Variation in Health and Health Care Use by Socioeconomic Status in Winnipeg, Canada: Does the System Work Well? Yes and No

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How well does the health care system serve the health needs of the population? At a time when health care expenditures around the world are under attack and when it is increasingly recognized that the most vulnerable individuals have the greatest health needs, this seems a pertinent question to ask.

Past research has suggested that the health care system is driven by many forces in addition to population health needs. The impact of physician practice style is most clearly demonstrated by the changes in a population's surgical exposure when a surgeon enters or leaves an area (Wennberg 1979; Roos 1983). Physician panels looking critically at practice patterns in areas with high rates of care have also concluded that need is not always the critical factor in the level of health care a population receives (Dyck et al. 1977; Caper 1991). Similarly, we know that system capacity (bed and physician supply) is important, a fact illustrated memorably by the Boston–New Haven studies (Wennberg, Freeman, and Culp 1987; Fisher et al. 1994). The two cities differ markedly in their spending on hospital care, largely because of the greater bed

capacity in Boston. This higher capacity, however, has not been shown to reflect a proportionately greater underlying need for health care.

Despite the importance of these non-needs-based factors, other studies in both the United States and Canada continue to demonstrate that individuals whose socioeconomic status is poor have poor health status, spend many more days in the hospital, and, particularly in Canada, have more contact with physicians (National Center for Health Statistics 1993; Statistics Canada 1994). In an earlier analysis that we conducted in Manitoba, Canada, we found that residents of regions with the highest use of hospitals (largely for medical admissions) also had the greatest socioeconomic deprivation and the poorest health status (Black, Roos, and Burchill 1995).

This study investigates how a universally insured health care system delivers care according to socioeconomic characteristics that are strongly related to health status. We first assess the degree to which mortality in this population varies according to socioeconomic characteristics and then how hospital care, surgical treatment, and physician contact vary according to income.

Methods

Our analysis is of the population of Winnipeg, Manitoba, a city of 600,000 and home to the provincial medical school and seven major hospitals. Manitoba has fewer physicians per capita than the average Canadian province (132 full-time equivalent physicians per 100,000 population), but it has a relatively rich supply of specialists (60 per 100,000 population); only one Canadian province—Ontario—has significantly more specialists (Health and Welfare Canada 1992). Winnipeg, where specialists comprise 53 percent of the physician supply, has the greatest concentration of specialists in the province.

Income Quintiles

Residents of urban Manitoba were divided into five equal-sized groups based on average neighborhood household income data derived from the 1986 Canadian Census public use database. Data describing character-

istics of neighborhood residents, including percentage of female-headed households, educational levels, and unemployment rates, were also taken from the 1986 Census. Census data were aggregated at the geographic unit of the enumeration area; the average population of these areas is 700.

Based on mean household income, the enumeration areas were ranked from poorest to wealthiest and then grouped into five population quintiles, with each quintile containing 20 percent of the city's population, or approximately 130,000 residents. Each Winnipeg resident was linked to an enumeration area by residential postal code; thus, for each resident a quintile income rank was assigned, with Q1 being the poorest.

Age- and sex-standardized mortality rates, as well as hospital, surgical, and visit rates, were calculated according to the direct method. Denominators were based on counts of individuals in each income quintile (as of December 1992), with numerators based on event counts (i.e., hospitalizations or deaths) for individuals identified as a member of a quintile. Health care events were determined through the use of claims data routinely collected to reimburse physicians and hospitals in Manitoba's universal insurance system.

Health Status Indicators

Health status indicators (perhaps better labeled "ill-health status indicators") have been developed from death information recorded in vital statistics. (A single cause of death is routinely recorded in Manitoba.) Mortality rates are reported separately for males and females, as is cause-specific mortality for several different types of conditions. These indicators were developed after an extensive literature review of population health descriptors (Cohen and MacWilliam 1995).

In addition, the mortality rate among persons up to age 74 is calculated. British researchers (Carstairs and Morris 1989), as well as a group of Canadian workers (Eyles et al. 1993), have suggested that the standardized mortality ratio for the years covering birth to age 74 is one of the most valid single indicators of health status capturing a population's need for health care. Life expectancy, here calculated from birth separately for males and females, is another commonly used measure of health status (Hansluwka 1985).

Hospital Use

The records of all short-stay hospital discharges (1 to 59 days) for Winnipeg residents were analyzed, regardless of where the hospitalization took place. Previous research has shown that the reporting of hospital use and surgical procedures is accurate in Manitoba (Roos et al. 1982; Roos, Sharp, and Wajda 1989).

