

Neighbourhood deprivation and healthcare service use for mood and anxiety disorders in a semi-rural population

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Abstract

A growing body of empirical evidence suggests that selected features of neighbourhood environments are related to higher morbidity and healthcare utilization. However, studies examining geospatial correlates tend to focus on physical health outcomes, large urban contexts, or specific patient groups. This research assesses the relationships between neighbourhood characteristics with mental health outcomes in a general, semi-rural population. Located in eastern Canada, the province of New Brunswick is significantly more rural (51%) than the national average (19%). We used provincial administrative health datasets linked to geocoded data on different dimensions of neighbourhood marginalization. Given Canada's universal coverage system, the administrative data capture all medical and hospital services. Among the New Brunswick population aged 1 or over, 10.7% had experienced a mood or anxiety disorder entailing the use of healthcare services. Multiple logistic regressions revealed that—after adjusting for age, sex, and rurality—the odds of mental health service contacts were significantly higher in neighbourhoods of higher material deprivation, residential instability, and ethnic concentration. The odds were lower in neighbourhoods of higher population dependency. This study shows that neighbourhood characteristics may influence mental health service use, but the nature of the relationships differs from those typically related to physical health.

Introduction

It has been widely postulated that more egalitarian social and residential environments can level the health of populations [1,2]. A growing body of empirical evidence suggests that selected characteristics of neighbourhood environments are related to higher morbidity and healthcare utilization, beyond individual-level characteristics, even in contexts of universal health coverage [3-5]. Much of the literature on environmental population health research focuses on physical health, such as cardiometabolic, respiratory, or maternal-perinatal health outcomes [6,7]. Some studies have examined associations between geospatial indicators and mental health outcomes; however, they have been tended to be limited to large, urban contexts [3,8-10] or to specific patient groups [4,11]. Little is known about the influence of neighbourhood environments on mental health service contacts at the population level in contexts of smaller urban and rural settlements.

The objective of this research was to investigate associations between neighbourhood environments and service use for depression and other mood and anxiety disorders across the lifespan in New Brunswick, a Canadian province of uniquely smaller urban and rural areas. The research examined whether inequalities were observed in mental health service contacts among those living in socioeconomically marginalized neighbourhoods compared to those living in more affluent neighbourhoods, across different age groups from childhood to older adulthood, and between men and women. The study drew on multiple linked individual- and area-level administrative and geospatial datasets, and conformed to the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) protocol [12].

Methods

Study context

Located in eastern Canada, New Brunswick accounts for 2.1% of Canada's population of 35.2 million based on 2016 Census data. The province is characterized by a significantly higher rural population than the national average (51.0% versus 18.7%) [13]. All residents are covered for essential medical and hospital services through a single-payer health financing system, known as New Brunswick Medicare (some specific groups representing less than 3% of the population are excluded from this coverage, including the Canadian Armed Forces and federal prisoners, who are covered under federal insurance programs). Access points to mental health services include hospitals, physician offices, community-based clinics and counselling services, and schools [14]. There is some evidence that, among persons living with a chronic neurological disease, the risk of hospital admission for mental health disorders is higher among those living in materially deprived neighbourhoods [5].

Data sources

Pseudonymized provincial administrative health datasets were linked to geospatial socioenvironmental data for the fiscal year 2015/2016 (covering the period from April 1, 2015 to March 31 of the following calendar year). Resident registrations, physician service billings, and hospital discharge abstracts captured person-level information on age, sex, and urban/rural residence, as well as healthcare contacts for mood and anxiety disorders. Given universal healthcare coverage, the administrative data are considered complete for all eligible residents. The geospatial data included four different composite measures of neighbourhood marginalization curated from census data.

Outcome measure

The outcome of interest was having any service contact in the year for a mood disorder, an anxiety disorder, or both, using a validated algorithm tracing individuals' interactions with the provincially-insured healthcare system among the population aged 1 year and older. Cases of service contacts were defined in accordance with the Canadian Chronic Diseases Surveillance System (CCDSS), based on a primary diagnosis mapped to the International Classification of Diseases, 10th revision (ICD-10 codes F30-F42; F44-F48; F68) [15]. A validation study had demonstrated that the CCDSS case criteria were strongly able to estimate annual healthcare contacts for mood and anxiety disorders (specificity 92.2–93.4%; negative predictive value 96.0–96.9%), but could not necessarily be extrapolated to infer all diagnosed cases (sensitivity 64.7–71.5%; positive predictive value 47.0–53.2%) [15].

