

**Sexual minority status and the hospital burden of cardiometabolic diseases:
protocol for an observational study using linked survey and hospital data**

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ABSTRACT

This paper outlines a protocol for a national observational study examining the association between sexual identity and potentially avoidable hospital costs for diabetes and other cardiometabolic diseases. Our aim is to strengthen the evidence base on sexual minority status as a social determinant of health. We will use data from the Canadian Community Health Survey (CCHS) linked to multiple years of acute-care inpatient records from the Discharge Abstract Database (DAD), representing all provinces except Quebec. Sexual identity is captured in the CCHS among respondents ages 18 to 59. Hospital costs measured from DAD data are considered as an aggregate reflection of the frequency and intensity of use of hospital resources to meet essential medical needs. The study falls within a wider program of research with funding from Diabetes Canada, the New Brunswick Health Research Foundation, the Heart and Stroke Foundation of New Brunswick, and Diabetes Action Canada to conduct policy-actionable population health and health services research using existing databases from official statistical sources.

BACKGROUND AND OBJECTIVES

There is increasing evidence that sexual minorities (lesbian, gay, and bisexual [LGB] individuals) experience significant health inequalities across a range of physical health indicators.^{1,2,3} Based on findings from a risk factor surveillance system in the United States, Beach et al. reported that sexual minorities may be at increased risk for diabetes mellitus compared to their heterosexual counterparts.³ Little is known about the association between sexual minority status and the risk of diabetes and its common complications and comorbidities in Canada. Diabetes is considered an ambulatory care sensitive condition (ACSC), that is, a condition for which the need for hospital admission can be largely prevented or reduced through appropriate management in primary and community care.⁴ This paper outlines a protocol for a study of the association between sexual identity and potentially avoidable hospitalization costs for cardiometabolic diseases in Canada. We hypothesize that the preventable hospital burden of cardiometabolic diseases will be higher among patients who identify as LGB, underscoring the need for clinical and public health actions to address health disparities among sexual minorities. In line with public health strategic plans favouring the leveraging of existing data sources to enhance chronic disease surveillance as a driver for prevention,⁵ our study taps into the rich information available through population health surveys linked to cause-specific data on hospital stays.

METHODS

We take advantage of a novel data resource available through Statistics Canada's Social Data Linkage Environment (SDLE): the Canadian Community Health Survey (CCHS) linked to multiple years of standardized data on inpatient care from the Discharge Abstract Database (DAD) for all Canadian provinces (excluding Quebec).⁶ Information from administrative health data alone is limited in terms of patient characteristics, while that from cross-sectional population surveys such as the CCHS is limited in terms of prospective healthcare utilization variables. The large-scale CCHS-DAD linked data sets allow us to test associations between the hospital burden of diabetes and other chronic conditions with a range of compelling social correlates, including

sexual identity. Details on the probabilistic linkage process among survey respondents who agreed to link their information to other databases are described elsewhere.⁷

The inclusion in the CCHS of data on sexual identity among respondents ages 18 to 59 followed evaluations of cognitive testing of questionnaire options on sexual orientation and relationships.⁸ Given the evidence that people were more willing to answer questions on sexual identity than sexual behaviours, Statistics Canada adopted the former concept in the nationally representative survey. However, it is likely this approach yields a smaller number of homosexual and bisexual Canadians compared to the option of asking people whether they had sexual relations with someone of the same sex.⁹ In the first Statistics Canada survey to include a question on sexual identity, 1.7% of Canadians 18-59 years reported that they considered themselves to be homosexual (lesbian or gay) and 1.3% reported themselves to be bisexual.⁹ To ensure sufficient sample sizes of persons self-identifying as LGB, we will pool together five years of annual CCHS data: 2007 to 2011. Our analysis will only include survey respondents with non-missing data for sexual identity and other patient-level variables of interest.

