Social determinants of health among Canadian inmates

Lynn A. Stewart, Amanda Nolan, Jennie Thompson and Jenelle Power

Abstract

Purpose – International studies indicate that offenders have higher rates of infectious diseases, chronic diseases, and physical disorders relative to the general population. Although social determinants of health have been found to affect the mental health of a population, less information is available regarding the impact of social determinants on physical health, especially among offenders. The purpose of this paper is to examine the relationship between social determinants and the physical health status of federal Canadian offenders.

Design/methodology/approach – The study included all men admitted to federal institutions between 1 April 2012 and 30 September 2012 (n = 2,273) who consented to the intake health assessment. Logistic regression analyses were used to explore whether age group, Aboriginal ancestry, and each of the individual social determinants significantly predicted a variety of health conditions.

Findings – The majority of men reported having a physical health condition and had experienced social determinants associated with adverse health outcomes, especially men of Aboriginal ancestry. Two social determinants factors in particular were consistently related to the health of offenders, a history of childhood abuse, and the use of social assistance.

Research limitations/implications – The study is limited to the use of self-report data. Additionally, the measures of social determinants of health were indicators taken from assessments that provided only rough estimates of the constructs rather than from established measures.

Originality/value – A better understanding of how these factors affect offenders can inform strategies to address correctional health issues and reduce the impact of chronic conditions through targeted correctional education and intervention programmes.

Keywords Prisoner health, Poverty, Child abuse, Social determinants of health, Correctional health, Offender’s health status

Paper type Research paper

Introduction

There is a growing body of evidence to suggest that the availability of good quality health services is only one factor among many affecting the overall health of a population (e.g. Raphael, 2009). For example, the average age of a population affects the prevalence rates of many age-related chronic health conditions such as arthritis, cardiovascular disease, central nervous system problems, and cancer (Denton and Spencer, 2010). Considering the latest census data have indicated that 15 per cent of the Canadian aging population are currently over 65 (Statistics Canada, 2011), with this percentage expecting to rise to 24 per cent by 2030 (Denton and Spencer, 2010), it is crucial for Canada to plan the accommodation of health needs of its aging population.

It has also been noted that social and environmental factors are as important as commonly considered behaviours such as smoking, excessive alcohol use, poor dieting, and lack of exercise in influencing the health of individuals (Raphael, 2009). These factors are referred to as social determinants of health, which the World Health Organization (WHO) (2008) broadly defines as “the conditions in which people are born, grow, live, work and age […] shaped by the distribution of money, power and resources at global, national and local levels”. Specifically in Canada, a consensus meeting convened in 2002 developed the following social determinants of...
The impact of social determinants on health has been well established for several decades. Within wealthy countries, influential studies have demonstrated the strong impact of social status and early life experiences on later health outcomes. The seminal Whitehall study (Marmot et al., 1978), for example, conducted long-term longitudinal research on British civil servants, and demonstrated that the prevalence of cardiovascular disease and mortality rates were strongly, and incrementally, associated with employment grade (classification level). This pattern persisted for cardiovascular disease even when controlling for other risk factors such as obesity, smoking, reduced leisure time, lower levels of physical activity, higher prevalence of underlying illness, higher blood pressure, and shorter height. The researchers concluded that there was an inverse association between social class, as assessed by grade of employment, and mortality from a wide range of diseases. Other studies, including a longitudinal study of graduates from a Wisconsin high school (Marks, 1996), and a Canadian study of 2,000 male respondents to the Canadian Health Survey (Hay, 1988) all drew a similar conclusion that there is a social gradient in self-reported health status. Social inequality is associated not only with material deprivation, but also with loss of a sense of autonomy, status, and greater psychosocial stress (Marmot and Bell, 2010; Mullainathan and Shafir, 2013; Wilkinson and Pickett, 2006). Such conditions are linked to family discord and child abuse (Eckenrode et al., 2014), factors that are, in turn, associated with later physical and mental health problems among adults with this early history (Gilbert et al., 2009; Norman et al., 2012). Recent large-scale longitudinal projects like the Adverse Childhood Experiences Study have produced many peer reviewed articles illustrating the later physical and health consequences for adults exposed to childhood maltreatment and neglect (Child Welfare Information Gateway, 2013). The life course perspective has accumulated an influential body of research that has illustrated the complicated interaction of social context as well as biological, behavioural, and psychosocial processes that operate across an individual’s lifespan to influence health outcomes (Kuh et al., 2003).

