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Physician Visits, Hospitalizations, and Socioeconomic Status: Ambulatory Care Sensitive Conditions in a Canadian Setting

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Objective. To determine whether rates of physician visits for ambulatory care sensitive (ACS) conditions are lower for people of low-socioeconomic status than of high-socioeconomic status in an urban population with universal health care coverage.

Data Sources/Study Setting. Physician claims and hospital discharge abstracts from fiscal years 1998 to 2001 for urban residents of Manitoba, Canada. The 1996 Canadian Census public use database provided neighborhood household income information. The study included all continuously enrolled urban residents in the Manitoba Health Services Insurance Plan.

Study Design. Twelve ACS conditions definable using 3-digit ICD-9-CM codes permitted cross-sectional and longitudinal comparison of ambulatory visits and hospitalizations. Neighborhood household income data provided a measure of socioeconomic status.

Data Collection/Extraction Methods. Files were extracted from administrative data housed at the Manitoba Centre for Health Policy.

Principal Findings. All conditions showed a socioeconomic gradient with residents of the lowest income neighborhoods having both more visits and more hospitalizations than their counterparts in higher income areas. Six of nine conditions with a sufficient *N* showed individuals living in the lowest income neighborhoods to have significantly more ambulatory visits before hospitalization for an ACS condition than did those in the most affluent neighborhoods. Many conditions showed a gradient in rate of hospitalization even after controlling for the number of ambulatory care visits.

Conclusions. In the Canadian universal health care plan, the poor have reasonable access to ambulatory care for ACS conditions. Ambulatory care may be more effective in preventing hospitalizations among relatively affluent individuals than among the less well off.

Key Words. Access to care, ambulatory care sensitive, hospitalization, physician visits, socioeconomic status

Recent cost containment efforts have increased the need to identify where resources might be most efficiently targeted and to monitor the effects of such interventions. At the same time, the economic and health benefits of appropriate primary and preventive care have received increasing attention (Starfield 1998; Shi et al. 2002). Population-based studies are central to "sentinel" approaches to evaluation, where rates of hospitalization or outcomes for selected medical conditions determine whether problems exist in the organization or quality of care (Rutstein et al. 1976; Weissman, Gatsonis, and Epstein 1992).

Combining these perspectives, Billings et al. (1993) developed the concept of ambulatory care sensitive (ACS) conditions, conditions for which "timely and effective outpatient care can help to reduce the risks of hospitalization by either preventing the onset of an illness or condition, controlling an acute episodic illness or condition, or managing a chronic disease or condition." Such conditions include asthma, angina, pelvic inflammatory disease, gastroenteritis, and congestive heart failure. To independently identify ACS conditions, Brown et al. (2001) used three different groups of physicians and somewhat different methodologies (Delphi panel, Modified Delphi panel, and Questionnaire panel). The degree of consensus among panels provided the basis for our ordering of these conditions.

The literature has stressed the socioeconomic gradient: hospitalizations for ACS conditions had a much stronger negative association with area income than did those for other diagnoses (Billings et al. 1993). Similar associations between ACS hospitalizations and neighborhood income have been replicated in adult, elderly, and pediatric populations (Schreiber and Zielinski 1997; Blustein, Hanson, and Shea 1998; Shi et al. 1999; Parchman and Culler 1999; Parker and Schoendorf 2000). This relationship has often been interpreted as vulnerable populations having inadequate primary care or greater barriers to such care than their more well-off counterparts.

Hospitalization rates for ACS conditions have been suggested as a proxy for the presence or absence of appropriate primary and preventive care; more physician visits within a community should result in fewer ACS hospitalizations (Billings et al. 1993; Billings, Anderson, and Newman 1996; Gadomski,

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Jenkins, and Nichols 1998). Reports of access to medical care in a small area were inversely correlated with hospitalization rates for five ACS conditions in urban California (Bindman et al. 1995). Increased physician supply and penetration of primary care have been associated with lower ACS hospitalizations in several studies (Krakauer et al. 1996; Friedman and Basu 2001; Ricketts et al. 2001; Backus et al. 2002; Basu, Friedman, and Bursten 2002). Research examining associations between the presence of a regular or continuous source of care and ACS hospitalizations has produced contradictory results (Gill 1997; Gill and Mainous 1998; Epstein 2001; Falik et al. 2001).

