

Hospitalization Disparities by Socio-Economic Status for Males and Females

Summary

This analysis examines disparities in hospitalization rates across socio-economic groups for Canada's census metropolitan areas. The analysis builds on previous research that has illustrated hospitalization disparities by socio-economic status in Canada—lower socio-economic groups have consistently higher hospitalization rates.¹⁻⁸ Canadian research also suggests that the relationship between socio-economic status and health differs by sex.^{9, 10}

Research shows there is variability in hospitalization rates that may be the result of differences in access to primary health care, including physician supply.¹¹⁻¹³ This analysis focuses on ambulatory care sensitive conditions and mental health, as these are conditions for which hospitalization could potentially be avoided with adequate primary health care.^{14, 15}

This analysis addresses the following research questions: Are there disparities in hospitalization rates across socio-economic groups for both males and females? Do the magnitude and cost of these disparities differ by sex?

Key Findings

Hospitalization disparities across socio-economic groups exist for both sexes for ambulatory care sensitive conditions and mental illness, and they are consistently observed across census metropolitan areas in Canada.

- The magnitude of disparities is generally higher for males than females when measured by excess hospitalization rates.ⁱ
- For both sexes, excess rates associated with socio-economic status account for an estimated 33% to 40% of hospitalization rates.

i. The excess hospitalization rate is the sum of differences in hospitalization rates between the highest socio-economic group and each lower group, converted to a rate per 100,000.



Analysis in Brief

Who We Are

Established in 1994, CIHI is an independent, not-for-profit corporation that provides essential information on Canada's health system and the health of Canadians. Funded by federal, provincial and territorial governments, we are guided by a Board of Directors made up of health leaders across the country.

Our Vision

To help improve Canada's health system and the well-being of Canadians by being a leading source of unbiased, credible and comparable information that will enable health leaders to make better-informed decisions.

Federal Identity Program

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- For ambulatory care sensitive conditions, excess rates are significantly higher for males than for females. Estimated costs of excess hospitalizations are \$89 million for males and \$71 million for females.
- For mental illness, excess hospitalization rates are also higher for males than for females. The total estimated excess costs are \$123 million for males and \$125 million for females (based on populations of 10.2 million males and 10.7 million females in urban Canada).

Introduction

Research shows Canadians of all ages in lower socio-economic areas have higher health service use.¹⁻⁸ Recent reports by the Chief Public Health Officer and the Senate Subcommittee on Population Health, as well as an international report by the World Health Organization, echo concern over the extent of health disparities associated with socio-economic status for multiple measures of health.¹⁶⁻¹⁸ The World Health Organization has also highlighted the importance of considering gender in efforts and interventions aimed at promoting health equity.¹⁶ Making data at different levels (such as by geography and socio-economic status) available for both males and females is one way to address gender equity through the health system.¹⁹

Research has demonstrated that the relationship between socio-economic status and health differs by sex.^{3, 9, 20} For example, studies have shown that life-expectancy disparities across socio-economic groups were larger for males than for females.^{10, 21} A Canadian study showed differences in life expectancy between the highest and the lowest income groups to be 7.4 years for males versus 4.5 years for females.¹⁰ Another study found health disparities were also more pronounced for men than women for lung cancer, circulatory diseases, digestive diseases and alcoholism.²⁰

New analyses presented here examine measures of hospitalization disparities by socio-economic status for males and females living in Canadian census metropolitan areas. This analysis is an extension of previous work by the Canadian Population Health Initiative that explored the relationship between health and socio-economic status. The 2008 report *Reducing Gaps in Health: A Focus on Socio-Economic Status in Urban Canada* showed that hospitalization rates were consistently higher for people from lower socio-economic areas in each of the 15 census metropolitan areas examined.⁷ The present analysis expands on the previous work by examining disparities in hospitalization rates across socio-economic groups separately for males and females. In addition, it explores measures of the magnitude of disparities and estimated costs.

One proposed reason for health disparities between socio-economic groups, as reflected in higher hospitalization rates among low-income populations, is variable access to primary health care.^{14, 22} The adequacy of a health system's primary care infrastructure has been positively related to desirable health outcomes.¹¹⁻¹³ It therefore follows that inadequate access to primary health care may contribute to higher hospitalization rates, as is observed among low-income populations. This is particularly true for conditions that can be managed on an outpatient basis by a primary health care provider. Accordingly, the outcomes of interest in this analysis are ambulatory care sensitive conditions and mental illness—hospitalization for these conditions is potentially avoidable through preventive care and early disease management provided in an ambulatory setting, such as primary health care.^{14, 15, 23, 24}

Identifying Terms

Ambulatory care sensitive condition (ACSC) hospitalizations: Acute care hospitalizations for ACSCs include those where the main diagnosis was for one of seven conditions: epilepsy, chronic obstructive pulmonary disease, asthma, heart failure and pulmonary edema, hypertension, angina and diabetes.²⁵ See Appendix A for more details on the data sources.

ACSC hospitalization rates are calculated only for patients younger than age 75; this corresponds roughly to the set life expectancy in the developed world (that is, deaths prior to age 75 are considered premature and potentially avoidable).^{26, 27}

Mental illness hospitalizations: Mental illness hospitalizations include those where the most responsible diagnosis was a code from Chapter 5: Mental and Behavioural Disorders of the World Health Organization's *International Classification of Diseases*.²⁸ In addition, mental health-related hospitalizations reported to the Ontario Mental Health Reporting System from Ontario general hospitals with designated adult mental health beds are included. See Appendix A for more information on the data sources.

Socio-economic status: The Institut national de santé publique du Québec Deprivation Index is used to operationalize socio-economic status at the dissemination areaⁱⁱ level based on 2006 census data.^{30, 31} Both social (marital status, living arrangement) and material (income, education, employment) factors are combined in the index. Dissemination areas in each of the 33 census metropolitan areas in Canada were assigned to one of five groups, or quintiles, each representing a population area with a different level of socio-economic deprivation. Residents from the highest socio-economic status areas are least deprived, representing 20% of the total population in each census metropolitan area based on ranking of areas; those in the lowest socio-economic status areas are the most deprived 20% (see Appendix B for details).

