Association between perceived unmet health care need and risk of adverse health outcomes among patients with chronic medical conditions

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ABSTRACT:

Background: Adults with chronic medical conditions are more likely to report unmet health care need. Whether unmet health care need is associated with an increased risk of adverse health outcomes is unclear.

Methods: Adults with ≥1 chronic condition (arthritis, COPD, diabetes, heart disease, hypertension, mood disorder, stroke) from the 2001 and 2003 Canadian Community Health Survey cycles were linked to national hospitalization data. Participants were followed from the date of their survey until March 31, 2005 for the primary outcomes of all-cause and cause-specific hospitalization. Secondary outcomes included length of stay, 30-day and 1-year all-cause readmission to hospital, and in-hospital mortality. Negative binomial regression models were used to estimate the association between unmet health care need, hospitalization, and length of stay, adjusting for socio-demographic variables, health behaviors, and health status. Logistic regression was used to estimate the association between unmet need, readmission, and in-hospital mortality. Further analyses were conducted by type of unmet need.

Results: Of the 51,932 adults with chronic disease, 15.5% reported an unmet health care need. Participants with unmet health care need had a similar risk of all-cause hospitalization (adjusted rate ratio [RR] 1.04; 95% CI: 0.94-1.15) compared to those with no unmet need. When stratified by type of need, participants that reported issues of limited resource availability had a slightly higher risk of hospitalization (RR=1.18; 95% CI: 1.09-1.28). There was no association between unmet need and length of stay, readmission, or in-hospital mortality.

Interpretation: Overall, unmet health care needs were not associated with an increased risk of inpatient hospitalizations among those with chronic conditions. However, certain types of unmet needs may be associated with higher or lower risk. Whether unmet needs are associated with other measures of resource use remains to be determined.

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INTRODUCTION:

Approximately 1 in 3 Canadians have one or more chronic diseases including diabetes, hypertension, arthritis, and heart disease [1-4] and the direct cost associated with management of these conditions in Canada exceeds $40 billion/yr.[5] Consequently, improving care for patients with chronic disease has become a major focus.[6-9] Despite multidisciplinary care programs, many Canadians do not receive adequate care for management of their chronic medical conditions.[10-12] Patients with chronic medical conditions, and in particular those with multiple conditions, are more likely to report a perceived unmet health care need – a commonly used indicator of inadequate access to care.[13]

Perceived unmet health care need is often defined as a need for health care that remains because appropriate health care was not received.[14] It is conceivable that an unmet need may result in delays in receiving medical attention and, in turn, result in worse health outcomes.[14] If this is true, then determining the association between unmet health care need and adverse outcomes is important from a health services delivery standpoint, as recognition and elimination of these potentially modifiable barriers to care may improve health outcomes. However, the evidence relating unmet need, health care utilization, and health outcomes is limited and inconsistent.

Previous work has shown that unmet needs are associated with higher rates of emergency department visits [15, 16] while other studies have found equivocal changes in rates of hospitalization and general physician visits in the general population.[14] Studies employing other commonly used measures of inadequate access to care have also found that patients who self-reported delayed health care or difficulties in accessing medical services had higher rates of

hospitalizations and longer length of stay [17, 18] while others have shown no differences in adverse outcomes including mortality and functional decline.[19] These discrepant results may be due to differences in study population, issues of recall bias, and self-reported measures of health care utilization. Few studies have addressed the effect of unmet need and outcomes in a high-risk population of patients with chronic disease. Further, the majority of studies could not determine if there are differential effects of unmet need type on health outcomes. To address these limitations we used Canadian population-based data to determine the association between unmet health care need and risk of hospitalization among adults with chronic disease. We also sought to determine if unmet health care needs were associated with features of the hospitalization including length of stay, readmission, and in-hospital mortality. We hypothesized that the presence of an unmet need would result in a higher risk of outcomes compared to chronic disease groups with no unmet need.