On the other hand, gradients in ACS hospitalizations may simply reflect socioeconomic gradients in health status and not in health care. In Manitoba, those with the poorest health status have the highest hospital use and expenditure rates (Roos et al. 2004). In the United Kingdom, hospital admission rates reflect socioeconomic differences and patient morbidity, not quality in primary care (Giuffrida, Gravelle, and Roland 1999; Reid, Cook, and Majeed 1999).

Individual-level (rather than aggregate) data in a defined population can examine such questions as: What is the relationship between ambulatory visits and hospitalizations for ACS conditions for patients of differing socioeconomic statuses? Do patients resident in low-income neighborhoods have fewer or more ambulatory visits before hospitalizations than their counterparts in more affluent neighborhoods?

This paper explores these issues for urban residents of the province of Manitoba, Canada. Canadians are provided complete coverage for physician visits and hospital stays under Canadian national health insurance. Within Canada, Manitoba has generally ranked in the mid-range of a series of indicators of health status, socioeconomics, and health care expenditures (Shanahan and Gousseau 1999). In Winnipeg (which included 77 percent of Manitoba's 1996 urban population), physician supply figures are influenced by the city's serving as a referral center for the entire province of 1.1 million people. A cross-Canada study of 57 health regions (which did not take the rural referral base into account) ranked Winnipeg fourteenth in physicians per capita and eighth in per capita supply of specialists (Maclean's 2003).

The effective bed supply in urban Manitoba is not high by North American standards (Roos, Burchill, and Carriere 2003). Hospital use patterns across socioeconomic groups were largely similar to those found elsewhere in Canada and internationally (Manga, Broyles, and Angus 1987; Haan, Kaplan, and Camacho 1987; Carstairs and Morris 1989; Pappas et al. 1993). Urban Manitoba has experienced slightly lower overall rates of ACS hospitalizations

(6.99 per 1,000 in 1990 and 5.72 in 2000 after significant health care reform) than three other Canadian centers (Hamilton, Ottawa, and Toronto) (Billings, Anderson, and Newman 1996). In 1990, Canadian rates were generally in the lower part of the range for 15 American cities.

METHODS

In Manitoba, a single diagnosis is available on physician claims, while up to sixteen diagnoses are present on the hospital discharge abstracts. One diagnosis—that labeled as "most responsible" in the Canadian implementation of ICD-9-CM coding—was used to define the relevant hospital diagnosis. The "most responsible" diagnosis is essentially equivalent to that specified as the "principal" diagnosis in American data sets (Tu et al. 2001).

The Manitoba Centre for Health Policy maintains a comprehensive, longitudinal, population-based administrative database containing all claims routinely submitted by physicians and health care facilities for all individuals registered with the Manitoba Health Services Insurance Plan (Roos et al. 1993). Nonparticipation is minimal since there are no premium payment requirements. Reflecting the fee-for-service environment, just 7 percent of physicians submit "evaluation claims" (claims for which remuneration is not attached) for any portion of their visits (Watson et al. 2004). Surgical procedures and patient location are recorded with a high degree of accuracy (Roos and Nicol 1999). The available diagnostic information is generally satisfactory, but using hospital abstracts alone underestimates the prevalence of the conditions studied (Robinson et al. 1997; Huzel et al. 2003).

Manitoba ICD-9-CM codes have been coded on hospital discharge abstracts up to the 5-digit level for certain conditions but only at the 3-digit level from the physician claims. However, twelve relatively common ACS conditions (Billings et al. 1993) can be specified almost completely on the basis of the 3-digit ICD-9-CM code. The conditions are: asthma, angina, pelvic inflammatory disease, gastroenteritis, congestive heart failure, severe ear–nose–throat (ENT) infections, epilepsy, bacterial pneumonia, tuberculosis (pulmonary and other), iron deficiency anemia in children up to 5 years of age, cellulitis, and dental conditions (Table 1).

