Socioeconomic Gradients in Mortality and the Use of Health Care Services at Different Stages in the Life Course

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Statistics Canada/
Manitoba Centre for Health Policy and Evaluation
Linkage Project

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The Manitoba Centre for Health Policy and Evaluation

The Manitoba Centre for Health Policy and Evaluation (MCHPE) is a unit within the Department of Community Health Sciences, Faculty of Medicine, University of Manitoba. The MCHPE is active in health services research, evaluation and policy analysis, concentrating on using the Manitoba health data base to describe and explain patterns of care and profiles of health and illness.

Manitoba has one of the most complete, well-organized and useful health data bases in North America. The data base provides a comprehensive, longitudinal, population-based administrative record of health care use in the province.

Members of the MCHPE consult extensively with government officials, health care administrators, and clinicians to develop a research agenda that is topical and relevant. This strength, along with its rigorous academic standards and its exceptional data base, uniquely position the MCHPE to contribute to improvements in the health policy process.

The Centre's researchers are widely published and internationally recognized. They collaborate with a number of highly respected scientists from Canada, the United States and Europe.

FOREWORD

Manitoba Health and Health Canada, in common with many other jurisdictions, have become increasingly aware of the importance of supporting basic research designed to help identify the determinants of health in order to inform policy makers about how best to improve the population's health and how best to accomplish this goal efficiently and cost-effectively.

As a result of this awareness, Manitoba Health encouraged the Manitoba Centre for Health Policy and Evaluation to collaborate with Statistics Canada to determine the feasibility and utility of linking provincial administrative health care use data with census data for a sample of Manitobans. This collaboration began in 1992.

This undertaking had three goals. The first was to have access to previously unavailable information on the social and economic status of our population. This information, when linked to our existing data files on the use of health care services would enhance our capacity to better inform public policy by improving our ability to understand and describe differences in the need for medical care. The second goal was to assess the potential of the combined information for contributing to our understanding of the processes which produce inequalities in health. The third goal was to test its potential to provide insights which might help identify how best to improve the health status of Manitobans.

In this report, we have demonstrated that the linkage of records from these two independent sources is feasible. It has produced a representative sample with which to characterize and describe the social, economic and health states of Manitobans. This resource has been created at a fraction of the cost of a population survey. The research resource created by this project is not a substitute for longitudinal cohort surveys in the investigation of the causes of illness and disability, but such comprehensive cohort studies are extremely rare in Canada. While we emphatically believe that this research resource will make a useful and unique contribution to informed policy-making concerning health and health care policies in Manitoba, this is a judgement that will be rendered only in the fullness of time.

FOREWORD (continued)

In the process of evaluating the feasibility and utility of this enriched data base, we have paid scrupulous attention to the larger question: how to reconcile the record linkages involved in this collaboration with the protection of personal privacy. We have taken all possible precautions to ensure that all aspects of this project have protected the confidentiality of individual information, ranging from a review of the project by the federal Privacy Commissioner to the stringent security protocols which protect unauthorized access to these data. This project is, we believe, an example of the balance that is possible between the rights of individuals in Canadian society to the protection of personal privacy and the benefits to the collective whole which potentially may follow from detailed understanding of the circumstances and needs of individuals in our society.

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INTRODUCTION

This report presents results from the first of three research projects currently in progress which are based on the linkage of records for 48,000 Manitobans which describe health service utilization and socio-economic status. The objective of this project was to analyze socioeconomic differences in mortality and the utilization of health care services at different stages in the life course. Subsequent reports will compare the explanatory power of individual and area-based measures of socioeconomic status in describing differences in health status and health services utilization and a description of differences in morbidity across occupational groups.

Important age-related trends in the use of health services over the past two decades in Canada have been well described. Particularly notable is the rising intensity of medical services provided to the elderly over the past two decades, driven by aggressive secondary prevention therapies in chronic disease, the medicalization of aging processes and heroic interventions in end stage disease processes (1-5). However, a comprehensive description of socioeconomic gradients in morbidity and mortality across age cohorts for a representative population has not been accomplished to date in Canada. This study describes socioeconomic differences in the utilization of health services at seven stages in the life course (ages 0-4, 5-14, 15-29, 30-49, 50-64, 65-74 , 75+). The objective of this study was to identify those classes of morbidity which dominate utilization of health care services at each stage of the life course and simultaneously, the classes of morbidity which show the greatest disparities in relation to socioeconomic status.

This study has used a unique database, created through the collaboration of Statistics Canada, the Government of Manitoba and the University of Manitoba. It combines very high quality information on individual encounters with the Manitoba health care system over a seven year period (1983-1990) with detailed socioeconomic data obtained for individuals from the 1986 Census. In addition, this research database contains information on respondents to the 1986 post-censal Health and Activity Limitation Survey, which provides a detailed description of disability in the Manitoba population (6-8).

Despite continued gains in average life expectancy this century, socioeconomic differences in mortality and health persist and the magnitude of these differences may be increasing (9-15). Some researchers have speculated that differences in the trajectory of health over the age course among different socioeconomic strata may be an important factor in these patterns. House, for example, has suggested that morbidity and decline in functional status is postponed until relatively late in life among the higher socioeconomic strata, whereas lower socioeconomic groups develop chronic illnesses and functional limitation earlier in middle and early-old age periods (16). If so, a major opportunity for continued improvement in population life expectancy and quality adjusted life years may lie in strategies aimed at selectively improving the health status of lower socioeconomic groups.

Socioeconomic differences in health status appear to be greatest in middle age (9,17-18,124). Evidence implicates a number of mechanisms, including: health-related behaviors (19-23), access to and utilization of preventive and therapeutic care (24-28) and perhaps differences in immune function and host-defence resilience (29). The impact of many of these factors on health may be greatest in middle and early old age, as the duration of exposure becomes chronic and biological vulnerability increases (30).

At the level of the individual, ill health may be thought of a disturbance or deficit in a normal or ideal state of health which may manifest as physical or psychological symptoms and which may lead to a state of impairment, disability or handicap in normal social and occupational role functions. Health status deficits may be mild or severe, chronic or transient. Although there are diverse approaches to the measurement of health states (35-37), ranging from interview-based simple subjective assessments (38,39) and complex multi-domain multiple item instruments (40,41) to clinical and biophysical measures, no single health status measure is appropriate or valid for all purposes (42). The routine surveillance of the health of a population requires a different approach to conceptualizing and measuring health from that of a clinical trial attempting to detect the therapeutic benefit of a specific medical procedure.

In this report, we describe the health of the population of Manitoba through the imperfect lens of records of health care use. In the absence of a definitive measure of health status, this report describes the prevalence of individuals receiving insured medical treatment for specific classes of disorder. We have termed this construct treatment prevalence. The operational definition of this measure is described in the following methods section. While for some conditions, such as fractures or pregnancy and childbirth, treatment prevalence is effectively equivalent to true prevalence at this time in Canada, there are many classes of disorder where treatment rates over fixed time periods of observation will underestimate or overestimate the true prevalence of disorder in a population (35,43).

While there are multiple approaches to the measurement of socioeconomic status (31-34), in this study we have used two commonly reported measures of social and economic hierarchy: the level of attained education for each individual and total household income. As education is typically completed by early adulthood, it is viewed as a stable, long term marker of socioeconomic status. Income, on the other hand, being more variable over the life course, is an indicator of socioeconomic status over the short term. Conceptually, these two characteristics can be understood to have distinct and partially independent associations with processes which relate to health. For example, for adults over the age of 25, education is temporally prior to any subsequent change in health, while the relationship between income and health may be more reciprocal. While levels of income may lead directly to health consequences, it is also possible that illness can lead to declines in income (16). Furthermore, income is conceptually related to household consumption of goods and services, and thus relates most directly to the material circumstances of the household. Education, on the other hand, is more directly related to attitudes, beliefs and preferences concerning health and perhaps to the social community surrounding and individual.

METHODS

In this study, mortality and health service utilization is described in relation to socioeconomic status measured in June 1986 for a sample of approximately 5% of the Manitoba population.

Study Sample

This study is based on a random sample of the Manitoba population in 1986, and consists of 47,935 individuals in 16,627 private or collective dwellings. The sample was created from the efforts of a pilot project which evaluated the feasibility of linking individual records maintained by the Manitoba Health Services Insurance Plan (MHSIP) and Statistics Canada as a component of the larger goal of assessing the utility of such linked datasets. Conducted over a two year period (January 1992 - December 1993), the pilot project proceeded through three phases:

1) a record linkage of the universe of all individuals in households which responded to the 1986 census 2B questionnaire to parallel personal identities in the registrant file maintained by MHSIP,
2) selection of a representative sample of no more than 20,000 households from the domain of households, collective dwellings and institutions successfully linked in the previous phase,
3) the abstracting of health care histories for all members of sampled linked households, the abstracting of social, economic and occupational information from the census and the integration of the two databases into an analysis database.

<u>Phase I: Record Linkage</u>

Record linkage was at the individual level. Each individual Manitoban in the 2B census file was placed within the residential postal code reported to the census at June 1986, and compared to all Manitobans reported at that postal code by the MHSIP registry file for the same time period. No names or dwelling address information was used in the matching. Determination of a match between the two files was based upon information contained in each file describing birth year, birth month, gender and household characteristics, such as marital status and the presence of children in the household. If a pair of records were found to match perfectly on all these characteristics, a match was accepted deterministically. Following the identification of these perfect matches, residual unmatched records were evaluated using probabilistic linkage methods (44,45). A total of 80.4% of individual records were successfully linked in the two databases. Detailed explanation of the methods and results of this phase are reported elsewhere (46,47)

Validation of the Record Linkage Phase

To assess the quality of the linkage methodology, permission was obtained from the confidentiality oversight bodies supervising this project to compare actual names and addresses for a selection of linked records. A sample of 2,102 linked records, stratified by marital status , urban/rural residence and family structure were drawn from two domains: linked records with linkage weights above the threshold required to be included in the sampling phase of the project (Phase II), and linked records with weights below this threshold, which were not eligible for inclusion in Phase II. The Manitoba Health Services Insurance Plan provided names and addresses for this sample as of June 1986, and these records were compared manually by Statistics Canada staff with microfilm copies of census 2B questionnaires. All lists of names and addresses were destroyed following this comparison, and no adjustment of individual records on the study database was performed based on information from this validation study.