Based on Wennberg's (1986) work, we have also defined the following categories of inpatient medical care:

- *High-variation medical conditions* apply to conditions like pneumonia, gastroenteritis, and chronic obstructive lung disease for which highly variable admission rates have been consistently demonstrated. These conditions represent more than 80 percent of medical admissions to the hospital (Wennberg 1986). We analyzed both pediatric and adult discharges.
- *High-variation surgical conditions* include pediatric and adult inpatient surgical cases that do not have low-variation characteristics.
- *Low-variation conditions* are medical and inpatient surgical conditions that demonstrate relatively stable rates across populations. The term applies to heart attack, hip fracture, and colon cancer surgery, for which there is little clinical ambiguity about the need for hospitalization.

Three indicators are included that the literature suggests reflect the need for health care: ambulatory-care-sensitive conditions (Billings et al. 1993); avoidable hospitalizations (Weissman, Gatsonis, and Epstein 1992); and conditions amenable to medical treatment (Charlton et al. 1983; Poikolainen and Eskola 1986; Desmeules and Semenciw 1991). All are based on hospital discharge rates for specific types of conditions for which medical treatment is believed to be effective in preventing the condition, finding and treating the condition in an early phase to avoid major consequences, or treating the condition in a late phase, thereby avoiding death or disability. In addition, hospital discharge rates for the same set of diagnostic conditions as were reported for mortality rates are included.

Surgical Use

Both inpatient and outpatient surgery is recorded by Manitoba Health, including emergency procedures performed outside of the province. Other extraprovincial procedures are estimated to be less than 1 percent of all surgical procedures. Age- and sex-standardized rates for 12 common or high-profile procedures are reported here. Because the frequency of some procedures is low, resulting in potentially unstable rates, two years of data were analyzed (1991 and 1992), although only the 1992 data are reported; 1991 patterns were similar, or differences are reported.

Physician Contacts

All but a small minority of Winnipeg physicians practice under a fee-for-service system. Data describing physician contacts are taken from claims payment data, which capture approximately 90 percent of all ambulatory medical care, including physician visits to residents of nursing homes and physician services in hospital emergency rooms and outpatient departments. Salaried physicians are required to submit "evaluation claims," and they are included. Visits are distinguished according to whether they are referred visits to specialists, unreferred visits to specialists, or visits to family and general practitioners. Specialists are paid substantially more for visits resulting from a referral by another physician, but there is no requirement that such a referral precede patient contact with a specialist, and there is no copayment associated with any type of physician visit.

Statistical Methods

To examine the possibility of a significant linear trend across income groups in mortality and use rates, we used a chi-square test for trend with one degree of freedom (Snedecor and Cochran 1980, 206–7) upon assigning scores for the five income groups (X) as -2 (= poorest), $-1,0,1,2$ (= wealthiest). If health status, and hence need for medical care, is positively related to socioeconomic status, then mortality and use rates will decrease as we move from the poorest group ($X = -2$) toward the highest income group ($X = 2$). Slope estimates of less than

.50 over income groups (equivalent to *Q1/Q5* ratios less than 1.2) were not tested for linear trend.

Results

Characteristics of Residents by Income Quintile

Mean household incomes range from $18,607 in the poorest quintile neighborhoods to $53,777 for residents of the wealthiest neighborhoods. Residents of the poorest neighborhoods are more likely to be unemployed and to lack a high school education (table 1). Fully 31 percent of the household heads in the poorest neighborhoods are women, compared with 4 percent in the wealthiest neighborhoods (table 1).

Health Status by Income Quintile

There was a marked difference in age- and sex-standardized death rates across the Winnipeg population in 1992 (table 2). Individuals in middle-

TABLE 1
Characteristics of Winnipeg Residents by Relative
Affluence of Neighborhood

Characteristics	Q1	Q2	Q3	Q4	Q5	Ratio[a]
Mean household income ($)	18,607	25,719	31,050	37,942	53,777	2.9
Female-headed households (%)	31	16	13	6	4	7.8
Residents aged 25 to 34 with high school education (%)	63	65	71	75	82	1.3
Unemployment rate, aged 45 to 54 (%)	10	7	5	4	3	3.3
Treaty status aboriginals (%)	7	2	1	0	0	7+
Number of residents	126,340	106,688	116,599	145,488	145,945	

[a]*Q5/Q1: Q1* = poorest; *Q5* = wealthiest.

