Socioeconomic and Demographic Determinants of Mental Health across Canadian Communities

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Citation

Abstract

Background Many factors contribute to health. This study uses community level data to estimate the impact of socioeconomic and demographic factors as well as physical health on community mental health outcomes. Method Multiple regression analysis was used to estimate the impact of determinants on community mental health outcomes for men and women using community level data from up to 113 health regions covering almost the entire population in Canada. Results Study findings indicate that communities with higher proportions of aboriginal people have greater mental illness hospitalization. Minorities have poorer perceived mental health but better objective measures of less mental illness hospitalization and self injury hospitalization. Also, communities with higher proportion of low income persons show poorer results for many objective mental health outcomes. Higher prevalence of lone parents in a community is associated with greater perceived life stress and greater mental illness hospitalizations for men. Poor physical health is also a predictor of poor mental health. Conclusion Improving the living conditions of aboriginal people and other low income people could reduce mental illness hospitalizations in a community, helping minorities the majority of whom are immigrants with their settlements in their host communities could improve perceived mental health and life stress, and helping lone parents who are men with counseling services to better cope with their situations could reduce their perceived life stress and mental illness hospitalization. Also, improving the physical health of individuals across communities could have a positive impact on mental health outcomes across communities.

INTRODUCTION

Population health has a multifaceted nature and the impact on health of the broader societal context in which populations live is well documented (1-6). The emerging paradigm of social determinants of health captures various approaches to health that recognize the role of contextual social, economic, and political factors as fundamental determinants underlying the health of individuals and populations (7-11).

There is vast literature on the socioeconomic determinants of physical health or illness while not as much research on the socioeconomic determinants of mental health. There are several factors for this discrepancy. First, mental health is often vaguely conceptualized or not well-defined. There have been evolving conceptual processes over time (12). Different societies or communities may have their own conceptions of mental health or consider different thresholds to identify a mental health problem. Mental health is also variously defined for different stages of life from infancy to old age (13). Second, mental health is not easily measurable.

The self-reported indications of mental health in response to survey instruments may not be accurate as individuals have an inherent tendency to avoid being identified as mentally ill with its consequent social stigmatization. Third, there is limited reliable data on mental health determinants, especially those related to social or communal factors. Fourth, a relative lack of interest at the policy level and therefore an inadequate commitment of resources to mental health would be another factor for insufficient research on the societal determinants of mental health (14, 15).

To underscore the importance of mental health in the overall health and wellbeing of populations around the world, the World Health Organization (WHO) released a comprehensive report on mental health promotion (16). The contributors to this extensive report identified a vast array of individual and social/communal determinants of mental health. Among the individual determinants, sense of coherence, self-esteem, sense of control, and optimism are emphasized. At the communal level, social support and social capital in its various conceptions are emphasized. In

Canada, a report on the incidence and prevalence of major mental illnesses in Canada was released by Health Canada to raise the profile of mental illness among various stakeholders. This report indicated that 20% of Canadians will experience a mental illness during their lifetime (17). More recently, the Mental Health Commission of Canada (MHCC) raised awareness about mental health problems and the critical need to prevent such problems and promote mental health and wellbeing of all Canadians. Their report emphasized the engagement of mentally ill in their own recovery, the role of families in promoting and providing mental care, the equitable and timely access to appropriate and effective services, the inclusion of mentally ill as valued members of the society, and use of best evidence from multiple sources of knowledge to inform actions (18). The broad literature on this topic also identifies a wider set of socioeconomic determinants of general health and mental health that includes early life, education, employment and working conditions, food security, housing, income and social exclusion (8, 9, 15, 19).