Key predictors

Geospatial predictors were drawn from the Canadian Marginalization Index (CAN-Marg), which quantifies four different dimensions of neighbourhood socioeconomic status associated theoretically and empirically with health and behavioural outcomes [16], including:

- *Material deprivation* – e.g., proportions of low-income families, lone-parent families, adults without postsecondary credentials, homes needing major repairs;
- *Residential instability* – e.g., proportions living alone, home ownership, residential mobility, crowding, and multi-unit housing;
- *Ethnic concentration* – proportions of recent immigrants and visible minorities;
- *Population dependency* – proportion of seniors, labour force participation rate, dependency ratio.

The CAN-Marg indices were generated and ordered at the lowest level of standard census geographic units (known as dissemination areas); for the present analysis, areas in the two lowest quintiles were defined as the most marginalized neighbourhoods.

Statistical analysis

The individual-level administrative datasets were linked deterministically to the geospatial datasets by residential postal code. Following a presentation of descriptive statistics, multiple logistic regressions were used to examine the associations between neighbourhood environments and the use of healthcare services for mood and anxiety disorders. The analyses controlled for individuals' age, sex, and community size. Community size was defined as whether the individual resides more than 40 kilometers outside of one of New Brunswick's three main urban areas (Moncton, Saint John, and Fredericton), as defined for use in provincial healthcare resource planning.

To facilitate the interpretation of the results from the logistic regressions, adjusted odds ratios (ORs) and bootstrapped 95% confidence intervals (CIs) were estimated for each predictor. The analyses were limited to individuals with non-missing data for all variables of interest. Separate models were run by sex, to see if there were gendered differences in healthcare seeking behaviours. All population counts were rounded to a base of five, and adjusted to reinforce the confidential nature of the data.

Research ethics

This study was approved by the Research Ethics Board of the University of New Brunswick, Canada, as part of a larger investigation into factors affecting health and healthcare use drawing on linked provincial administrative datasets (REB #2017-076).

Results

Based on the administrative data, the population of New Brunswick eligible for Medicare-insured services totalled 775,225 persons in the 2015/2016 fiscal year. After excluding persons who did not have valid demographic or postal code information or who were younger than 1 year of age, the final cohort included 743,160 individuals residing in 1,378 neighbourhoods.

Among the resident population, 79,655 (10.7%) had experienced a mood or anxiety disorder entailing the use of healthcare services in the period of observation. Most of these individuals resided in neighbourhoods characterized with high material deprivation (75%), residential instability (60%), and population dependency (76%) (Table 1). Similar to the general population, 43% resided in rural areas (i.e., outside of the main urban catchment areas). Females and adults of working age (25-64 years) were disproportionally represented among those having mental health service contacts.

Table 1: Percentage distribution of the population aged 1 year and over by selected person- and neighbourhood-level characteristics, according to healthcare utilization for mood and anxiety disorders, New Brunswick (Canada), 2015/2016

	Used healthcare services for mood and anxiety disorders (N=79,655)	Without service contacts for mood and anxiety disorders (N=663,505)
Age group		
1-24 years	15.6%*	26.3%
25-44 years	31.6%*	23.5%
45-64 years	36.1%*	30.8%
65 years and over	16.7%*	19.4%
Sex		
Female	66.5%*	49.1%
Male	33.5%*	50.9%
Community size		
Rural	43.0%	42.8%
Urban	57.0%	57.2%
Neighbourhood material deprivation		
Low	25.2%*	26.7%
High	74.8%*	73.3%
Neighbourhood residential instability		
Low	39.8%*	42.8%
High	60.2%*	57.2%
Neighbourhood ethnic concentration		
Low	66.4%*	67.1%
High	33.6%*	32.9%
Neighbourhood population dependency		
Low	24.1%	24.2%
High	75.9%	75.8%

Notes: *=significantly different from the total population ($p < 0.05$). Low=two lowest quintiles of neighbourhood marginalization indices.

Source: New Brunswick administrative health administrative datasets linked to geospatial socioenvironmental datasets.

Results from the multiple logistic regression indicate that the odds of service use for mood and anxiety disorders were significantly higher among females than males (OR:2.07 [95%CI:2.04-2.10]) (Table 2, model 1), reflecting widely observed sex-specific patterns of mental health care-seeking behaviours, diagnostics, and treatment. As expected, compared to adults aged 25-44, the odds were lower among children and youth (OR:0.45 [95%CI:0.44-0.46]) and among seniors (OR:0.62 [95%CI:0.60-0.63]).

After adjusting for age, sex, and rurality, results showed that the odds of having a service contact for a mood or anxiety disorder were significantly higher among patients residing in neighbourhoods of higher material deprivation (OR=1.07 [95%CI:1.05-1.09]), residential instability (OR:1.11 [95%CI:1.09-1.13]), and ethnic concentration (OR=1.02 [95%CI:1.00-1.04]). The odds were somewhat lower among patients residing in neighbourhoods of higher population dependency (OR:0.98 [95%CI:0.96-1.00]). The observed associations between selected features of neighbourhood environments and mental health service use generally held among both males and females (Table 2, models 2 and 3).