METHODS:

Study Population

We obtained data from the 2001 and 2003 cycles of the Canadian Community Health Survey (CCHS) linked to the national hospitalization file (the Health Person-Oriented Information file) from April 1, 1997 to March 31, 2005. The CCHS is a national survey conducted by Statistics Canada that provides self-reported estimates of health determinants, health status and health care utilization at the health region level. The target population of the CCHS is household residents aged 12 years and older in the 10 provinces and 3 territories, excluding those living on Indian reserves or Crown land, full-time members of the Canadian Forces, institutional residents, and some residents of remote areas of Canada.[20] The national hospitalization file captures

administrative, clinical, and demographic information on hospitalizations and provides detailed discharge statistics from Canadian health care facilities including admission and discharge date, length of stay, in-hospital mortality, as well as diagnostic and procedure codes for each patient. Discharge data are received from acute care facilities and select chronic care and rehabilitation facilities across Canadian provinces except Quebec.[21] Within the hospitalization file, International Classification of Diseases – 9th Revision, Clinical Modification (ICD-9-CM) coding is used for diagnostic and procedure codes until 2001/02, following which ICD-10 was implemented.

Survey and hospitalization data were linked at the individual level using an established probabilistic linkage methodology based on unique identifying information including health insurance number, postal code, date of birth, and age.[22] Linkage was conducted for all CCHS respondents living outside Quebec who provided consent to link their survey data to other sources of health information. Within this linked data source, we identified adults (≥18 yrs) with at least one self-reported chronic medical condition (arthritis, chronic obstructive pulmonary disease (COPD) or emphysema, diabetes, heart disease, hypertension, mood disorders, and stroke). The Health Council of Canada has recognized these seven chronic conditions of interest as those with the highest prevalence or impact on health care utilization.[2, 3]

Perceived unmet health care needs

The exposure of interest was self-reported unmet health care needs identified within the CCHS. Each respondent was asked, "During the past 12 months, was there ever a time when you felt you needed health care but didn't receive it?" If respondents answered yes to this initial question,

they were prompted with a follow-up question: "Thinking of the most recent time, why didn't you get care?" Reasons for an unmet need were classified into 4 categories: accessibility, availability, acceptability, or personal choice, modified from a classification system developed by Chen and Hou.[23] These categories were established to separate personal from health-care system related reasons for unmet needs, and to further identify issues related to an individual's assessment or evaluation of the system (i.e., acceptability) from those related to personal circumstances and unrelated to the health care system (i.e., choice) (Appendix 1).

Outcomes:

The primary outcomes of interest were all-cause and cause-specific hospitalizations identified within the hospitalization file. The study period was defined by the date of participation in the CCHS for each respondent, with follow-up to March 31, 2005 (the last date for which hospitalization data was available). For all-cause hospitalization, we assessed the number (count) of hospitalizations excluding pregnancy-related events. Given that a number of chronic conditions used to define our study cohort commonly occur together and are associated with vascular-related morbidity [24-26], cause-specific hospitalizations for acute myocardial infarction (AMI), congestive heart failure (CHF) and stroke were identified using pre-specified ICD-9-CM and ICD-10 codes within the most responsible diagnosis field (Appendix 2). Secondary outcomes included in-hospital length of stay (defined as the count of in-hospital days for all admissions following participation in the CCHS survey), 30-day and 1-year all-cause readmission to hospital (identified between the first and second hospitalizations following CCHS participation) and in-hospital mortality within any hospitalization.

Other variables of interest:

Socio-demographic variables and health behaviors were based on the Health Behavior Model proposed by Anderson [27], a framework to understand determinants that affect health services use and patient satisfaction. The framework includes predisposing factors, enabling factors, personal health choices, and health care system/environmental factors. With the components of this framework in mind, we considered the following variables as potential confounders: age, sex, marital status, education, household income, immigration status, residency type (urban or rural), aboriginal status, presence of a regular family doctor, perceived health status, body mass index (BMI), smoking and drinking status, and level of physical activity (definitions available at www.statcan.gc.ca/concepts/health-sante/index-eng.htm)

Statistical Analysis:

We described respondents' socio-demographic information and health behaviors using proportions, which were compared across unmet health care need status using chi-squared tests. All descriptive statistics were weighted to reflect the Canadian population using sampling weights provided by Statistics Canada. Due to the multistage sampling methodology used in the CCHS surveys, bootstrapping techniques were used to obtain estimates of variance and confidence intervals (CI).