There is evidence that within wealthy countries, the health of indigenous peoples may be particularly marked by the impact of social inequalities (Gracey and King, 2009). Higher rates of injuries, non-communicable disease, and violence contribute to the difference in life expectancies among the Australian Aboriginal and Torres Strait Islander peoples where the life expectancy is 56 years for men compared to 77 years for all Australian men (Australian Bureau of Statistics, 2005). The Aboriginal people of Canada (i.e. First Nations, Métis, and Inuit) also have lower life expectancies than Canadians in general, and report poorer overall health, despite being, on average, younger (Gionet and Roshanafshar, 2013; Reading and Wien, 2009).

Many health studies indicate that offenders have high rates of many chronic health conditions; in particular, rates of infectious diseases, brain injury, and psychiatric disorders are elevated relative to the general population (Fazel and Baillargeon, 2011; Harmon, 2012; McIsaac et al., 2016; Stewart et al., 2015; Wilper et al., 2009; Zakaria et al., 2010). Several factors may contribute to these elevated rates. For instance, offenders engage in more high-risk health behaviours such as intravenous drug use (IDU), tattooing, smoking, physical aggression, multiple sexual partners, and alcohol abuse than members of the general population (e.g. Tolou-Shams et al., 2010). In addition, many of the above noted socio-economic factors known to be associated with poorer health including poverty, low educational attainment, substandard housing, and unemployment or underemployment are also more common among offender populations (Hamilton and Bhatti, 1996; Public Health Agency of Canada, 2003; WHO, 2008). Furthermore, in some cases, incarceration itself, with the stressors of prison life, increased exposure to individuals with higher rates of infection, and continued risky behaviours while in correctional facilities, may contribute to generally poorer health of offenders (Awofeso, 2010; de Viggiani, 2006; Patterson, 2013).

A recent study examined the self-reported physical health status of incoming federally sentenced offenders to the Correctional Service of Canada (CSC; Stewart et al., 2015). Although offenders
did not report having chronic health problems at rates as high as those cited in American
(Fazel and Baillargeon, 2011) and Australian (Indig et al., 2010) research with correctional
samples, the study did confirm earlier research on infectious diseases within CSC (Zakaria et al.,
2010) that had found that men and women in Canada’s federal correctional system had higher
rates of blood borne viruses than the general adult population. Preliminary analyses examining
which subgroups of offenders within this population had poorer health indicated that men over
50 years of age reported higher rates of diabetes, prostate problems, cardiovascular problems,
and arthritis than those under 50 years; Aboriginal men reported higher rates of blood borne
viruses and head injury than non-Aboriginal men, and men with histories of IDU had higher rates
of blood borne viruses than those who did not report IDU (Stewart et al., 2015).

While the literature indicates that social determinants associated with marginalised social status is
related to poorer health outcomes, and that offenders tend to experience marginalised social
statuses and higher rate of many physical health conditions, the relationship between social
determinants and physical health within correctional samples has not been explored empirically.
In fact, no research which examined whether the social determinants of health were useful
concepts in predicting physical health condition among offenders was identified.

The present study

To address the gap in the literature regarding the influence of social determinants of health on
offender populations, the relationship between adverse social determinants and physical health
status of federally sentenced Canadian men at admission to a correctional facility was examined.
While it is known that social determinants also affect the mental health of a population
(WHO, 2008), the present research focussed only on social-economic factors that may have
contributed to higher rates of poor physical health among the men examined. It was anticipated
that a better understanding of these types of factors would help inform strategies to address
offenders’ physical health issues, and, potentially, reduce the progression and impact of chronic
health conditions through targeted correctional education and intervention programmes.
The findings could also be used to contribute to the development of broader social programmes
to address potential root causes that lead to criminal behaviours and poorer health.