TABLE 2

Mortality Characteristics of the Population of Winnipeg by Relative
Affluence of Neighborhood of Residence: Life Expectancy and Age-
and Sex-Standardized Mortality Rates per 1,000 Residents in 1992

Mortality characteristics	Q1	Q2	Q3	Q4	Q5 [d]	Ratio [e]
Age-standardized death rates						
Males	13.7	10.2	8.7	7.8	6.2***	2.2
Females	9.4	8.0	7.3	6.7	6.6***	1.4
Ages 0 to 74	6.7	4.5	3.9	3.1	2.7***	3.4
Life expectancy [a]						
Males	65.3	70.5	72.8	74.3	76.6	1.2
Females	74.4	77.8	79.5	80.0	82.1	1.1
Death by type of disease						
Chronic diseases [b]	4.0	3.1	2.9	2.5	2.3***	1.7
All cancer	2.9	2.3	2.2	1.9	1.8***	1.6
All injuries [c]	0.8	0.5	0.4	0.3	0.2***	4.0
Deaths from specific diseases						
Ischemic heart disease	2.53	1.90	1.81	1.82	1.45***	1.7
Hypertension	0.11	0.05	0.04	0.04	0.02**	5.5
Vascular complications	0.88	0.67	0.59	0.59	0.60**	1.5
Diabetes	0.22	0.16	0.18	0.15	0.10*	2.2
Pneumonia	0.42	0.34	0.25	0.38	0.31	1.3
Colon cancer	0.35	0.26	0.32	0.20	0.25	1.4
Lung cancer	0.93	0.69	0.63	0.51	0.37**	2.5
Breast cancer	0.011	0.031	0.031	0.021	0.041	0.2

[a]Life expectancy is based on 5 years of mortality data from 1989 to 1993. The ratio here
is *Q5/Q1*.
[b]Chronic diseases: deaths from ischemic heart disease, diabetes, asthma, hypertension,
vascular complications, and emphysema.
[c]All injuries: deaths from motor vehicles, falls, vehicular nontraffic, drowning, poison-
ing, fire and flames, and suicide.
[d]From χ^2 test of no linear trend in rates across income groups: *$p < .05$; **$p < .01$;
***$p < .001$.
[e]*Q1/Q5*: *Q1* = poorest; *Q5* = wealthiest.

income neighborhoods (*Q3*) had higher mortality than individuals re-
siding in the highest-income neighborhoods; those residing in the poorest
neighborhoods demonstrated the highest mortality. Patterns remained
unchanged from the 1991 data (available from the author). These pat-

terns held across the gender-specific mortality rates, for persons from birth to age 74, by disease groups, and for five of the eight specific diseases examined. Life expectancy for males and females showed the same trend, ranging from 65.3 years among male residents of the lowest-income neighborhoods to 76.6 years for those in the highest-income neighborhoods, with a similar range for females of 74.4 to 82.1 years.

Hospital Use by Income Quintile

Having established that health status, as indicated by mortality, differs markedly by socioeconomic strata for Winnipeg residents, we review the short-stay hospital use of these same populations in table 3. Rates of hospitalization for each income quintile are described based on three measures: the rate of individuals hospitalized during the year; the rate of discharges; and the number of days spent in the hospital. Across every measure, the pattern parallels the health status gradient shown in table 2. Individuals of low-income neighborhoods are hospitalized at a much higher rate than individuals in middle-income neighborhoods, who in turn are hospitalized more frequently than residents of high-income neighborhoods. The least variation occurs in the "individuals hospitalized" indicator: the less healthy the group, the more likely individuals are to be readmitted to the hospital during the year and to remain for a longer average length of stay.

Figure 1 classifies hospitalizations according to Wennberg's grouping: high-variation medical conditions; high-variation surgical cases; low-variation medical and surgical cases; and, finally, obstetric dis-

TABLE 3
Hospital Use Characteristics of the Winnipeg Population by Relative
Affluence of Neighborhood of Residence in 1992

Short-stay hospital use[a,b]	Q1	Q2	Q3	Q4	Q5[c]	Ratio[d]
Individuals hospitalized	102	84	77	70	65***	1.6
Discharges	130	103	93	84	76***	1.7
Days	937	711	637	569	500***	1.9

