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Using Community-Level Mental Health Surveillance Data to Examine the Relationship of Depression Prevalence to Social Determinants of Health and Access to Mental Health Services

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ABSTRACT

The effect of social determinants of health on depression prevalence and treatment access was examined using community survey and administrative data on mental health service users in the Calgary Health Region (CHR). Consistent with national prevalence data, depression was significantly associated with female gender, younger age, and health risk factors such as smoking, hypertension, and obesity. The prevalence of depression causing interference in daily functioning across 19 social districts (subregions within the CHR) was significantly related to community-level indicators of single-parent status, low-income families, and low

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educational achievement in each district. Disparities in treatment access were also found with persons living in the most impoverished districts having the lowest rates of accessing professional mental health services.

Keywords: major depression, epidemiology, administrative data, social determinants, community level planning

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RÉSUMÉ

L'impact des déterminants sociaux de la santé sur la prévalence de la dépression et l'accès aux soins a été examinée à l'aide de données provenant d'une enquête communautaire et des données administratives relevant des utilisateurs et utilisatrices des services de santé mentale dans la Calgary Health Region (région de santé de Calgary, CHR). Conformément aux données nationales sur la prévalence, la dépression a été significativement associée au sexe féminin, à la jeunesse et aux facteurs de risque qui influencent la santé, comme le tabagisme, l'hypertension et l'obésité. La prévalence d'une dépression qui nuit au fonctionnement quotidien dans 19 quartiers (sous-régions de la CHR) a été liée à quelques indicateurs au niveau de la communauté : familles monoparentales, familles à faible revenu et faible niveau d'éducation dans chaque quartier. Des disparités par rapport à l'accès au traitement ont également été trouvées chez les personnes vivant dans les quartiers les plus pauvres ayant les taux d'accès à des services professionnels de la santé mentale les plus faibles.

Mots clés : dépression majeure, épidémiologie, données administratives, déterminants sociaux, planification au niveau de la communauté

The relationship between socioeconomic status and major depression is well documented (Patten, Wang et al., 2006). Individuals characterized as having a low income, being a single parent, or being unemployed are at higher risk for developing depression (Bristow & Patten, 2002), independent of known age and sex risk factors (Gadalla, 2008; Lennon, 1995; Lorant et al., 2007). These variables, often referred to as social determinants of health (Bambra et al., 2010), also have an impact, along with race and ethnicity, on how depressed persons access mental health services (Chow, Jaffee, & Snowden, 2003; Miranda & Cooper, 2004; Mojtabai & Olfson, 2006). In Canada, the gap between those in need of mental health treatment and those receiving help is enormous. According to the 2002 national mental health survey, less than 35% of persons with mental disorders in Canada had sought treatment in the past year (Statistics Canada, 2003). Treatment-seeking among persons with major depression is somewhat higher; however, 47% of depressed individuals did not access professionally guided therapies (Wang et al., 2005).

Although the social determinants of health are implicated in most mental disorders, depression is often the focus in population health research because of its high prevalence and impact on both individuals and society. Major depression and substance use disorders are the most common mental health problems in the general population (Statistics Canada, 2003). Furthermore, major depression is the fourth leading cause of disease burden worldwide and is expected to become the second leading cause by 2020 (Ustun & Kessler, 2002). Unlike other mental disorders that are less prevalent and often require highly specialized services with limited availability (e.g., schizophrenia, eating disorders), treatment for depression can be accessed in a variety of settings in both urban and rural population centres (community mental health clinics, outpatient services, primary care). This makes major depression an excellent disorder in which to study disparities in treatment access within a defined geographic area.

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Population data on the distribution and correlates of mental health problems such as depression remains underutilized by decision makers in publicly funded mental health services. One reason for this is the lack of depth provided by most epidemiological data on disorder prevalence and trends in treatment-seeking. For example, data from the Canadian Community Health Survey (CCHS 1.2) on Mental Health and Well-being, an often-cited source of the extent of mental illness in Canada (Gadalla, 2008; Streiner, Cairney, & Lesage, 2005), has limited utility for community-level mental health surveillance and service planning activities. Decision makers need locally derived data to understand the unique characteristics of the community residents who may need to access health services. An investigation by Patten and Liu on anxiety disorders and cardiovascular risk factors using a data source similar to the present study demonstrated the value of focusing on a smaller geographic zone to study these relationships (Patten & Liu, 2007). In order to effectively manage service distribution it is necessary to have detailed information on mental illness at the regional level.