Method

Participants

The CSC is the national correctional system responsible for administering prison sentences of
two years or more. As mandated, CSC collects offender’s health information and under the
Privacy Act paragraph 8(2)(j), CSC is permitted to compile health data for statistical use without
additional offender consent as long as the information is used in a manner consistent with the
purpose for which the data were collected (for more detail see www.csc-scc.gc.ca/info-
source/007007-0004-eng.shtml). Given this, CSC’s research is not submitted to an ethics
review board but rather CSC fulfils these obligations through an internal formal process which
adheres to the Tri-Council requirements for informed, voluntary consent, and guarantees
confidentiality for all research participants. All results are aggregated and no cells under 5 are
reported for purposes of anonymity.

Participants included all men admitted to CSC institutions between 1 April 2012 and
30 September 2012 (n = 2,273) who consented to the routine intake health assessment.
The average age of participating men was 36 years (SD = 12; range = 18-82) and 22 per cent
(n = 496) self-identified as being of Aboriginal ancestry (i.e. First Nations, Métis, and Inuit). Data on
health conditions of women offenders were collected and have been reported elsewhere
(Nolan and Stewart, 2017), but were not included in these analyses because the sample size was
not adequate to run regression procedures.

Measures/Material

Physical health conditions. CSC uses a series of forms to assess and record the
health information of inmates at intake. This assessment includes self-reported information
on medical issues requiring immediate attention, current or past health conditions, and infectious disease screening.

Data were collected from all incoming male offenders over a six-month period in 2012 and the prevalence rates of health conditions were then aggregated. The prevalence of having any health condition was calculated and individual health conditions were collapsed according to their respective system or health issue. Any health condition was coded based on the total number of offenders regardless of missing data, whereas individual health conditions were coded so that percentages excluded missing values. The following were examined: central nervous system related (i.e. head injury, seizure activity, and spinal injury); cardiovascular system related (i.e. high blood pressure, arrhythmia, high cholesterol, angina, heart attack, and stroke); respiratory system related (i.e. asthma, bronchitis, and pulmonary disease); musculoskeletal system related (i.e. back pain, arthritis, walking difficulty, and osteoporosis); and blood borne viruses (i.e. HIV/AIDS and hepatitis C). It was not possible to examine physical health conditions relating to the gastrointestinal system (i.e. ulcers) and the endocrine system (i.e. diabetes) due to small number (i.e. < 5 per cent of offenders reported having these health conditions).

International research based on findings from longitudinal studies have demonstrated that self-perceived health provides a reliable assessment as good as, or better than, measures such as functional ability, chronic diseases and psychological well-being and may also be more stable than physicians’ ratings (Shields and Shooshtari, 2001).

Demographics. Participants’ age and Aboriginal ancestry were extracted from CSC’s Offender Management System (OMS), a computerised file system maintained to manage information on all federally sentenced offenders. For those offenders who identified as being of Aboriginal ancestry, subgroup membership was also examined by First Nations and Métis ancestry. There were too few offenders to disaggregate by Inuit ancestry.

Social determinants of health. Information used to assess social determinants was extracted from the Dynamic Factor Identification and Analysis-Revised (Brown and Motiuk, 2005; Stewart et al., 2017) in OMS. We selected and categorised several indicators according to six broad social determinant factors: early life (i.e. relations with parental figure were negative during childhood, abused during childhood, and witnessed family violence during childhood); education (i.e. has less than grade 10 or equivalent); employment (i.e. job history has been unstable); income (i.e. financial instability has used social assistance); housing (i.e. unstable accommodation); and all social supports limited (i.e. prosocial support from family, friends, and an intimate partner is limited). We did not have reliable information to allow analysis of the following social determinants noted in the literature: working conditions, food insecurity, and health services.