To determine the relationship between unmet health care needs and risk of all-cause hospitalization, we used multivariate zero-inflated negative binomial regression with backward elimination techniques. This regression analysis addresses the excess of zero counts (participants with no hospitalizations) as well as the potential for over-dispersion observed within the

distribution of hospital events as compared to the Poisson distribution. We identified potential effect modifiers a priori, and interaction terms were developed for unmet need by age and unmet need by sex. Model fit was assessed by the likelihood ratio test. Rate Ratios (RRs) were calculated for respondents with an unmet health care need compared to those without (reference group), adjusted for socio-demographic variables, health behaviors, health status, and survey cycle (to account for change across time). Age was categorized as (18-44 yrs, 45-64 yrs, 65+ yrs) and BMI was categorized into obese (BMI $\geq$ 30 kg/m^2) and non-obese (< 30 kg/m^2). For household income, "missing" was included as a separate category due to the large number of respondents with missing data for this variable. Similar models were developed to determine whether the association between unmet health care need and all-cause hospitalization differed by the type of unmet need reported (accessibility, availability, acceptability, personal choice). We also assessed the association between unmet need and cause-specific hospitalizations for AMI, CHF, and stroke among respondents with chronic disease. Recognizing that associations with barriers to care and hospital outcomes may differ by type of chronic disease, sensitivity analyses were performed in only those participants with self-reported vascular-related chronic conditions only (hypertension, diabetes, heart disease, and stroke).

For the secondary outcomes (length of stay, all-cause readmission to hospital within 30 days or 1 year, and in-hospital mortality), we limited the cohort to chronic disease participants with at least one hospitalization. To determine the relationship between unmet health care need and length of stay, multivariate negative binomial regression modeling was performed. Multivariate logistic regression was used to model the odds of readmission to hospital and in-hospital mortality by unmet health care need status. Model development and assessment was similar to that described

for the primary outcomes. For all statistical tests, $P < 0.05$ was considered statistically significant. All analyses were conducted at the Prairie Regional Data Centre in Calgary, Alberta using STATA 11.0 (Statacorp, College Station, TX). This study was approved by the Ethics Review Board of the University of Calgary and Statistics Canada.

RESULTS:

A total of 51,932 adult respondents with at least one chronic medical condition were included in the cohort, of whom 15.5% reported an unmet need in the previous year. Participants with an unmet need were younger, more likely to be female, had higher levels of education, and were more likely to be obese compared to those with no reported unmet needs. Furthermore, the proportion of respondents with a regular family doctor was lower among those with a reported unmet need (Table 1). Amongst participants with a reported unmet need (n=7,897), the most commonly reported unmet need related to availability (50.4%) and personal choice (35.8%).

Association between unmet need and all-cause hospitalization:

The mean follow-up time for participants was 3.0 years (standard deviation: 1.1 years). During this study period 21,166 participants experienced 47,075 all-cause hospitalizations. Compared to respondents without an unmet need, there was no increased risk of all-cause hospitalization for respondents with an unmet need (Adjusted RR: 1.04; 95% CI: 0.94, 1.15) (Figure 1). There was no evidence of effect modification by age (p=0.61) or sex (p=0.12). When stratified by type of unmet need we found that subjects reporting an unmet need related to availability of resources had a slightly increased risk of hospitalization compared to those with no unmet need (Adjusted RR: 1.18; 95% CI: 1.09, 1.28). Subjects reporting unmet need related to acceptability had no

difference in the risk of hospitalization compared to those with no unmet need (Adjusted RR: 0.85; 95% CI: 0.71, 1.02).

Association between unmet need and cause-specific hospitalization:

Compared to participants with no unmet need, participants with unmet needs were less likely to be hospitalized for AMI (RR: 0.63; 95% CI: 0.43, 0.94) and stroke (RR: 0.63; 95% CI: 0.49, 0.85). No differences were observed in the risk of CHF-related hospitalizations (RR: 0.88; 95% CI: 0.62, 1.26) (Figure 2).

Sensitivity Analyses:

Sensitivity analyses limiting the study cohort to participants with vascular-related chronic conditions (n=14,618) did not change the observed association between unmet need and all-cause hospitalization (RR: 1.07, 95% CI: 0.91, 1.26). However, the association between unmet need and cause-specific hospitalizations were attenuated and non-significant; AMI (RR: 1.05; 95% CI: 0.70, 1.56), stroke (RR: 0.57; 95% CI: 0.32, 1.03), CHF (RR: 1.20; 95% CI: 0.63, 2.26).