Most research on mental health relies on individual data collected from surveys in which various scaled instruments are used to capture the subjective mental health of the respondents. An example of such research in Canada uses data from the 1994-1995 cycle of the National Population Health Survey in Canada (20). Individual surveys use instruments that capture various individual attributes and allow the introduction of new and refined concepts of mental health or illness. However, they can miss the social environment in which these attributes are nurtured and framed. To account for social determinants and broader communal factors of mental health, researchers increasingly use multilevel analyses to measure the separate impact of both individual and communal determinants of health. Typically, they use individual data from sample surveys along with some aggregate indicator that represents the socioeconomic conditions of the entire neighborhoods or communities in which those individuals reside (21-27). The results from such studies, as far as physical health is concerned, predominantly indicate that social environments (contextual factors) do contribute to health outcomes beyond individual level socioeconomic status (compositional factors), but such contribution is usually modest (21, 25, 26, 28). Similar studies in Canada, however, find no effect to modest effect of these factors on individual health outcomes (22, 23, 29-31). Such divergent findings could be attributed to differences in methodology, data, time frame, and selection of variables among other things. One could argue

that some of the indeterminacy may be related to the fact that individual data is used in conjunction with aggregate data. It is often hard, if not impossible, to relate a communal feature captured by some aggregate measure to the health and wellbeing of individuals living in that community, as the identification of the pathways through which communal factors affect individual outcomes is not easy.

Recent work on this front using concept mapping qualitative methods looks promising. A study on a relatively small sample of men and women from low and non-low socioeconomic positions in Toronto, Canada uses the concept mapping method (32, 33). It asks participants to relate six distinct clusters of neighbourhood characteristics to each other and identify the importance of each for good mental wellbeing using diagrams. The clusters are formed out of over a hundred neighbourhood characteristics. The study finds notable differences in cluster importance by participant socioeconomic position and gender.

This study does not follow this concept mapping qualitative approach as this study's approach is quantitative. An alternative approach that this study proposes would be to study community level factors (captured by aggregate data) along with aggregate (average) health data from these communities. This approach avoids the problem of agreement between aggregate and individual level data (34) and the potential underestimation of community level influences when individual socioeconomic characteristic are included (26, 35).

Therefore, this study uses aggregate data from over 100 health regions (communities) in Canada to examine the potential determinants of mental health in these communities. This study contributes to the literature in several ways. Aside from being one of a few studies that uses only aggregate data at the community level, it examines several measures of perceived and objective mental health outcomes. Moreover, it uses data from all communities across Canada that covers almost the entire population in the country. As such it is not subject to the limitation of sample selection and related biases that arise from using survey data from a select number of communities. Also, this study considers health regions as communities. Health regions are self-contained areas where the resident populations receive their healthcare and related services. This would be closer to the concept of community than census tracts or other arbitrary area divisions. The mental health outcomes used in this study are age standardized for each community, which implies that age has been somehow controlled for. This

study also provides separate estimates for mental health outcomes for both men and women. Doing so, should minimize the bias associated with not controlling for individual demographic factors. This study aims to investigate the role of socioeconomic and demographic factors measured at the community level for population mental health outcomes across Canadian communities.

METHOD

SAMPLE AND SETTING

This study used aggregate data on Health Indicators from Statistics Canada and the Canadian Institute for Health Information (36) on a maximum of 121 Health Regions across Canada from the time period 2006 – 2009, the narrowest window of time in which data for the greatest number of health regions are available. The most recent data on demographic and socio-economic determinants are those for 2006 as they are reported every 5 years. Data on mental health outcomes belong to 2007-2008 or 2009 depending on the specific measure of mental health. Some of the health regions are large and comprise a variety of communities. Yet, some are small and more resembling of a community. Lack of available data has constrained the choice of variables.

MEASURES

DEMOGRAPHIC MEASURES

For demographic determinants this study uses the prevalence of aboriginal (ABORIG) and minorities (MINORITY) in the communities. This study also uses the proportion of rural population in each community (RURAL) to capture any spatial or geographical attributes of communities that might bear on mental health.

SOCIOECONOMIC MEASURES

The prevalence of low income persons (LOW-INC) (15 years and older) is used as an economic determinant. It is defined on the basis of low income cut-offs (LICOs) which represent levels of income where people spend disproportionate amounts of money for food, shelter and clothing. LICOs are based on family and community size and are updated to account for changes in the Consumer Price Index (36). The ratio of post secondary education graduates to high school graduates (EDU-RATIO) is used as a proxy for communal educational attainment. Lone parenthood prevalence (LONE-P) is also used to capture the effect of family environment on mental health. It is defined for both men and women. Prevalence of the sense of

belonging to community (BELONG) is used to represent social cohesion as appropriate for men and women. It measures the proportion of people in a community that indicated "somewhat strong to very strong" sense of belonging to their community.