Data

Four fiscal years (1998–2001) of inpatient, day surgery, and ambulatory visit data from Manitoba Health were used; emergency room and hospital

Table 1: Differing Definitions of Selected ACS Conditions (Hospital Separations in Manitoba, 1998–2000)

*ACS Conditions**	*N using Billings et al. Definitions*†	*N Using 3-Digit Adaptations*	*% Increase Using 3-Digit Adaptations*
Asthma	4,115	4,115	0.0
Angina	4,998	5,050	1.0
Pelvic inflammatory disease	1,409	1,409	0.0
Gastroenteritis	2,959	2,993	1.1
Congestive heart failure	9,759	10,582	8.4
Severe ENT infections	2,451	2,487	1.5
Epilepsy	825	825	0.0
Bacterial pneumonia	11,906	12,036	1.1
Pulmonary/other tuberculosis	258	258	0.0
Iron deficiency anemia‡	113	114	0.9
Dental conditions	1,509	1,509	0.0
Cellulitis	3,547	3,547	0.0
	18,158	18,289	

*Diagnoses are ordered according to the degree of consensus among three panels reported by Brown et al. (2001). The top five diagnoses in this table were identified by all panels as ACS.

†Billings et al. (1993) suggest 4-digit definitions for several conditions. Some 5-digit codes were used to specify congestive heart failure.

‡Iron deficiency anemia in children up to 5 years of age.

ACS, ambulatory care sensitive; ENT, ear–nose–throat.

outpatient visits were not complete. Inpatient and day surgery stays were counted as hospitalizations. The urban population of Manitoba (*n* of 794,555) was studied to reduce variability in access to primary care, physician practice, and hospitalization patterns across different settings.

Income Quintiles

Following Roos and Mustard (1997), Manitoba urban residents were divided into five equal-sized groups based on average household income in each census enumeration area on the 1996 Canadian Census. The ordering of urban neighborhood income is quite stable, with correlations around 0.85 over 5-year census intervals. The category "urban" was defined as representing areas with "minimum population concentrations of 1,000 and a population density of 400 or more per square kilometer, based on the previous census population counts" (Statistics Canada 1996, p. 229). The maximum number of households in large urban areas is 375. Postal or municipal code was used to link each resident to an enumeration area; this permitted assigning the hospital

discharge abstracts and physician visits to income quintiles (*Q*1 being the lowest).

Exclusions

Overall, 4.1 percent of hospital discharge abstracts and 1.7 percent of physician visits were eliminated because of missing or inappropriate income values for an enumeration area (for example, residence in a personal care home or other institution). Records reflecting non-Manitoba residence, discharge dates or physician visit dates outside the indicated study period, duplicate records, and errors in age values were also removed; each category removed represented less than 1 percent of all records.

Calculating Rates

In analyzing rates, the numerator comprised all indicated events for the three fiscal years, 1998–2000. The denominator consisted of all persons classified as urban and registered with Manitoba Health from April 1, 1998 through March 31, 2001 and those who were born or had died during this period. Rates are expressed on the basis of person years, calculated from the duration of registration for all persons in the denominator. Utilization rates were age-standardized by the direct method. Eleven age groups were generated, beginning with age 0–14, continuing with 10-year groupings to age 74, and using 5-year groupings thereafter. The values of key variables (age, residential postal code) at the time of the first-occurring ACS event were assigned to all subsequent records for that individual.

RESULTS

Rates of ACS Visits and Hospitalizations

Rates of ambulatory visits for the twelve individual ACS conditions varied dramatically from 4,310.28 per 10,000 person years (PY) for severe ENT infections to 8.05 per 10,000 person years for pulmonary and other tuberculosis (Table 2). Hospitalization rates varied much less than those for ambulatory visits, from a high of 27.26 per 10,000 PY for congestive heart failure to a low of 0.59 per 10,000 PY for tuberculosis. Other frequent hospitalizations for bacterial pneumonia, angina, asthma, and pelvic inflammatory disease showed rates of 25.81, 12.77, 10.77, and 7.74 per 10,000 PY, respectively. The least frequent hospitalizations were for epilepsy (1.74 per 10,000 PY) over the entire population and for iron-deficiency anemia (1.67) among children up to 5 years of age.

Table 2: Rates (per 10,000 PY) of Ambulatory Visits and Hospitalizations (Urban Manitoba, 1998–2000)