Association between unmet need and length of stay, readmission, and in-hospital mortality:

Amongst subjects with at least one hospitalization, we found no differences in length of stay among participants with unmet needs compared to those without (Adjusted RR: 0.97; 95% CI: 0.85, 1.10) (Table 2), or in the risk of 30-day or 1-year readmission to hospital (Table 3). Similarly, there was no association between unmet needs and in-hospital mortality (Adjusted OR: 0.82; 95% CI: 0.62, 1.09).

INTERPRETATION:

Using a large population-based survey linked to national hospitalization records, we found no association between perceived unmet health care needs and risk of inpatient hospitalization (all-cause or cause-specific) among participants with chronic disease. Only among adults reporting unmet needs related to resource availability was there a slight increased risk of all-cause hospitalization, compared to those with no unmet needs. There was no association between unmet health care needs and features of the hospitalization including length of stay, hospital readmission or in-hospital mortality.

Previous studies using the CCHS have found that unmet needs are associated with increased health care resource use, including increased general physician visits and emergency department visits.[14-16] Though few studies have explored the association between unmet needs and hospitalizations specifically, it has been suggested that respondents with an unmet need also have more hospitalizations compared to those with no unmet need.[14] However, these findings were statistically non-significant and based on self-reported measures of health care use. A strength of our study was the ability to measure the outcomes of interest within national administrative data, eliminating concerns of recall bias that may be present in prior studies.

In relation to other commonly used measures of limited access to care, our findings contrast previous work which suggests that limited access or delays in seeking care may result in increased risk of hospitalization and longer lengths of stay.[17, 18] Bindman et al explored the association between self-reported access to care and risk of hospitalization in California, and reported that individuals with poor perceived access to medical care (5-point scale that asked

respondents how difficult it was for them to get health care) had higher rates of hospitalization for chronic diseases compared to those with no access difficulties.[17] Similarly, Weissman et al observed that patients who self-reported a delay in receiving medical attention had hospital stays that were 9% longer compared to patients with no reported delays.[18] Though these studies suggest a potential association between limited access to care and hospital related outcomes, both were cross-sectional in nature and could not determine if the perceived barriers to care preceded the outcomes of interest. In our study the prospective design eliminated issues of temporality. A prior study also employing a prospective design found no association between self-reported delays in care and health outcomes. Specifically, Rupper and colleagues showed that delays in seeking medical attention did not increase the risk of mortality or functional decline in a population of community dwelling elderly subjects.[19] They concluded that additional work is needed to explore the process of seeking health care and to better understand the current measures of limited access to care that are used in health research.

An interesting finding that warrants further exploration was the differential effect of the type of unmet need and risk of all-cause hospitalization. We found a small but statistically significant increased risk of all-cause hospitalization among participants with an unmet need related to availability (lengthy wait times and unavailable services) but not for other types of need including accessibility, acceptability or personal choice. Although not statistically significant, a prior study suggested a trend to increased risk of hospitalization for patients with an unmet need related to wait times and limited resource availability.[14] Though it is difficult to determine the exact mechanism behind this association, we speculate that not receiving timely care may result in additional care requirements at a later date. Regardless, these findings highlight the need for a

disaggregated approach to the study of unmet need in future studies and suggest that specific types of unmet needs may put chronic disease patients at greater risk for adverse outcomes.

We found that participants with chronic disease and an unmet need were less likely to have cause-specific hospitalizations for AMI and stroke. This may in part be a result of the chronic conditions used to define our study cohort. Reasons for hospitalization may be different for patients with symptomatic chronic conditions with unmet needs (arthritic, COPD, mood disorders) compared to those with vascular-related chronic conditions (diabetes, hypertension, heart disease, stroke). Furthermore, this association was attenuated and non-significant when we limited our cohort to participants with vascular-related chronic conditions.