[a]Rate per 1,000 residents.
[b]Only stays of 59 days or less are included. Rates are age- and sex-standardized.
[c]From χ^2 test of no linear trend in rates across income groups: ***$p < .001$.
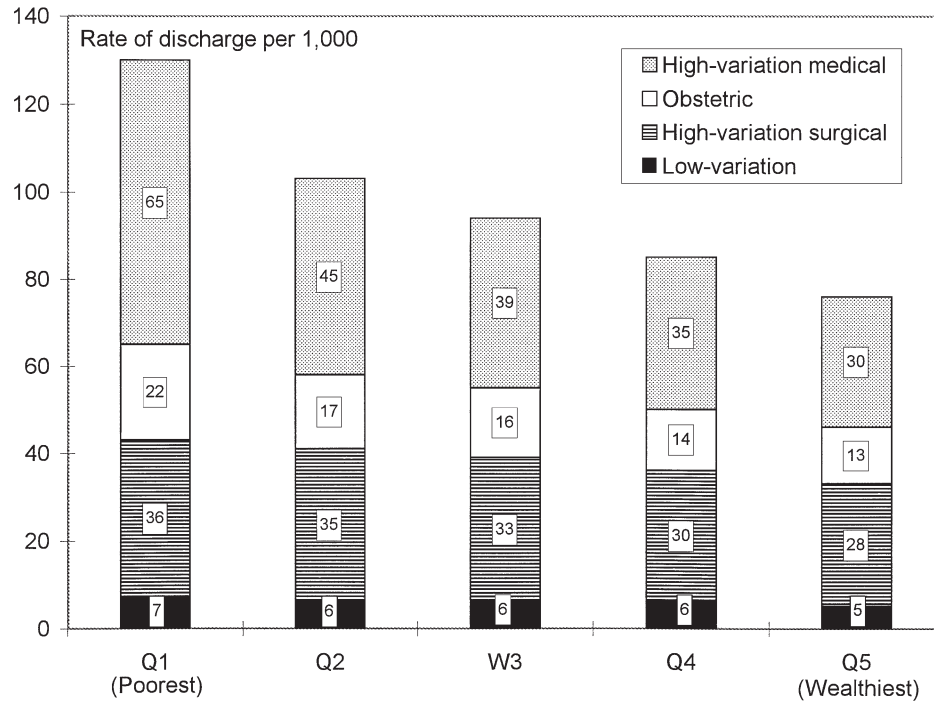[d]*Q1/Q5: Q1* = poorest; *Q5* = wealthiest.

FIG. 1. Hospital use by relative affluence of neighborhood, using Wennberg's type of hospitalization.

charges. For every type of discharge, the wealthier the neighborhood of residence, the lower the hospital use rate. Residents of the poorest neighborhoods were 40 percent more likely than the wealthiest group to be admitted to the hospital for the low-variation conditions. High-variation surgical discharges follow the health status gradient less closely, with individuals from the poorest income neighborhoods only 28 percent more likely to undergo a procedure. For high-variation medical conditions, however, residents of the poorest neighborhoods had fully 117 percent more discharges than residents of the wealthiest neighborhoods (65 per 1,000 versus 30). Finally, table 4 reports both the hospitaliza-

TABLE 4

Age- and Sex-Standardized Hospital Admission Rates for the Population
of Winnipeg by Relative Affluence of Neighborhood of Residence in 1992[a]

Hospitalizations	Q1	Q2	Q3	Q4	Q5[d]	Ratio[e]
By type						
Ambulatory sensitive	18.1	12.5	10.5	9.7	7.6***	2.4
Avoidable	7.8	6.0	4.8	4.2	3.9***	2.0
Amenable	17.9	13.4	11.2	11.1	9.0***	2.0
By type of disease						
Chronic diseases[b]	11.69	10.30	9.66	8.80	7.82***	1.5
All cancer	7.29	7.69	7.94	7.45	6.82	1.1
All injuries[c]	12.61	8.47	6.49	6.69	6.05***	2.1
For specific diseases						
Ischemic heart disease	4.43	4.75	4.47	4.28	4.25	1.0
Hypertension	0.39	0.24	0.17	0.21	0.14	2.8
Vascular complications	1.75	1.68	1.55	1.52	1.31	1.3
Diabetes	0.91	0.61	0.68	0.50	0.28	3.3
Pneumonia	3.07	1.79	1.44	1.40	1.06***	2.1
Colon cancer	0.65	0.72	0.70	0.50	0.66	1.0
Lung cancer	1.09	1.10	1.11	0.97	0.76	1.4
Breast cancer	0.92	1.27	1.34	1.43	1.09	0.8