Sex: In this analysis the term “sex” rather than “gender” is used because the population under study is broken down into male and female on the basis of the sex of individuals in the hospitalization record. There is no content that would allow an extrapolation of the role of (social) gender relations versus sex-linked biology (or the interaction of both) in the outcomes that were found, nor did the present analyses lend themselves to such exploration.

ii. According to Statistics Canada, a dissemination area is a small geographical area, typically with a population of 400 to 700 people. Dissemination areas are the smallest areas for which census data can be distributed and cover all provinces and territories in Canada.²⁹

Results

Previous Canadian Population Health Initiative analyses showed that hospitalization rates for multiple health indicators were consistently higher for people living in low socio-economic status areas than for the middle and high groups across the census metropolitan areas.⁷ New analyses presented in this analysis go deeper to look at disparities across socio-economic groups by sex and to examine the magnitude and cost of these disparities.

Hospitalization Rates by Sex

From a population health perspective, which aims to improve health and reduce disparities, it is considered beneficial for populations to have low hospitalization rates for ACSCs and mental illness, as well as for there to be small disparities between socio-economic groups. Therefore, before examining and comparing disparities in hospitalizations, current hospitalization rates for males and females are provided.

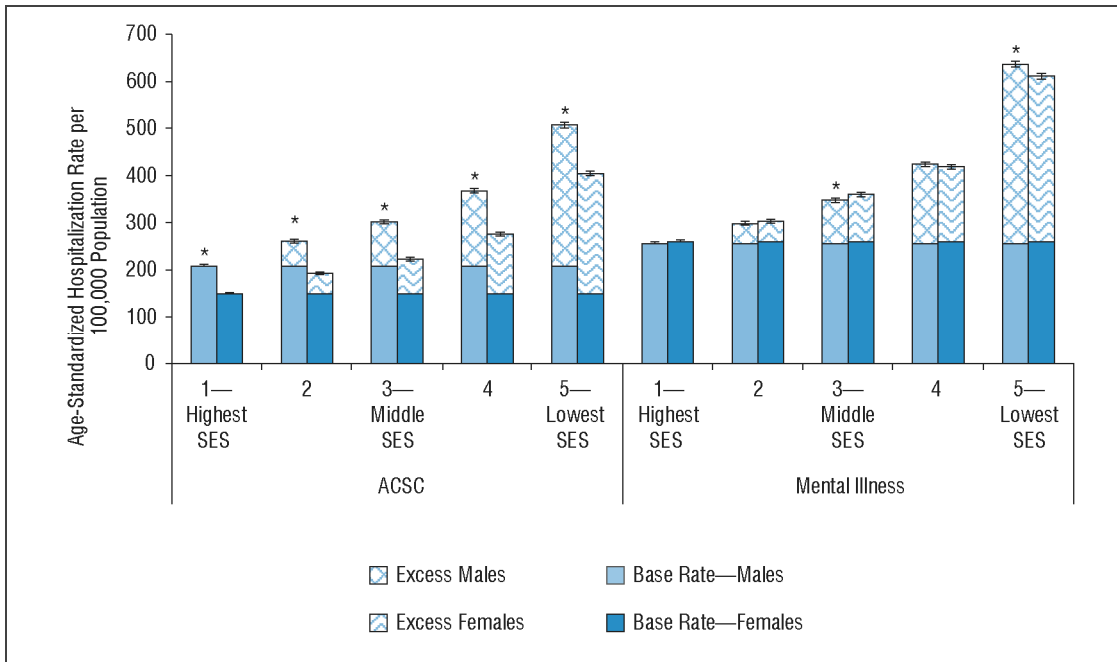
As shown in Figure 1, hospitalization rates for ACSCs were consistently and significantly higher for males than for females in each socio-economic status group. This pattern is consistent across census metropolitan areas (see Appendix C). For mental illness, sex differences in hospitalization rates were less consistent and less pronounced. Significant differences were observed only in the middle socio-economic status group, where females had higher rates, and the lowest group, where the rate was higher for males. Results from area-specific analyses did not reveal a consistent pattern of sex differences in hospitalization rates for mental illness.

- Hospitalization rates for ACSCs were significantly higher for males than females. This was the case for all socio-economic groups.
- For mental illness, differences by sex in rates were inconsistent. Females tended to have higher rates than males in the same socio-economic group when looking across census metropolitan areas.

Disparities in Hospitalization Rates

Figure 1 illustrates hospitalization disparities for both health conditions and both sexes, for all 33 census metropolitan areas combined. The observed pattern, referred to as a gradient, shows that the lower the socio-economic status group the higher the rate of hospitalization. To compare the magnitude of disparities in hospitalization rates between males and females, a summary measure of excess was used. Excess refers to rates over and above those observed in the group with the lowest rate. As seen in Figure 1, the rate in the highest socio-economic status group is significantly lower than the rates for other groups for both conditions. This is consistent for most census metropolitan areas (see Appendix C). Accordingly, for these analyses, the highest socio-economic status group is the reference (the base group to which every other group was compared), and its hospitalization rate became the base rate. The base rate is represented by the dark shading and the excess rates by the lighter shading in the figure. The total excess hospitalization rate, or magnitude of the disparity, for a health condition is calculated by summing the excess rates across all socio-economic status groups and converting to an age-standardized rate per 100,000.

Figure 1: Age-Standardized Hospitalization Rates by Socio-Economic Status and Sex



Notes
 * Significant difference between males and females at the 95% confidence level.
 Analysis represents results for all 33 census metropolitan areas combined. Census metropolitan area-specific results and differences between socio-economic status groups are provided in Appendix C.

Sources
 Discharge Abstract Database, 2005–2006 to 2007–2008, and Ontario Mental Health Reporting System, 2006–2007 and 2007–2008, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, 2005–2006 to 2007–2008, ministère de la Santé et des Services sociaux du Québec.

Measuring the Magnitude of Disparities

To compare observed differences in outcomes between population groups, different measures can be used to summarize the magnitude of disparities. The measure selected may depend on whether observed disparities appear as a threshold or a gradient. With a threshold effect there is a difference between the rate for one group versus all other groups, among which there is little difference.⁶ In cases like this, the ratio of the lowest to the highest rates can be used to measure the size of the disparity.

For disparities that are characterized by a gradient, as seen in Figure 1, a measure that takes all groups into consideration (not just the highest and lowest groups) can be used to describe the magnitude of the observed disparities. Two such measures, adapted from previous research,^{6, 32, 33} are used in this analysis.

Total excess hospitalization rate—the sum of all differences in hospitalization rates between the highest socio-economic status group (base or reference group) and each lower group. This sum is converted to a rate per 100,000 by dividing by 5 (for the number of groups in the total population) to yield a rate that is comparable to the overall hospitalization rate and comparable between males and females.