Our overall results of no association between unmet needs and risk of hospitalization, readmission or mortality can be interpreted in a number of ways. First, it may be an indication that our health care system, with universal access, is adequate to meet the needs of individuals with chronic disease. Despite 16% of adults with chronic disease reporting an unmet need, these unmet needs did not translate into an increased risk of inpatient hospitalization and related events. Second, it may be that patients with unmet needs are accessing other aspects of the health care system to maintain their health status and avoid hospitalization. Specifically, unmet needs have been associated with increased emergency department visits [16] and visits to general practitioners in emergency departments as opposed to primary care settings.[15] Finally it is also possible that our current measures of limited access to care are non-specific and cannot discriminate between those at risk for adverse outcomes from those that are not. The need for

future work to better understand the meaning of an "unmet need" and how patients interpret these questions in the setting of health surveys has been emphasized.[28]

Our results should be interpreted in light of its limitations. First, our exposure of interest was obtained from self-reported survey data and measured at one point in time. As a result, we could not determine if an unmet need reported at the beginning of the study was sustained throughout follow-up or represented a short-term need that was resolved. It is possible that our relatively long follow-up time may be one reason for the null findings as the impact of an unmet need might be more immediately realized in this population. Though future studies should consider the use of a time-varying covariate to measure the effect of unmet needs over time, given the constant need for care amongst patients with chronic disease, and in particular those with multiple chronic conditions, it is likely that a perceived unmet need would be sustained throughout follow-up. Secondly, there is the possibility of residual confounding, as we could not adjust for chronic disease severity or duration – two variables that may affect the potential association in question. We did however adjust for self-perceived health status and a number of other relevant covariates using the Health Behavior Model proposed by Anderson [27] and feel that any unmeasured variables would need to be very strong to influence our findings. Finally, we did not capture outpatient deaths and were unable to account for this as a potential competing risk in our analysis. However the number of deaths outside of hospitals is likely to be low and similar across unmet need status. Despite these limitations, our study has a number of strengths. Our ability to link national survey data with national hospitalization records provides a unique opportunity to comprehensively assess the effect of unmet health care need on health care utilization and outcomes in chronic disease populations. The use of a prospective cohort design

also ensured that our exposure preceded the outcomes of interest and allowed us to account for differential follow-up times amongst study participants. Finally, the use of a population-based cohort of adults (≥18 yrs) with at least one high impact chronic condition increases the generalizability of the study results. This is particularly important given the growing burden of chronic disease in Canada and abroad.

In summary, our study provides a national perspective on the association between unmet health care need and hospital outcomes among adults with chronic medical conditions, and indicates that adults with chronic conditions and self-perceived unmet needs do not experience an increased risk of hospital-specific outcomes. The small increased risk for the subgroup with an unmet need defined by limited resource availability may suggest a high-risk group in which unmet need result in poor health outcomes. Future work should focus on identifying these groups as well as exploring other measure of health care utilization that may better reflect the impact of self-perceived unmet need.

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CONTRIBUTOR STATEMENT:

Paul Ronksley was involved in the concept and design of the study. He was also responsible for drafting the manuscript, conducted the analysis, and interpreting the data. Dr. Claudia Sanmartin contributed to the concept and design, interpretation of data, and provided intellectual content. Similarly Drs. Quan, Ravani, Tonelli, and Manns contributed to the concept and design of the study and provided interpretation and intellectual content to subsequent drafts of the manuscript. Dr. Brenda Hemmelgarn also contributed to the study conception and design, data interpretation, and manuscript revisions. All authors read and approved the final draft. Dr. Hemmelgarn is study guarantor.

COMPETING INTERESTS:

None

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Table Legend:

Table 1. Participant characteristics

Table 2. Association between unmet health care need and hospital length of stay (amongst participants with at least one hospitalization n=21,166)

Table 3. Associations between unmet health care need, readmission to hospital, and in-hospital mortality (amongst participants with at least one hospitalization n=21,166)

Figure Legend:

Figure 1. Association between unmet health care need and all-cause hospitalization (stratified by type of unmet need)

Figure 2. Association between unmet health care need and cause-specific hospitalization

Appendices:

Appendix 1. Categorization of types of unmet need

Appendix 2. ICD-9-CM and ICD-10 codes for identifying cause-specific hospitalizations