Our outcome variable is hospitalization costs for each acute-care stay among patients 18-59 years for diabetes and selected commonly comorbid cardiovascular ACSCs, based on the resource intensity weights (RIW) available in the DAD. Since 2005, diagnostic data in DAD records have been consistently coded to the *International Classification of Diseases, 10th revision, Canadian adaptation* (ICD-10-CA).¹⁰ We will use eight years of discharge databases for our analysis: fiscal years 2005/06 through 2012/13. We will include any hospitalization where the most responsible diagnosis was for diabetes (ICD-10-CA codes E10-E14), other endocrine and metabolic diseases (codes E15-E16, E70-E90), hypertensive diseases (codes I10-I15), and cardio- and cerebro-vascular diseases (codes G08, G45, H34.0, H34.1, I20-I99). To estimate the cost of each hospital stay, the RIW will be multiplied by the cost of a standard hospital stay (CHSH), that is, a relative cost based on the expected “average” costs for clinical care for different types of patients and on hospitals’ total inpatient expenditures (excluding physician remuneration).^{11,12} We will apply the latest national 2012/13 CHSH indicator to all data to control for inflation and other differences in relative cost-efficiency across time and locations.

We will use multiple linear regression to assess the association between sexual identity and hospital costs for cardiometabolic diseases, controlling for age, sex, income adequacy, modifiable risk factors (unhealthy eating, tobacco use), and other patient-level variables. The characteristics at the time of the survey will be assumed to represent those at the time of the hospital episode. Sexual identity and other population characteristics will be described statistically applying bootstrapped weights, in accordance with Statistics Canada's methodological guidance for analyses using the linkable CCHS microdata files.¹³ Descriptive unweighted counts will be rounded to a base of five and adjusted to reinforce the confidential nature of the data using Statistics Canada control algorithms. Bivariate chi-square tests and t-tests will be used to assess the associations between sexual identity and the key risk and protective factors for cardiometabolic diseases, with the significance level set at $p < 0.05$. The multivariate regression model will use the logarithm of hospital costs to reduce the effects of skewed data, estimating the coefficient for each predictor of interest and its associated cluster-robust standard error to account for the possibility of multiple hospital admissions per person over the period of observation.¹⁴ All analyses will be conducted using the Stata 15 statistical software package.¹⁵

RESEARCH ETHICS

We have obtained approval to access the de-identified confidential linkable data sets in the secure environment of the New Brunswick Research Data Centre (NB-RDC), located on the University of New Brunswick's Fredericton campus. This study complies with the University of New Brunswick's Research Ethics Board, which does not require an internal institutional review for research projects using data accessed through the NB-RDC in accordance with the *Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans*.¹⁶

SUPPORT FOR THE STUDY

Diabetes Canada, the New Brunswick Health Research Foundation, the Heart and Stroke Foundation of New Brunswick, and Diabetes Action Canada have provided financial support for

the research. Data analysis will be conducted at the New Brunswick Research Data Centre, which is part of the Canadian Research Data Centre Network. The services and activities provided by the NB-RDC are made possible by the financial or in-kind support of the Social Sciences and Humanities Research Council, the Canadian Institutes of Health Research, the Canadian Foundation for Innovation, Statistics Canada, and the University of New Brunswick. The funders and partners have no role in the study design, data analysis, or research dissemination strategy.

EXPECTED OUTCOMES OF THE STUDY

Results from this research are expected to strengthen the evidence base on sexual minority status as a social determinant of potentially avoidable hospitalizations for high-burden chronic diseases to help inform health and social policy and planning decisions. While analyses elsewhere have examined the influences of sociodemographic characteristics on ACSC-related hospitalizations, a notable gap is consideration of a wide range of potential confounders, including patients' sexual identity. Our study using the CCHS-DAD linked data resource uniquely allows us to address this gap.

To facilitate the translation of research into action, we will disseminate our findings through a paper for publication consideration in a peer-reviewed journal as well as presentations at conferences targeting researchers, healthcare practitioners, and policy makers and advisers. Research dissemination will conform to the STROBE (*STrengthening the Reporting of OBservational studies in Epidemiology*) guidelines.¹⁷ We aim to submit the research paper for publication by December 2019.

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