	*Income Quintile**							
	Q1	*Q2*	*Q3*	*Q4*	*Q5*	*Overall*	*Q1/Q5*	*95% CI*‡
Ambulatory visits								
Asthma	1,080.86	860.00	824.66	811.79	706.20	853.16	1.53	1.51–1.55
Angina	180.31	174.19	170.04	169.19	154.68	169.69	1.17	1.13–1.21
Pelvic inflammatory disease	29.80	25.10	20.70	15.61	11.91	20.56	2.50	2.20–2.88
Gastroenteritis	467.43	351.76	319.71	303.13	255.86	336.52	1.83	1.79–1.87
Congestive heart failure	342.76	314.26	294.40	251.72	216.83	289.79	1.58	1.53–1.63
Severe ENT infections	5,162.16	4,293.46	4,155.78	4,178.97	3,834.42	4,310.28	1.35	1.34–1.35
Epilepsy	98.06	73.01	50.44	39.25	30.32	57.05	3.23	3.03–3.45
Bacterial pneumonia	283.77	262.15	239.46	237.88	212.06	246.78	1.34	1.30–1.37
Pulmonary/other tuberculosis	10.78	9.33	7.83	7.70	4.53	8.05	2.38	2.03–2.86
Iron deficiency anemia†	78.32	44.94	44.13	36.44	32.55	48.11	2.41	1.94–3.04
Dental conditions	276.34	161.96	143.92	124.38	98.28	158.86	2.81	2.71–2.91
Cellulitis	544.16	423.43	395.51	367.07	333.54	410.05	1.63	1.60–1.66
Hospitalizations								
Asthma	16.53	13.51	9.91	8.27	5.70	10.77	2.90	2.50–3.37
Angina	13.54	15.83	12.75	11.08	9.73	12.77	1.39	1.21–1.58
Pelvic inflammatory disease	10.30	7.88	7.81	6.60	6.25	7.73	1.65	1.34–2.02
Gastroenteritis	6.33	8.98	5.94	4.44	3.59	5.92	1.76	1.46–2.17
Congestive heart failure	33.19	31.82	27.06	21.72	19.20	27.26	1.73	1.58–1.92
Severe ENT infections	6.14	6.75	3.79	3.41	2.81	4.60	2.18	1.77–2.74
Epilepsy	2.68	2.47	1.46	1.29	0.90	1.74	2.98	2.17–4.36
Bacterial pneumonia	35.62	32.06	21.83	22.14	16.48	25.81	2.16	1.95–2.40
Pulmonary/other tuberculosis	1.92	0.42	0.28	0.33	0.05	0.59	41.65	14.68–inf§
Iron deficiency anemia†	3.98	1.72	1.14	0.90	0.31	1.67	12.72	3.39–inf§
Dental conditions	4.52	4.23	2.86	2.59	2.27	3.24	1.99	1.57–2.59
Cellulitis	10.93	8.22	6.69	5.48	4.62	7.23	2.37	1.99–2.86

*Rates were age-adjusted by the direct method. *Q*1 was the lowest neighborhood income quintile and *Q*5 the highest. The *Q*1/*Q*5 ratio was generated from the rates without rounding off to two decimal places.

†Crude rates because of small age range.

‡Confidence intervals were generated from 1,000 bootstrap replications per ACS condition. Other confidence intervals are available on request.

§Because of a 0 in the denominator, there were no upper limits to the bootstrapped confidence interval.

ACS, ambulatory care sensitive; ENT, ear–nose–throat; PY, person years.

Utilization and Poverty

Visit and hospitalization rates for all twelve conditions were higher among residents of the low-income neighborhoods than among their intermediate and high-income counterparts (Table 2). Individuals in the lowest income quintile were much more likely to use ambulatory care for such conditions as epilepsy, dental conditions, pelvic inflammatory disease, iron deficiency anemia, and pulmonary/other tuberculosis. Visit rates were more than two to three times the rates of visits for such conditions compared with high-income populations (as measured by the *Q*1/*Q*5 ratio). Asthma, congestive heart failure, cellulitis, and gastroenteritis showed rates of ambulatory care visits by the residents of neighborhoods with the lowest income 50–80 percent higher than visit rates for their counterparts in the highest income neighborhoods. Only angina demonstrated few socioeconomic differences in primary care utilization (*Q*1/*Q*5 ratio of 1.17).

Hospitalization rates for tuberculosis and pediatric iron deficiency anemia exhibited the most dramatic socioeconomic gradients, with the rates among individuals in the lowest income neighborhoods (*Q*1) being 38.40 and 12.84 times the rates of those in the highest income areas (*Q*5), respectively. Such rates for epilepsy, asthma, and immunization-related diseases among residents of the poorest urban neighborhoods were nearly three times those of the most prosperous areas, and over twice as high for cellulitis, ENT infections, pneumonia, and dental conditions. Similar *Q*1/*Q*5 ratios for hospitalizations (from 1.65 to 1.76) were observed for pelvic inflammatory disease, congestive heart failure, and gastroenteritis. Even for angina, the rates of hospitalization were 40 percent higher among residents of the poorer urban areas than those among more affluent residents.