PHYSICAL HEALTH

In addition to the above demographic and socioeconomic measures, perceived poor or fair physical health (PH) is also used as a determinant of mental health.

MENTAL HEALTH MEASURES

Six measures of mental health are examined. The prevalence of perceived poor or fair mental health (PMH) and the prevalence of those who perceived a lot of life stress (PLS) are used as two subjective measures. The prevalence of mood disorders as diagnosed by health professionals (MOOD), hospitalization rate for mental illness per 100,000 population (MI-HOSP), mental illness patient-days per 10,000 population (MI-PD), and self-injured hospitalization rates per 100,000 population (SELFINJ) are considered as four objective measures. All mental health measures are for people aged 12 years or more separately measured for men and women.

STATISTICAL ANALYSES

Six separate multivariate linear regression analyses were conducted for the mental health outcomes. This was done separately for men and women. Predictors include the demographic variables of ABORIG, MINORITY and RURAL; the socioeconomic variables of LOW-INC, EDU-RATIO, LONE-P and BELONG and the additional variable of PH. The p-values are based on White's heteroskedasticity-consistent standard errors and are two-sided. EViews 7.0 statistical software was used for estimations.

RESULTS

Table 1 shows analyses for perceived mental health. For men, increased MINORITY and PH were significantly associated with increased perceived mental health while decreased EDU-RATIO was significantly associated with increased perceived mental health. No other variables were statistically significant. For women, a similar significant pattern was seen for MINORITY and PH. Also, ABORIG was significantly associated with perceived mental health. No other variables were statistically significant.

Figure 1

Table 1: Estimates of the Impacts of Determinants on Perceived Mental Health (PMH)

Determinants	Men			Women		
	Beta	SE	p-value	Beta	SE	p-value
Constant	7.989	2.973	0.008	5.146	3.808	0.180
ABORIG	0.004	0.022	0.867	0.052	0.025	0.039
MINORITY	0.039	0.011	0.001	0.029	0.013	0.028
LONE-P	-0.031	0.325	0.924	-0.012	0.090	0.891
EDU-RATIO	-0.077	0.037	0.037	-2.920	3.728	0.435
BELONG	0.017	0.017	0.334	0.007	0.022	0.762
LOW-INC	-0.019	0.016	0.240	-0.024	0.026	0.359
PH	0.167	0.069	0.017	0.229	0.083	0.007
RURAL	-0.016	0.009	0.065	-0.015	0.010	0.141
n		106			108	
R^2		0.288			0.301	

Note: In this table Beta indicates the estimated coefficient and SE stands for the standard errors of Beta. ABORIG stands for aboriginal, LONE-P for lone parent, EDU-RATIO for educational ratio, BELONG for sense of belonging, LOW-INC for low income and PH for poor physical health. Also, n indicates the number of observations (communities) and R^2 shows the goodness-of-fit.

Table 2 shows analyses for perceived life stress (PLS). For men, increased MINORITY and LONE-P were significantly associated with increased perceived life stress while decreased ABORIG, BELONG and LOW-INC were significantly associated with increased perceived life stress. No other variables were statistically significant. For women, increased EDU-RATIO and PH was associated with increased perceived life stress, while decreased BELONG and RURAL were associated with increased perceived life stress. No other variables were statistically significant.