[a]Rate per 1,000 residents.
[b]Chronic diseases: ischemic heart disease, diabetes, asthma, hypertension, vascular complications, and emphysema.
[c]All injuries: motor vehicle, falls, vehicular nontraffic, drowning, poisoning, fire and flames, and suicide.
[d]From χ^2 test of no linear trend in rates across income groups: *$p < .05$; **$p < .01$; ***$p < .001$.
[e]Q1/Q5: Q1 = poorest; Q5 = wealthiest.

tion rates for the conditions that the literature suggests reflect the need for health care and the disease-specific rates of hospital use. For most conditions, the poorer the neighborhood, the more likely the residents were to be hospitalized. The major exception is cancer, which shows no gradient by income quintile except in the case of lung cancer.

Surgery by Income Quintile

Overall, rates of surgery show less tendency than medical discharges to vary with socioeconomic status, our proxy for health status. Table 5 reports rates of 12 common surgical procedures across the income groups. Orthopedic procedures do not appear to covary with socioeconomic status. Knee surgery rates in both 1991 and 1992 appear to show a reverse gradient (although this was not statistically significant). The higher rates were found in residents of higher income neighborhoods. No relation between cardiovascular surgical rates and socioeconomic status was observed in 1991, although in 1992 there were somewhat

TABLE 5
Rates of Surgical Procedures in the Winnipeg Population by Relative
Affluence of Neighborhood of Residence in 1992

Procedure[a]	Q1	Q2	Q3	Q4	Q5 [b]	Ratio[c]
Total hip replacement	4.8	4.9	5.7	4.9	5.2	0.9
Total knee replacement	2.3	3.5	3.5	4.0	3.5	0.7
CAB surgery	3.4	4.8	6.3	5.3	5.3*	0.6
PTCA	5.0	4.4	5.0	4.0	4.4	1.1
Pacemaker implant	5.4	5.3	3.8	4.4	4.4	1.2
Tympanostomy	49.4	68.7	60.7	53.7	44.0*	1.1
Tonsillectomy/adenoidectomy	45.0	68.4	56.0	59.5	50.0	0.9
Hysterectomy	33.5	32.1	35.3	34.5	37.1	0.9
Cholecystectomy	24.7	22.9	21.0	24.9	22.4	1.1
Back surgery	3.3	4.7	3.4	4.0	3.6	0.9
Hemorrhoidectomy	5.1	5.6	5.0	6.0	4.7	1.1
Breast surgery	13.0	14.3	15.7	16.0	14.0	0.9

[a]Rates are age- and sex-standardized per 10,000 residents.
[b]From χ^2 test of no linear trend in rates across income groups: *$p < .05$.
[c]Q1/Q5: Q1 = poorest; Q5 = wealthiest.
Abbreviations: CAB, coronary artery bypass; PTCA, percutaneous transluminal coronary angioplasty.

higher rates of bypass surgery in the residents of highest income neighborhoods ($p < .05$). Only tympanostomy tended to occur at higher rates in children of lower income neighborhoods. Finally, rates for six other common procedures are presented. None of these procedure rates was higher in the groups with demonstrably poorer health: residents of lower income neighborhoods.

Physician Contact

Why are individuals from poor neighborhoods much more likely to be admitted to the hospital for medical conditions but no more likely to undergo surgery than those from high income neighborhoods? Part of the answer may be evident in table 6, which suggests that specialist physicians provide no more care to residents of low income neighborhoods (our proxy for high health needs) than they do to residents of high income neighborhoods. We also examined contact rates by specialty type across the income quintiles (not presented here) and found that only pediatricians showed a slight tendency to provide more care to patients in the highest risk groups. Residents in the lowest quintile

TABLE 6
Physician Contact Rates across the Winnipeg Population by Relative Affluence of Neighborhood of Residence in 1992

Physician contacts	Q1	Q2	Q3	Q4	Q5[a]	Ratio[b]
Mean visits per resident to						
All physicians	5.8	5.2	5.0	4.8	4.7***	1.2
General practitioner	4.2	3.6	3.4	3.3	3.0***	1.4
Specialist						
Referred	0.2	0.2	0.2	0.2	0.2	1.0
Unreferred	1.4	1.4	1.4	1.3	1.5	0.9
Percent having 1 or more contact with						
Any physician	84.0	85.0	85.2	84.6	85.0	1.0
General practitioner	76.2	75.6	75.6	75.0	73.1	1.0
Specialist						
Referred	18.0	17.9	18.0	18.0	18.0	1.0
Unreferred	36.5	37.9	37.7	37.4	40.3	0.9

[a]From χ^2 test of no linear trend in rates across income groups: ***$p < .001$.
[b]*Q1/Q5: Q1* = poorest; *Q5* = wealthiest.

averaged 4.4 pediatric visits per year; those in the highest, 4.2 visits. Internists and surgical subspecialists showed a distinct reverse gradient in the provision of their services: approximately 15 percent more visits were provided to members of the highest income households.