Another source of information for planning mental health services is administrative data. In Canada, the public health care sector provides the majority of health services, including treatment of addictions and mental disorders. Detailed information on the recipients of health services are captured in various administrative datasets. This information is easily accessible and cost-effective for research purposes (Frohlich et al., 2007). Such databases provide a "real-world" perspective on the treatment of mental disorders that generalize to the practice of providing mental health services. Furthermore, administrative datasets can provide precise estimates of treated prevalence and avoid the recall bias of health surveys (Mortensen, 1995). Mental health administrative data has been used to research the effects of system changes on service use and quality of care (Greenberg & Rosenheck, 2005), variations in treatment practices across settings (Speer & Newman, 1996), predictors of service utilization (Karlin & Norris, 2006), determining the proportion of the general population with mental health problems who receive treatment (Andrews, Issakidis, Sanderson, Corry, & Lapsley, 2004), cost-effectiveness of mental health services (Andrews, 2006), and place-based population health research (Frohlich et al., 2007). Although the quality of administrative data, particularly the coding of diagnoses, is an often-cited concern, a recent investigation of the validity of administrative data concluded that diagnoses derived from visits to specialty mental health services were valid for many disorder classes, including mood disorders (Frayne et al., 2010).

In summary, there is little research on the impact of the social determinants of health on depression and treatment-seeking within smaller defined catchment areas. The Calgary Health Region (CHR) in Alberta is a unique environment for conducting this research. Foremost, the prevalence of depression is higher in Alberta compared to the rest of Canada (Statistics Canada, 2003). In addition, the CHR is the largest fully integrated regional health system in Canada. The CHR is subdivided into smaller subregions that were specifically created for monitoring disease prevalence, health behaviours, and treatment access. Our objectives for this report were: (a) describe the geographic distribution of major depression in the CHR catchment area that encompasses both urban and rural Alberta communities; (b) associate the distribution of cases of major depression with variations in social determinants of health across geographic subregions; and (c) estimate the gap between persons in need of treatment for depression and those receiving care from the public mental health care system.

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METHOD

Setting

The Calgary Health Region (CHR) is one of five defined catchment areas for the province of Alberta. All public health services in Alberta fall under a single governing body called Alberta Health Services (AHS), but the boundaries of the CHR (now referred to as the Calgary Zone) have not changed since 2006 when the present data were collected. The CHR covers a geographic area of 39,000 square kilometres and has a population of over 1.3 million inhabitants. It includes one large urban city (Calgary) and several smaller cities and towns including Banff, Airdrie, Okotoks, and Canmore. The CHR provides a wide range of adult addiction and mental health services, including specialized inpatient treatment in three large urban hospitals, day hospital services, outpatient programs, and community outreach programs. Ethical approval for this project was acquired from the University of Calgary Conjoint Health Research Ethics Board.

Data Sources

Calgary Health Region population survey (CHRPS). Data from this large telephone survey of the adult population of the CHR was collected over a 2-year period between March 2006 and March 2008 (N = 8213). Random-digit dialing was used to contact households. The individual (18 years and older) with the most recent birthday was selected to participate to mitigate the effects of volunteer bias. Basic demographics were collected from each respondent including age, gender, and total annual household income in four categories ($0 to $30,000, $31,000 to $60,000, $61,000 to $90,000, and over $90,000). Because the median family income in Calgary in 2006 was $68,048 (Statistics Canada, 2006b), we dichotomized the income variable into $0 to $60,000 versus $61,000 and over. The Calgary Health Region population survey (CHRPS) collects information on known modifiable risk factors for the leading burdens of diseases such as cancer, cardiovascular disease, mental illness, diabetes, and injury. Health content used for the present study included: hypertension (self-report of a doctor diagnosis), obesity (body mass index $\geq$ 30 kg/m^2, calculated by dividing the self-reported weight in kilograms by the square of self-reported height in metres); smoking status (self-report of smoking daily or occasionally), high cholesterol (self-report of doctor diagnosis), hazardous drinking (score of 4 or more on the short form of the Alcohol Use Disorders Identification Test [AUDIT-C] (Dawson, Grant, Stinson, & Zhou, 2005)), and inactivity (defined as <2100 metabolic equivalent [MET] minutes per week based on a series of questions about respondents' physical activity per day).