Ratio of excess to total—the ratio of the sum of excess hospitalization rates to the total hospitalization rate in all socio-economic groups.ⁱⁱⁱ This can be interpreted as the proportion of the total hospitalization rate that can be attributed to excess hospitalizations in lower socio-economic groups.²⁸

Research on measuring disparities suggests that both relative and absolute measures are valid and argue both should be considered.^{32, 34} The excess hospitalization rate represents an *absolute* measure of disparity, as it reflects the difference in rates between socio-economic status groups. The ratio of the excess to the total hospitalization rate represents a *relative* measure, since it compares the excess relative to the total rate. In some cases, absolute and relative measures don't produce the same results. In this analysis there is an emphasis on the absolute measure to estimate the cost associated with excess hospitalizations.

Magnitude of Hospitalization Disparities Across Socio-Economic Groups

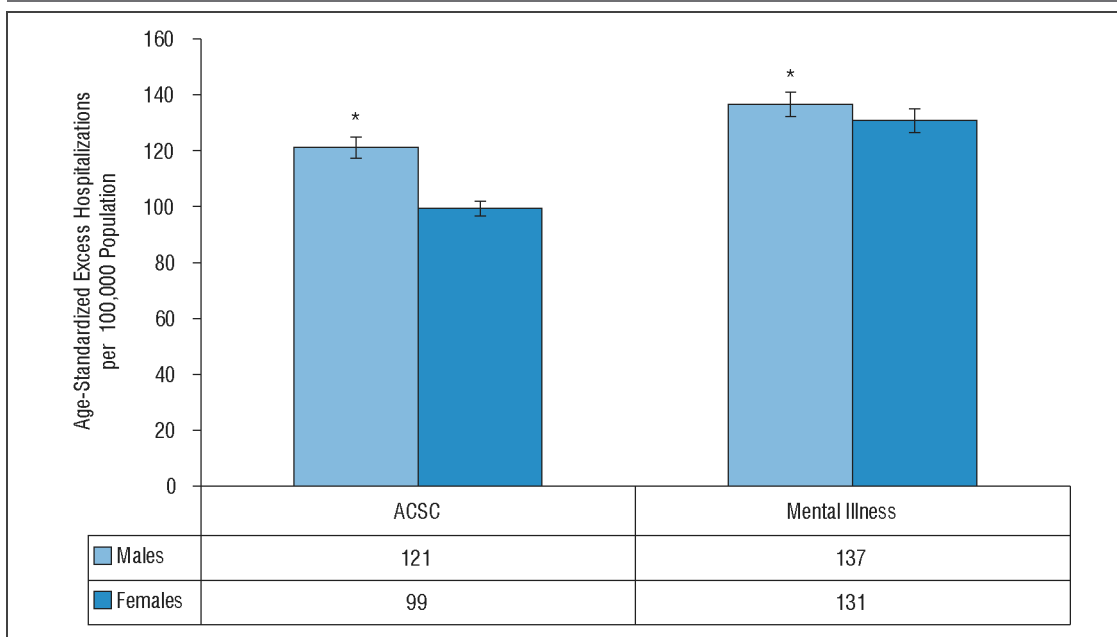
This analysis explores the magnitude of disparities through different methods. First, total excess hospitalization rates are calculated and compared between males and females. This total excess rate is then compared to the overall rate for all socio-economic status groups to determine what proportion of the total hospitalization rate is estimated to be excess.

Are Excess Hospitalization Rates Higher for Males or Females?

Figure 2 illustrates the differences in the magnitude of the disparity in hospitalizations across all socio-economic status groups between males and females. The estimated age-standardized excess hospitalization rate for ACSCs was 121 per 100,000 for males, significantly higher than the 99 excess hospitalizations per 100,000 for females. For mental illness, excess hospitalization rates were more similar for males (137 per 100,000) and females (131 per 100,000); however, the difference was still significant. Excess rates were significantly higher for males than females in about one-third (11 of 33) of census metropolitan areas for ACSCs and in seven areas for mental illness (see Appendix D).

iii. This is a variation on the disparity index, where the ratio is the sum of the excess divided by the reference group, which is not always the total.

Figure 2: Age-Standardized Excess Hospitalization Rates for Males and Females



Notes

* Significant difference between males and females at the 95% confidence level.

Analysis represents results for all 33 census metropolitan areas combined. Census metropolitan area-specific results are provided in Appendix D.

Sources

Discharge Abstract Database, 2005–2006 to 2007–2008, and Ontario Mental Health Reporting System, 2006–2007 and 2007–2008, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, 2005–2006 to 2007–2008, ministère de la Santé et des Services sociaux.

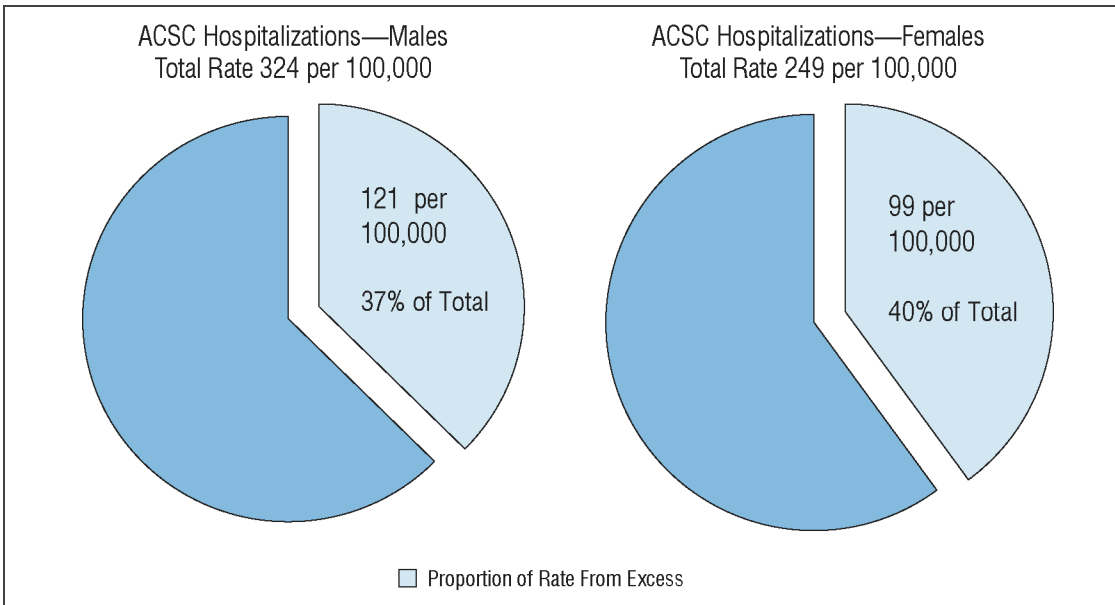
What Proportion of the Hospitalization Rate Is Excess?