Figure 2

Table 2: Estimates of the Impacts of Determinants on Perceived Life Stress (PLS)

Determinants	Men			Women		
	Beta	SE	p-value	Beta	SE	p-value
Constant	25.45	6.955	<0.001	23.300	8.113	0.005
ABORIG	-0.184	0.046	<0.001	0.010	0.049	0.842
MINORITY	0.078	0.032	0.015	-0.032	0.051	0.534
LONE-P	1.531	0.670	0.024	-0.026	0.200	0.896
EDU-RATIO	0134	0.079	0.093	0.210	0.077	0.008
BELONG	-0.226	0.048	<0.001	-0.199	0.052	<0.001
LOW-INC	-0.100	0.041	0.017	-0.097	0.060	0.109
PH	-0.037	0.110	0.733	0.327	0.137	0.019
RURAL	0.030	0.018	0.111	-0.057	0.023	0.015
N		112			113	
R^2		0.494			0.349	

Note: In this table Beta indicates the estimated coefficient and SE stands for the standard errors of Beta. ABORIG stands for aboriginal, LONE-P for lone parent, EDU-RATIO for educational ratio, BELONG for sense of belonging, LOW-INC for low income and PH for poor physical health. Also, n indicates the number of observations (communities) and R^2 shows the goodness-of-fit.

Table 3 shows analyses for mood disorders. For men, increased PH was significantly associated with increased mood disorders while decreased EDU-RATIO and RURAL were significantly associated with increased mood disorders. No other variables were statistically significant. For women, like men, increased PH was significantly associated with increased mood disorders and decreased RURAL was significantly associated with mood disorders. Also,

decreased LOW-INC was significantly associated with mood disorders. No other variables were statistically significant.

Figure 3

Table 3: Estimates of the Impacts of Determinants on Mood Disorders (MOOD)

Determinants	Men			Women		
	Beta	SE	p-value	Beta	SE	p-value
Constant	13.43	3.121	<0.001	7.222	5.587	0.199
ABORIG	-0.041	0.022	0.071	-0.043	0.029	0.141
MINORITY	-0.015	0.018	0.399	-0.013	0.026	0.623
LONE-P	0.058	0.341	0.865	0.210	0.124	0.092
EDU-RATIO	-0.113	0.031	<0.001	-0.024	0.061	0.693
BELONG	-0.009	0.024	0.712	0.038	0.036	0.297
LOW-INC	-0.022	0.021	0.308	-0.120	0.039	0.003
PH	0.149	0.046	0.002	0.384	0.092	<0.001
RURAL	-0.019	0.009	0.046	-0.035	0.016	0.030
n		110			111	
R^2		0.327			0.267	

Note: In this table Beta indicates the estimated coefficient and SE stands for the standard errors of Beta. ABORIG stands for aboriginal, LONE-P for lone parent, EDU-RATIO for educational ratio, BELONG for sense of belonging, LOW-INC for low income and PH for poor physical health. Also, n indicates the number of observations (communities) and R^2 shows the goodness-of-fit.

Table 4 shows analyses for mental illness hospitalization. For men, increased ABORIG, LONE-P, BELONG, LOW-INC and PH were significantly associated with increased mental illness hospitalization while decreased MINORITY was significantly associated with increased mental illness hospitalization. For women, only increased ABORIG and LOW-INC were significantly associated with increased mental illness hospitalization whereas decreased MINORITY as well as EDU-RATIO were significantly associated with increased mental illness hospitalization. No other variables were statistically significant.

Figure 4

Table 4: Estimates of the Impacts of Determinants on Mental Illness Hospitalization (MI - HOSP)

Determinants	Men			Women		
	Beta	SE	p-value	Beta	SE	p-value
Constant	22.511	599.769	0.970	1104.823	604.796	0.070
ABORIG	8.353	3.005	0.006	16.673	2.806	<0.001
MINORITY	-5.308	1.956	0.008	-7.235	2.042	0.001
LONE-P	92.821	44.926	0.041	-18.992	16.091	0.241
EDU-RATIO	-11.120	6.945	0.112	-15.278	6.391	0.019
BELONG	7.545	3.404	0.029	2.582	3.972	0.517
LOW-INC	7.808	3.399	0.024	11.324	3.676	0.003
PH	19.812	9.653	0.043	9.232	9.579	0.337
RURAL	-2.166	1.595	0.178	-2.626	1.885	0.167
n		108			108	
R^2		0.432			0.378	

Note: In this table Beta indicates the estimated coefficient and SE stands for the standard errors of Beta. ABORIG stands for aboriginal, LONE-P for lone parent, EDU-RATIO for educational ratio, BELONG for sense of belonging, LOW-INC for low income and PH for poor physical health. Also, n indicates the number of observations (communities) and R^2 shows the goodness-of-fit.