Mental health in the CHRPS was assessed using the Patient Health Questionnaire (PHQ-9) (Martin, Rief, Klaiberg, & Braehler, 2006). The PHQ-9 produces a categorical score for the presence or absence of major depression and a continuous score of depression severity (range 0 to 27). The latter score can further categorize the severity of symptoms as minimal (0 to 4), mild (5 to 9), moderate (10 to 14), and severe (15 to 27). Identification of major depression is based on DSM-IV scoring rules (American Psychiatric Association, 1994). Specifically, the individual must report a total of five symptoms of depression, at least one of which must be depressed mood or the loss of interest or pleasure in activities lasting at least two weeks. The remaining symptoms must come from the following list: changes in appetite or weight; insomnia or hypersomnia; agitation; feelings of worthlessness or guilt; fatigue or loss of energy; recurrent thoughts of death or suicidal ideation; or difficulty thinking, concentrating, or making decisions. Symptoms must be present for more

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than half of the days in the last two weeks. An additional question asks respondents to rate the degree of interference from their symptoms. Because our interest was in the prevalence and distribution of clinically significant depression requiring specialty care, we defined major depression as having a PHQ-9 score of 10 or more and reporting that the symptoms caused interference in daily functioning.

The PHQ-9 is a brief assessment tool and not a diagnostic instrument. Scores on the PHQ-9 have been shown to reliably predict major depression that is diagnosed using a more in-depth interview (Martin, Rief, Klaiberg, & Braehler, 2006), but like all screening tools it may overestimate the actual prevalence of major depression in the population by including persons with mild, brief depressive episodes. PHQ-9 may also detect other mood disorders that present with similar symptoms to major depression (e.g., bipolar disorder, seasonal affective disorder, dysthymic disorder, atypical depression, and depression related to another mental disorder or physical health problem). In a brief survey such as the CHRPS, it is not possible to rule out other causes of depressive symptoms. Hence, the prevalence estimates derived from the PHQ-9 may in fact represent the prevalence of any mood disorder in each geographic area.

Administrative data on mental health service users. The administrative records of mental health service users in the CHR are maintained in a central data repository. All users were assessed by a mental health professional (psychiatrist, psychiatric nurse, psychologist, or social worker) licensed in Alberta to conduct diagnostic evaluations. For each service user there is a minimum data set created consisting of a unique lifetime identifier (ULI), referral source, admission and discharge dates, length of stay, program enrolment, age, gender, postal code, and mental health diagnosis based on DSM-IV (American Psychiatric Association, 1994). Records are extracted from over 95% of the mental health information systems used to provide services to adult, child and adolescent, geriatric and Aboriginal clients, and then linked into the central database. The remaining 5% of users engage in services from which complete data may not obtained because of the nature of the service (e.g., crisis or outreach services in which a ULI is not obtained). To match the time frame of the CHRPS data, administrative records on all adult patients ($\geq$ 18 years) with a diagnosis of a mood disorder who received treatment from a mental health program between March 2006 and March 2008 were accessed (N = 9,213). The sample included users of inpatient treatment (27% of cases were admitted to hospital at least once), outpatient services (76%), and emergency room (ER) services (51% had visited the ER at least once). A large proportion of patients (39%) used more than one service type and 16% of service users had used all three categories of service (inpatient, ER, and outpatient).