Procedure/Analytic approach

Logistic regression analyses were used to explore whether age group and Aboriginal ancestry significantly predicted each of the individual social determinants and the individual physical health conditions. Logistic regression allows the examination of the relationship between a set of predictor variables and a dichotomous outcome using odds ratios. Odds ratios greater than 1 reflect an increase in the likelihood of a given outcome in the presence of a predictor variable, whereas odds ratios less than 1 reflect the decrease in the likelihood of that outcome (Tabachnick and Fidell, 2007). Generally, when using logistic regression, it is recommended to have at least ten events per variable (Tabachnick and Fidell, 2007); however, there is also research which suggests that this may be too conservative and that five to nine events per variable are sufficient but in this case, the results should be considered more cautiously than in cases with a larger number of events (Vittinghoff and McCulloch, 2007). All logistic regression modelling conducted and reported here met these rules of thumb (i.e. lowest number of events examined was 223 with no more than 13 variables being considered). Logistic regression models were built to determine which of the social determinant factors best predicted each of the individual health conditions. Models were constructed so that age group and Aboriginal ancestry were entered first, and then each of the significant social determinant factors were entered based on the largest odds ratio in predicting each physical health condition individually. If a social determinant factor was not found to be significant (at the p < 0.05 level) with the inclusion of the
other covariates, it was excluded from the model. Finally, additional analyses were conducted to assess if differences existed between men of First Nations and Métis descent; however, given the small number of Métis men, it was often not possible to reliably examine differences between the groups.

Results

Prevalence of physical health conditions

The prevalence of the physical health conditions among incoming offenders is presented in Table I. Overall, 61 per cent of offenders self-reported having at least one health condition at admission. Examining the presence of a physical health condition within a particular system, just over one-third of the offenders reported having a condition affecting their central nervous system which includes head injury, seizure activity, and spinal injury, with head injury being the most common of these three.

Given the evidence in the literature that both age and Aboriginal ancestry are related to health status, we examined the impact of age and Aboriginal ancestry on whether physical health conditions were present among male offenders. Results revealed that age was related to the reporting of three health conditions in particular: older men (over 50 years) were more likely than their younger counterparts to report having any health condition, cardiovascular health issues, and musculoskeletal conditions. Compared to non-Aboriginal men, men of Aboriginal ancestry were more likely to report having health conditions affecting their central nervous system and to have blood borne viruses.

Prevalence of social determinants factors

The prevalence of the social determinants factors is presented in Table II. The overwhelming majority of offenders had adverse social determinants factors. Over two-thirds of offenders had an unstable job history (69 per cent), and over half experienced financial instability (61 per cent), had used social assistance (56 per cent), and had an educational attainment of less than grade 10 (56 per cent). Notably, those of Aboriginal ancestry were more likely than their non-Aboriginal counterparts to have reported each of the social determinants of health. Compared to Métis men, First Nations men were more likely to report social determinants associated with poorer health outcomes. In particular, First Nations ancestry were more likely than men of Métis descent to report social determinants of health relating to early life, education, and the use of social assistance.

<table>
<thead>
<tr>
<th>Physical health condition</th>
<th>n = 2,273 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any health condition</td>
<td>61.06</td>
</tr>
<tr>
<td>Central nervous system</td>
<td>36.37</td>
</tr>
<tr>
<td>Musculoskeletal system</td>
<td>25.18</td>
</tr>
<tr>
<td>Respiratory system</td>
<td>17.42</td>
</tr>
<tr>
<td>Cardiovascular system</td>
<td>14.25</td>
</tr>
<tr>
<td>Blood borne viruses</td>
<td>9.84</td>
</tr>
</tbody>
</table>

Notes: With the exception of any health condition, which was calculated using the total n, the presence of each health condition was calculated using only the complete data (i.e. those who had missing information were excluded). aIncludes issues of the central nervous system (head injury, seizure activity, and spinal injury), issues of the cardiovascular system (high blood pressure, arrhythmia, high cholesterol, angina, heart attack, and stroke), issues of the respiratory system (asthma, bronchitis, and pulmonary disease), issues of the musculoskeletal system (back pain, arthritis, walking difficulty, and osteoporosis), blood borne viruses (HIV/AIDS, HVC), diabetes, ulcers, prostate problems, and any history of cancer; bIncludes head injury, seizure activity, and spinal injury; cIncludes back pain, arthritis, walking difficulty, and osteoporosis; dIncludes asthma, bronchitis, and pulmonary disease; eIncludes high blood pressure, arrhythmia, high cholesterol, angina, heart attack, and stroke; fIncludes HIV/AIDS and HCV
Relationship between the social determinants of health and physical health conditions

Initially, the relationships between each of the social determinants of health and each of the physical conditions were examined. As expected, many of the social determinants were related to the physical health conditions even when controlling for the effects of age and Aboriginal ancestry. Given this finding, multivariate analyses were conducted to assess which of the social determinants factors best predicted each of the physical health conditions. These analyses are presented in Table III.