Among individuals in private households, 95.5% of linked records included in the sampling phase were found to agree on name in the two data sources. Actual residential addresses did not contribute additional information. The agreement rate was lower among residents of collective dwellings included in Phase II (62.9%). Finally, agreement was low on linked records which had been excluded from the sampling phase (40.1%) (APPENDIX TABLE C.1)

Phase II: Sample Design and Sample Selection

While the individual was the unit for the linkage phase of the study, in the sample selection phase the household was the sampling unit. This difference introduced the potential for both matched and unmatched individuals to be present in a sampled household. A household was defined as matched if all members matched, also if all but one adult matched, or all members but one infant matched or all members with the exception of persons aged 17-19 matched (48).

Sampling of matched households was performed using stratified random sampling, with stratification on eight characteristics: household composition, household age structure, urban or rural residence, household income tercile, household education tercile, gender composition of household, an indicator of census sampling probability and household response to the disability screening question on the census 2B questionnaire (48). A total of 16,627 households were sampled, combining both private dwellings (N=16,387, TABLE A.1) and collective dwellings (N=240). Collective dwellings include non-institutional collective households (hotels, motels, hutterite colonies, lodging houses and work camps) and institutional collective households (hospitals, institutions for the physically handicapped, orphanages and children's homes, penal and correctional institutions, psychiatric institutions, nursing homes and young offender facilities).

Sampled households contained a total of 47,935 individuals of which 3,306 (7.4%) were not successfully linked to the MHSIP registry file. A total of 1,998 households

Table A.1
Sample Selection, By Strata
Manitoba

	Private Dwellings	Non-Institutional Collective Dwellings	Institutional Dwellings	Total
Total Number of Households(1) in Census 2B Sample(2)	82,611	640	377	83,638 (66,619) (3)
Total Number of Persons in Census 2B Sample	235,800	12,400	13,800	262,000 (210,650) (3)
Selected Sampling Units	16,387	170	70	16,627
Number of Individuals in Selected Sampling Units	46,670	477	788	47,935
Linked Individuals(5) (Percent of Selected Individuals)	43,396 (92.9%)	445 (93.3%)	788 (100.0%)	44,629 (93.1%)

(1) Households include single and multiple families residing in private dwellings, non-institutional collective households (hotels, motels, hutterite colonies, lodging houses and work camps) and institutional collective households (hospitals, institutions for the physically handicapped, orphanages and children's homes, penal and correctional institutions, psychiatric institutions, nursing homes and young offender facilities)
(2) The Census 2B sample represents an approximate 20% sample of all Manitoba households on June 3, 1986
(3) The number in brackets represents the number of units matched during the linkage phase of the project
(5) The sampling unit was defined as a household in which at least one member had been successfully linked across the two files. In some cases, one or more individuals in a linked household were not successfully matched. See section titled Sample Design and Sample Selection for precise definition.

(12.1%) contained at least one unlinked member. Unlinked records were considered analogous to a non-response condition in survey research. In this case, while census information was available for these cases, there was no corresponding information describing health service utilization. A preliminary imputation strategy has been implemented, where health care records from a similar linked record were assigned to the unlinked record. As a long term solution, an imputation approach will assign a health service history from a linked record which was not sampled in the original sample selection, which will re-establish the independence of observations in the dataset.

Phase III: Abstracting Health Care Histories

Following the selection of the sample, health service records were abstracted for a seven year period for all individuals in the sample. In total, 99,916 hospital discharge abstracts and 4,008,243 physician service claims were abstracted for the sample for a seven year period from FY83/84 to FY89/90. In addition, 1,660 admission records and 3,346 level of care assessment records describing care provided by the provincial nursing home system were abstracted.

A file was also derived from insurance registration records, containing one record per person in the sample. This file is used as a reference dataset, describing each sample member's registration status, including personal health information number, date of birth, date of death, date of the beginning of insurance coverage, date of cancellation of insurance coverage and the reason for cancellation of insurance coverage (either death or out-migration). Two additional variables were obtained from a linkage of insurance registration files to computerized vital statistics records. Mortality events in the sample (N=3,409) are reported to June 1993. For deaths reported by vital statistics, two variables are available which describe the cause of death, and if death was deemed due to an injury, the external cause of injury.

Confidentiality Protection Provisions.

A number of important procedures have been established to protect the confidentiality of personal information in this dataset. These procedures are defined in an operating agreement (49), which includes the monitoring of all research by an independent oversight body. Study datasets are maintained within Statistics Canada premises, and may only be accessed by individuals authorized under the federal Statistics Act. Records on all datasets established for this project contain an individual identifier, the Manitoba Personal Health Information Number (PHIN). All PHINs have been scrambled by MHSIP prior to release to the University of Manitoba's Centre for Health Policy and Evaluation, and cannot be matched to actual numbers presently in use in the Manitoba health care system. Names and street addresses are excluded from the analysis database.

Representativeness of Sample Estimates of Population Characteristics

To assess the validity of the sample estimates of Manitoba population characteristics, we performed a number of descriptive analyses. In the case of mortality, the annual mortality rate estimated from linked records in the sample (7.51 deaths per 1,000 population over the two year period June 1986 to May 1988) was found to compare favourably with the annual mortality rate calculated from actual reported deaths in this period (7.97/1,000) for the complete Manitoba population. Imputing mortality and health care utilization to the 3,306 records in the sample which were not successfully linked did not appreciably change the mortality estimate derived from the sample (7.30/1,000). APPENDIX TABLE C.2 reports the actual and estimated mortality by 5 year age groups. With the exception of children under the age of ten, and persons aged 80 years or older, the 95% confidence intervals associated with the sample estimate enclosed the mortality rate observed in the population.

An analysis of the income quartile distribution of the 3,306 individual records which were not linked in the sampling of households in Phase II suggests that, overall, there was no evidence of bias. As reported in APPENDIX TABLE C.3, unlinked male and female records were distributed approximately equivalently across income quartiles. However, on an age-specific basis, there was evidence that males and especially females under the age of 50 were disproportionately represented in households in the lowest income quartile. This pattern was inverted among older unlinked individuals, with both men and women more likely to be members of high income households. The interim imputation methodology moderated these age-specific biases.

The Census does not obtain information on income or attained education for residents of institutional collective dwellings. Because the socioeconomic status of these individuals could not be described, these individuals have been excluded in the primary analyses contained in this report, along with residents of non-institutional collective dwellings. As is described in APPENDIX TABLE C.4, the mortality rate among these excluded individuals was substantially in excess of the experience of the population living in private dwellings in June 1986.

Representativeness of Sample Estimates of Health Care Utilization

To assess the validity of sample estimates of population health care utilization, weighted estimates of ambulatory medical care and hospital utilization produced by the sample were compared with actual utilization of all Manitobans alive and in the province in June 1986. Medical care utilization estimated from the sample agreed very closely with actual population utilization. However, the sample underestimated hospital separations in FY86/87 relative to the population resident in Manitoba on census day by approximately 4% and to underestimate total days of care by 22% (50). Two factors are responsible for this underestimation of hospital days: 1) an under-representation of long stay separation (> =60 days) in the sample, and 2) an under-

Table A.2
Definition of Diagnoses
Included in Each of Fifteen Categories of Disorder

Disorder Category	ICD-9-CM Diagnostic Codes
Cardiovascular and Cerebrovascular Disease	390-405, 410-417, 420-459
Diabetes	250
Mental Illness	290-319,331
Cancer	140-239
Respiratory and gastrointestinal infectious disease	001-009, 460-466, 480-490
Musculoskeletal disorders	710-729
Injury and Poisoning	800-999
Disorders of Eye and Ear	360-389
Chronic Obstructive Pulmonary Disease	490-496
Digestive System Disorders	530-575
Genitourinary Disorders	580-629
Fertility	V27
Complication in Pregnancy	640-644, 646-648
Conditions in the Perinatal Period	760-773, 775-779
Congenital Anomalies	740-759

representation of hospital care for the treatment of mental health disorders among adults aged 20-64. Although accounting for approximately 2% of all admissions, long stay admissions represent 38% of total hospital days (602,000 of 1,595,000 days in FY86/87). The under-representation of long-stay separations to persons over the age of 65 in the sample accounts for 66.6% of the total sample under-estimation. Among persons under the age of 65, 44.6% of the sample under-estimation of hospital days can be attributed to persons in treatment for mental health disorder, accounting for an additional 10.9% of the total sample under-estimation. These two factors account for 77.5% of the difference in hospital days between the sample and the population. With the exclusion of long stay hospital separations, the sample under-estimate of days of hospital use declines from 22% to 7.4% (APPENDIX TABLE C.5). Accordingly, in this report we have restricted analysis to short stay hospital utilization, defined as admissions with lengths of stay less than 60 days.

Measures

Classification of Disorder

Categories of disorder were selected for analysis which satisfied two conditions: first, the prevalence of disorder was high enough to be meaningfully described using a 5% population sample, and 2) the disorder was not confined to one particular age group. In the case of the second condition, we made some adjustments in the case of fertility, pregnancy complication and perinatal and early childhood health. The diagnostic ranges included in each of the 15 categories of disorder are reported in TABLE A.2. In general, the categories in this study are congruent with the ICD-9-CM major category divisions, with the exception of the category which combines respiratory and gastrointestinal infections, and the inclusion of cerebral degeneration disorders (including alzheimer's disease) in the category of mental illness.

Treatment Prevalence

For this portion of the analysis, treatment prevalence was defined as the number of persons receiving medical care for a specific class of disorder over a one year observation interval. For the purposes of this analysis, we reviewed diagnostic codes reported on hospital abstracts and physician claims over the period July 1985 to June 1986. Case definition criteria were the presence of one or more eligible diagnostic codes on a hospital separation abstract or two or more physician claims with an eligible diagnosis in a 365 day period. An individual person may be recorded in more than one disorder category in these analyses.

As a requirement for payment, physicians must declare a single diagnosis responsible for the patient encounter on all reimbursement claims. This medical care record does not indicate whether the physician is reporting a presumptive or established diagnosis. To reduce the number of false positive classifications associated with the reporting of presumptive diagnoses we implemented a case definition requiring that an eligible diagnosis must appear on 2 or more physician claims in the 365 observation period. Treatment prevalence estimates based on the study's case definition are approximately 40% lower than would be obtained from estimates based on the presence of a single eligible diagnosis in the observation period. As might be expected, the effect of case definition criteria on treatment prevalence estimates varied by disorder group. Estimates were reduced by as little as 30% in the case of diabetes to as much as 80% in the case of disorder groups dominated by acute, transient disease episodes (such as respiratory and gastrointestinal infections). Within a disorder group, the effect of the stringent case definition on treatment prevalence estimates was equivalent across socioeconomic quartiles. The results of these sensitivity analyses are available from MCHPE.