Table 5 shows analyses for mental illness patient days. For men, increased LOW-INC was significantly associated with increased mental illness patient days while decreased MINORITY was significantly associated with increased

mental illness patient days. For women, a similar pattern emerged for LOW-INC and MINORITY. Also, increased ABORIG was significantly associated with increased mental illness patient days. No other variables were statistically significant.

Figure 5

Table 5: Estimates of the Impacts of Determinants on Mental Illness Patient Days (MI - PD)

Determinants	Men			Women		
	Beta	SE	p-value	Beta	SE	p-value
Constant	-1439	732.937	0.052	738.9	713.053	0.303
ABORIG	1.020	4.906	0.836	10.494	4.367	0.018
MINORITY	-12.047	3.556	0.001	-12.871	2.449	<0.001
LONE-P	165.351	87.618	0.062	-4.284	22.227	0.848
EDU-RATIO	4.712	6.503	0.470	-7.435	8.183	0.366
BELONG	10.836	5.521	0.052	-2.662	4.605	0.564
LOW-INC	16.288	4.331	<0.001	18.400	4.583	<0.001
PH	6.264	8.942	0.485	5.660	13.652	0.679
RURAL	-3.476	2.229	0.122	-2.973	2.320	0.203
n	108			108		
R²	0.366			0.278		

Note: In this table Beta indicates the estimated coefficient and SE stands for the standard errors of Beta. ABORIG stands for aboriginal, LONE-P for lone parent, EDU-RATIO for educational ratio, BELONG for sense of belonging, LOW-INC for low income and PH for poor physical health. Also, n indicates the number of observations (communities) and R² shows the goodness-of-fit.

Table 6 shows analyses for self injury hospitalization. For men, increased LONE-P, BELONG and PH were significantly associated with increased self injury hospitalization while decreased MINORITY and RURAL were significantly associated with increased self injury hospitalization. For women, increased ABORIG and BELONG were significantly associated with increased self injury hospitalization while decreased MINORITY was significantly associated with decreased self injury hospitalization. No other variables were statistically significant.

Figure 6

Table 6: Estimates of the Impacts of Determinants on Self Injury Hospitalization (SELFINJ)

Determinants	Men			Women		
	Beta	SE	p-value	Beta	SE	p-value
Constant	-23.624	68.505	0.730	-78.035	107.696	0.472
ABORIG	0.352	0.495	0.480	3.065	0.957	0.002
MINORITY	-0.696	0.218	0.002	-1.403	0.377	<0.001
LONE-P	20.278	5.839	0.001	-2.815	2.533	0.269
EDU-RATIO	-0.530	0.728	0.468	0.515	1.016	0.613
BELONG	0.820	0.412	0.049	1.418	0.543	0.010
LOW-INC	-0.341	0.325	0.298	0.740	0.652	0.259
PH	3.078	1.020	0.003	4.329	2.392	0.073
RURAL	-0.428	0.196	0.032	-0.662	0.369	0.076
n	97			106		
R²	0.434			0.377		

Note: In this table Beta indicates the estimated coefficient and SE stands for the standard errors of Beta. ABORIG stands for aboriginal, LONE-P for lone parent, EDU-RATIO for educational ratio, BELONG for sense of belonging, LOW-INC for low income and PH for poor physical health. Also, n indicates the number of observations (communities) and R² shows the goodness-of-fit.

DISCUSSION

To make sense of the associations between various determinants and mental health outcomes as reported in

Tables 1-6, the results are summarized in Table 7. A positive sign (+) indicates a statistically significant (at 5%) association with the expected sign. A dash mark (—) indicates no statistically significant association, and a question mark (?) indicates statistically significant association with the unexpected sign. The addition of (n) indicates a negative significant association. M and W refer to men and women, respectively.