Social determinants of health. The Calgary zone is divided into 19 social districts for the purposes of health surveillance and use of consistent geographic areas by the provincial government and other public service agencies. These are geographic units of analysis developed by a consortium of data users and policy makers that included the City of Calgary, the Calgary Board of Education, United Way of Calgary and Area, and Alberta Health Services. Social districts 1 to 15 cover urban areas, and social districts 16 to 19 cover rural areas. Each social district has a detailed profile, including population, immigration, life expectancy, community characteristics and health system accessibility. In the present study we examined four common social determinants of health for each social district: (a) proportion of households living below the low-income cutoff (LICO), (b) proportion of single-parent households, (c) unemployment rate in youth (age 18 to 25 years), and (d) proportion of residents who did not complete grade 9. These indicators were chosen because data was available for the same years as the CHRPS and administrative data. Youth unemployment

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was chosen because the risk of depression is highest in persons under 30 years of age (Patten, Wang et al., 2006). LICO is a widely used Statistics Canada measure of poverty defined as households that spend 20 percentage points more of their gross income on food, shelter, and clothing than the average Canadian (Statistics Canada, 2006a).

Data Analysis

Our analysis approach was largely descriptive. Logistic regression modelling was conducted to identify the major risk factors for major depression using the CHRPS data. Proportional weights were applied to the CHRPS data to adjust for sampling biases in age and gender by social district. Weights also adjust for geographic differences in age and gender within each social district. The weights were calculated as the inverse of the estimated selection probability for each participant according to their age and gender. Prevalence is reported as the proportion of the population within each social district and the estimate per 1,000 adult residents. For some analyses, we compared the individual-level estimates from the CHRPS data with the community-level characteristics of the 19 social districts. In all analyses, major depression was defined on the basis of the PHQ-9 scoring algorithm and reporting interference from the symptoms. We reasoned that persons with depression severe enough to cause psychosocial impairment would be more likely to seek treatment in one of the CHR addiction and mental health programs. The treated prevalence within AHS addiction and mental health services was computed by examining the total number of adults with a diagnosis of mood disorder in relation to the total number of adults residing within the Calgary zone for the years 2006 to 2008.

RESULTS

Population Estimates of Depression Using CHRPS

About 4.9% of CHR residents, or over 60,000 individuals, reported symptoms that were consistent with major depression causing interference in daily functioning. This is consistent with the CHR estimate (3.4%) derived from an earlier study that employed a brief diagnostic tool (Patten, Adair et al., 2006). The PHQ-9 continuous score for depression provides an indication of the severity of depressive symptoms in all residents including persons who do not meet the diagnostic criteria for major depression. Within the CHR 77% of respondents reported minimal symptoms of depression, 17% reported mild depression, 5% reported moderately severe depression, and approximately 1% reported severe depression.

Table 1 displays the sample demographics and health risk profile for individuals who were classified as clinically major depressed based on their PHQ-9 score. The prevalence of major depression in women was about 1.5 times higher than the rate in men (7.1% vs. 4.7%). Higher depression was also associated with younger age and having a family income of less than $60,000 per year. In terms of health risk factors, major depression was significantly associated with smoking, obesity, hypertension, and high cholesterol. The variables significantly associated with major depression were combined into a logistic regression model. Smoking, obesity, hypertension, and high cholesterol were collapsed into a single variable: number of cardiovascular risk factors (range 0 to 4). The overall model was significant (Wald $\chi^2 = 137.93$, $p < .001$). All variables in the model (age, gender, income, and number of cardiovascular risk factors) significantly predicted major depression ($p < .001$ for each variable).

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Table 1

Demographic Trends and Health Risk Factors in 8,213 Adults Screened for Major Depression in the Calgary Health Region

Variables	Weighted proportion within sample ($N = 8213$)	% depressed with interference reported	χ^2
Demographics			
Gender			
Female	50.9	5.5	21.87*
Male	49.1	3.3	
Age group			
18–24	13.6	5.6	20.65*
25–34	24.2	3.8	
35–44	21.1	4.7	
45–54	14.2	4.0	
55–64	11.5	2.6	
65+	15.2		
Family income			
< $60,000	40.0	7.6	102.27*
> $60,000	60.0	2.4	
Health risk factors			
Tobacco use			
Smoker	19.8	8.9	93.47*
Non-smoker	80.2	3.3	
Obesity			
BMI > 30	16.8	6.5	15.43*
BMI < 30	83.2	4.0	
Activity level			
Inactive	42.2	4.8	2.37
Active	57.8	4.1	
Blood pressure			
High	22.5	6.0	12.9*
Normal	77.5	4.0	
Cholesterol			
High	28.2	5.4	6.54*
Normal	71.7	3.9	
Alcohol use			
Hazardous	34.7	4.6	0.62
Non-hazardous	65.3	4.1	

Note. BMI = body mass index.