Table 1. Participant characteristics

Variables	All* (n=51,932)	Unmet Needs (n=7,897)	No Unmet Needs (n=44,035)	p value†
Male (%)	43.0	36.9	44.1	<0.001
Age, yrs (%)				
18-44 yrs	28.3	44.2	25.4	
45-64 yrs	40.0	38.5	40.3	<0.001
65+ yrs	31.7	17.2	34.3	
Rural Resident (%)	20.0	19.4	20.1	0.285
Household Income (%)				
- <$50,000	9.9	10.0	9.9	
- $50-60,000	8.9	8.4	9.0	
- $60-80,000	13.7	13.2	13.8	0.209
- >$80,000	19.8	19.0	20.0	
- Missing	47.6	49.4	47.3	
Marital Status (%)				
- Married / Common-law	66.3	59.9	67.5	
- Single	13.1	19.8	11.8	<0.001
- Widowed/Separated/ Divorced	20.6	20.3	20.7	
Level of Education (%)				
- Less than high school	27.6	23.3	28.4	
- High school graduate	19.3	18.3	19.5	<0.001
- Some post secondary	8.0	10.8	7.5	
- Post secondary graduate	45.1	47.7	44.6	
Obese (BMI ≥ 30) (%)	21.7	23.6	21.4	0.010
Born outside of Canada (%)	23.6	19.4	24.4	<0.001
Aboriginal Status (%)	2.3	3.6	2.1	<0.001
Have a Regular Family Doctor (%)	94.1	88.6	95.1	<0.001

Self-perceived Health (%)				
- Excellent	11.2	7.4	11.9	
- Very Good / Good	63.6	56.2	65.0	<0.001
- Fair / Poor	25.2	36.4	23.1	
Smoking Status (%)				
- Current	24.5	35.4	22.5	
- Former	46.8	40.1	48.0	<0.001
- Never	28.7	24.5	29.5	
Drinking Status (%)				
- Regular / Occasional	76.1	78.3	75.8	
- Former	17.4	16.9	17.4	<0.001
- Never	6.5	4.8	6.8	
Physical Activity Level (%)				
- Active	19.8	18.6	20.0	
- Moderate	24.0	23.1	24.2	0.062
- Inactive	56.2	58.3	55.8	

* Among patients with at least one chronic condition of interest (arthritis, COPD, diabetes, heart disease, hypertension, mood disorder, stroke)

† Chi squared test by unmet need status

Abbreviations: BMI (Body Mass Index)

Table 2. Association between unmet health care need and hospital length of stay (amongst participants with at least one hospitalization n=21,166)

	Length of Stay in Hospital (days), Median (IQR)	Multivariate Adjusted Model* RR (95% CI)	P value
No unmet need (n=17,824)	7 (3-17)	Reference	
Unmet need (n=3,342)	5 (2-15)	0.97 (0.85-1.10)	0.596

* Multivariate negative binomial regression model adjusted for age, sex, obesity, household income, level of education, marital status, having a regular family doctor, self-perceived health status, aboriginal status, and survey cycle.