Figure 7

Table 7: Summary of the Associations Between Determinants and Mental Health Outcomes

	PMH		PLS		MOOD		MI-HOSP		MI-PD		SELFINJ	
	M	W	M	W	M	W	M	W	M	W	M	W
ABORIG	—	+	?(n)	—	—	—	+	+	—	+	—	+
MINORITY	+	+	+	—	—	—	+(n)	+(n)	+(n)	+(n)	+(n)	+(n)
LONE-P	—	—	+	—	—	—	+	—	—	+	+	—
EDU-RATIO	+(n)	—	—	?	+(n)	—	—	+(n)	—	—	—	—
BELONG	—	—	+(n)	+(n)	—	—	?	—	—	—	?	?
LOW-INC	—	—	?(n)	—	—	?(n)	+	+	+	+	—	—
PH	—	—	+	+	+	+	+	—	—	—	+	—
RURAL	—	—	—	+(n)	+(n)	+(n)	—	—	—	—	+(n)	—

Note: In this table ABORIG stands for aboriginal, LONE-P for lone parent, EDU-RATIO for educational ratio, BELONG for sense of belonging, LOW-INC for low income, PH for poor physical health, PMH for perceived mental health, PLS for perceived life stress, MOOD for mood disorders, MI-HOSP for mental illness hospitalization, MI-PD for mental illness patient days and SELFINJ for self injury hospitalization.

Looking at the results across various mental health outcomes, this study finds that greater proportions of aboriginals and mostly lesser proportions of minorities in a community are the two demographic determinants with higher number of plausible associations with mental health outcomes. Among the socioeconomic determinants, only the prevalence of low income persons in a community generally shows greater associations with mental health outcomes. Of the remaining determinants or predictors, physical health status is often associated with mental health outcomes. Looking at the results across various determinants for different mental health outcome, one could see considerable variation. It is difficult to explain such variation given the aggregate nature of the underlying data. A possible source of variation may be the fact that two of the mental health outcomes are subjective whereas the remaining four are objective. Perceptions of mental health and expressions of life stress are different in terms of accuracy and intensity of a mental health condition than actual hospitalizations for often more severe mental health issues. Also, variation in the number of observations used for the estimation of various mental health outcomes might have played a role in such variations.

Perceived poor or fair mental health (PMH) in a community is associated with the proportion of minorities which in Canada are often immigrants for both men and women. Given the difficulties of adjusting to and settling in a new environment, it is plausible to find higher rates of PMH among the immigrants, especially those who have recently

arrived. This is in contrast to findings by some other Canadian studies that report a "healthy immigrant effect" – the observation that recent immigrants are healthier than their native counterparts (37 – 42). Different data sources, mental health measures and levels of analysis (individual vs. aggregate) may account for this contrast. PMH for women is found to be positively associated with the proportion of aboriginal people in a community, which is consistent with the existing evidence on higher prevalence of perceived mental health issues among aboriginals in Canada (43). However, this study did not find this result for PMH among men, a discrepancy that is challenging to explain. PMH for men is negatively associated with educational achievement, a result consistent with most studies that have used individual education status as a correlate for mental health and a few others that have considered community level education (44, 45). This study did not find the same result for PMH among women, which is again an anomaly that is challenging to explain. Finally, physical health status is a significant predictor of PMH for both men and women. Such results are in agreement with findings of previous studies (20, 39).

Perceived life stress (PLS) is significantly associated with the sense of belonging in a community for both men and women. Communities with higher proportions of people who have a somewhat strong sense of belonging are found to have lower proportions of PLS. This finding confirms recurrent evidence from studies using individual data (41, 42). Interestingly, communities with higher proportions of aboriginals appear to have lower proportions of PLS among men. As was the case with PMH, the proportion of minorities is positively associated with increased PLS among men. This is a plausible result as minorities or immigrants, especially those recently arrived, go through a lot of stress in the process of assimilation in their host communities. Since this study did not find a similar result for PLS among women, one can suggest that a disproportionate burden of settlement falls on men as the traditional heads of families. Also, PLS among men is significantly associated with lone parenthood. Higher proportion of lone parents of men in a community is associated with higher prevalence of PLS in that community. There is no association between PLS among women and women lone parenthood, which would suggest that perhaps lone men are not as capable as lone women in coping with stress in their lives. A study by the Canadian Institute for Health Information finds that married men are more likely to improve their distress than married women (44). Although