Mortality

For all individuals in the sample, deaths were ascertained from June 1986 to June 1993, through linkage to computerized vital statistics files. Stillbirths were identified from hospital separation abstracts.

Measures of Socioeconomic Status

Two measures of socioeconomic status derived from variables based on education and income, were developed for the purposes of this study, both derived from information provided by respondents to the 2B questionnaire in the 1986 census. Both education and income were represented as ordinal measures, forming four equal sized quartile groups of the population. To support the comparison of the relative importance of education and income in describing difference in health service utilization and disorder treatment prevalence, we have chosen to produce quartile measures of both education and income. For many age groups it is not plausible to articulate more than four meaningful levels of attained education which create groups of approximately equal size.

The highest level of educational attainment was obtained by the census for all adults over the age of 15 residing in private dwellings or non-institutional collective dwellings. The census does not ascertain educational attainment for residents of institutions, or for children under the age of 15. For adults, attained education at the individual level was used to classify individuals into age-specific quartiles of education. Because the quartile structure is age specific, we do not refer to specific levels of education in these analysis. For children under the age of 15, a measure of the mean attained education of household adults was computed and assigned to all children in the household. In turn, children were classified into quartiles on an age-specific basis. Following from this method, it is possible that children in the same household may have different education quartile ranks.

Unlike education, income was measured at the household level for residents of private dwellings, summing reported income from all sources for all adults over the age of 15. Total household income was assigned to each member of the household, and individuals were ranked in quartiles on an age-specific and residence-specific basis. Household income measures have not been adjusted for household size. The residence strata was formed from a simple urban vs rural classification, using criteria defined by Statistics Canada. APPENDIX TABLES C.6 and C.7 describe the age-specific levels of education and household income used to define quartiles.

Analysis

In this report, analysis of mortality, treatment prevalence and the utilization of hospital and medical care is contrasted among individuals grouped into equal sized quartiles on the basis of two measures of socioeconomic status. Mortality and measures of treatment prevalence are assumed to be binomially distributed, and differences across quartiles on these measures have been statistically assessed using tests based on the chi-square distribution. The two primary measures of health care utilization, short-stay hospital days per 1,000 population and dollars of ambulatory medical care per capita, have very skewed and unknown distributions. Since sample sizes are moderately large, an approximate normal distribution has been assumed, using an asymptotic theory.

In the treatment prevalence analyses, chi-square tests for equality and for trend across quartiles were performed and the obtained p values have been reported in this document. Confidence intervals for treatment prevalence rates were computed using the method described by Fisher and Yates (53). An additional series of tables describe treatment prevalence rates for the sample simultaneously classified by income and education quartiles. Multivariate logistic regression has been used in these analyses to derive estimates of the magnitude of the independent association of income and education with observed treatment prevalence rates.

There are two important characteristics of analyses reported in this document which are relevant to the interpretation of these results. In the treatment prevalence analyses, which are central to the primary question in this study, age-specific treatment prevalence rates are described for fifteen major categories of disorder, separately by income and education quartiles. Accordingly, there is a high probability of significant associations occurring by chance under this multiple testing framework. Conservative reporting of statistical significance, based on Bonferroni adjustment methods (51,52), have been incorporated in the major treatment prevalence summary tables in this report.

The second consideration concerns the size of age strata. The number of observations in each age strata are unequal, and recognition of this is important for the interpretation of the results of statistical tests. Smaller differences can be detected across quartile levels of larger age groups. Age groups were formed on the basis of age-related morbidity patterns, rather than to equalize the size of age strata.

RESULTS

Sample Characteristics

APPENDIX TABLES C.8 through C.11 report sample strata sizes and population estimates which are relevant for the interpretation of the following analyses. APPENDIX TABLE C.8 provides information on the number of observations which underlie the age- and education-specific analyses. The weighted sample estimates a Manitoba population of 1,048,381 individuals, of whom 23,478 were estimated to reside in collective dwellings. In the analyses reported in this study, residents of collective dwellings have been excluded. As described in APPENDIX TABLE C.8, the unweighted quartile totals in the sample are not of equal size. However, following the application of sample weights, the distribution across quartiles approximates an equal assignment.

APPENDIX TABLE C.11 describes the distribution of the sample when classified simultaneously by quartile of household income and individual attained education. This table demonstrates that income and education are only partially correlated measures of socioeconomic status as constructed in this sample. For example, less than 36% of the estimated 238,213 individuals in the lowest education quartile are also in the lowest income quartile. Alternatively, within the two median education quartiles, this is only a moderate association with the quartile of household income. The significance of these patterns will be revisited in the discussion of the results of the analysis.

APPENDIX TABLES C.9 and C.10 report strata sample sizes for the fertility and pregnancy complication analyses, which are based on different denominators than the core analyses.

Table A.3
Mortality, By Income and Education Quartile

Weighted Analysis, Estimated Annual Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1 Lowest	7.15	8.80	7.05	4.00	7.00
Q2	6.85	9.60	6.95	6.80	7.60
Q3	7.50	5.85	5.75	5.40	6.00
Q4 Highest	5.95	7.20	3.75	3.20	4.50
Total	6.95	7.90	5.85	4.55	6.30

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1 Lowest	1.43	<.01	(1.10, 1.86)	1.38	<.05	(1.06, 1.79)
Q2	1.57	<.001	(1.22, 2.02)	1.62	<.001	(1.26, 2.08)
Q3	1.27	NS	(0.97, 1.65)	1.21	NS	(0.93, 1.58)
Q4 Highest	1.00	-	- -	1.00	-	- -
Trend	1.12	<.01	(1.04, 1.22)	1.13	<.01	(1.05, 1.22)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

Age		Income Quartile			Education Quartile		
	N (3)	OR	p	95%CI	OR	p	95%CI
0-14	4	0.58	NS	(0.12, 2.89)	0.60	NS	(0.12, 3.03)
15-29	12	0.89	NS	(0.46, 1.69)	1.97	NS	(0.93, 4.16)
30-49	44	1.34	<.05	(1.00, 1.80)	1.24	NS	(0.94, 1.65)
50-64	93	1.36	<.01	(1.12, 1.65)	0.96	NS	(0.79, 1.16)
65+	379	1.04	NS	(0.94, 1.14)	1.13	<.05	(1.03, 1.25)
Overall	532	1.12	<.01	(1.04, 1.22)	1.13	<.01	(1.05, 1.22)

Q1 = Lowest
(1) Odds of mortality relative to highest quartile. Odds ratios estimated from logistic regressions simultaneously testing for income and education.
(2) Odds of mortality with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.
(3) Number of deaths in sample strata over 24 month period: June 1986 to May 1988.

Mortality

Based on this sample, an estimated 12,229 deaths occurred over a 24 month period to non-institutionalized residents of Manitoba, and approximately 73% of these deaths occurred to persons over the age of 65. Almost 40% of deaths were attributed to cardiovascular and cerebrovascular causes, and an additional 30% were attributed to cancers.

On an overall basis, mortality was moderately associated with both income and education quartile rank. For example, the odds ratio for risk of death among persons in the lowest income quartile was 1.43 (95% CI: 1.10, 1.86, TABLE A.3) relative to the highest quartile, and 1.38 (95% CI: 1.06, 1.79) among persons in the lowest education quartile relative to the highest quartile.

Within age groups, mortality was inversely related to income quartile among those aged 30-49 and 50-64, after adjusting for education (TABLE A.3). Relative to those with the highest levels of education, mortality was higher among lower education groups for all ages except children under the age of 15. However, a significant inverse association of mortality with education was only observed among those aged 65 and older after adjustment for income. On an overall basis, the odds of mortality with a one level decrease in income quartile was 1.12 (95% CI: 1.04, 1.22) and a virtually identical association with education was observed (1.13, 95% CI: 1.05, 1.22). When stratified into two age groups, less than and greater than age 65, education quartile was inversely associated with mortality in both age groups, while income was only associated with mortality among persons under the age of 65 (TABLE A.4).

As expected, rates of mortality were low among persons under the age of 65, with fewer than 20 deaths observed over a 24 month period among persons under the age of 30 in this sample. As a result of the infrequent occurrence of death at younger

Table A.4
Mortality, By Socio-Economic Status and Age

Estimated Mortality Rate /1,000, Excluding Residents of Collective Dwellings

	Education Quartile						
	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
< 65	2.65	1.71	1.59	1.72	1.90	0.089	0.045
> 65	35.72	44.45	36.30	24.50	35.47	0.000	0.005
Total	6.95	7.90	5.85	4.55	6.30	0.000	0.000

	Income Quartile						
	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
< 65	2.60	2.35	1.49	1.22	1.90	0.004	0.000
> 65	34.52	41.42	37.12	28.17	35.47	0.048	0.145
Total	7.00	7.60	6.00	4.50	6.30	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square test for equality
P(2) = Chi-Square test for trend

ages, this sample did not provide sufficient size to meaningfully examine socioeconomic patterns in mortality at these younger ages (see TABLE A.5).

TABLE A.3 includes a tabulation of mortality rates observed in the sample when cross-classified by income and education. In general, mortality patterns in this table are consistent with the summary measures described above. The lowest mortality rate was observed among persons in both the highest income and highest education quartile, and mortality rates tended to increase across declining quartiles of education and income. However, among age groups over the age of 65, the data display an unexpected discontinuity from a linear gradient (see TABLE A.5). As depicted in TABLE A.3, in three of four income quartiles, the lowest education quartile (QUARTILE 1) had a lower mortality rate than the adjacent quartile (QUARTILE 2). This deviation from the expected linear trend is also shown in FIGURE A.1. The data in TABLE A.5 indicate that this pattern is present only among those over the age of 65, and is especially evident among those over the age of 75. There are at least two explanations for this unexpected pattern. First, the data may represent the consequence of a differential recruitment of individuals in the lowest socioeconomic quartile into institutional settings such as nursing homes and extended care hospital facilities. Mortality among residents of institutional care facilities is excluded from the analyses reported in this section. A second explanation may lie in the impact of higher mortality in the early and middle adults age periods among individuals in the lower quartiles. This hypothesis predicts that survivors of this early mortality would perhaps be healthier than the average individual in the upper quartiles, and is consistent with Fries compression of morbidity hypothesis (56). The pattern observed in these data are plausibly due to the effect of both processes.