Overall, two of the social determinants – abused during childhood and used social assistance – were associated with the most physical health conditions. For example, men who reported being abused during childhood were almost twice as likely to report a blood borne illness compared to those who had not being abused. Interestingly, neither unstable accommodation nor limited social support was related to any of the physical health conditions when the other social determinants factors were simultaneously considered in the models. Thus, their predictive ability in this population is limited. The remaining social determinants of health were often only associated with the prediction of one of the physical health conditions. For example, men who reported having a negative relationship with their parents were almost 40 per cent more likely to report having an issue related to their respiratory system.

It should be noted that the presence of social determinants did not completely mediate the relationship between age, Aboriginal ancestry, and having a physical health condition. For example, offenders who were 50 years of age and over were 4.5 times more likely to have cardiovascular problems and twice as likely to have musculoskeletal problems compared to those who were under 50 years of age. Furthermore, the relationship between Aboriginal ancestry and having a central nervous condition also remained significant after the inclusion of the social determinants of health. More specifically, Aboriginal men were still 33 per cent more likely than non-Aboriginal men to report having a health issue affecting their central nervous system, suggesting that other factors beyond those measured in this study play a role in explaining higher rates of conditions affecting the central nervous system among Aboriginal men.

Discussion

The purpose of this research was to examine the relationship between social determinants of health factors and physical health conditions of male offenders being admitted to custody. Overall, even within a population of highly disadvantaged men, two key factors, a history of...
childhood abuse and use of social assistance, consistently stood out as being associated with poorer health. The latter may be considered a broad proxy for poverty. In general, results demonstrated that when controlling for age, Aboriginal ancestry, and other social determinants factors, a history of being abused as a child and adult use of social assistance remained predictive of having any health condition, as well as several specific health conditions. These two broad factors may subsume the other factors included in our models related to childhood adversity (i.e. witnessed family violence, relations with parental figure were negative) and economic hardship (e.g. financial instability, unstable employment history, and unstable accommodation). Low education level and financial instability were not found to be associated with poorer health; indeed, those with lower education had lower rates of cardiovascular disease. This may be related to using the threshold of aged 50 to dichotomise men by age group. Very young men in CSC may have low education status and less financial stability, but are unlikely to have cardiovascular problems.

The literature on the health impact of child adversity and abuse is well established. Felitti et al. (1998), for example, reported a strong graded relationship between the breadth of exposure to abuse or household dysfunction during childhood and risk factors for several of the leading causes of death in adults. Furthermore, Delima and Vimpani (2011) documented the structural and functional changes to the brain associated with child maltreatment. These,