Figures 3 and 4 illustrate the proportion of the total hospitalization rate estimated to be the excess for ACSCs and mental illness, respectively. Excess hospitalizations for lower socio-economic status groups compared to the highest group accounted for 37% of the total ACSC hospitalization rate for males and for 40% of the total ACSC hospitalization rate for females. Note that when excess rates were used (an absolute measure), males had higher disparities than females. However, when the proportion of the excess of the total rate was estimated (a relative measure), males no longer had higher disparities. This inconsistency between the absolute measure of excess rate and the relative measure of proportion was the result of the relatively higher total hospitalization rate for ACSCs for males than females (that is, the ratio of 121 per 324 hospitalizations for males is smaller than the ratio of 99 per 249 hospitalizations for females). Thus, compared to females, males had higher ACSC hospitalization rates overall and therefore also higher rates of excess hospitalization. However, when the proportion of the excess rate relative to the total ACSC hospitalization rate for each sex was considered, excess was higher for females. These results emphasize the importance of considering both relative and absolute measures when examining disparities.

For mental illness, excess represented about one-third of the total hospitalization rate for both males (35%) and females (33%). In this case, the excess hospitalization rate was also proportionately higher for males than females (137 per 392 versus 131 per 391, respectively). For both ACSCs and mental illness and for both males and females, approximately half of the excess rate was attributable to the lowest socio-economic status group (analyses not shown here).

- When the size of disparities is measured by excess hospitalization rates, disparities are larger for males.
 - Excess hospitalization rates are significantly higher for males than females for both ACSCs and mental illness.
- For both males and females, 33% to 40% of hospitalization rates for ambulatory care sensitive conditions and mental illness are estimated to be excess rates associated with lower socio-economic status groups.

Figure 3: Proportion of Excess ACSC Hospitalization Rate by Sex



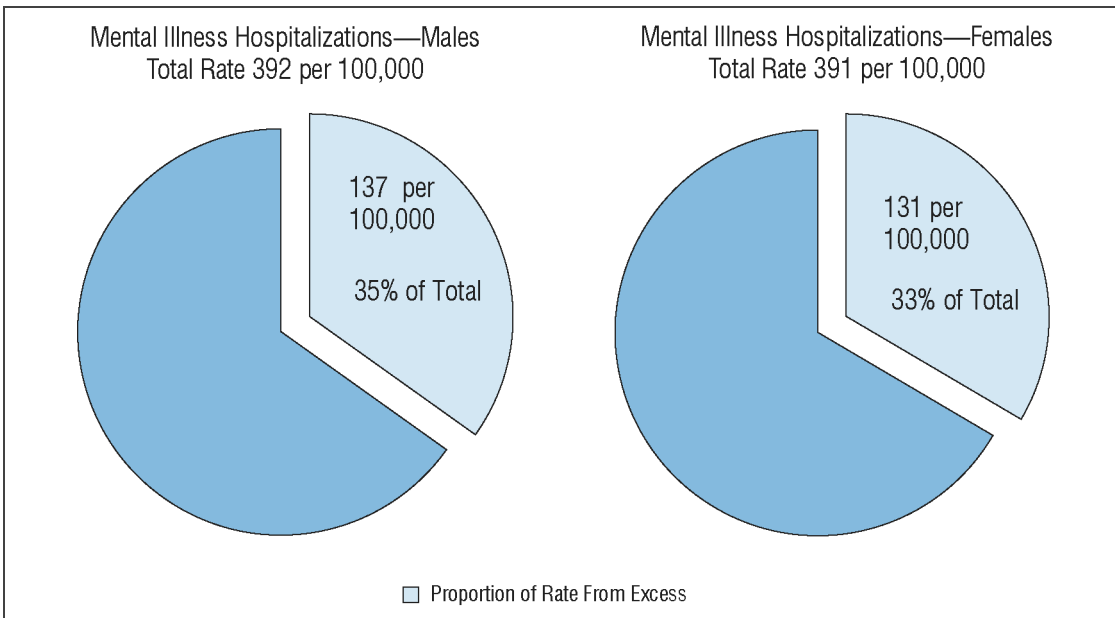
Note

Analysis represents results for all 33 census metropolitan areas combined.

Sources

Discharge Abstract Database, 2005–2006 to 2007–2008, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, 2005–2006 to 2007–2008, ministère de la Santé et des Services sociaux.

Figure 4: Proportion of Excess Mental Illness Hospitalization Rate by Sex



Note

Analysis represents results for all 33 census metropolitan areas combined.

Sources

Discharge Abstract Database, 2005–2006 to 2007–2008, and Ontario Mental Health Reporting System, 2006–2007 and 2007–2008, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, 2005–2006 to 2007–2008, ministère de la Santé et des Services sociaux.

What Are the Estimated Costs Associated With Excess Hospitalization Rates?

The cost of acute care hospitalizations presented in this analysis is based on the estimates provided in a 2008 CIHI report.³⁵ The estimate for the average cost (weighted by condition) of an acute care hospital stay for ACSCs was \$7,559 for males and \$7,139 for females. For mental illness hospitalizations the estimated cost was \$8,821 for males and \$8,935 for females. Of note, the estimated cost of an acute care hospitalization for ACSCs is higher for males, while for mental illness the cost is slightly higher for females (see appendices D and E for more details on variable definitions and cost estimates). As these estimated costs are from 2004–2005, costs are likely to be underestimated.

Estimates of the total and excess costs for a population of 100,000 for one year are shown in Table 1. Estimates are based on the average cost of acute hospitalizations and assume that the cost of a hospitalization for all socio-economic status groups is the same. The average estimated cost for ACSC hospitalizations among males was \$2.4 million (per 100,000 population). Of this cost, nearly \$1 million was estimated to come from hospitalizations in lower socio-economic status groups that are in excess of the base rate experienced by the highest group. For females, approximately \$700,000 of a total \$1.8 million was estimated to come from excess hospitalizations. Since hospitalization rates and the average cost for an ACSC hospitalization are significantly lower for females, the total estimated cost of excess is also lower for females. Again, approximately half of the excess-related costs come from the disparity observed in the lowest socio-economic status group.