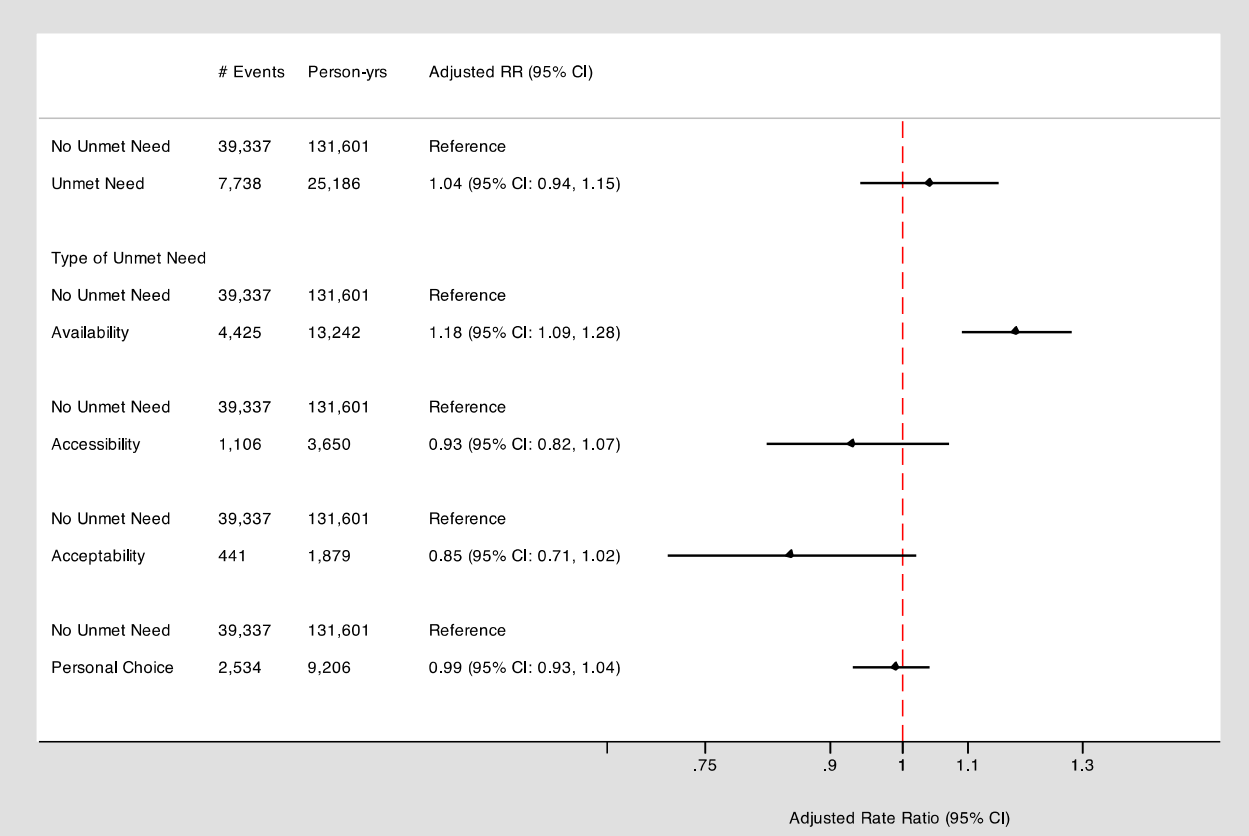
Table 3. Associations between unmet health care needs, readmission to hospital, and in-hospital mortality (amongst participants with at least one hospitalization n=21,166)

	30-day Readmission to Hospital, n (%)*	Multivariate Adjusted Model† OR (95% CI)	P value
No unmet need (n=17,824)	1,612 (9.0)	Reference	
Unmet need (n=3,342)	295 (8.8)	0.99 (0.79-1.25)	0.930
	1-Year Readmission to Hospital, n (%)*	Multivariate Adjusted Model† OR (95% CI)	P value
No unmet need (n=17,824)	5,537 (31.1)	Reference	
Unmet need (n=3,342)	979 (29.3)	0.95 (0.82-1.10)	0.492
	In-Hospital Mortality, n (%)*	Multivariate Adjusted Model† OR (95% CI)	P value
No unmet need (n=17,824)	1397 (7.8)	Reference	
Unmet need (n=3,342)	166 (5.0)	0.82 (0.62-1.09)	0.169

* Proportions weighted to represent Canadian household population.