Primary Care and Hospitalizations

The ratio of rates of ACS visits to hospitalizations (*V*/*H* ratio) varied considerably across conditions, reflecting both the prevalence of the condition and the nature of the disease. Care for severe ENT infections was primarily ambulatory (937 visits per one hospitalization). The lowest ratio of visits to hospitalizations was for the relatively infrequent pelvic inflammatory disease with one hospitalization for every 2.66 primary care visits (Table 3). Congestive heart failure, pneumonia, and angina were among the most frequent ACS hospitalizations, while in the middle of the ambulatory visit rates. Asthma, the second most frequent reason for ambulatory visits, was the fourth most frequent reason for hospitalization (*V*/*H* ratio of 79.22).

Table 3: Ratio of Ambulatory Visit Rates to Hospitalization Rates for ACS Conditions (Urban Manitoba, 1998–2000)

	*Income Quintile**							
	Ratio of Visit Rates to Hospitalization Rates							
	Q1 V/H	*Q2 V/H*	*Q3 V/H*	*Q4 V/H*	*Q5 V/H*	*Overall V/H*	*Q5 V/H versus Q1 V/H*	*95% CI*‡
ACS conditions								
Asthma	65.39	63.66	83.21	98.16	123.89	79.22	1.89	1.63–2.20
Angina	13.32	11.00	13.34	15.27	15.9	13.29	1.19	1.04–1.36
Pelvic inflammatory disease	2.89	3.19	2.65	2.37	1.91	2.66	0.66	0.52–0.85
Gastroenteritis	73.84	39.17	53.82	68.27	71.27	56.84	0.96	0.80–1.18
Congestive heart failure	10.33	9.88	10.88	11.59	11.29	10.63	1.03	0.99–1.23
Severe ENT infections	840.74	636.07	1,096.5	1,225.5	1,364.6	937.02	1.62	1.32–2.04
Epilepsy	36.59	29.56	34.55	30.43	33.69	32.79	0.92	0.66–1.35
Bacterial pneumonia	7.97	8.18	10.87	10.74	12.87	9.56	1.61	1.46–1.79
Pulmonary/other tuberculosis	5.61	22.21	27.96	23.33	90.6	13.64	16.13	6.16–inf§
Iron deficiency anemia	19.68	26.13	38.71	40.49	105.00	29.34	5.35	1.45–inf§
Dental conditions	61.14	38.29	50.32	48.02	43.3	49.03	0.71	0.56–0.92
Cellulitis	49.79	51.51	59.12	66.98	72.19	56.72	1.45	1.22–1.75

*Rates were age-adjusted by the direct method.

† *Q1* was the lowest neighborhood income quintile and *Q5* the highest.

‡Confidence intervals for the ratio (*Q5 V/H* versus *Q1 V/H*) were generated from 1,000 bootstrap replications per ACS condition. Other confidence intervals are available on request.

§Because of a 0 in the denominator, there were no upper limits to the bootstrapped confidence interval.

ACS, ambulatory care sensitive; ENT, ear–nose–throat.

Over half of the ACS conditions showed individuals of higher socioeconomic status to have considerably more visits per hospitalization. Most strikingly, one tuberculosis hospitalization was found for each 5.61 visits among patients in the lowest income neighborhoods compared with one admission for 90.60 visits among those in the highest income areas. Similar, although less dramatic, patterns were found for iron deficiency anemia, asthma, bacterial pneumonia, severe ENT infections, pelvic inflammatory disease, and cellulitis (Table 3). Other ACS conditions (angina, congestive heart failure, epilepsy, and gastroenteritis) have similar *V/H* ratios across socioeconomic groups.

Visits Prior to Hospitalization

The poorest individuals were found to see physicians more frequently than the most affluent. Does ambulatory care prevent subsequent hospitalizations? Table 4 presents the frequency both of all visits prior to hospitalization and of those with the same diagnosis as the index hospitalization. Without considering diagnosis on the physician claim, significantly more visits were recorded for individuals in *Q*1 than in *Q*5 for six of the nine ACS conditions studied. Eight of the nine conditions averaged more visits having the same diagnosis as the index hospitalization for individuals in *Q*1; given the small numbers, only two of these differences proved statistically significant.