For mental illness, the estimated total cost of acute hospitalizations is similar for males and females. For each sex, the cost associated with the total excess in hospitalizations represented roughly \$1.2 million of the total \$3.5 million estimate per 100,000 population (approximately one-third of the cost of all hospitalizations related to mental illness). Of the excess cost, the lowest socio-economic status group contributed just more than half. In other words, despite the increasing gradient in hospitalization rates with decreasing socio-economic status shown in Figure 1, the bulk of excess hospitalizations and associated costs comes from the lowest socio-economic group.

Table 1: Total and Excess Cost per 100,000 Population per Year

	Ambulatory Care Sensitive Conditions				Mental Illness			
	Males	Percent	Females	Percent	Males	Percent	Females	Percent
Total Cost (rate / 100,000 x average cost)	\$2,449,000		\$1,778,000		\$3,458,000		\$3,494,000	
Total Excess Cost From All Socio-Economic Status Groups (excess rate / 100,000 x average cost)	\$916,000	37%	\$710,000	40%	\$1,208,000	35%	\$1,170,000	33%
Total Excess From Lowest Socio-Economic Status Group (SES group 5 rate / 500,000 x average cost)	\$452,000	18%	\$364,000	20%	\$670,000	19%	\$625,000	18%

Note

Cost estimates represent average costs per 100,000 population per year (2005–2006 to 2007–2008) based on an age-standardized population.

Sources

Discharge Abstract Database, 2005–2006 to 2007–2008, and Ontario Mental Health Reporting System, 2006–2007 and 2007–2008, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, 2005–2006 to 2007–2008, ministère de la Santé et des Services sociaux; Canadian Institute for Health Information, *The Cost of Acute Care Hospital Stays by Medical Condition in Canada, 2004–2005* (Ottawa, Ont.: CIHI, 2008).

What do these age-standardized costs per 100,000 population amount to for the total population? For the approximately 10.2 million males in all census metropolitan areas, the total cost for mental illness per year would be \$352 million (10,185,000 / 100,000 x \$3.46 million). Roughly \$123 million of this total cost is estimated to come from hospitalizations in lower socio-economic groups (that is, excess rates). In other words, if males in all socio-economic groups had the same hospitalization rates as the highest group for mental illness, an estimated \$123 million could be saved per year. For ACSCs, excess costs represent roughly \$90 million of \$238 million in total estimated costs (Table 2).

An estimated 10,705,320 females were living in the census metropolitan areas in 2006. As costs for females are based on a larger population, total costs cannot be directly compared between sexes. For females, excess costs represented \$71 million, or 40%, of the total costs for ACSCs and \$125 million, or 34%, of the total costs for mental illness. See Appendix E for more details.

Table 2: Total and Excess Cost Estimates for Total Population, Canadian Census Metropolitan Areas, 2006

	Ambulatory Care Sensitive Conditions				Mental Illness			
	Males	Percent	Females	Percent	Males	Percent	Females	Percent
Total Cost	238,060,000		177,640,000		352,200,000		374,040,000	
Total Excess Cost From All Socio-Economic Groups	89,040,000	37%	70,940,000	40%	123,040,000	35%	125,250,000	33%
Excess From Lowest Socio-Economic Group Only	43,940,000	18%	38,970,000	22%	68,240,000	19%	66,910,000	18%

Note

Based on population estimates from 2006 census in all census metropolitan areas where socio-economic status was available.

Sources

Census, 2006, Statistics Canada; Discharge Abstract Database, 2005–2006 to 2007–2008, and Ontario Mental Health Reporting System, 2006–2007 and 2007–2008, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, 2005–2006 to 2007–2008, ministère de la Santé et des Services sociaux; Canadian Institute for Health Information, *The Cost of Acute Care Hospital Stays by Medical Condition in Canada, 2004–2005* (Ottawa, Ont.: CIHI, 2008).

- For males, excess costs are estimated to be \$89 million for ACSCs and \$123 million for mental illness. For females, these costs are estimated at \$71 million and \$125 million for ACSCs and mental illness, respectively.
- For both sexes and both ACSCs and mental illness, total excess costs are estimated to be more than \$400 million.
- The lowest socio-economic status group accounts for roughly half of all estimated excess costs.

Discussion

This analysis supports previous national and international studies indicating people with lower socio-economic status have poorer health status—for example, higher hospitalization rates,⁸ higher mortality rates^{9, 21} or shorter life expectancy^{10, 16}—compared to those with higher socio-economic status. In addition, the analysis presented makes a contribution to the existing literature on health disparities by examining and presenting sex differences.

For both sexes, results in this analysis indicate that there is an inverse relationship between socio-economic status and hospitalizations, where lower socio-economic status is associated with higher rates. To compare the magnitude of the disparities between males and females, our analyses estimated excess hospitalization rates as well as the proportion of the total rate that is excess. Excess hospitalization rates were found to be higher for males than females for both ACSCs and mental illness for all 33 census metropolitan areas combined. For both males and females approximately 33% to 40% of the overall hospitalization rate is estimated to be excess.

The disparities in health associated with socio-economic status are reflected in the costs to the health care system. Analyses showed that if males in all socio-economic groups had the same hospitalization rates as those in the highest socio-economic status group, an estimated \$123 million could be saved per year for mental illness and \$89 million saved for ACSCs. Similarly for females, this potentially translates into savings to the system of \$71 million and \$125 million for ACSCs and mental illness, respectively. This amounts to approximately \$400 million in potential savings that could be achieved by eliminating disparities in hospitalization rates associated with socio-economic status—an amount comparable to the 2010 annual operating budget for health promotion in Canada's most populous province.³⁶

Further research should focus on better understanding the causes of the observed differences in health service utilization by socio-economic status and sex. It should take into consideration differences in disease prevalence,^{37–39} the need for health care services for specific conditions, health care utilization and lifestyle behaviours.^{13, 40, 41} For example, related analyses from the Canadian Population Health Initiative examining the prevalence of mental illness and asthma (one of seven ACSCs) showed consistently higher mental illness in lower compared to higher socio-economic status groups but less pronounced differences for asthma. Sex differences were not considered.⁴ To explore appropriateness of care for ACSCs and mental illness, future analyses need to examine other factors, including prevalence, lifestyle behaviours, primary care and patient self-management, each by sex.