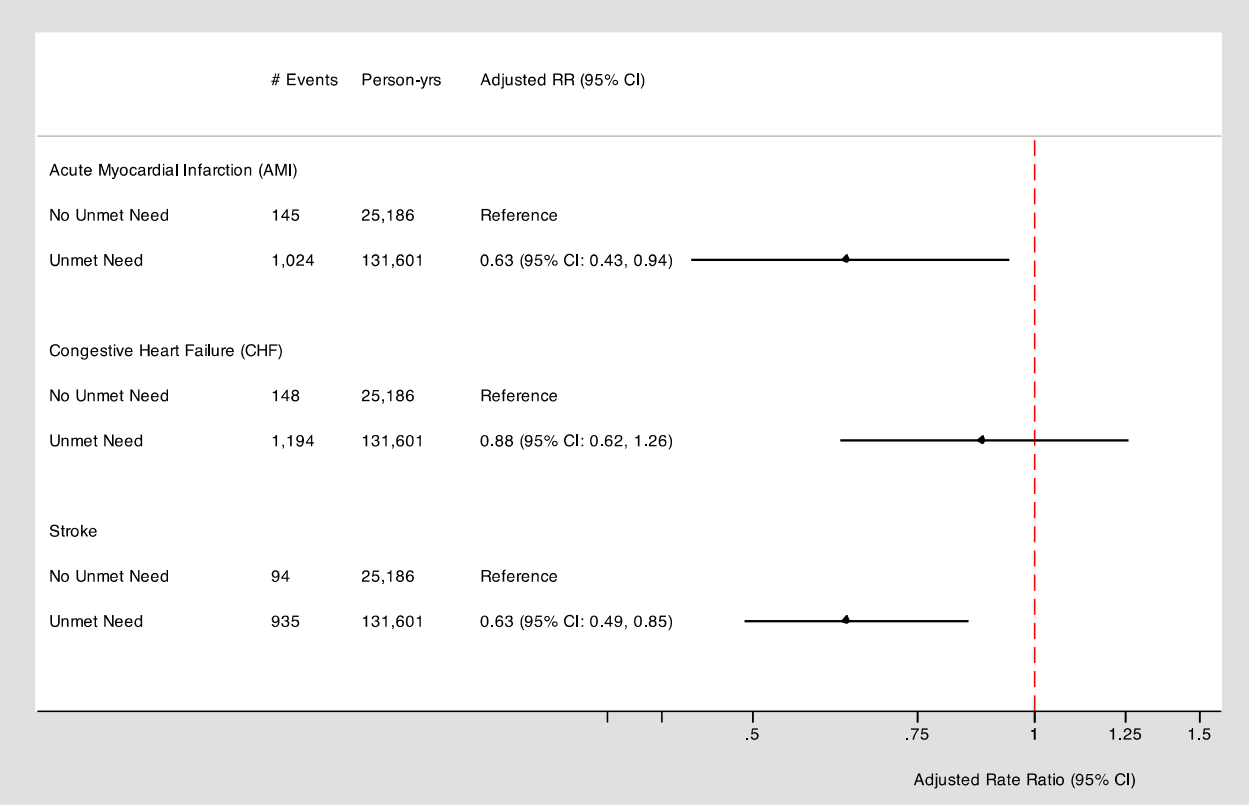
† Multivariate logistic regression models adjusted for age, sex, obesity, household income, level of education, marital status, having a regular family doctor, self-perceived health status, aboriginal status, and survey cycle.

Figure 1. Association between unmet health care need and all-cause hospitalization (stratified by type of unmet need)



Multivariate zero-inflated negative binomial regression models adjusted for age, sex, obesity, household income, level of education, marital status, having a regular family doctor, self-perceived health status, aboriginal status, and survey cycle.

Figure 2. Association between unmet health care need and cause-specific hospitalization



Multivariate zero-inflated negative binomial regression models adjusted for age, sex, obesity, household income, level of education, marital status, having a regular family doctor, self-perceived health status, aboriginal status, and survey cycle.

Appendix 1. Categorization of types of unmet need

Type of Unmet Need
Accessibility (barriers that restrict the entry into or use of health care resources) - Cost - Transportation
Availability (reflect perceived deficiencies in health care delivery that inhibit a persons ability to receive care) - Waiting time too long - Not available when requested - Not available in area
Acceptability (personal attributes and attitudes related to the health care system) - Dislike doctor/Afraid - Language problems - Didn't know where to go
Personal Choice (concerns attitudes and competing responsibilities not related to the health care system) - Too busy - Didn't get around to it/Didn't bother - Felt it would be inadequate - Decided not to seek care - Personal/Family responsibilities

Appendix 2. ICD-9-CM and ICD-10 codes for identifying cause-specific hospitalizations

Cause-specific event	ICD-9-CM Codes	ICD-10 Codes
Acute Myocardial Infarction	410	I21, I22
Congestive Heart Failure	428.x	I50.x
Stroke	325.x, 362.3, 430.x, 431.x, 433.x1, 434.x1, 435.x, 436, 437.6	H34.1, I60.x, I61.x, I63.x, I64.x, I67.7, G08, G45.x (excluding G45.4)

X