the mental health outcome (distress) in that study is different from the current study, it indicates the advantage of married status for men as compared to women, or by implication the disadvantage of lone men as compared to lone women such as was indicated in the current study. Another interesting result is the negative association between the proportion of rural population and the prevalence of PLS for women in a community. Perhaps life in rural communities is less hectic and stressful than in urban communities, at least for women.

Higher prevalence of poor physical health in a community is significantly associated with higher prevalence of mood disorder (MOOD) for both men and women in that community. This echoes the findings for PMH and PLS for women and is in line with the findings of previous studies that report increased odds of psychological distress for those with poor self-rated physical health (20, 39, 45). As well, higher proportions of rural population in a community indicated a lower prevalence of MOOD. However, the magnitude of the association was very small. Communities with higher educational attainment appear to have lower prevalence of MOOD for men. Although numerous studies report better physical and mental health outcomes for individuals with higher educational attainment, very few studies consider educational attainment at the community level. The current study findings have similar findings to two such studies. First, a recent study (46) finds higher community level education to be associated with lower mortality for men but not women. Second, another study (47) finds better physical but not mental health due to higher neighbourhood-level education. The latter study does not provide separate results for men and women. The current study found that communities with greater prevalence of low income people show higher prevalence of MOOD for women. This is similar to two Canadian studies but differs from a third Canadian study. It is similar to a study on metropolitan areas in Canada that found higher chances of depression among low income individuals with a greater chance for women than men (40). It is also similar to a another Canadian study that found increased prevalence of depression for low income individuals with higher rates for women than men (48) However, it differs from a third Canadian study that found increased chance of distress among low income households with a greater chance for men than women (45).

Mental illness hospitalization rates (MI-HOSP) are significantly associated with proportion of aboriginal and minorities in a community but in opposite directions.

Communities with higher proportion of aboriginals have higher MI-HOSP. Whereas communities with higher proportion of minorities have lower MI-HOSP. Comparing the MINORITY results with those for PMH and PLS imply that, in general, communities with higher proportions of minorities show lower prevalence of objective mental health (such as MI-HOSP) but higher prevalence of perceived mental health (such as PLS or PMH). The lower prevalence of MI-HOSP in communities with higher proportion of minorities might be taken as evidence supporting the "healthy immigrant effect" (37-42). However it must be pointed out that immigrants are not a homogenous group as they vary by ethnic and cultural background as well as their legal status in the host country. Moreover, it has been argued that it is not clear whether this effect is the result of a greater resilience in the immigrants or a difference in how they understand and conceptualize mental health problems (49). The prevalence of low income in a community is positively associated with MI-HOSP for both men and women. This finding indicates the role of economic deprivation for a community's acute mental health outcome. A recent study in rural Germany finds that higher average income in an area is associated with lower rates of hospital admission rates for schizophrenia and affective disorders (50). Although average income masks the distribution of income, higher average income tends to reduce the prevalence of low income in a community. As such, the finding of the study in Germany is consistent with the current finding for the Canadian communities. Once again this study shows some gender differential results for the lone parenthood and education attainment in a community. As was the case for perceived life stress, increased prevalence of lone parenthood is associated with increased mental illness hospitalization for men but not women, which once again underscores the difficulty of lone parenthood for men. As for the educational attainment, these findings indicate that lower educational attainment in a community is associated with higher prevalence of mental illness hospitalization for women but not men. It is hard to explain this differential result given the aggregate nature of the data. More surprising was the positive association between sense of belonging and MI-HOSP for men for which there appears no convincing explanation. It should be noted, however, that hospitalization rates are not necessarily a measure of the higher prevalence of mental health problems in a community. It could well be that a community has greater mental health facilities and therefore accommodates a greater number of people with mental health problems.