<table>
<thead>
<tr>
<th>Table III</th>
<th>Logistic regression models predicting physical health problems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model and covariates</strong></td>
<td><strong>Odds ratio</strong></td>
</tr>
<tr>
<td><strong>Central nervous system</strong></td>
<td></td>
</tr>
<tr>
<td>Aboriginal ancestry: Aboriginal vs non-Aboriginal</td>
<td>1.33*</td>
</tr>
<tr>
<td>Age: 50+ vs &lt; 50</td>
<td>0.87ns</td>
</tr>
<tr>
<td>Abused during childhood</td>
<td>1.59***</td>
</tr>
<tr>
<td>Model $\chi^2$ (df)</td>
<td>34.76 (3)***</td>
</tr>
<tr>
<td><strong>Cardiovascular system</strong></td>
<td></td>
</tr>
<tr>
<td>Aboriginal ancestry: Aboriginal vs non-Aboriginal</td>
<td>1.03ns</td>
</tr>
<tr>
<td>Age: 50+ vs &lt; 50</td>
<td>4.53***</td>
</tr>
<tr>
<td>Has less than grade 10 or equivalent</td>
<td>0.67**</td>
</tr>
<tr>
<td>Financial instability</td>
<td>0.71*</td>
</tr>
<tr>
<td>Model $\chi^2$ (df)</td>
<td>110.81 (4)***</td>
</tr>
<tr>
<td><strong>Respiratory system</strong></td>
<td></td>
</tr>
<tr>
<td>Aboriginal ancestry: Aboriginal vs non-Aboriginal</td>
<td>0.70*</td>
</tr>
<tr>
<td>Age: 50+ vs &lt; 50</td>
<td>1.02ns</td>
</tr>
<tr>
<td>Job history has been unstable</td>
<td>1.58**</td>
</tr>
<tr>
<td>Relations with parental figure were negative during childhood</td>
<td>1.38*</td>
</tr>
<tr>
<td>Model $\chi^2$ (df)</td>
<td>22.41 (4)***</td>
</tr>
<tr>
<td><strong>Musculoskeletal system</strong></td>
<td></td>
</tr>
<tr>
<td>Aboriginal ancestry: Aboriginal vs non-Aboriginal</td>
<td>0.84ns</td>
</tr>
<tr>
<td>Age: 50+ vs &lt; 50</td>
<td>1.95***</td>
</tr>
<tr>
<td>Used social assistance</td>
<td>1.39**</td>
</tr>
<tr>
<td>Model $\chi^2$ (df)</td>
<td>29.33 (3)***</td>
</tr>
<tr>
<td><strong>Blood borne viruses</strong></td>
<td></td>
</tr>
<tr>
<td>Aboriginal ancestry: Aboriginal vs non-Aboriginal</td>
<td>1.27ns</td>
</tr>
<tr>
<td>Age: 50+ vs &lt; 50</td>
<td>1.90**</td>
</tr>
<tr>
<td>Has used social assistance</td>
<td>2.47***</td>
</tr>
<tr>
<td>Financial instability</td>
<td>2.79***</td>
</tr>
<tr>
<td>Abused during childhood</td>
<td>1.75**</td>
</tr>
<tr>
<td>Witnessed family violence during childhood</td>
<td>1.69**</td>
</tr>
<tr>
<td>Model $\chi^2$ (df)</td>
<td>101.69 (6)***</td>
</tr>
</tbody>
</table>

**Notes:** CI, confidence interval. aIncludes head injury, seizure activity, and spinal injury; bincludes high blood pressure, arrhythmia, high cholesterol, angina, heart attack, and stroke; cincludes asthma, bronchitis, and pulmonary disease; dincludes back pain, arthritis, walking difficulty, and osteoporosis; eincludes HIV/AIDS and hepatitis C virus. *p < 0.05; **p < 0.01; ***p < 0.001
in turn, were related to psychological and neurological problems, but also with poor physical health – possibly due to prolonged stress reactions. The authors noted that given evidence for neural plasticity, early identification that would allow the implementation of interventions could reduce future negative outcomes. Canada’s relatively high rates of child poverty compared to other OECD nations (placing it 20th of 30 wealthy developed nations) and poor access to regulated childcare across the country are factors limiting the quality of early childhood development, particularly for more marginalised groups (Mikkonen and Raphael, 2010). Some researchers have concluded that the importance of social programmes to improve the early life of children is so critical that a comprehensive early childhood education programme would be the single best means of improving Canadian health outcomes (Evans et al., 2007).