General practitioners, on the other hand, appear to provide more care to those at highest risk (table 6). Overall, individuals from low income households have higher rates of contacts with physicians than do individuals from high income households, although contact rates do not vary as markedly as might be expected, given the health status differences among income groups.

Discussion

Who Needs Health Care Most?

This study has evaluated variations in health status across socioeconomic groups and assessed the extent to which hospitals and physicians operating under a universally funded system deliver health care according to need. Across six of the 14 mortality measures we found a more than twofold difference in rates, indicating that the health of Winnipeg residents declined with their socioeconomic status. Others have observed variations in health status across groups of differing socioeconomic status (Haan, Kaplan, and Camacho 1987; Carstairs and Morris 1989; Pappas et al. 1993; Evans, Barer, and Marmor 1994), but the significance of this phenomenon and its gradient quality are not well appreciated in mainstream health services research. While most are not surprised that the poor have poorer health status, it is another matter entirely to appreciate that the health of residents in middle income neighborhoods is poor compared with that of people living in higher income neighborhoods.

Does the System Deliver According to Need?

Specific components of the insured care system—namely, acute medical admissions to the hospital and care provided by general and family practitioners—serve the public very well and deliver more service to groups in the poorest health. Hospital use patterns similar to those seen in Winnipeg have been observed by other researchers in Canada (Broyles

et al. 1983), the United States (Wissow et al. 1988; McMahon et al. 1993), and Finland (Keskimaki, Salinto, and Aro 1995).

The high medical admission rates also appear to reflect real health needs rather than the influence of social factors unrelated to health. Guadagnoli, Cleary, and McNeil (1995) have documented that poorer patients with chest pain have poorer function upon admission to the hospital than patients of higher socioeconomic status. In Manitoba, using the criteria developed by Interqual (Jacobs and Lamprey 1979; Ludke et al. 1990) and data abstracted from medical records to deter-mine whether a patient's condition requires treatment in an acute hos-pital setting, we found that individuals from low income neighborhoods were as likely to have been admitted appropriately to the hospital as were individuals from the highest income neighborhoods (DeCoster and Roos 1996).

Other parts of the health care system respond less well to patient need, however. While physicians in general do a good job of delivering more care to groups with poorer health status, this is largely due to the delivery patterns of general and family practitioners. Specialists, par-ticularly internists and surgical subspecialists, provide substantially more care to the healthiest group in Winnipeg, residents of the highest in-come neighborhoods, than to any other group in the city.

The delivery of surgical care appears remarkably unresponsive to the health needs of the population. We found Wennberg's (1986) high-variation surgical conditions to vary even less with neighborhood in-come levels (our proxy for health status) than did his low-variation conditions, which are the conditions he argues should reflect patient need and not physician practice style or hospital bed capacity. Across 12 surgical procedures examined, none showed a strong tendency toward higher rates among the poorer, less healthy residents.

Given that we are relying on mortality rates to demonstrate differing health states rather than measuring the prevalence of conditions that indicate a need for specialist contact or surgery, are our conclusions justified? In the 1994 National Population Health Survey, 68 percent of Canadian women in the highest income households reported their health to be excellent or very good, compared with 61 percent of those in the upper middle income groups and 39 percent in the lowest income groups, after adjusting for age. There was a similar pattern for males. The 1991 Canadian General Social Survey of 10,000 households (Statistics Canada

1994) provides additional evidence of a strong and consistent gradient across income categories in relation to indicators of need for specialist health care. Across 10 of the 13 types of problems assessed (i.e., "Do you have" arthritis, rheumatism, or bursitis?" "Have you ever had trouble with your heart, such as heart attack, angina, heart failure, or rheumatic heart disease?"), the lowest income groups reported the most health problems and the upper income groups, the fewest. Fully 37 percent of those in the lowest income category reported arthritis disorders, compared with 12 percent in the highest income group, suggesting the high probability that conditions indicating a need for hip and knee replacements are distributed across the population in an income-gradient fashion. Similarly, 15 percent of those in the lowest income group reported that they have had a heart problem, compared with 4 percent in the highest income group. These and other data showing that ischemic heart disease is most common in the lowest income groups (Wilkins, Adams, and Brancker 1989; National Center for Health Statistics 1990) also strongly suggest that the need for coronary artery bypass surgery (CABS) and percutaneous transluminal coronary angioplasty rises as incomes fall.