Although not shown in a table, ambulatory visits in the year after the index hospitalization showed few regular patterns; for six out of the nine conditions the most affluent had slightly more visits than the least affluent. Individuals with complicated histories (those with an index hospitalization and one or more hospitalizations in the previous year) were too few for detailed analyses. Finally, analysis of 1999 ambulatory visits for the large number of Manitobans having no hospitalizations in 1998–2000 showed individuals in the lowest income quintile ($n = 100{,}471$) to be somewhat more likely to visit the doctor (means of 4.38 ambulatory visits overall and 0.66 visits for ACS conditions) than those in the other quintiles.

Hospitalizations Controlling for Ambulatory Visits

A regression predicting hospitalization rate and controlling for the number of ambulatory visits for each condition in Table 4 tallied hospital stays and visits in each year (1998–2000) separately; thus, an individual with hospitalizations in each year would be counted three times. The six ACS conditions with the most hospitalizations (asthma, angina, congestive heart failure, severe ENT

Table 4: Ambulatory Visits in Year before Index Hospitalization for Highest and Lowest Income Quintiles (1999–2000 Hospitalizations)

	Visits in Year before Index Hospitalization					
ACS Diagnosis at Hospitalization (Number of Hospitalizations)	*Mean*			*Mean*		
	Any Diagnosis	*Q1/Q5 Ratio*	*p-Value for Q1/Q5 Ratio**	*Same Diagnosis as Hospitalization*	*Q1/Q5 Ratio*	*p-Value for Q1/Q5 Ratio**
Asthma						
Q1 (308)	12.89	1.20	.020	2.70	1.04	.721
Q5 (112)	10.77			2.59		
Angina						
Q1 (424)	13.52	1.05	.404	1.15	1.19	.151
Q5 (178)	12.89			0.97		
Pelvic inflammatory disease						
Q1 (149)	13.16	1.36	.001	0.28	2.00	.068
Q5 (91)	9.65			0.14		
Gastroenteritis						
Q1 (156)	13.39	1.29	.015	0.69	1.13	.554
Q5 (80)	10.39			0.61		
Congestive heart failure						
Q1 (930)	13.84	1.01	.879	1.73	1.47	.001
Q5 (237)	13.74			1.18		
Severe ENT infections						
Q1 (173)	13.47	1.33	.003	2.56	1.04	.822
Q5 (79)	10.14			2.47		
Bacterial pneumonia						
Q1 (897)	12.48	1.08	.142	0.73	1.30	.007
Q5 (277)	11.56			0.56		
Dental conditions						
Q1 (133)	10.12	1.30	.042	0.54	1.23	.429
Q5 (61)	7.79			0.44		
Cellulitis						
Q1 (302)	12.36	1.20	.032	1.22	0.98	.917
Q5 (109)	10.30			1.24		

Individuals resident in urban Manitoba and hospitalized in fiscal years 1999 or 2000, but having no hospitalizations in the previous year, were used in this analysis. The nine conditions included in Table 4 had 60 or more index hospitalizations in *Q5*, the quintiles with the fewest hospitalizations. The other three conditions had 18 (epilepsy) or fewer *Q5* hospitalizations.

**Q1* was the lowest neighborhood income quintile and *Q5* the highest. *Q1*/*Q5* ratios were tested using a negative binomial regression in the SAS GENMOD procedure (Pedan 2001).

ACS, ambulatory care sensitive; ENT, ear–nose–throat.

infections, bacterial pneumonia, and cellulitis) showed hospitalization rates for residents of the lowest income neighborhoods to be significantly geater than those of their counterparts from the highest income neighborhoods with the same number of visits. Lower income individuals with the most primary care visits tended to have the highest hospitalization rates for these conditions (see the three examples in Figure 1). The other conditions (pelvic inflammatory disease, gastroenteritis, and dental conditions) had relatively few hospitalizations for comparison.

Sensitivity Testing

Additional hypotheses were explored. Residents of low-income neighborhoods might have been more likely to have several visits within a single episode of illness. Rather than counting each visit separately, physician visits 14 or fewer days apart were considered as part of the same episode. Multiple visits per episode were greatest for bacterial pneumonia (21 percent reduction in overall rate using episodes) and for cellulitis (17 percent reduction). $Q1/Q5$ ratios were altered only minimally by this episode-based approach.