Table A.5
Mortality, By Socio-Economic Status and Age

Estimated Mortality Rate/1,000, excluding residents of collective dwellings

	Education Quartile						
	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
00-04	0.20	-	-	-	0.05	0.874	0.492
05-14	0.05	-	-	0.45	0.15	0.340	0.211
15-29	0.80	0.50	0.05	0.20	0.40	0.194	0.065
30-49	2.95	1.05	1.95	1.05	1.75	0.490	0.040
50-64	8.75	7.45	5.25	9.10	7.55	0.246	0.775
65-74	22.85	25.85	24.25	17.85	22.60	0.360	0.249
75-+	52.35	71.40	55.95	38.45	55.80	0.007	0.090
Total	6.95	7.90	5.85	4.55	6.30	0.000	0.000

	Income Quartile						
	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
00-04	-	-	0.15	-	0.05	0.891	0.828
05-14	0.05	0.05	-	0.35	0.15	0.556	0.342
15-29	0.75	-	0.05	0.70	0.40	0.027	0.960
30-49	2.65	2.00	1.40	0.90	1.75	0.119	0.017
50-64	9.70	10.75	6.10	4.00	7.55	0.005	0.002
65-74	23.35	25.65	24.00	17.05	22.60	0.321	0.204
75-+	51.65	65.75	58.30	46.40	55.80	0.201	0.488
Total	7.00	7.60	6.00	4.50	6.30	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square test for equality
P(2) = Chi-Square test for trend

Figure A.1
Mortality per 1,000 Population
By Income and Education Quartile

Excluding residents of Institutional and Collective Dwellings

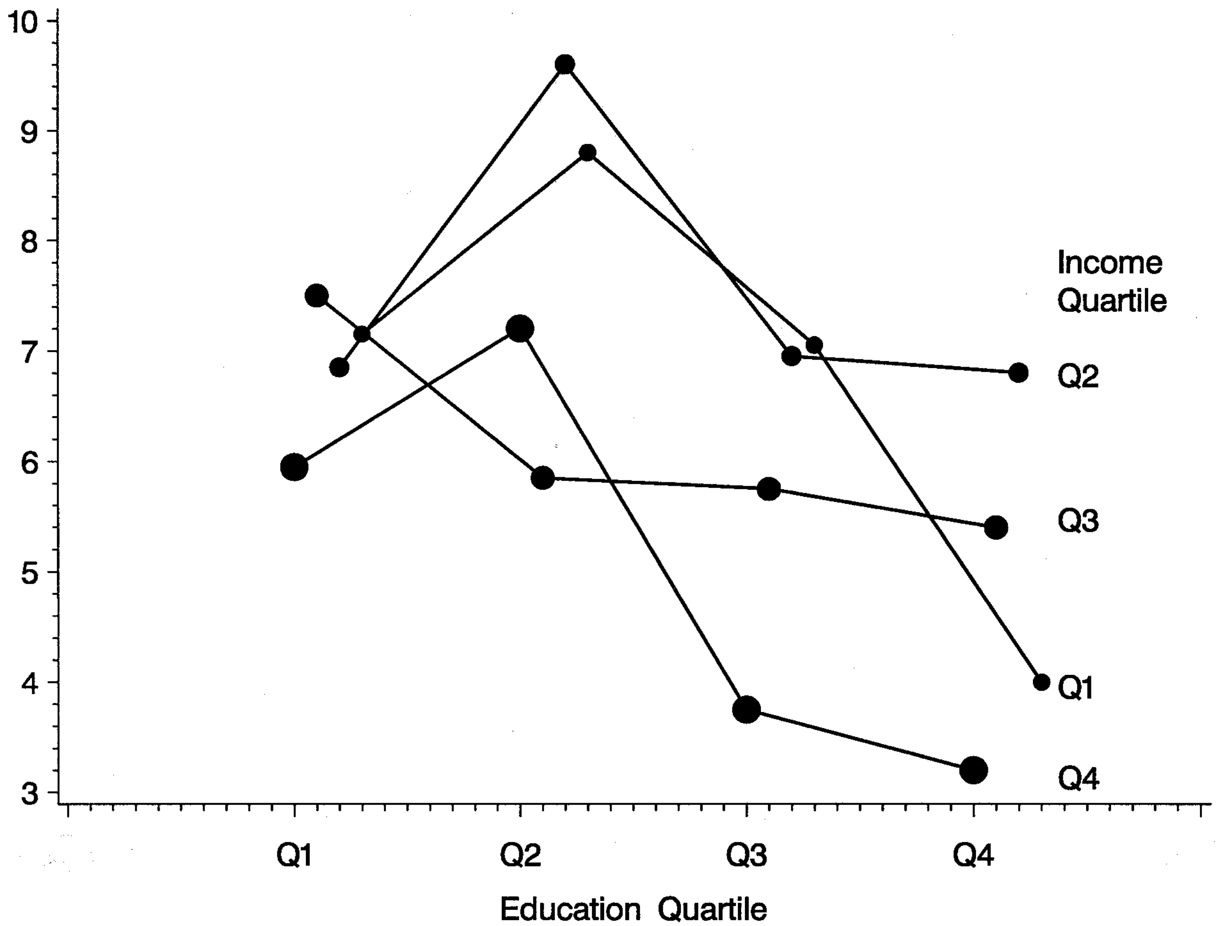


Table A.6
Age-Specific Mortality Rates and
Treatment Prevalence Rates For Selected Disorder Categories, By Age

	Age Group							
Rate / 1,000 population (1)	0-4	5-14	15-29	30-49	50-64	65-74	75+	Total
Mortality	0.05	0.15	0.40	1.75	7.55	22.60	55.80	6.3
Treatment Prevalence								
Cardiovascular/Cerebrovascular Disorders	1.5	1.9	17.3	76.8	267.2	437.0	551.2	126.3
Diabetes	-	1.0	4.0	14.7	48.6	77.1	82.5	22.4
Mental Illness	7.1	16.2	51.9	89.4	92.7	99.2	130.6	67.6
Cancer	2.4	4.9	10.1	26.7	48.5	88.3	111.0	30.2
Respiratory/Gastrointestinal Infections	527.7	279.4	180.9	166.6	129.6	118.6	144.7	199.2
Musculoskeletal Diseases	7.5	36.7	87.3	146.6	219.5	238.5	254.3	130.2
Injury and Poisoning	165.0	195.0	215.7	147.7	136.1	132.8	158.5	169.9
Disorders of Eye and Ear	456.2	287.8	175.5	171.2	218.3	279.5	349.7	231.9
Chronic Obstructive Pulmonary Disease	28.1	34.8	14.7	14.7	34.5	76.3	75.5	29.4
Digestive System Disorders	81.9	17.8	46.3	71.1	106.6	135.3	166.1	72.7
Genitourinary Disorders	44.0	23.0	165.7	153.8	129.6	128.0	152.7	124.4
Congenital Anomalies	37.6							
Perinatal Period	280.7							
Fertility (2)			82.1	36.1				57.0
Pregnancy Complication (3)			347.6	286.0				326.5

(1) Excluding residents of collective and institutional dwellings
(2) Rate of live and still births per 1,000 women
(3) Rate of pregnancy complication per 1,000 live and still births

Treatment Prevalence Patterns

This section begins with a summary of findings of the relationship of treatment prevalence to the two measures of socioeconomic status across 15 disorder categories. Following this summary description, detailed results within the disorder categories are presented. In reviewing these detailed results within specific disorder categories, interested readers are referred to tables and figures in the Appendix.

TABLE A.6 reports age-specific treatment prevalence rates across the 15 categories of disorders examined in this study.

TABLE A.9 provides a summary of the relationship of education and income to mortality and the treatment prevalence of 14 classes of disorder, using five age categories. The odds ratios in the table describe the change in treatment prevalence with a 1 level decrease in quartile, relative to the highest quartile: odds ratios greater than 1 indicate increasing treatment prevalence with declining levels of income or education. To partially control for multiple testing across disorder categories within age groups, we have only reported odds ratios with p values less than .01. Information in this summary table is derived from detailed tables reported in the Appendix (APPENDIX TABLES A1.1-A15.2). The relationships reported in TABLE A.9 are also depicted graphically in TABLE A.7 for education and TABLE A.8 for income. In these tables, a positive relationship is indicated by a plus sign, for example, where higher levels of education are associated with higher rates of treatment.

A number of general observations pertain to the pattern of relationships depicted in this table. Of the 128 age- and disorder-specific relationships tested in the table, the majority were found to show no association between socioeconomic status and treatment prevalence. Of the associations that were observed, negative relationships were dominant, indicating a higher treatment prevalence among individuals of lower

Table A.7
Summary of Association of Educational Attainment and Treatment for Specific Classes of Disorder, By Age

A negative sign indicates treatment prevalence rises with declining education and are based on odds ratios estimated from age-specific logistic regressions, adjusting for income. Odds ratios with p values less than .01 are not reported.

	Age 0-14	15-29	30-49	50-64	65+
Cardiovascular and Cerebrovascular Disorders	.	.	-	.	-
Cancer	+	.	.	.	.
Diabetes	.	.	-	.	.
Mental Illness and Disorder	.	.	.	.	-
Respiratory and Gastrointestinal Infectious Disease	.	.	.	-	.
Disorders of Eye and Ear	+	+	.	+	+
Chronic Obstructive Pulmonary Disease	.	.	.	.	.
Digestive System Disorders	.	.	-	.	-
Genitourinary Disorders	-	.	.	.	.
Injury and Poisoning	.	-	-	.	.
Musculoskeletal disorders	.	.	-	.	.
Fertility		-	+		
Complication in Pregnancy		-	.		
Conditions in the Perinatal Period (1)	.				
Congenital Anomalies (2)	.				

(1) Treatment prevalence in children aged 0-12 months
(2) Treatment prevalence in children aged 0-4 years

See Appendix Tables A1.2 to A15.2 for estimated treatment prevalence rates by age and education quartile and associated test for equality and trend.

Table A.8
Summary of Association of Household Income and Treatment Prevalence of Classes of Disorder, By Age

A negative sign indicates treatment prevalence rises with declining income and are based on odds ratios estimated from age-specific logistic regressions, adjusting for education. Odds ratios with p values less than .01 are not reported.