Self-reports of pain in the survey again showed marked gradients, with 65 percent of low income individuals reporting no pain compared with 85 percent of those with high income. Thirteen percent of those with low income reported severe pain, compared with 3 percent in the highest income group. Finally, reports of activity limitation ranged from 25 percent of persons in the lowest income group to 7 percent of those in the highest.

One might optimistically point to the small differences in surgical rates across socioeconomic groups in this study as evidence that universal access works, especially when compared with U.S. data. Thus, Carlisle et al. (1995) show that the lower the income of the Los Angeles County area, the lower the rate for five of the eight surgical procedures studied. In a cross-border study, Anderson et al. (1993) showed that, in the nonelderly population, CABS rates steadily increased from the lowest to the highest income quintile in both California and New York, while in Canada those living in the lowest income areas had the highest CABS rate. For the elderly this pattern was less clear. Whereas the Canadian national health insurance system may exceed the U.S. system in delivery of surgical care to those who need it, Canada does not go

much farther. The delivery of care by surgeons and specialist physicians remains remarkably untargeted toward those groups with the highest medical needs.

Why Don't Surgeons and Specialists Serve
High-Need Populations?

These data corroborate the early work on small area variations in surgical rates suggesting that physician practice style is at least as important as the health needs of populations in determining population surgical rates. Thus, rates of discretionary procedures like laminectomy have been shown to be extremely sensitive to new neurosurgeons moving into an area. The number of procedures performed on residents of one region in Maine doubled over a two-year period, although indications for the spinal surgery did not justify such an increase (Keller et al. 1990), and the rates later proved amenable to reduction.

At the same time, our examination of delivery patterns and need across the entire system suggests that the story is more complicated. Why does surgical practice appear to respond so differently to health needs than do medical admissions?

Physicians are trained to treat sick people, to try to make them better. Medical admissions represent an acute phenomenon; very sick people are unconscious, in pain, vomiting, or running high fevers. These are symptoms that are difficult, or impossible, for patients and their families to live with and equally difficult for physicians to dismiss or disagree about. The major caveat is bed supply, but within this capacity constraint, the acute crises represented by medical admissions will be dealt with, and triage will ensure that the sickest are treated first. Because more of the sickest people are likely to be in the low- and middle-income groups, they will receive more medical care.

Surgery is different. Most common conditions that lend themselves to surgical treatment are less acute; joint pain, abdominal discomfort, and coronary artery disease are chronic conditions with which people can cope at some level. It is likely that the higher the socioeconomic group membership, the better one is able to negotiate the health care system: to be able to communicate—or, more critically, to be believed—when there is a problem for which surgical treatment may be beneficial;

to be aware of surgical treatments; and to ask for a referral to a special-ist—or simply to be able to make and keep appointments.

Does this mean that individuals whose economic status is poor care less about their health than others? Because individuals in the poorer neighborhoods make more contacts with physicians than others, any suggestion that they present at a more advanced stage of disease would appear to be a problem of the medical care they receive rather than a result of their failure to seek care early enough for treatment to be beneficial. A more likely explanation is that the problems associated with living in poverty obstruct individuals' ability to use the system of care offered by medical and surgical specialists. In a study of prenatal care we found that, for the first birth, the number of prenatal visits made by women in the lowest income groups was very similar to that of women in the highest income groups. By the second birth, however, almost two prenatal visits on average separated the highest income mothers from the lowest, and by the fourth birth, almost three (Mustard and Roos 1994). It is not hard to imagine the difficulties in arranging child care, coping with children on public transportation, and other problems that would make it more difficult for the low income mother who has several children to keep appointments than for a woman with greater socioeconomic supports. Family practitioners, often located in walk-in clinics and community health centers and available for unsched-uled visits, are apt to be more accessible to individuals with less control over their lives.