Analyses presented here need to be interpreted in a Canadian context, where all residents have universal access to hospitals and outpatient physician services, regardless of their ability to pay.⁴² Results from this analysis support previous observations that disparities in health care service utilization by different socio-economic groups persist within Canada's publicly funded health care system^{7, 9, 17, 43} and are consistent with other Canadian research on health care utilization. For example, a recent Canadian study comparing health care utilization rates and costs between income groups showed that low-income residents were more likely to be hospitalized and to receive medication but less likely to visit a primary care physician than middle- and high-income residents.⁸ The differences in health care utilization were attributable, in part, to higher disease prevalence among low-income residents. Furthermore, low-income residents were estimated to consume approximately 40% of total health care costs, including physician and medication use as well as hospitalizations. These findings are comparable to the cost estimates of acute hospitalizations presented in this analysis.

Patterns in hospitalization rates for ACSCs and mental illness in relation to socio-economic status pose more complex issues than can be addressed in this analysis. Accordingly, costs related to estimated excess hospitalization rates should be interpreted with caution. Additional studies are needed to clarify when higher hospitalization rates for some conditions are the result of avoidable health service utilization and when they reflect a greater need for medical care for both males and females across socio-economic status groups.

Conclusion

There is a consistent pattern of disparities in hospitalization rates across socio-economic groups for both males and females. The present analyses reinforce the findings on health disparities previously underlined in Canada and internationally: for both men and women hospitalizations increase as socio-economic status decreases. But the strength of this relationship depends, to some extent, on sex as well as the type of hospitalization. In addition, analyses explore measures of the size and cost of disparities across socio-economic groups. Larger disparities tended to be seen for males than for females, particular for ACSCs. Hospitalization disparities make up 33% to 40% of total costs, with the most deprived group making the largest contribution.

About the Canadian Population Health Initiative

The Canadian Population Health Initiative, a part of the Canadian Institute for Health Information, was created in 1999. Our mission is twofold:

- To foster a better understanding of factors that affect the health of individuals and communities; and
- To contribute to the development of policies that reduce inequities and improve the health and well-being of Canadians.

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Appendix A: Data Sources and Methods

Data Sources

CIHI's Discharge Abstract Database contains data on hospital discharges from across Canada; data is provided directly to CIHI by participating hospitals from all provinces and territories, except Quebec. The Discharge Abstract Database was used to extract acute care hospitalization cases for ACSCs and mental illness^{iv} based on the most responsible diagnosis for 2005–2006 to 2007–2008. Hospitalization data for Quebec for 2005–2006 to 2007–2008 came from the Fichier des hospitalizations MED-ÉCHO, ministère de la Santé et des Services sociaux du Québec. Ontario Mental Health Reporting System⁴⁴ data was also used to extract hospitalizations where the main diagnosis was mental illness-related for 2006–2007 and 2007–2008. This includes data for patients from across the country hospitalized in an Ontario general hospital with designated adult mental health beds.

Methods

Hospitalization counts for three years were pooled together. For males and females, analyses are based on 99,355 and 80,574 hospitalizations for ACSCs, respectively, and 120,379 and 131,911 hospitalizations for mental illness, respectively. Rates were calculated by taking the total count divided by the total population within the socio-economic group and sex. Populations for 2005–2006 and 2007–2008 were projected based on census data from 2001 and 2006, to come up with a total population for the pooled years. Hospitalization rates were then age-standardized and adjusted by a direct method of standardization based on the July 1, 1991, Canadian population.

A test of differences between proportions was carried out to compare hospitalization rates between males and females stratified by socio-economic status, as well as between the highest and all lower socio-economic status groups among males and females separately. Variance estimates were calculated based on the age-standardized groups used. A test of the difference between proportions was carried out to compare the magnitude of the disparities between males and females. Disparities were measured here by the sum of the difference between each socio-economic status group rate and the highest group and expressed as an age-standardized rate per 100,000. All comparisons were tested at the 95% confidence level.

Cost estimates for the total population were based on 2006 census counts of all males and females in all census metropolitan areas where socio-economic status was available. Cost estimates for mental illness were based on 10,185,025 males and 10,705,320 females. For ACSCs, since estimates are calculated only for the population younger than 75, total population counts were estimated at 9,720,845 for males and 9,991,230 for females.

iv. Data includes discharges from acute care facilities only (psychiatric facilities are excluded).

Appendix B: Deprivation Index

Measuring Disparities in Socio-Economic Status

To operationalize area-level socio-economic status, the Institut national de santé publique du Québec (INSPQ) Deprivation Index was used to assign geographical areas in each of Canada’s 33 census metropolitan areas to one of five groups. Each group represents approximately 20% of the population ranked into quintiles by the socio-economic status of the area. The INSPQ Deprivation Index includes both material and social components shown to be related to health and allows data to be presented at the Statistics Canada dissemination area level.³¹ All components are extracted from the 2006 census (both the long and short forms). For further information on how these components were identified and calculated, please see Pampalon et al., 2009.³¹

Components of the INSPQ Deprivation Index:³¹

Material component

- Percentage without high school graduation
- Employment ratio
- Average income

Social component

- Percentage of single-parent families
- Percentage of persons living alone
- Percentage of persons separated, divorced or widowed

Each dissemination area in each of the 33 census metropolitan areas was assigned an individual score on the material INSPQ Deprivation Index. Those scores ranged from 1, which represented the highest socio-economic status group, to 5, which represented the lowest group, with intermediate points of 2, 3 and 4. In total, 32,765 dissemination areas were assigned a material component score and a social component score across the 33 census metropolitan areas. The process for combining the material and social components of the INSPQ Deprivation Index to calculate an overall or combined score is depicted in Table B1.

Table B1: Combination of Material and Social Components of the INSPQ Deprivation Index^v

		Social Components				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Material Components	Quintile 1	1—Highest	1—Highest	1—Highest	2	3—Middle
	Quintile 2	1—Highest	2	2	3—Middle	4
	Quintile 3	1—Highest	2	3—Middle	4	5—Lowest
	Quintile 4	2	3—Middle	4	4	5—Lowest
	Quintile 5	3—Middle	4	5—Lowest	5—Lowest	5—Lowest

Some examples of how the material and social components are combined include the following:

- A dissemination area that has a quintile score of 1 on the material component and a quintile score of 3 on the social component would be considered 1, or the highest socio-economic status group, on the combined measure.
- A dissemination area that has a quintile score of 4 on the material component and a quintile score of 3 on the social component would be considered a 4, one of the intermediate points on the scale.

v. Only dissemination areas within the 33 census metropolitan areas examined were included in this AiB.