	Age 0-14	15-29	30-49	50-64	65+
Cardiovascular and Cerebrovascular Disorders	.	.	.	-	.
Cancer	.	.	+	.	.
Diabetes	.	.	-	-	.
Mental Illness and Disorder	.	-	-	-	-
Respiratory and Gastrointestinal Infectious Disease	.	-	-	.	.
Disorders of Eye and Ear	+	.	.	+	.
Chronic Obstructive Pulmonary Disease	.	.	.	-	.
Digestive System Disorders	.	-	-	-	.
Genitourinary Disorders	.	-	.	.	.
Injury and Poisoning	.	.	-	.	.
Musculoskeletal disorders	+	.	.	-	.
Fertility		-	.		
Complication in Pregnancy		-	.		
Conditions in the Perinatal Period (1)	.				
Congenital Anomalies (2)	.				

(1) Treatment prevalence in children aged 0-12 months
(2) Treatment prevalence in children aged 0-4 years

See Appendix Tables A1.2 to A15.2 for estimated treatment prevalence rates by age and income quartile and associated test for equality and trend.

Table A.9

Summary of Association of Mortality and Treatment Prevalence with Measures of Educational Attainment and Household Income for Specific Classes of Disorder, By Age

Odds of mortality or treatment with a one level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education effects
Odds ratios with p values >.01 are not reported (bonferroni adjustment for multiple testing
For additional detailed descriptions, see Appendix Tables A1.2-A15.2.

* <.01, ** <.001

		Age Group 0-14	15-29	30-49	50-64	65+
Mortality	Education	.	.	.	.	1.13 *
	Income	.	.	1.34 *	1.36 *	.
Treatment Prevalence						
Cardiovascular and Cerebrovascular	Education	.	.	1.18 **	.	1.06 *
	Income	.	.	.	1.07 *	.
Cancer	Education	0.60 *	.	.	.	.
	Income	.	.	0.87 *	.	.
Diabetes	Education	.	.	1.19 **	.	.
	Income	.	.	1.32 **	1.15 *	.
Mental Illness and Disorder	Education	.	.	.	.	1.17 **
	Income	.	1.22 **	1.12 **	1.23 **	1.17 **
Respiratory and Gastrointestinal	Education	.	.	.	1.11 *	.
	Income	.	1.07 *	1.11 **	.	.
Disorders of Eye and Ear	Education	0.88 **	0.90 **	.	0.92 *	0.92 *
	Income	0.95 *	.	.	.	.
Chronic Obstructive Pulmonary Disease	Education	.	.	.	.	.
	Income	.	.	.	1.19 *	.
Digestive System Disorders	Education	.	.	1.16 **	.	1.09 *
	Income	.	1.20 **	1.10 *	1.12 *	.
Genitourinary Disorders	Education	1.18 *	.	.	.	.
	Income	.	1.17 **	.	.	.
Injury and Poisoning	Education	.	1.13 **	1.09 **	.	.
	Income	.	.	1.13 **	.	.
Musculoskeletal Disorders	Education	.	.	1.16 **	.	.
	Income	0.84 *	.	.	1.08 *	.
Fertility	Education		1.19 **	0.73 **		
	Income		1.20 **	.		
Conditions in Perinatal Period	Education	.				
	Income	.				
Congenital Anomalies	Education	.				
	Income	.				

attained education or lower household income. Focusing on the central question of this study, a relationship between socioeconomic status and the prevalence of disorder is most frequently present among young and middle aged adults, those aged 15-64. Among children 0-14, four of the five relationships are actually positively associated with socioeconomic status, indicating increasing rates of treatment with higher levels of income or education.

The following section provides a description of findings within specific disorder categories, beginning with a summary measure which examines the association of socioeconomic characteristics with the prevalence of persons who received treatment for conditions in three or more disorder categories.

THREE OR MORE DISORDERS: TABLE A.10 reports the proportion of persons within each age group who received treatment for conditions in three or more disorder categories during the 12 month observation period, stratified separately by income and education quartile. The lowest frequency on this measure was observed among children 5-14, rising over subsequent age groups to more than a third of persons over the age of 75.

Across age strata, the prevalence of persons receiving treatment for conditions in three or more disorder categories was more strongly related to household income than education (Table A.11). Overall, a decline in one income quartile was associated with an increase of 1.11 in the odds of three or more disorders ($p < .001$). In contrast, a one level decline in education quartile was associated with an odds ratio of 1.06 ($p < .001$, TABLE A.11). Both of these estimates are derived from logistic regressions which simultaneously tested for education and income effects.

Table A.10
Prevalence of Persons with Three or More Disorders in Treatment By Age and Socioeconomic Status

Excludes residents of collective and institutional dwellings
Excludes care related to fertility, pregnancy complication, perinatal conditions and congenital anomalies.

Percent with three or more disorders in treatment

Income		Q1 % SD	Q2 % SD	Q3 % SD	Q4 % SD
Age	0-4	15.9 (1.12)	12.9 (1.24)	13.9 (1.29)	13.2 (1.31)
	5-14	7.8 (0.53)	5.9 (0.56)	6.1 (0.59)	6.2 (0.62)
	15-29	11.7 (0.52)	10.1 (0.56)	8.7 (0.58)	7.4 (0.49)
	30-49	15.8 (0.61)	12.4 (0.66)	11.9 (0.57)	11.0 (0.56)
	50-64	23.8 (1.00)	18.7 (1.01)	18.1 (0.96)	17.1 (1.06)
	65-74	32.6 (1.59)	29.7 (1.53)	25.7 (1.57)	25.7 (1.49)
	75+	36.5 (1.93)	40.0 (1:99)	36.1 (1.95)	32.7 (2.17)

Education		Q1 % SD	Q2 % SD	Q3 % SD	Q4 % SD
Age	0-4	14.5 (1.07)	15.4 (1.33)	15.0 (1.33)	11.2 (1.22)
	5-14	5.6 (0.46)	7.3 (0.62)	6.3 (0.58)	6.6 (0.63)
	15-29	9.9 (0.48)	9.6 (0.54)	10.2 (0.63)	8.3 (0.52)
	30-49	15.3 (0.61)	13.5 (0.69)	12.4 (0.58)	10.2 (0.54)
	50-64	21.7 (0.97)	19.1 (1.02)	19.0 (0.98)	17.1 (1.06)
	65-74	29.3 (1.54)	30.2 (1.54)	30.4 (1.65)	24.7 (1.45)
	75+	38.3 (1.95)	36.3 (1.95)	37.9 (2.24)	32.6 (2.31)

Table A.11
Prevalence of 3 or More Disorders in Treatment
By Age and Socio-Economic Status

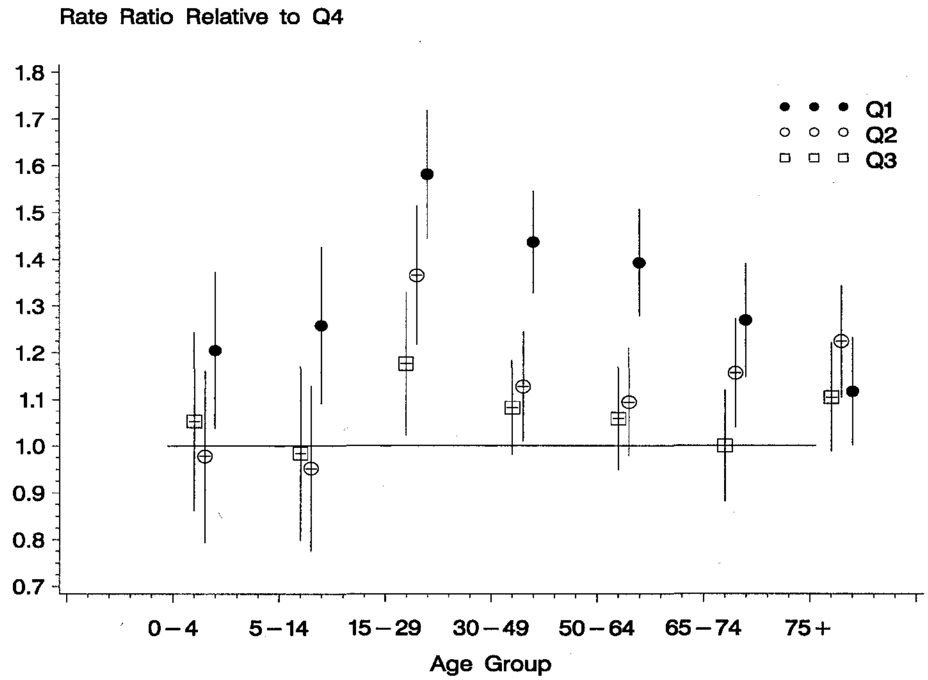
Age Specific Test for Trend
Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
Age	OR	p	95%CI	OR	p	95%CI
0-4	1.02	NS	(0.92, 1.14)	1.08	NS	(0.97, 1.21)
5-14	1.09	NS	(0.99, 1.20)	0.94	NS	(0.85, 1.03)
15-29	1.18	<.001	(1.11, 1.25)	1.02	NS	(0.96, 1.08)
30-49	1.11	<.001	(1.06, 1.19)	1.13	<.001	(1.07, 1.18)
50-64	1.13	<.001	(1.06, 1.20)	1.06	<.05	(1.00, 1.13)
65-74	1.12	<.001	(1.04, 1.20)	1.04	NS	(0.97, 1.12)
75+	1.06	NS	(0.97, 1.14)	1.06	NS	(0.98, 1.14)
Overall	1.11	<.001	(1.08, 1.14)	1.06	<.001	(1.04, 1.09)
Q1	1.37	<.001	(1.27, 1.49)	1.24	<.001	(1.14, 1.34)
Q2	1.14	<.001	(1.05, 1.23)	1.24	<.001	(1.15, 1.34)
Q3	1.05	NS	(0.97, 1.14)	1.20	<.001	(1.11, 1.30)
Q4	1.00	-	- -	1.00	-	- -
Overall	1.11	<.001	(1.08, 1.14)	1.06	<.001	(1.04, 1.09)