Table 2: Adjusted odds ratios (and 95% confidence intervals) for the risk of healthcare utilization for mood and anxiety disorders, total and by sex

	(1) Both sexes		(2) Males		(3) Females	
	OR	95%CI	OR	95%CI	OR	95%CI
Age group (ref: 25-44 years)						
1-24 years	0.45*	0.44-0.46	0.48*	0.47-0.50	0.43*	0.42-0.44
45-64 years	0.88*	0.86-0.89	0.94*	0.91-0.97	0.84*	0.82-0.86
65 years and over	0.62*	0.60-0.63	0.71*	0.68-0.73	0.58*	0.56-0.59
Sex (ref: Male)						
Female	2.07*	2.04-2.10	--	--	--	--
Community size (ref: Urban)						
Rural	1.00	0.98-1.02	1.00	0.98-1.03	1.00	0.98-1.02
Neighbourhood material deprivation (ref: Low)						
High	1.07*	1.05-1.09	1.02	0.99-1.06	1.10*	1.08-1.13
Neighbourhood residential instability (ref: Low)						
High	1.11*	1.09-1.13	1.13*	1.10-1.16	1.10*	1.08-1.12
Neighbourhood ethnic concentration (ref: Low)						
High	1.02*	1.00-1.04	1.03	1.00-1.06	1.01	0.99-1.04
Neighbourhood population dependency (ref: Low)						
High	0.98*	0.96-1.00	1.00	0.97-1.04	0.96*	0.94-0.99

Notes: **=p<0.05; ref=reference category; OR=odds ratio; CI=confidence interval. Low=two lowest quintiles of neighbourhood marginalization indices.

Source: New Brunswick administrative health administrative datasets linked to geospatial socioenvironmental datasets (N=743,160 individuals aged 1 year and over residing in 1,378 neighbourhoods with valid geocoded information).

Discussion

A small but growing body of literature is providing insights on the role of neighbourhood environments as a social determinant of adverse mental health outcomes. Previous studies have tended to focus on residents of larger cities. This study used linked individual-level and area-based datasets to provide a population-wide assessment of socioenvironmental equity in mental health outcomes in a context characterised by smaller urban and rural settlements. The results showed that the risk of healthcare service contacts for mood and anxiety disorders was significantly higher among persons residing in neighbourhoods of higher material deprivation (OR=1.07 [95%CI:1.05-1.09]), residential instability (OR:1.11 [95%CI:1.09-1.13]), and ethnic concentration (OR=1.02 [95%CI:1.00-1.04]), after adjusting for age, sex, and rurality.

Given widely observed sex-specific differences in mental health care-seeking behaviours and treatment, split-sex analyses were also conducted. The significance of the relationships with selected features of neighbourhood environments generally held among females and males.

The present findings were consistent with research elsewhere indicating that the relationship between certain characteristics of local environments and mental health may differ from those related to physical health. While population dependency has been widely related to chronic physical health problems [16], no significant association was found with the present measure of mental health, possibly reflecting age-specific patterns of mental service contacts. A recent Canadian study found no association between mental health outcomes and physical activity-friendliness of built environments [17]. A study from selected urban areas in China also had unexpected findings, notably that residence in higher-income neighbourhoods was not significantly associated with risk of mental disorders [9]. More research is needed to determine which indicators of neighbourhood disadvantage are more closely associated with common mental health disorders across the lifespan, and under different health financing systems and contexts of rurality.

Some potential limitations to this study should be noted. First, given the cross-sectional nature of the analysis, causality cannot be implied. It is possible that persons with certain mental disorders may socially select into different types of neighbourhoods and housing [18]. Second, information was lacking in the administrative datasets on person-level socioeconomic and behavioural indicators that may mediate areal effects on mental health outcomes. Third, it is likely that the outcome measure underestimated the prevalence of mental health service contacts, given the inability to capture those who did not seek medical care or who used exclusively community-based, school-based, or private services in the available datasets.

Conclusions

Rising prevalence of depression and other mood and anxiety disorders are of increasing concern to meet the demands for responsiveness of healthcare services among more rural populations while ensuring sustainability. This study showed that socioenvironmental characteristics of local communities may influence mental health service use and increase the burden to the healthcare system. These findings suggest that further investigation is needed to better inform joint actions among rural development and community planners, public health practitioners, and other stakeholders to address mental health implications of neighbourhood design.

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