There is also a well-established literature on the impact of economic deprivation on health as assessed both by the development index of a nation, with poorer nations having lower life expectancies and higher rates of infectious and chronic diseases (Leon and Walt, 2001; Marmot, 2005), and also across social strata within developed nations (Raphael, 2002). Relative income has recently been shown to affect the actual morphology of children’s brains; the impact was most pronounced for children who were most disadvantaged (Noble et al., 2015). In Canada, Wilkins and colleagues (Wilkins, 2007; Wilkins et al., 1989) have noted that individuals living within the poorest 20 per cent of neighbourhoods were more likely to die of cancers, heart disease, diabetes, and respiratory diseases among other health problems. Raphael (2009) pointed out that the argument that poor people bring on health problems through lifestyle choices such as higher rates of smoking, substance abuse, and poor nutritional habits is not supported by research that has demonstrated that health differences remain even after these lifestyle factors are considered. Some of the most disadvantaged groups such as indigenous people of Canada have sharply lower indices of overall health (King, 2010). An understanding of how poverty and child abuse affect the health of individuals and the implementation of policies and social programmes that effectively address these risk factors should be part of an overall national health promotion strategy (Evans et al., 2007). As Marmot (2005) observed, “If the major determinants of health are social, so must be the remedies” (p. 1103).

Our results also revealed that offenders of Aboriginal ancestry were significantly more likely than non-Aboriginal offenders to have experienced all of the social determinants associated with poorer health. Nonetheless, when predicting each of the physical health conditions using age, Aboriginal ancestry, and social determinants factors as covariates, differences between Aboriginal and non-Aboriginal men remained only with regard to health conditions of the central nervous system. This category of health condition includes head and spinal injury and seizure activity. Further research could examine whether these conditions may be linked to lifestyle factors not represented among the social determinants. For example, there is evidence that head injury is present at much higher rates among offenders (McIsaac et al., 2016) and is associated with a history of substance abuse (Center for Disease Control and Prevention, n.d.). Rates of substance misuse are more frequent among federal offenders of Aboriginal ancestry than non-Aboriginal offenders (Mullins and Farrell-MacDonald, 2012).

**Limitations and conclusion**

The study is limited to the use of self-report data only to assess the prevalence of chronic health conditions. However, it is important to note that findings from longitudinal studies have demonstrated that self-perceived health is predictive of chronic disease incidence and mortality even when more objective health measures are taken into account (Shields and Shooshtari, 2001).

We recognise that the research described provided only crude estimates of the social determinants constructs. The measures were derived from parole officers’ assessments based on adult offenders’ responses to structured interviews at the time of their entry into federal custody. Although some indicators reflect offenders’ early aversive childhood experiences, others describe more recent adult lifestyle factors. The direction of the relationship between poor health and exposure to social determinants in adulthood such as
poverty and unstable accommodation, therefore, cannot be clarified with our methodology. It may be that the effects of early childhood abuse, poverty, and unstable accommodation set up the stressful circumstances that contribute to psychological deterioration and drug use thereby heightening the risk for contracting blood borne viruses and neurological injury. As described in the life course literature, it is very likely that the biological and social factors contributing to poor health among offenders are multi-determined and the numerous risk factors in the lives of many offenders interact and cumulatively influence health status in adult life. A more in-depth study would be provided by a life course examination of the long-term effects on health of physical or social exposures to these deleterious factors during the lifespan (Kuh et al., 2003).

Nevertheless, even given its shortcomings, this study was able to confirm that findings from the literature pointing to the impact of economic disadvantage and early childhood abuse on the health of individuals apply to the health status of adult Canadian male offenders. Although the Aboriginal men in this sample had higher rates of social determinants factors than non-Aboriginal men, when these factors were controlled, few differences in health status were noted between the two groups.

Our results point to particularly poor health outcomes for intravenous drug users. Intervening early to disrupt the pathways or chains of risk that lead towards serious substance abuse would reduce the probability of poor health and other negative outcomes like criminality. Within the adult criminal justice system, many of the offenders will have already developed these behavioural patterns by the time they are first incarcerated. Policies that provide for effective substance abuse treatment to reduce the harm of use, or the chance of relapse after release, could contribute to better social and health outcomes for these men. Furthermore, Aboriginal groups require policies and funding that enable them to address factors like poverty and family violence that put them at increased risk for poor health (Gracey and King, 2009). Evidence-based social and intervention programmes that prevent and address child abuse and raise the quality of life for those who are economically and socially disadvantaged are critical elements of health promotion efforts that would contribute to reducing health inequalities among vulnerable populations. The correctional environment provides a public health opportunity to promote health through addressing factors associated with serious health consequences.

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