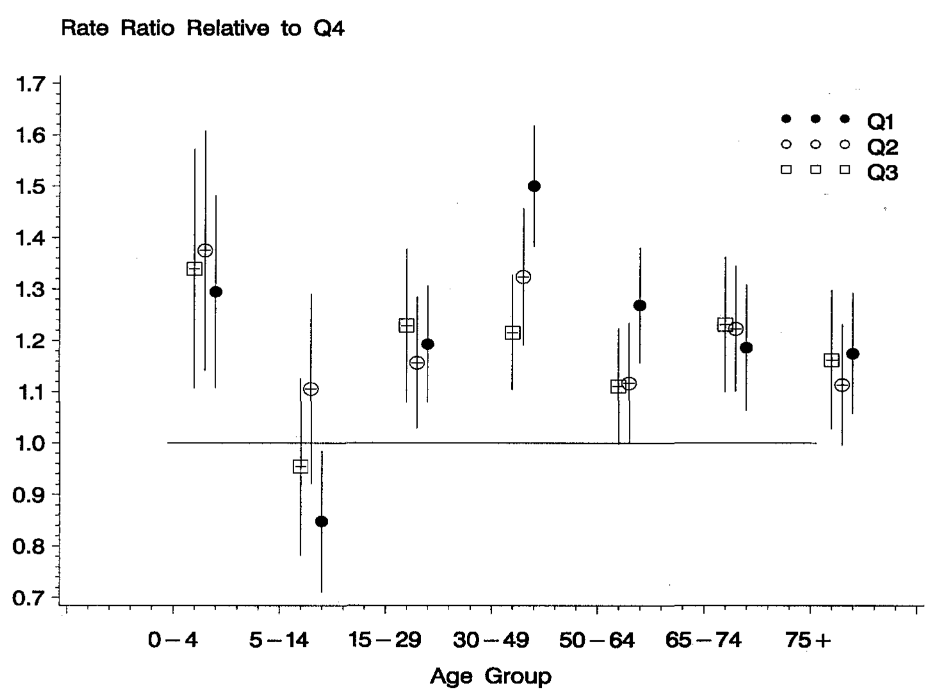
Q1 = Lowest

(1) Odds of 3 or more disorders with a 1 level decrease in quartile, relative to the highest quartile. Odds ratios estimated from logistic regressions simultaneously testing for linear income and education trends.

Figure A.2
Relative Risk of Three or More Disorders
By Age and Income Quartile



Relative Risk of Three or More Disorders
By Age and Education Quartile



The stronger association of income with the prevalence of three or more disorders in treatment was also seen on an age-specific basis, with significant trends in risk with descending income quartile found in four age groups (15-29, 30-49, 50-64, and 65-74) (TABLE A.11). In comparison, linear trends in risk associated with education quartile were only observed in two age groups (30-49 and 50-64).

Age-specific risks are depicted in FIGURE A.2, plotted as risk ratios relative to the highest quartiles of income and education. The pattern evident in relation to income is most consistent with the House hypothesis that the largest socioeconomic gradients in health deficits occur among adults under the age of 65. The pattern found across education quartiles, while not incompatible with this expected pattern, is less consistently evident.

CARDIOVASCULAR AND CEREBROVASCULAR DISORDERS: Generally dominated by chronic diseases, the conditions in this class of disorders are uncommon among children, and dominate the end of the life course, rising to a treatment prevalence of 551/1,000 persons over the age of 75 . Income and education quartile rank is inversely related to treatment prevalence only among adults aged 50-64 (see APPENDIX TABLE A1.1, A1.2).

DIABETES: The overall and age-specific prevalence estimates of diabetes in this sample are consistent with data from other Canadian studies describing the prevalence of clinically diagnosed disease (22,57). Socioeconomic differences in the treatment prevalence of this disorder are greatest for those aged 30-49 and 50-64, and these differences do not persist in the two oldest age cohorts. Socioeconomic differences appear to be larger for income than for education. A pattern in the prevalence of diabetes among persons aged 75+ is also present in a number of other disorders: while the highest prevalence of diabetes is observed among persons with the lowest education in this age group, the pattern associated with income shows a much lower rate among persons in the lowest income quartile. (see APPENDIX TABLE A2.1, A2.2)

MENTAL ILLNESS: The treatment prevalence of mental health disorders, which in this analysis include serious mental illnesses, minor mental health disorders and the dementias, rises through the adult years to approximately 1 in 10 persons at ages 30-64. In contrast to the typical clinical impression that the prevalence of major and minor psychiatric disorder declines in the elderly, these data show an increasing prevalence of disorder in treatment with advancing old age, which reflects the rising prevalence of cognitive impairment disorders and the affective and psychotic conditions which are often secondary to cognitive decline (43).

Overall, both education quartile and income quartile are inversely related to the treatment prevalence of these disorders . However, the treatment prevalence of mental health disorders is much more strongly related to income (Q1/Q4 RATE RATIO: 1.62) than to education (Q1/Q4 RATE RATIO: 1.34), and this pattern is evident in the age-specific rate comparisons. Many mental health disorders can have a substantial effect on social and occupational functioning, which in turn can result in reduced income earning opportunity. Education, as a characteristic established early in life, is less likely to be influenced by mental illness.

There is one additional pattern in these data which is important to consider. In the older age groups, the treatment prevalence rate ratios associated with education climb steeply from 1.13 (Q1/Q4) for ages 50-64 to 2.31 for aged 75+. This pattern may be evidence of a higher incidence of cognitive deficit among the elderly with low levels of education (58-62). (see APPENDIX TABLE A3.1, A3.2)

CANCER: No relationship between education or income and cancer treatment prevalence rates were observed in any age group over the age of 50. Among younger age groups there were a number of inconsistent patterns observed: a positive relationship between education quartile and cancer treatment prevalence rates for ages 5-14, and a positive relationship between income quartile and cancer treatment prevalence rates for ages 30-49. (see APPENDIX TABLE A4.1, A4.2)

RESPIRATORY AND GASTROINTESTINAL INFECTIONS: The treatment of respiratory and gastrointestinal infection was most prevalent among the very young (0-4 years of age: 527/1,000), and generally declined with advancing age. On an overall basis, the treatment prevalence for these infectious disorders was related to income quartile, but not to education quartile. On age-specific basis, higher income quartiles were consistently associated with lower treatment rates from ages 15 through 74. This pattern was not seen within age groups in relation to education quartile. (see APPENDIX TABLE A5.1, A5.2)

MUSCULOSKELETAL DISEASES: Musculoskeletal disorders were found to rise in prevalence with age. A statistically significant positive gradient was observed for children aged 5-15 and an inverse gradient was observed for adults aged 30-49 for both income and education quartiles. No associations with either socioeconomic measure was observed in older age groups. (see APPENDIX TABLE A6.1, A6.2)

INJURY AND POISONING: Rates of treatment for injury and poisoning were similar over the age course, ranging from 165/1,000 in children under the age of five to 158/1,000 for those over the age of 75. Among adults between the ages of 15 and 64, groups with higher incomes and levels of education had lower treatment prevalence rates. (see APPENDIX TABLE A7.1, A7.2)

DISORDERS OF THE EYE AND EAR: Treatment prevalence rates for these disorders show an age-related U shaped curve similar to that describing respiratory and gastrointestinal infectious diseases. In relation to the socioeconomic status measures, however, this class of disorder is unique, consistently showing higher treatment prevalence rates among the higher income and more educated groups. This pattern is especially evident in relation to education quartile. (see APPENDIX TABLE A8.1, A8.2)

CHRONIC OBSTRUCTIVE PULMONARY DISEASE: This category of disorder, which includes asthma, is relatively uncommon compared to the other classes of disorder measured in this study. The age profile is U shaped, with highest rates among children (ages 5-14: 34.8/1,000) and the elderly (65-74: 76.3/1,000). Among children aged 5-14, a positive relationship was seen between education quartile and treatment prevalence. Among adults, this association is reversed, with both education and income quartile showing an inverse relationship with the treatment prevalence of these disorders for age groups 30-49 and 50-64. These associations are diminished among the elderly and are no longer statistically significant. (see APPENDIX TABLE A9.1, A9.2)

DIGESTIVE SYSTEM DISORDERS: For both education quartile and income quartile, age-specific rates of treatment in this class of disorder were consistently higher among individuals in the lower quartiles, with the exception of those individuals aged 75+. The magnitude of socioeconomic differences were greatest among young children (under the age of five) and younger adults (ages 15-49). (see APPENDIX TABLE A10.1, A10.2)

GENITOURINARY DISORDERS: This heterogeneous class of disorders, which includes kidney disorders and conditions affecting the male and female genital organs, is inversely related to both income and education in adolescence and young adulthood. At other ages, treatment prevalence rates are not associated with socioeconomic status. (see APPENDIX TABLE A11.1, A11.2)

CONGENITAL ANOMALIES: In children under the age of five, congenital anomalies were diagnosed or in treatment in 37.6 per 1000 children. The estimate from this sample is lower than that provided by a population-based analysis in British Columbia (61/1000 births) which was based on information contained in an active surveillance registry (63). In part the lower rate estimated from the Manitoba sample will be due to the use of all children under the age of five in the denominator. No relation between the prevalence of congenital anomalies in treatment and mean attained education of household adults or household income was observed. (see APPENDIX TABLE A12.1, A12.2)

FERTILITY: On an age specific basis, fertility rates were related to both household income and the level of education of the mother. Among women aged 15-29, fertility was markedly lower among women in the highest income or education quartile relative to women in the lower three quartiles of education or income. Among older women, the relation between education or income and fertility was the reverse, with the highest fertility among women in the top education or income quartiles. Among older women, the rate ratio (Q4/Q1) was larger for education (2.73) than for income (1.39). The contrasting fertility patterns among younger and older women with respect to level of education are such that on a overall basis among all women of reproductive age there is no relation between level of education and the fertility rate. (see APPENDIX TABLE A14.1, A14.2)

PREGNANCY COMPLICATION: The rate of complication in early pregnancy is reported for women giving birth in the twelve months following June 1986. Approximately 1/3 of pregnant women had a complication in the range ICD-9-CM 640-644, 646-648 noted in their medical care records over a 270 day period prior to birth, and the rate of complication was appreciably higher among younger women compared to women over the age of thirty. Although approximately similar, the excess risk of complication would appear to be greater with declining level of maternal education (RATE RATIO Q1/Q4: 1.50) than is associated with household income (RATE RATIO Q1/Q4: 1.29). (see APPENDIX TABLE A15.1, A15.2)

Utilization of Hospital and Medical Care

This section of the report provides summary information on the use of insured medical services in relation to household income and levels of attained education. These are important data for understanding the distribution effects of a tax-funded universal insurance system (65-69) and have not been commonly available in Canada over the first 25 years of this program (70-77).