A given individual might have appeared more than once in counting ambulatory visits and hospitalizations, affecting the $Q1/Q5$ ratio. This possibility was tested in two different ways:

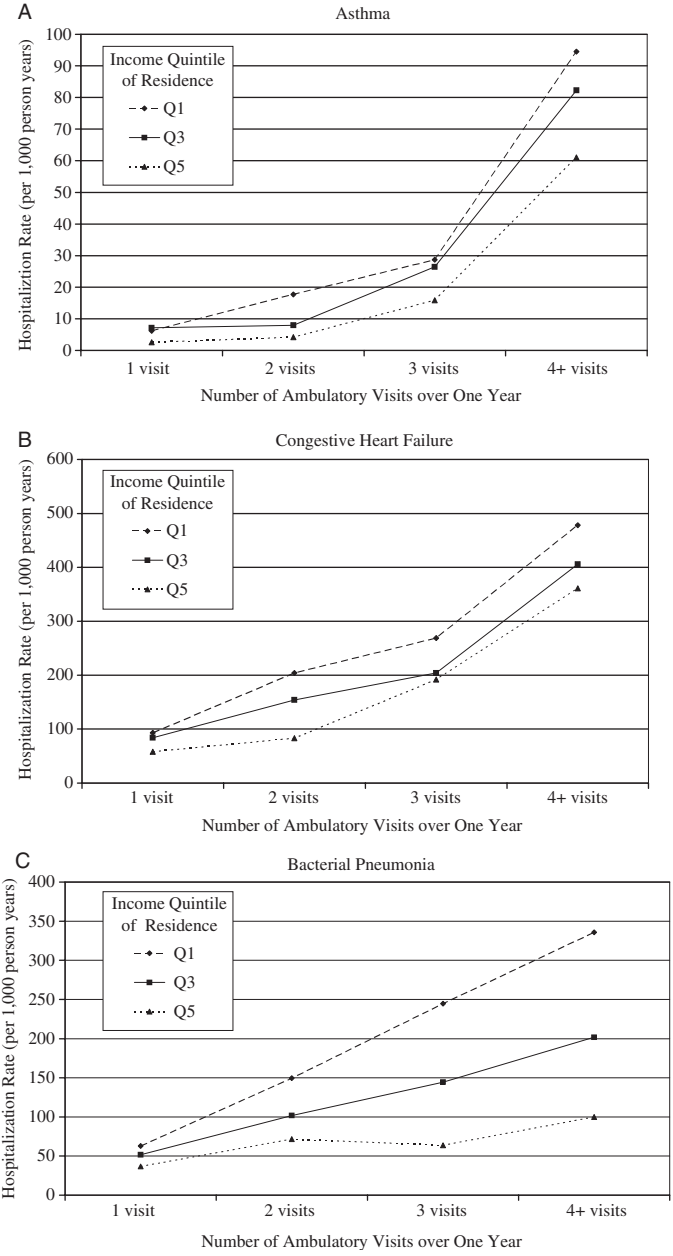
(a) For any given ACS diagnosis, a particular individual was allowed to appear only once in the 3-year period.
(b) A particular individual was allowed to appear only once in the 3-year period. The first ACS diagnosis found was noted, then the next individual considered.

Counting in terms of individuals rather than visits markedly lowered some of the rates, but sensitivity testing changed the $Q1/Q5$ ratios relatively little.

DISCUSSION

ACS conditions are of considerable research interest; typing "ACS conditions" into the PubMed search facility generated a listing of 17 papers in 2003. No single study has been able to deal with all possible types of care which might affect hospitalization rates. Thus, this paper has not included emergency department and outpatient visits; these visits are not part of the standard Manitoba hospital data sets. A relatively small number of such visits (based in the Winnipeg teaching hospitals) are captured as ambulatory visits. An earlier,

Figure 1: Hospitalization Rate by Frequency of Ambulatory Visits and Income Quintile of Residence for Three ACS Conditions (Urban Manitoba, 2000)



more labor-intensive analysis using 1 year of Winnipeg data found 4.9 percent of ambulatory care to be provided in emergency departments. Residents of lower income neighborhoods were disproportionately likely to receive such care (Mustard et al. 1998).