The research by Davis, Winkleby, and Farquhar (1995) on changes in knowledge of cardiovascular disease risk factors and risk-reduction strat-egies also suggests that the poor care just as much about their health as anyone else, but that they are less likely to know how to improve it. All socioeconomic groups had a similarly high interest in cardiovascular risk modification (the researchers measured socioeconomic risk by edu-cational levels). However, high socioeconomic groups had more knowl-edge of risk reduction strategies, and the gap in knowledge between socioeconomic groups increased over the 10-year study period.

Policy Implications

When there are wide variations in hospital use rates, particularly for medical discharges (and with so much surgery moving to outpatient settings, most variations will be driven by medical admissions), the first

explanatory factor to be investigated should be socioeconomic differences in the populations. Where high use rates are found to coexist with a population of poor socioeconomic status, overuse is probably not the only, or the most likely, problem; such rates are more likely to be driven by poor health.

The evidence presented here also argues for closer monitoring of surgical practice. It suggests that reviews of unnecessary and inappropriate surgery should target use among the higher income groups and that investigation of underservice should concentrate on residents of low- and middle-income neighborhoods. It also suggests that the move toward organized priority lists in Canada is a rational way to ensure that those who truly need surgical interventions receive them (Coyte et al. 1994). We have demonstrated elsewhere that the mortality risks from excessive rates of surgery are a matter of at least as much concern as the mortality risks from poor-quality surgical care (Roos et al. 1995).

More broadly, these data underscore the problems with having a physician supply like that found in Winnipeg, which is dominated by specialists. If specialist care is not organized to serve those who have the greatest health needs, a surplus of specialist physicians will be both costly and inefficient. Policy initiatives designed to ensure that the middle and lower socioeconomic groups have good access to specialist care and that upper income groups are protected from overreliance on specialists, particularly for their primary care, are needed.

Others have observed that there is no difference in the quality of the primary care provided by general practitioners, generalists, or subspecialist physicians (Greenfield et al. 1995; Franks, Nutting, and Clancy 1993), and some research suggests that family physicians may provide more effective first-contact access to health care than is offered by either general internists or pediatricians (Parchman and Culler 1994). In Germany, there has been a deliberate move to combine controls on the number of physicians with measures to encourage family practitioners over specialists (Henke, Murray, and Ade 1994).

Can higher rates of surgery among the wealthier socioeconomic groups (relative to their "need" for treatment) explain their remarkably better health status? Not likely. Japan, the country whose citizens have made the most dramatic gains in life expectancy over the last several decades to become the healthiest people in the world (Schieber, Poullier, and Greenwald 1992), is reported to have almost an aversion to surgery, with rates a quarter of those in the United States (Marmor 1992). The

Japanese place less emphasis than North Americans on highly trained specialist physicians and postgraduate qualifications (Marmor 1992).

Nor should we point to the disproportionate use of specialist care among the healthier, wealthier groups to argue for increased requirements for specialist training. Overall, Winnipeg residents have a much higher rate of access to and contact with specialists than do rural Manitobans (Tataryn, Roos, and Black 1995), yet their health is similar (Cohen and MacWilliam 1995). Instead, these gradients point to the enormous potential for improving the health status of populations by shifting expenditures from health care to innovative social programs. If male residents of Winnipeg's middle income neighborhoods could achieve the life expectancy of those living in the highest income neighborhoods, this would represent a greater gain in life expectancy (3.8 years for males and 2.6 for females) than could be achieved by eliminating cancer (estimated in 1987 to be 2.8 years) (Manton 1991). The potential health gains to those in the lowest income neighborhoods are dramatically higher (11.3 years for males and 7.7 for females). Since the healthy residents of high-income neighborhoods also contact physicians less frequently, spend much less time in the hospital, and have no higher rates of surgery, the potential reduction in health care expenditures could be enormous.

The challenge for society is to put these findings into operation. This is not likely to be achieved by investing more in health care. The Canadian universal system, at least as reflected in Manitoba, does extremely well at providing access on the basis of need—at least some aspects of the system do—and would seem to have gained control over escalating health care costs. (The past two years in Manitoba have seen decreases in expenditures on acute hospitals and physicians.) Social policy initiatives to reduce poverty, improve childhood nurturing (e.g., Hawaii's statewide Health Start program), education (Weikert, Berreuta-Clement, and Schweinhart 1984; Schweinhart et al. 1993), and parental support (Olds et al. 1985, 1986) are needed to translate our growing knowledge of the determinants of health into the production of a healthy population.

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