruses. It should be noted that, both a previous CSC inmate survey[27], as well as routine infectious disease surveillance data, concur that

virtually all inmates were infected prior to their current incarceration.[28]

Conclusion

This study provides the first systematic estimate of the prevalence of chronic health conditions among incoming federal inmates in Canada. Newly-admitted federal inmates reported engaging in lifestyle risk factors such as drinking and injection drug use at rates higher than reported for the Canadian public[29], but with the exceptions of HCV, back pain and asthma, the prevalence of many chronic conditions were similar to or less than that of men in the Canadian general population. Furthermore, the rates of most conditions are lower than those reported in American and Australian prison populations. Some inmate subgroups may require a higher concentration of health service resources (e.g., Aboriginal, older inmates, and those with a history of intravenous drug use). The research provides a benchmark from which trends in prevalence of chronic health conditions in Canada's penitentiaries can be monitored over time, and thus help to inform the design of primary and preventative health programs. CSC continues to address infectious diseases by education, harm reduction policies, and offering testing and treatment to infected inmates. Correctional programs are designed to reduce injection drug and alcohol abuse and are proven to reduce criminal recidivism for a diverse range of offenders.[30] Future research should investigate whether these programs also have a beneficial effect in reducing related chronic health conditions among federal offenders.

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Table 1

Self-reported Chronic Health Conditions among Newly-admitted Federal Male Inmates (2012) and the Canadian Male Population

	Newly-admitted Federal Male Inmates	
Health Condition	%	*n*
Any health condition	46.7	1,062
Central nervous system		
Head injury	34.1	738
Seizures	4.3	92
Spinal injury	2.6	56
Musculoskeletal system		
Back pain	19.3	411
Arthritis	8.3	177
Osteoporosis	0.4	9
Respiratory system		
Asthma	14.7	318
Bronchitis	2.9	63
Other pulmonary disease	1.8	38
Cardiovascular system		
Hypertension	8.5	184
High cholesterol	5.3	114
Heart attack	2.0	44
Arrhythmia	1.6	34
Angina	1.4	30
Stroke	0.7	16
Blood-borne viruses		
HIV/AIDS[†]	1.3	27
Hepatitis C	9.4	191
Endocrine system		
Diabetes	4.2	88
Gastro intestinal system		
Ulcers	3.2	69
Reproductive system		
Prostate problems	2.8	60
Any cancer history	1.8	39

Note: N varies by conditions due to missing data.
[†] HIV/AIDS = human immunodeficiency virus / acquired immunodeficiency syndrome.

Table 2

Chronic Health Conditions among Federal Male Offenders by Age Group and Aboriginal Ancestry

	Age Group					Aboriginal Ancestry				
	<50 years (n = 1,970)		50+ years (n = 302)			Aboriginal (n = 496)		Non-Aboriginal (n = 1,774)		
Health Condition	%	n	%	n	φ_c	%	n	%	n	φ_c
Central nervous system										
Head injury	34.6	648	30.7	90	.03	43.0	193	31.7	543	**.10**
Seizures	4.0	75	5.8	17	.03	5.1	23	4.0	68	.02
Spinal injury	2.5	47	3.1	9	.01	2.9	13	2.5	43	.01
Musculoskeletal system										
Arthritis	6.6	122	19.2	55	**.16**	8.1	36	8.3	140	.003
Osteoporosis	0.3	6	1.1	3	.04	0.5	2	0.4	7	.002
Back pain	18.0	332	27.5	79	.08	16.4	73	20.0	338	.04
Respiratory system										
Asthma	15.1	284	11.6	34	.03	12.7	57	15.2	261	.03
Bronchitis	2.9	55	2.7	8	.004	3.1	14	2.9	49	.01
Other pulmonary disease	1.2	23	5.1	15	**.10**	0.7	3	2.0	35	.04
Cardiovascular system										
Hypertension	6.1	114	23.8	70	**.22**	7.8	35	8.7	149	.01
Heart attack	1.3	24	6.8	20	**.13**	2.0	9	2.0	35	.001
High cholesterol	3.4	64	17.1	50	**.21**	2.4	11	6.0	103	.06
Angina	0.6	12	6.1	18	**.16**	1.1	5	1.5	25	.01
Stroke	0.4	8	2.7	8	.09	0.4	2	0.8	14	.02
Arrhythmia	1.4	26	2.7	8	.04	1.3	6	1.6	28	.01
Blood-borne virus										
HIV/AIDS[†]	1.3	23	1.5	4	.005	2.4	10	1.1	17	.05
Hepatitis C	8.8	156	12.7	35	.05	15.5	66	7.7	124	**.11**
Endocrine system										
Diabetes	2.9	54	11.9	34	**.15**	3.6	16	4.3	72	.01
Gastro intestinal system										
Ulcers	3.0	56	4.4	13	.03	2.7	12	3.3	57	.02
Reproductive system										
Prostate problems	1.4	26	11.8	34	**.21**	2.5	11	2.9	49	.01
Any cancer history	1.0	19	6.8	20	**.15**	0.9	4	2.0	35	.04

Note: N varies by conditions due to missing data. Numbers that are bolded represent meaningful effect sizes for interpretation.
*BMI = Body Mass Index. [†]HIV/AIDS = human immunodeficiency virus / acquired immunodeficiency syndrome.

Table 3

Lifestyle Risk Factors Related to Health Outcomes for Newly-admitted Federal Male Offenders, Overall and by Aboriginal Ancestry, (2012)

	Total (N = 2,273)		Aboriginal (n = 496)		Non-Aboriginal (n = 1,774)		
Lifestyle Risk Factor	%	*n*	%	*n*	%	*n*	φ_c
Drinks alcohol	52.6	1,049	62.1	257	49.8	786	**.10**
Ever inject drugs	20.8	415	27.6	114	18.9	299	.09
Cigarette smoker	21.1	453	19.7	89	21.5	364	.02
No physical exercise	21.1	407	15.1	61	22.7	346	.08
Overweight (BMI* 25 – 29.9) or obese (BMI 30+)	64.5	1,164	67.9	243	63.6	919	.04

Note: N varies by conditions due to missing data. Numbers that are bolded represent meaningful effect sizes for interpretation (i.e., at least a weak association).
*BMI = Body Mass Index.