* $p < .01$

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Table 2 shows the estimated prevalence of major depression per 1,000 population for each of the 19 social districts. After controlling for geographic variations in age and gender, social district 3 had the highest prevalence of depression (96 per 1,000) while social district 4 had the lowest estimate (22 per 1,000). These districts also differed on many of the social determinants of health (results discussed below). There was no significant difference in the prevalence of depression in the rural versus urban areas of the CHR (4.5% vs. 5.2%, $t_{[18]} = 0.73$, $p > .05$).

Table 2

Estimated Prevalence of Adults with Depression Leading to Psychosocial Impairment in Each Social District and Proportion of Who Receive Treatment within Calgary Health Region

Social District (SD)	Pop. Total	Adults with depression and psychosocial impairment	Living below LICO	Prevalence of depression (per 1000 pop.) controlled for age and sex	Treated prevalence for mood disorders in AHS Mental Health Services (per 1000 pop.)	Estimation of unmet needs—proportion of depressed persons treated by CHR mental health services
Urban						
1	90,367	2,892	7.7	32	4.0	12%
2	75,496	3,246	5.8	43	4.4	10%
3	84,968	8,157	13.1	96	4.8	5%
4	48,773	1,073	8.5	22	5.1	23%
5	71,754	3,085	13.3	43	8.3	19%
6	58,529	4,214	14.0	72	5.4	8%
7	71,083	1,919	6.9	27	4.9	18%
8	59,389	2,791	14.9	47	10.1	21%
9	45,385	3,495	23.4	77	10.6	14%
10	60,358	4,165	19.1	69	8.0	12%
11	54,779	3,780	13.8	69	8.3	12%
12	37,833	2,573	11.6	68	8.0	12%
13	87,641	3,681	8.2	42	6.6	16%
14	95,602	4,015	6.1	42	6.1	14%
15	73,979	1,923	5.4	26	5.9	23%
Rural						
16	54,502	1,581	4.5	29	7.5	26%
17	12,689	749	6.8	59	9.5	16%
18	96,037	5,282	3.9	55	8.3	15%
19	59,635	2,206	4.5	37	7.5	20%
All	1,238,799	60,827	10.1	50	7.0	16%

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Variation in Population Depression Prevalence and Proportion Treated by Health Services

Table 2 also shows how variation in population prevalence of depression across the social districts relates to the proportion of population who received treatment for mood disorders by CHR mental health services. The difference in population and treated prevalence for depression is actually very large (less than 1 in 5 persons with depression received help from CHR services). In social districts with a higher proportion of depressed residents, there is a higher proportion of residents getting help from CHR mental health services. Nonetheless, disparities exist between the need for help and accessing service. For example, only 5% of residents in social district 3 accessed mental health services for mood disorders despite this subregion having the highest overall prevalence of depression. The proportion of residents living below the low-income cut-off in this social district (13%) was higher than overall CHR average (10%). Conversely, an estimated 26% of depressed residents of social district 16 accessed mental health services despite this subregion having one of the lowest population rates of depression (29 per 1,000 compared to the average of 50 per 1,000 for the entire CHR population) and only 4.5% of residents being in the low-income category (less than half the average for the CHR).