Characterizing socioeconomic status using mean neighborhood income seems generally appropriate in studying ACS conditions; physician supply and hospital bed supply are typically measured to assess residents' access to care in a given geographic area. Income data from the 1996 National Population Health Survey were available at the household level for a relatively small urban Manitoba sample (weighted $n = 4725$). First Nations (aboriginal) individuals were not included; they tend to be among the poorest members of the population (and thus heavily represented in $Q1$). The three conditions having an adequate number of visits in the 1994–1998 period (severe ENT infections, asthmas, and cellulitis) showed $Q1/Q5$ ratios between 1.19 and 1.27.

Canadian Medicare's "natural experiment" was designed to provide equality in access to all medically necessary hospital, diagnostic, and physician services. The American literature implies that low-income individuals will have inadequate, infrequent primary care and therefore higher hospitalization rates. Relatively high visit rates should be associated with lower rates of hospitalizations. This was not the case in urban Manitoba.

With no formal barriers to primary care, both physician visits and hospital admissions varied substantially across areas of differing socioeconomic status. Residents of the poorest urban neighborhoods not only utilized primary care significantly more than residents of comparatively affluent areas, but were also more often hospitalized for each ACS condition. Ambulatory care's capability to prevent or reduce hospitalization appears to vary across income groups (Figure 1).

Medical record reviews have shown essentially no differences among socioeconomic groups in the acuity levels of hospitalized patients in Winnipeg (Strumwasser, Paranjpe, and Ronis 1990; DeCoster et al. 1999; Bruce et al. 2002). Lower income individuals do not appear to have been differentially hospitalized because of social circumstances (e.g., homelessness, alcoholism), person-centered factors (e.g., inability to follow a prescribed outpatient treatment regimen), or behavioral problems (e.g., lack of compliance) while being in better physical health than their higher income counterparts.

The Winnipeg poor have more frequent contact with general practitioners; socioeconomic groups differ little in contact with specialists (Roos et al. 1999). Winnipeg residents of lower income neighborhoods have been shown to have a higher need for health care (estimated from an index combining age,

gender, socioeconomic status, and health status) (Roos et al. 1999, 2004). The rate of use among lower income groups appears to be "needs-driven and hence not easily managed away" (Roos, Burchill, and Carriere 2003, p. 9).

While socioeconomic status and rates of ACS hospitalizations have been associated in many North American studies, factors other than access doubtlessly contribute to the differences (Billings et al. 1993; Parchman and Culler 1994; Blustein, Hanson, and Shea 1998). As noted outside Manitoba, higher rates of visits and hospitalizations may be because of the poor's higher disease prevalence, increased disease severity, and multiple comorbidities (Weissman, Gatsonis, and Epstein 1992; Billings et al. 1993; Anderson et al. 1996; Blustein, Hanson, and Shea 1998). Interestingly, in Spain (with universal financial access to health care), no association between socioeconomic status, primary care, and ACS hospitalizations existed either within adult or pediatric populations (Casanova and Starfield 1995; Casanova, Colomer, and Starfield 1996).

Would different kinds of care—perhaps more effectively integrating visits with other services— reduce overall rates of hospitalization among the poor? A recent Manitoba study of the elderly found continuity of care to reduce both hospitalizations for all conditions and hospitalizations for ambulatory sensitive conditions (Menec et al. 2004). Manitoba's population-based programs directed toward childhood immunizations, screening mammography, and Papanicolaou testing are also worth noting (Gupta et al. 2003). Are particular barriers to care (time constraints, costs of transportation, lack of information, and so on) significantly affecting primary care and eventual hospitalization rates?

Work might focus on the ACS conditions for which costs can be contained without damaging outcomes. Boston and New Haven, two cities with leading teaching hospitals, differ dramatically in the rates of hospital utilization and associated expenditures for heart failure and pneumonia (Wennberg, Freeman, and Culp 1987). Such variation vis-à-vis congestive heart failure has been found among Medicare patients of 77 major American hospitals (Wennberg et al. 2004). Attention to the prevention, treatment, and out-of-hospital care of these two conditions might prove particularly fruitful, given the high hospitalization rates and observed socioeconomic gradients in utilization.

Doing "more of the same," which in Canada means increasing physician supply to deal with apparent shortages, is unlikely to change the socioeconomic gradient accompanying visits and hospitalizations. American studies suggesting that having more physicians will decrease ACS hospitalizations among the poor may be predicated on visit rates considerably lower than those found in urban Manitoba. Indeed, problems with primary care and health system performance have recently been reported across five English-

speaking countries (Schoen et al. 2004). Regardless of the health care system, markedly reducing ACS hospitalizations is likely to prove difficult.

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