Appendix C: Age-Standardized Hospitalization Rates by Census Metropolitan Area and Socio-Economic Status

CMA	SES Group	Age-Standardized Hospitalization Rates			
		ACSCs		Mental Illness	
		Rate per 100,000		Rate per 100,000	
		Males	Females	Males	Females
33 CMAs Combined	1—Highest	208	150	256	260
	2	261*	193*	299*	304*
	3—Middle	302*	223*	348*	360*
	4	368*	276*	424*	419*
	5—Lowest	507*	405*	636*	611*
Victoria	1—Highest	158	132	412	378
	2	212*	161	429	529*
	3—Middle	288*	282*	709*	650*
	4	256*	196*	565*	482*
	5—Lowest	361*	338*	856*	827*
Vancouver	1—Highest	176	133	360	322
	2	219*	157*	361	350*
	3—Middle	253*	176*	431*	423*
	4	324*	217*	530*	470*
	5—Lowest	404*	276*	822*	690*
Abbotsford—Mission	1—Highest	298	170	448	475
	2	310	227	528	468
	3—Middle	322	219	571*	564
	4	406*	323*	815*	766*
	5—Lowest	701*	513*	1,222*	1,110*
Kelowna	1—Highest	283	158	324	428
	2	333	274*	499*	531*
	3—Middle	441*	335*	631*	668*
	4	484*	408*	680*	914*
	5—Lowest	492*	318*	901*	1,017*
Edmonton	1—Highest	147	112	192	213
	2	216*	188*	236*	268*
	3—Middle	282*	221*	297*	355*
	4	340*	289*	391*	411*
	5—Lowest	498*	405*	546*	558*

CMA	SES Group	Age-Standardized Hospitalization Rates			
		ACSCs		Mental Illness	
		Rate per 100,000		Rate per 100,000	
		Males	Females	Males	Females
Calgary	1—Highest	157	124	209	271
	2	215*	202*	276*	336*
	3—Middle	264*	217*	324*	404*
	4	339*	249*	453*	477*
	5—Lowest	430*	357*	556*	611*
Saskatoon	1—Highest	182	123	216	176
	2	246*	198*	243	302*
	3—Middle	352*	225*	363*	428*
	4	446*	448*	396*	414*
	5—Lowest	718*	459*	679*	554*
Regina	1—Highest	267	274	255	304
	2	442*	352*	339*	348
	3—Middle	520*	304	418*	470*
	4	684*	518*	557*	515*
	5—Lowest	1,181*	892*	945*	888*
Winnipeg	1—Highest	137	123	267	291
	2	223*	143	284	357*
	3—Middle	259*	259*	385*	405*
	4	350*	270*	540*	510*
	5—Lowest	539*	431*	835*	883*
Thunder Bay	1—Highest	463	281	502	505
	2	398	332	627*	555
	3—Middle	638*	438*	814*	801*
	4	615*	492*	1,005*	1,052*
	5—Lowest	1,092*	940*	1,771*	2,061*
Greater Sudbury	1—Highest	368	286	404	454
	2	551*	455*	618*	619*
	3—Middle	396	323	518*	493
	4	429	431*	743*	667*
	5—Lowest	640*	584*	1,340*	1,473*
Barrie	1—Highest	272	233	297	261
	2	332	273	347	439*
	3—Middle	336	284	367	385*
	4	488*	407*	539*	613*
	5—Lowest	452*	505*	739*	633*
Windsor	1—Highest	239	169	211	278
	2	358*	202	338*	329*
	3—Middle	357*	270*	405*	373*
	4	498*	290*	563*	554*
	5—Lowest	567*	524*	1,010*	977*

CMA	SES Group	Age-Standardized Hospitalization Rates			
		ACSCs		Mental Illness	
		Rate per 100,000		Rate per 100,000	
		Males	Females	Males	Females
London	1—Highest	194	177	224	229
	2	255*	188	274*	252
	3—Middle	301*	232*	355*	378*
	4	367*	281*	402*	492*
	5—Lowest	480*	445*	645*	723*
Guelph	1—Highest	286	125	56	111
	2	311	222*	118*	126
	3—Middle	441*	220*	123*	108
	4	443*	305*	226*	207*
	5—Lowest	544*	499*	254*	170*
Brantford	1—Highest	369	346	337	373
	2	414	277	354	326
	3—Middle	556*	304	577*	591*
	4	750*	477*	569*	472
	5—Lowest	896*	733*	1,076*	827*
Kitchener	1—Highest	208	147	265	305
	2	250*	168	331*	407*
	3—Middle	301*	221*	368*	365*
	4	392*	286*	592*	638*
	5—Lowest	498*	397*	772*	782*
St. Catharines–Niagara	1—Highest	341	287	379	406
	2	317	286	433	397
	3—Middle	511*	390*	734*	685*
	4	542*	419*	731*	656*
	5—Lowest	690*	537*	1,107*	948*
Hamilton	1—Highest	240	147	214	217
	2	264	182*	228	241
	3—Middle	419*	270*	334*	384*
	4	375*	255*	371*	359*
	5—Lowest	617*	471*	573*	610*
Toronto	1—Highest	193	127	244	240
	2	239*	171*	264*	268*
	3—Middle	265*	193*	290*	303*
	4	311*	225*	345*	355*
	5—Lowest	408*	288*	499*	488*
Oshawa	1—Highest	182	179	173	302
	2	276*	205	252*	289
	3—Middle	262*	224*	250*	359*
	4	324*	230*	295*	375*
	5—Lowest	549*	425*	573*	691*