Very detailed tabulations of the use of ambulatory medical care and the utilization of hospital care are reported in APPENDIX TABLES B.1-B.4. Three measures of ambulatory medical care (Dollars per 1,000 population, Visits per 1,000 population and Visits per 1,000 persons in treatment) are reported stratified by income quartile (APPENDIX TABLE B.1) and education quartile (APPENDIX TABLE B.2), over category of disorder and three age groups (0-29, 30-64 and 65+). In the measure of visits per 1,000 persons in treatment, the denominator is formed of persons in treatment within a specific disorder category, as defined in the description of treatment prevalence. This measure is potentially useful as an indicator of differences in the intensity of care received by persons in different socioeconomic quartiles which may be related to differences in the severity of disorder. Three corresponding measures of hospital utilization (Short stay hospital days per 1,000 population, Short-stay separations per 1,000 population and Short-stay separations per 1,000 persons in treatment are reported by income quartile (APPENDIX TABLE B.3) and education quartile (APPENDIX TABLE B.4).

A number of observations can be drawn from these detailed tables. Paradoxically perhaps, while hospital utilization increases substantially with descending income or education quartile, there is no corresponding gradient in the utilization of ambulatory medical care. Relative to the highest quartiles, groups with lower income or education use more hospital care, within most disorder groups both for measures of separations per 1,000 population and separations per 1,000 persons in treatment. Across the three age groups described in these tables, the greatest socioeconomic differences in hospital utilization are present for persons aged 30-64. And while there are many individual age-specific disorder groups which show contradictory patterns, differences in the measure of hospital separations per 1,000 over all disorder categories is steeper across education quartiles than income quartiles for all three age groups.

Disorder-specific hospital utilization by income quartile is reported in APPENDIX TABLE B.5. The three disorder categories associated with the greatest number of days of care were cardiovascular and cerebrovascular disorders, cancers and digestive system disorders. These three categories of disorder also showed the smallest differences across quartiles in the rate of hospital days per 1,000 population. The largest differences over income quartiles were seen for mental illness, respiratory and gastrointestinal infections, chronic obstructive pulmonary disorders and pregnancy complications. Corresponding data classified by education quartile is reported in APPENDIX TABLE B.6.

As previously noted, within many disorder categories the utilization of hospital days is more sharply stratified by education quartile than was seen for income quartile. One notable exception is mental illness, where hospital utilization, while related to household income, was not associated with education. This pattern is consistent with the onset of serious mental illnesses in early adulthood, generally after completion of schooling. At the same time, these diseases have dramatic negative impacts on individuals' ability to participate in the labour force. Furthermore, as discussed in the methods section, it is important to recognize that these data underestimate the total days of care provided to persons with mental health disorders, and may also underestimate the socioeconomic gradient in hospital utilization. The use of ambulatory medical care for mental health disorder, summarized in APPENDIX TABLES B.7 and B.8, contrasts remarkably with the profile of hospital utilization. In the case of income, ambulatory medical care is greatest in the lowest and highest income quartiles, while utilization actually increases with rising education quartile. These contradictory patterns of hospital care and the use of ambulatory medical care can perhaps be best understood as reflecting the socioeconomic attributes of two distinct clusters of disorders within the broad mental illness category. The use of ambulatory medical care for the treatment of the more prevalent non-psychotic disorders is greatest in the higher quartiles, while persons with psychotic disorders are found concentrated in the lower income quartiles (43).

With the exception of the findings concerning the treatment of mental health disorders, ambulatory medical care shows no more than subtle differentials in relation to the measures of socioeconomic status. There is a general tendency across disorders for ambulatory medical care utilization to be slightly elevated in the lowest income quartile and the highest education quartile relative to the mean population utilization (APPENDIX TABLES B.7 and B.8).

Age specific patterns of ambulatory medical care utilization aggregated over all disorders is reported in TABLE A.12 and corresponding information for hospital utilization is reported in TABLE A.13. Ambulatory medical care is generally positively related to education quartile across all ages, with the exception of children under the age of 5. In contrast, the pattern of ambulatory medical care in relation to income is less consistent over age groups. Among adults aged 15-64, use of ambulatory medical care is highest among those in the lowest income quartile. Hospital utilization, on the other hand, shows sharp gradients over age groups in relation to both income and education quartiles (TABLE A.13). In the case of education, these

Table A.12
Estimated Expenditures on Ambulatory Medical Services By Age and Socio-Economic Status

Excludes inpatient services,
and ambulatory care for fertility, pregnancy complication, perinatal conditions and congenital anomalies

Education

Age	Dollars per person (SD) Q1		Q2		Q3		Q4		Total	
0-4	118.43	(4.44)	125.57	(4.52)	135.29	(4.56)	117.29	(3.82)	124.34	(2.21)
5-14	68.65	(1.90)	79.18	(2.10)	89.49	(2.35)	89.44	(4.09)	81.78	(1.31)
15-29	111.10	(3.07)	112.27	(2.77)	127.59	(4.03)	120.93	(3.71)	117.65	(1.68)
30-49	137.56	(3.97)	136.08	(4.09)	137.85	(3.47)	152.61	(5.68)	141.44	(2.21)
50-64	171.59	(6.08)	181.36	(6.29)	182.68	(6.64)	193.54	(7.26)	181.88	(3.27)
65-74	200.95	(8.57)	217.90	(8.73)	238.03	(9.40)	227.14	(8.53)	221.35	(4.41)
75+	218.48	(10.80)	256.77	(11.83)	290.19	(14.00)	270.30	(16.05)	256.93	(6.46)
Total	133.43	(1.80)	140.95	(1.90)	149.44	(2.03)	148.73	(2.43)	143.21	(1.02)

Income

Age	Dollars per person (SD) Q1		Q2		Q3		Q4		Total	
0-4	125.99	(4.37)	119.75	(4.59)	120.12	(4.02)	132.56	(4.57)	124.34	(2.21)
5-14	79.91	(2.24)	79.05	(2.24)	80.75	(2.19)	87.39	(3.70)	81.78	(1.31)
15-29	132.56	(4.04)	111.74	(2.66)	115.01	(3.21)	111.62	(3.36)	117.65	(1.68)
30-49	161.89	(4.82)	131.67	(4.76)	130.18	(3.48)	142.64	(4.47)	141.44	(2.21)
50-64	195.28	(7.12)	181.18	(7.02)	169.47	(5.40)	182.56	(6.59)	181.88	(3.27)
65-74	214.09	(7.89)	225.77	(8.70)	217.66	(9.23)	228.02	(9.43)	221.35	(4.41)
75+	252.63	(11.76)	258.81	(11.41)	258.60	(15.33)	257.82	(13.11)	256.93	(6.46)
Total	153.43	(2.14)	138.89	(2.03)	137.02	(1.87)	143.68	(2.12)	132.21	(1.02)

Table A.13
Estimated Days of Short-Stay Hospital Care (<60 Days)
By Age and Socio-Economic Status

Excludes residents of collective and institutional dwellings
Includes admissions for fertility, pregnancy complication,
perinatal conditions and congenital anomalies

Days /1,000 population (SD)

Education		Q1	Q2	Q3	Q4	Total
Age	0-4	891 (198)	670 (126)	528 (918)	226 (277)	570 (273)
	5-14	143 (47)	214 (51)	140 (42)	149 (30)	161 (22)
	15-29	677 (75)	454 (40)	428 (44)	328 (40)	470 (28)
	30-49	626 (75)	596 (84)	510 (57)	448 (47)	540 (33)
	50-64	1,301 (176)	1,149 (142)	988 (145)	820 (117)	1,072 (75)
	65-74	2,440 (402)	2,664 (324)	2,181 (384)	1,483 (243)	2,179 (170)
	75+	5,008 (558)	4,682 (515)	5,337 (758)	2,674 (462)	4,512 (293)
	Total	1,048 (55)	997 (52)	857 (54)	577 (36)	867 (25)

Days /1,000 population (SD)

Income		Q1	Q2	Q3	Q4	Total
Age	0-4	808 (180)	600 (141)	335 (111)	533 (124)	570 (73)
	5-14	204 (54)	168 (40)	99 (33)	175 (45)	161 (22)
	15-29	668 (71)	508 (51)	437 (53)	276 (42)	470 (28)
	30-49	651 (72)	590 (76)	478 (63)	441 (46)	540 (33)
	50-64	1,370 (166)	1,161 (170)	860 (135)	926 (132)	1,072 (75)
	65-74	2,883 (357)	1,969 (272)	2,346 (375)	1,499 (351)	2,179 (170)
	75+	4,419 (612)	4,531 (547)	4,602 (581)	4,499 (605)	4,512 (293)
	Total	1,068 (55)	897 (49)	800 (50)	708 (47)	867 (25)

Table A.14
Summary of Short-Stay Hospital Care (<60 Days) and Ambulatory Medical Care By Socio-Economic Status

Excludes residents of collective and institutional dwellings
Hospital Care includes admissions for fertility, pregnancy complication, perinatal conditions and congenital anomalies

Hospital Utilization

Days /1,000 population (SD)

Education Quartile	Income Quartile Q1	Q2	Q3	Q4	Total
Q1	1,119 (85.7)	1,008 (104.7)	875 (106.3)	1,034 (182.8)	1,048 (55.1)
Q2	1,071 (105.9)	1,047 (103.0)	959 (105.1)	895 (98.0)	997 (51.9)
Q3	1,183 (145.2)	733 (76.4)	798 (111.5)	759 (97.6)	857 (54.3)
Q4	794 (99.8)	614 (83.0)	582 (74.0)	470 (51.1)	577 (35.6)
Total	1,068 (54.6)	897 (49.1)	800 (50.4)	708 (47.1)	867 (25.2)

Ambulatory Medical Care

Dollars per Capita (SD)

Education Quartile	Income Quartile Q1	Q2	Q3	Q4	Total
Q1	142 (3.2)	128 (3.0)	126 (3.8)	133 (5.1)	133 (1.8)
Q2	153 (4.0)	133 (3.3)	138 (3.5)	140 (4.5)	141 (1.9)
Q3	169 (5.3)	146 (4.0)	140 (3.5)	145 (3.5)	149 (2.0)
Q4	156 (5.7)	154 (6.8)	141 (4.1)	148 (3.8)	148 (2.4)
Total	153 (2.1)	139 (2.0)	137 (1.9)	143 (2.1)	143 (1.0)

Figure A.3
Ambulatory Medical Services Per Capita
By Income and Education Quartile