Depression and Social Determinants of Health

Figure 1 shows the relationship between the prevalence of depression and the proportions of low-income status, single-parent households, youth unemployment, and low educational achievement across the 19 social districts. A robust relationship is evident between depression and community-level indicators of low-income status, single-parent households, and low education. Unexpectedly, the relationship between depression and youth unemployment level noted in the social district was not significant. Social districts 3 and 4, which had the highest and lowest prevalence of depression respectively, are both in the northern half of the city but with a very different socio-economic profile. The rate of poverty in social district 3 was 13% compared to 8% in social district 4; 16% of residents in social district 3 were single parents compared to 9% in social district 4. The proportion of depression variance accounted for by the three significant social determinants is reflected in the R-square value: 42%, 24%, and 39% for low-income status, single-parent households, and education, respectively. Low-income status and low educational achievement were highly correlated across social districts, $r = .57$, $p < .05$. Low income was also correlated with youth unemployment ($r = .84$, $p < .001$) and single-parent status ($r = .65$, $p < .01$).

DISCUSSION

The present study demonstrates the potential for using regional surveillance data to document the prevalence, characteristics, and socioeconomic correlates of mental health problems in a large community. Our analysis included two levels of population data: individual-level data on the prevalence and correlates of major depression within a large sample of community-dwelling adults, and community-level data on the prevalence of common social determinants of health. The individual-level data revealed how the prevalence of major depression varies across the population in a manner consistent with national-level epidemiological trends. Notably, higher rates of depression were found in women, young adults, and persons with lower income (Patten, Wang et al., 2006). Furthermore, major depression is positively associated with other health

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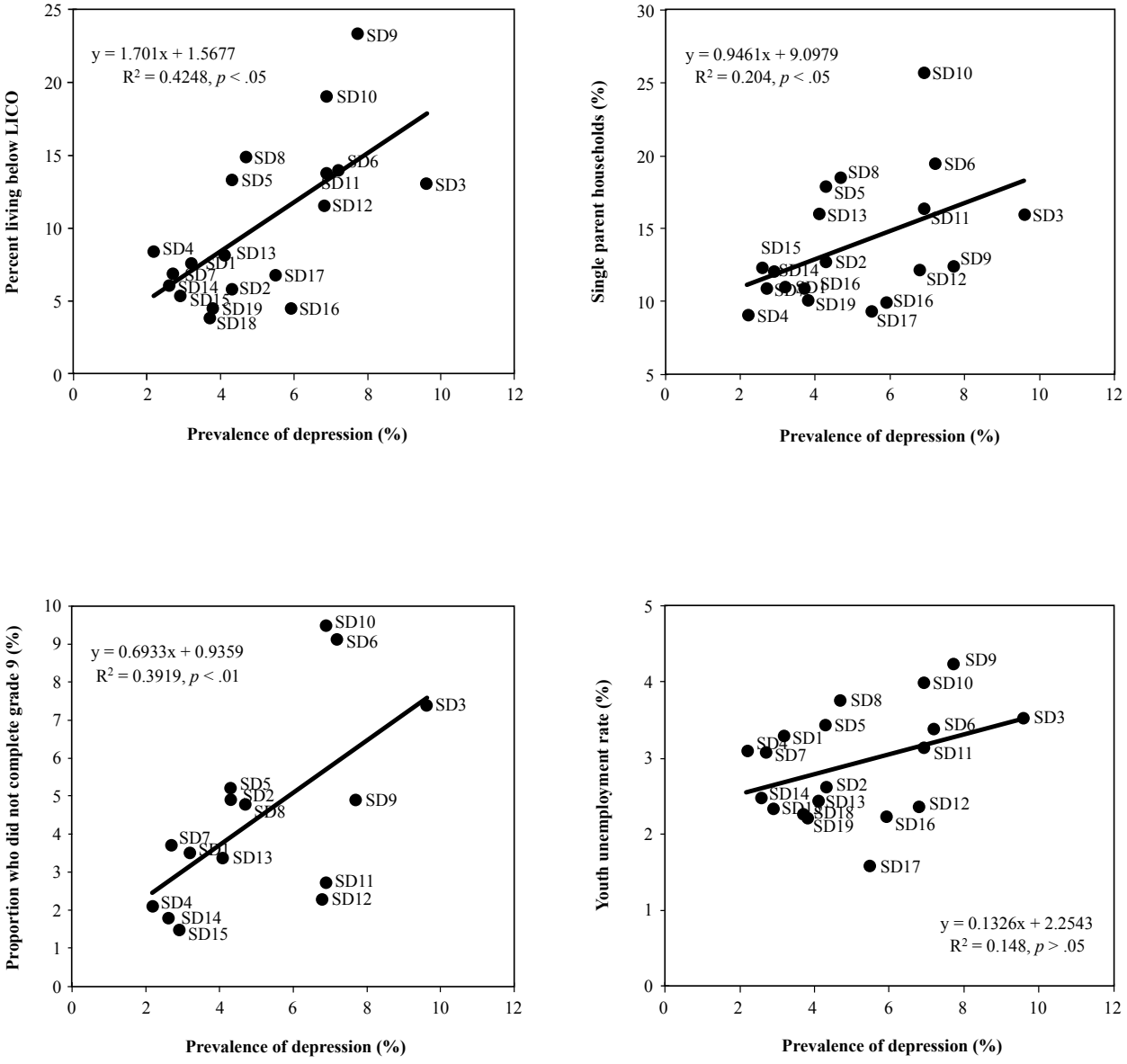
Figure 1