CMA	SES Group	Age-Standardized Hospitalization Rates			
		ACSCs		Mental Illness	
		Rate per 100,000		Rate per 100,000	
		Males	Females	Males	Females
Peterborough	1—Highest	329	343	368	385
	2	269	204*	323	278*
	3—Middle	367	222*	385	451
	4	534*	409	600*	494
	5—Lowest	897*	668*	948*	946*
Kingston	1—Highest	173	156	231	245
	2	258*	168	463*	321*
	3—Middle	355*	315*	569*	482*
	4	378*	320*	536*	460*
	5—Lowest	620*	507*	1,026*	890*
Ottawa-Gatineau	1—Highest	145	109	230	253
	2	170*	133*	265*	260
	3—Middle	211*	195*	336*	326*
	4	282*	257*	405*	400*
	5—Lowest	438*	413*	606*	634*
Montréal	1—Highest	216	151	249	216
	2	301*	218*	319*	278*
	3—Middle	352*	238*	321*	307*
	4	393*	304*	350*	330*
	5—Lowest	502*	411*	472*	403*
Trois-Rivières	1—Highest	216	141	259	283
	2	256	194	258	303
	3—Middle	316*	254*	358*	354
	4	362*	312*	382*	406*
	5—Lowest	537*	465*	932*	959*
Sherbrooke	1—Highest	241	176	310	298
	2	326*	226	309	378*
	3—Middle	432*	268*	481*	437*
	4	425*	382*	555*	552*
	5—Lowest	644*	595*	889*	778*
Québec	1—Highest	243	148	321	295
	2	267	185*	313	368*
	3—Middle	290*	210*	438*	351*
	4	354*	236*	473*	483*
	5—Lowest	498*	373*	696*	621*
Saguenay	1—Highest	399	281	114	133
	2	375	291	143	156
	3—Middle	480	394*	158	168
	4	528*	403*	217*	189*
	5—Lowest	752*	608*	280*	244*

CMA	SES Group	Age-Standardized Hospitalization Rates			
		ACSCs		Mental Illness	
		Rate per 100,000		Rate per 100,000	
		Males	Females	Males	Females
Saint John	1—Highest	264	210	106	200
	2	432*	366*	269*	189
	3—Middle	464*	389*	176*	197
	4	627*	436*	248*	333*
	5—Lowest	847*	833*	466*	416*
Moncton	1—Highest	426	226	401	437
	2	395	349*	407	467
	3—Middle	477	468*	567*	725*
	4	708*	444*	704*	705*
	5—Lowest	797*	647*	1,116*	920*
Halifax	1—Highest	247	163	128	143
	2	259	198	164*	168
	3—Middle	292	213*	136	220*
	4	460*	305*	228*	223*
	5—Lowest	449*	495*	351*	341*
St. John's	1—Highest	240	195	119	173
	2	368*	255*	247*	193
	3—Middle	379*	391*	225*	263*
	4	605*	466*	274*	320*
	5—Lowest	628*	437*	549*	413*

Notes

* Significantly different from highest socio-economic status group at the 95% confidence level.

Dark shaded cells indicate rates for males are significantly higher than for females. Lighter shading represents rates that were significantly higher for females. No shading indicates no significant difference.

Sources

Discharge Abstract Database, 2005–2006 to 2007–2008, and Ontario Mental Health Reporting System, 2006–2007 and 2007–2008, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, 2005–2006 to 2007–2008, ministère de la Santé et des Services sociaux.

Appendix D: Age-Standardized Excess Hospitalization Rates by Census Metropolitan Area

	Excess Age-Standardized Hospitalization Rates per 100,000			
	ACSCs		Mental Illness	
	Males	Females	Males	Females
All CMAs	121	99	137	131
Victoria	97	90	182	195
Vancouver	99	59	141	129
Abbotsford	109	120	269	202
Kelowna	124	141	283	284
Edmonton	150	131	140	148
Calgary	124	106	155	149
Saskatoon	207	168	163	199
Regina	352	194	248	201
Winnipeg	165	122	195	198
Thunder Bay	178	216	442	490
Greater Sudbury/Grand Sudbury	109	130	321	287
Barrie	104	107	161	205
Windsor	165	122	294	224
London	125	88	156	186
Guelph	119	149	99	33
Brantford	228	81	246	145
Kitchener	122	97	201	194
St. Catharines–Niagara	139	97	298	212
Hamilton	143	118	130	145
Toronto	90	74	84	91
Oshawa	137	74	136	101
Peterborough	150	26	157	126
Kingston	184	137	334	235
Ottawa–Gatineau	104	112	138	122
Montréal	137	113	93	91
Trois-Rivières	121	132	179	178
Sherbrooke	173	153	199	191
Québec	87	82	127	129
Saguenay	108	114	68	45
Saint John	263	237	147	67
Moncton	135	201	238	214
Halifax	94	112	73	76
St. John's	204	154	164	99

Note

Dark shaded cells indicate rates for males are significantly higher than for females at the 95% confidence level.

Sources

Discharge Abstract Database, 2005–2006 to 2007–2008, and Ontario Mental Health Reporting System, 2006–2007 and 2007–2008, Canadian Institute for Health Information; Fichier des hospitalisations MED-ÉCHO, 2005–2006 to 2007–2008, ministère de la Santé et des Services sociaux.

Appendix E: Cost Estimates

Cost of Acute Care Hospitalizations

The cost of acute care hospitalizations presented in this analysis is based on the cost estimates provided in the 2008 CIHI report *The Cost of Acute Care Hospital Stays by Medical Condition in Canada, 2004–2005*. Estimates for ACSCs and mental illness were based on the unit costs presented in Table E1.

Table E1: Unit Cost of Acute Care Hospitalizations for ACSCs and Mental Illness by Sex

Unit Cost of Acute Care Hospitalizations	Males	Proportion due to Condition	Females	Proportion due to Condition
Mental Illness Average Cost	\$8,821	100%	\$8,935	100%
ACSC Conditions				
Angina	\$5,858	16%	\$5,274	10%
Asthma	\$2,344	18%	\$2,815	19%
Chronic Obstructive Pulmonary Disease	\$8,353	24%	\$7,772	31%
Diabetes	\$10,507	13%	\$9,991	14%
Grand Mal Status and Other Epileptic Convulsions	\$7,927	9%	\$7,626	9%
Heart Failure and Pulmonary Edema	\$10,392	18%	\$9,168	14%
Hypertension	\$11,712	2%	\$10,950	2%
ACSC Weighted Average Cost	\$7,559		\$7,139	

Notes

Unit cost is the estimated average acute care inpatient cost per stay.

ACSC average cost is weighted by the proportion of all ACSC hospitalizations due to the specified underlying condition. Cost of chronic obstructive pulmonary disease is the estimated cost of chronic lower respiratory diseases, except asthma.

Limitations

Due to differences in the inclusion criteria of ICD-10 codes for defining ACSCs and mental illness between the Discharge Abstract Database and the report *The Cost of Acute Care Hospital Stays by Medical Condition in Canada, 2004–2005*, the costs provided in this analysis should be interpreted as crude estimates only.

Fee-for-service payments to physicians as well as other costs, such as out-of-pocket payments, are excluded.

The unit cost of acute care hospitalization for ACSCs and mental illness are presented in 2004 dollar values. They are not adjusted for inflation or potential variation in the hospitalization costs over the years.

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