There were more or less similar results for mental illness patient days (MI-PD) as for MI-HOSP. This is not unexpected as patient days data are constructed from hospitalization rates data where the duration of hospital stay – an indication of the severity of mental illness – is built into patient days data.

Finally, the results for self injury hospitalization (SELFINJ) show that higher proportion of aboriginal population in a community is associated with higher rates of SELFINJ for women. Such finding confirms previous findings by a study in Canada where much higher rates of hospitalization for self injury are reported for communities with higher proportions of aboriginal people, although the study does not provide separate estimates for men and women (43). It is also consistent with the finding of a study in Australia where higher hospitalization rates for self injury are reported among Aboriginal women (51). Higher proportion of minorities is associated with lower rates of SELFINJ for both men and women. Similar findings are reported in a study in the state of North Carolina in the United States (52). However, the suicide rates among immigrants or foreign-born minorities in some European countries are reported to be higher than non-immigrants (53, 54). The anomaly of a positive association between higher SELFINJ rates and the proportion of people who express a sense of belonging to their community is present for both men and women. Such results based on aggregate community data is in contrast with results from individual data in Canada that find sense of belonging as a contributing factor to better mental health (20, 42). The positive association of higher proportion of lone parenthood for men and SELFINJ in a community once again reinforces the finding that lone men have difficulty coping while this does not occur among lone women. SELFINJ rates are found to be lower in communities with higher proportions of rural population for men while no relationship was seen for women. As there are mixed patterns with the current study findings for other mental health outcomes, the role of rural population in community mental health outcomes may be challenging to interpret.

LIMITATIONS

This study has a number of limitations. First, as noted earlier, limitations of available indicators or measures in the data did not allow consideration of a fuller set of community characteristics that could potentially account for cross-community differences. For example, the communities (health regions) across Canada are different in size and the availability of mental healthcare services, which may affect

their mental health outcomes. Future investigation of such differences would be a worthwhile effort for planning the distribution of mental health resources. Second, when data are aggregated for an entire region they are washed out of their variations and nuances that explain much of the variations in observed individual mental health outcomes. In other words, finding strong associations between aggregated (averaged) data is often less likely. As such, any statistically significant associations that remain after aggregation might be considered as enduring and noticeable. Third, data from different years were used for this cross-sectional analysis. Although the time window (2006-2009) is relatively narrow for any major change to have happened, the full contemporaneous associations are not captured if data do not belong to the same year. Fourth, to best capture changes in community mental health outcomes over time and to be able to see the direction of causation from health determinants to mental health outcomes requires a longitudinal study of communities, which may be feasible as more data becomes available. Future research of a longitudinal study of mental health outcomes in communities using as many cycles of community mental health surveys as available would shed more light on the dynamics of mental health outcomes over time.

CONCLUSIONS

Using aggregate data at the community level, this study finds plausible associations between subjective and objective measures of community mental health outcomes on the one hand, and a number of demographic and socioeconomic factors on the other. Proportions of aboriginal people and minorities are strongly associated with either objective or subjective mental health outcomes. Prevalence of lone parents among men is associated with poorer mental health outcomes for a few outcomes. Of the socioeconomic factors, in many analyses the proportion of low income people in a community is associated with poorer community mental health. Higher educational attainment is associated with better mental health some analyses, but the association is not consistent across genders. Also, prevalence of community poor physical health is consistently associated with poor mental health for self-reported outcomes but not for objective outcomes. The study findings imply that policies aimed at improving the living conditions and incomes of aboriginal people could improve their mental health outcomes for mental illness hospitalization. The study also suggests that helping minorities, the majority of whom are immigrants, in smoother settlement in their host communities could improve their perceived mental health

and life stress, and providing appropriate counseling services to men who are lone parents for coping with their stressful situations could perhaps reduce perceived life stress and mental illness hospitalization for men. Also, helping low income individuals in communities through job creation and investments in their educational attainment could improve the overall health as well as mental health of communities across Canada. As more data and refined measures become available, more specific determinants of mental health could be identified that would guide the formulation of more specific polices for promoting mental health in Canada.

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