Relationship between the Prevalence of Major Depression and Four Social Determinants of Health



Note. The social determinants of health measured are percent living below low-income cutoff (LICO), proportion of single-parent households, unemployment rate in youth (15 to 25 years), and proportion of residents who did not complete grade 9. The linear trend line with R^2 value is shown for each scatterplot.

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risk factors including smoking, obesity, hypertension, and high cholesterol (Lesperance & Frasure-Smith, 2007). The latter finding has relevance for planning public health initiatives. Interventions for depression could be packaged with conventional medical interventions to address these health problems. Although depression was not associated with alcohol use, our study examined hazardous drinking rather than alcohol dependence. The association between depression and alcohol dependence is well established (Currie et al., 2006), but the relationship between depression and alcohol abuse or hazardous drinking is comparatively weaker (Grant et al., 2004).

The community-level data revealed trends in the variation of depression across subregional boundaries that correlated with common social determinants of health. The prevalence of depression was comparable in rural and urban areas of the CHR, although this result is confounded by the smaller sample in the rural social districts and the presence of one densely populated and modern town (Banff) in the rural social districts. The prevalence of depression was strongly correlated with community-level data on low income, single-parent status, and low educational achievement. This finding demonstrates the importance of understanding the potential impact of socioeconomic context on mental health. Living in poverty and raising children alone are significant stressors for people, particularly women, which can lead to depression. Persons with less than grade 9 education will be disadvantaged in the workforce, which can lead to chronic stress. Not surprisingly, low income and low educational achievement were highly correlated across social districts. Each of these indicators accounted for a high proportion of the variation in depression prevalence. The absence of a relationship between the community-level youth unemployment rate and prevalence of depression was unexpected. The scatterplot (Figure 1) suggests a positive relationship exists but the sample size may not have been sufficient to be statistically significant. Youth employment was highly correlated with low-income status. Social and economic problems tend to cluster together at the neighbourhood level (Sampson, 2004). The low-income status indicator may be an overall better indicator of community hardship.

The fact that depression is correlated with community-level indicators of socioeconomic status does not prove there is a causative link between these constructs. Although it is plausible that low income, low education, and being a single-parent are risk factors for depression, it could also be argued that depressed individuals gravitate to socially disadvantaged neighbourhoods. Longitudinal research is needed to determine the direction of the relationship. Research conducted in other jurisdictions provides compelling evidence that social disadvantage is a contributing factor to depression rather than a consequence (Kim, 2008). Researchers have theorized that unfavourable social and economic conditions in a community that are out of the personal control of residents can impact individual vulnerability to physical and mental health problems (Kim, 2008; Sampson, 2004). Direct evidence of causation was reported by researchers in the United Kingdom who found that an elevation in socioeconomic status results in decreased rates of depression in the community (Lorant et al., 2007). Prospective studies conducted in the United States have produced similar evidence of causation (Kim, 2008).

Another novel aspect of this study was the ability to compare the community population prevalence to the treated prevalence. Our administrative data is unique in that it covers service users from all aspects of addiction and mental health services in the CHR. Most of the published research on mental health care utilization patterns has focused on inpatient and emergency room visits (Halamandaris & Anderson, 1999; Pasic, Russo, & Roy-Byrne, 2005). There remains a large gap in our knowledge about utilization patterns

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for the clients who seek mental health services across all service types. The administrative data repository for the CHR links data from the entire spectrum of psychiatric services, including inpatient, day hospital, outpatient, and community outreach programs.

The comparison of population and treated prevalence across subregional boundaries produced some optimistic findings but also areas of concern. The rate of individuals who access CHR mental health services co-varies with the rate of depression across the social districts. That is, higher rates of depression were associated with higher rates of treatment seeking. However, there remains a large gap between actual rates of major depression with impairment and the proportion that access services within the CHR. Furthermore, the gap is largest in more impoverished areas such as social district 3 where we estimate only 5% of depressed individuals accessed CHR services for the treatment of mood disorders. We recognize a large proportion of the general population receives treatment for depression from independent physicians (general practitioners and private psychiatrists). We could not access physician billing data for the time periods covered by this study. However, the accuracy of billing data for mental health visits is questionable. The majority of general practitioners (GPs) do not use standardized methods of diagnosing mental disorders. A recent investigation revealed large discrepancies between the self-reported number of visits to general practitioners for mental health reasons and the actual number recorded in physician billing records (Palin, Goldner, Koehoorn, & Hertzman, 2011). An Alberta study found that physician billing records produced a higher rate of mood disorders in the population compared to the rates derived from population surveys that use standard diagnostic tools (Slomp, Bland, Patterson, & Whittaker, 2009). Caution should be exercised when using physician administrative data to estimate the treated prevalence of mental disorders.

We attempted to limit the extent of missing cases of GP-treated depression by narrowing the definition of depression to only individuals who reported impairment in daily functioning. These individuals would be more likely to require treatment from a specialty mental health provider. In addition, our main interest in this analysis was identifying disparities in access that may be related to neighbourhood characteristics (poverty, unemployment, etc.) rather than estimating the true extent of untreated depression. We can still approximate the rate of treatment seeking from independent physicians for depression using the national survey average as a surrogate for the CHR. According to the CCHS 1.2, about 40% of persons with major depression sought help from general practitioners in the past year (Wang et al., 2005). If this rate was constant across all social districts, then 34% to 55% of depressed persons in the CHR population still do not access conventional treatment services for their illness. These rates are consistent with a 2005 provincial mental health survey that found only 41% of Albertans with a diagnosis of major depression were prescribed antidepressant medications (Esposito et al., 2007). The proportion of untreated cases is likely even higher because many patients enrolled in CHR addiction and mental health services continue to receive treatment from their general practitioner. This contributes to another form of disparity in which some individuals receive help from multiple providers while other individuals receive no professional help.

We acknowledge our CHR population survey has methodological limitations. Only households with telephones are contacted, so homeless people or those without a residential phone line are not included in the estimates. The survey is conducted in English, so eligible respondents that do not understand English are excluded. The data on depression and other health behaviours (smoking, hypertension, etc.) is cross-sectional and causal relationships cannot be inferred. We previously noted the PHQ-9's lack of specificity for cases

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of unipolar depression. The prevalence of depression is likely over-estimated because of the instrument's limited capacity to exclude other mood disorders such as bipolar and substance-induced depressive disorders. For this reason, we compared PHQ-9 prevalence to persons treated for any mood disorder within the CHR addiction and mental health services.

Despite these limitations, this line of research has potential value for researchers, clinicians, and decision makers in all health regions. Although replication in another defined catchment area is needed, it is highly likely this pattern of depression prevalence and disparities in access is similar in other Canadian cities. Our findings from the CHR also demonstrate how the prevalence of a common mental health condition, major depression, is correlated with community-level indicators of common social determinants of health. These relationships can be studied at the subregional level, providing information to decision makers that can assist in identifying individuals who are at higher risk for depression. Additional resources to screen and treat depression should be placed in the social districts with the highest prevalence. Given the elevated risk of depression in single parents, community supports for this population (e.g., subsidized daycare, low-cost housing) would be logical preventive measures.

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