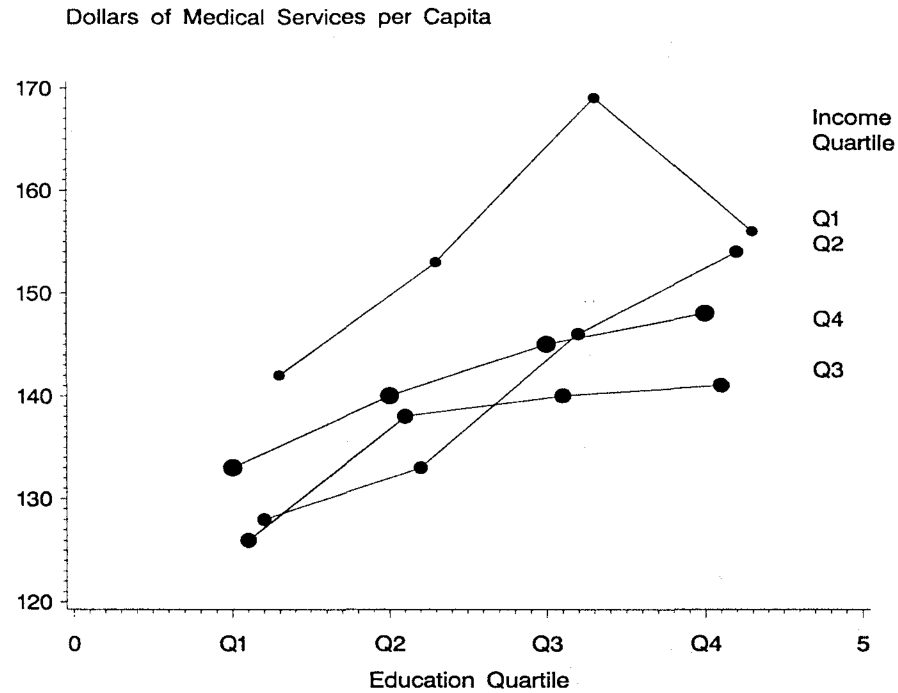
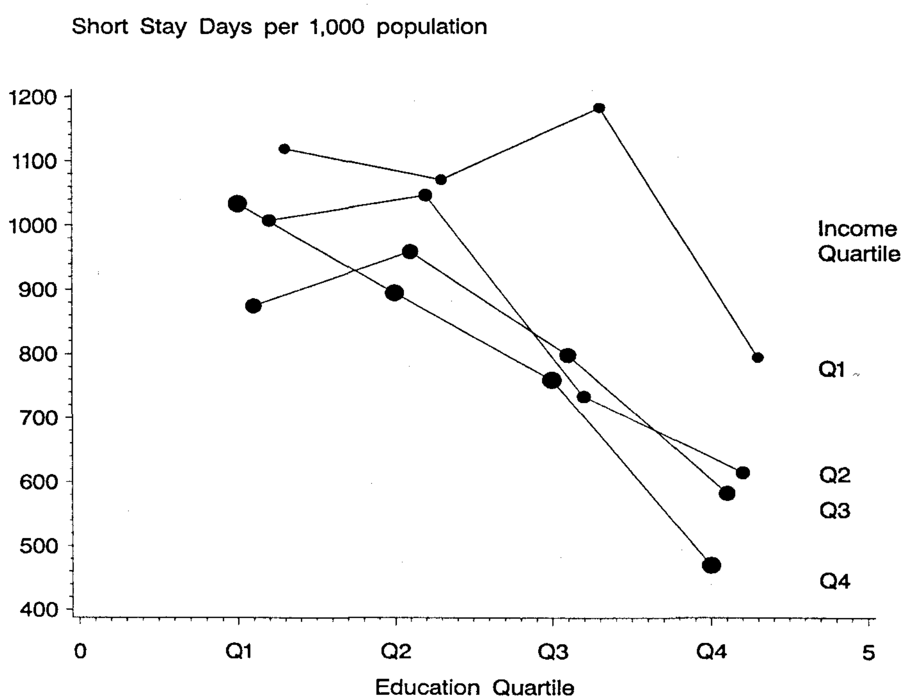


Figure A.4
Short Stay Hospital Days
By Income and Education Quartile



differences are actually most pronounced among children under the age of five, and adults over the age of 65.

FIGURES A.3 and A.4 summarize the contrasting relationships in the use of ambulatory medical care and hospital care by the socioeconomic status measures. These data are also provided in TABLE A.14. Ambulatory medical care does not show a pronounced gradient in use over income rank. Perhaps only in the lowest quartile of income is use higher than the mean utilization of the overall sample. However, within each income quartile, utilization of ambulatory medical care generally increases with rising education. In contrast, hospital utilization shows a more consistent pattern, where the use of hospital days increases with declining levels of both education and income.

DISCUSSION AND CONCLUSIONS

This study has described socioeconomic differences in mortality, the prevalence of morbidity in treatment and the utilization of hospital and ambulatory medical care for a representative sample of Manitobans in 1986. Our primary objective was to examine the magnitude of socioeconomic disparities in health states at different stages in the life course, with a principal focus on testing the hypothesis that these disparities are greatest among adults aged 30-64 relative to children, young adults and the elderly.

Although this study has used very different sources of information, the general findings confirm the observation from House's analysis of health interview survey respondents that the largest socioeconomic differences in health states are seen in the adult years. This report has presented data demonstrating that the concentration of socioeconomic disparities in the early and middle adult years in Manitoba was present for mortality, for those disorders in treatment which showed a relationship to socioeconomic status and for the prevalence of three or more disorders in treatment. Although higher rates of short-stay hospital admission were strongly associated with lower quartiles of household income or education, this disparity was seen over all age groups rather than particularly concentrated among adults aged 30-64. Finally, the use of ambulatory medical care was not correlated with these patterns, showing no relationship to household income, and a pattern of higher rates of use with higher levels of education.

There are a number of issues raised by these findings. The following discussion will: 1) offer observations concerning the comparability of these findings with other recent Canadian studies, 2) address important methodological issues including the validity of these data, 3) discuss the implications of these data for contributing to an understanding of the direct and indirect processes by which life conditions affect health, and 4) provide observations concerning the policy implications of these findings for the health care system and more broadly, public policies which affect health.

Comparability of Findings

A number of recent Canadian studies have described aspects of the relationship of socioeconomic status and health. However, relatively few of these studies have explicitly described socioeconomic differences in health across the age course. This section begins with a review of a selection of recent Canadian studies which have examined socioeconomic disparities in mortality and health status, followed by observations on studies which have described the utilization of health care services.

Mortality: In a comprehensive study comparing mortality differences across urban Canadian census tracts ranked by the prevalence of low income households in 1986, Wilkins et al estimate a relative mortality ratio of 1.32 between the 20% of the population living in census tracts with the highest density of low income households relative to the 20% of population with the lowest density (9). In our study, which combined urban and rural populations and measured socioeconomic status at the household rather than the neighbourhood level, the estimated mortality odds ratio was 1.43 (95% CI: 1.10, 1.86) comparing the top and bottom quartiles of household income, and 1.38 (95% CI: 1.06, 1.79) comparing the top and bottom quartiles of education (TABLE A.3). Despite the very different approach to the measurement socioeconomic status in these two studies, the similarity of risk estimates is noteworthy. The independent mortality risk associated with education in this study, combined with the similar magnitude of risk associated with income, suggests that the finding in the Wilkins study was not primarily attributable to illness causing downward socioeconomic migration prior to death (78). Consistent with our findings, the Wilkins study also described the greatest income-related inequalities in mortality among adults occurred over ages 25-64 (these differences were especially marked in males). Approximately 25% of person years of life lost prior to age 75 over these ages were defined as excess relative to the mortality experience of persons in the wealthiest neighbourhood quintile. About 45% of this excess mortality was due to accidents.

Although the Wilkins study documented strong income related differences in mortality among children under the age of one, especially attributable to perinatal causes, the study described in this report observed too few deaths in pediatric cohorts to replicate these analyses.

In a 20 year followup of a sample of Ontario males reporting good or excellent health at enrolment at age 45, risk of death in the lowest income quintile over the followup period was 2.4 times greater than that of the highest income quintile (79). In this cohort, education was not associated with mortality risk (both unadjusted and adjusted for income) over the follow-up period. This study estimated a cumulative mortality risk, compared to the point prevalence risk estimate obtained from the Manitoba study. Wolfson's study of male Canada Pension Plan recipients documented a similar magnitude of elevated mortality risk in the first five years of retirement in relation to lower levels of average labour force earnings in the twenty year period prior to retirement (113). As studies of single age cohorts, however, this research does not provide insight into the comparative mortality risk relative to socioeconomic status over different age groups.

Health Status: One comparison is available from a study which has used data from the 1990 Ontario Health Survey to describe socioeconomic patterns in mean scores on a health utility index developed by researchers at McMaster University, which forms a single composite score based on self-reported status on eight attributes of functional ability (40,80). When classified into five levels of educational attainment, approximating quintiles of the population, health status among those of lower educational attainment was consistently poorer across all adult age groups, with the largest differences in middle-aged adults aged 45-64.

Hayes' examination of the socioeconomic correlates of a set of health status measures in the 1978 Canada Health Survey found that income was consistently the best correlate across a range of measures of health status, although the study did not report age-specific analyses which would allow comparison with this study (81). Finally, although the 1991 General Social Survey devoted a substantial focus on the measurement of health, including the collection of information on the prevalence of 13 chronic health conditions in response to a telephone administered questionnaire, these data have not been published in a tabulated form which describes the prevalence of disorder for specific age groups by the measure of income adequacy reported in the study (82).

<u>The Utilization of Health Care</u>: In describing the use of insured medical services in relation to household income and levels of attained education, this study adds to the small number of Canadian studies which have examined this question (68-77). Some of these studies contrasted the use of health care services before and after the introduction of medicare (73,74). Three subsequent studies conducted in the first decade of public health insurance programs examined the utilization of health care services relative to household income in Ontario (69,70), Saskatchewan (71,72) and a representative national sample (68). More recently, a number of surveys designed to measure aspects of population health have provided opportunities to describe the pattern of health care utilization in relation to socioeconomic status (75-77,83-85).

In aggregate, these studies have found generally consistent patterns in the utilization of health care services in relation to socioeconomic status following the introduction of universal health insurance. Lower income households typically consume a greater volume of hospital services than median and high income households. This pattern is generally attributed to evidence of a higher prevalence of morbidity among low income households (83-86). At the same time, some of this work has not adequately accounted for the age and family structure correlates of household income, which may potentially inflate estimates of income-related differences in utilization. For example, elderly households typically have income below the mean of all households, and are consistently among the highest per capita users of health care.

These studies have also described a significant degree of equity of access to ambulatory medical care under the universal insurance mechanisms in this country. TABLE A.15 summarizes descriptions of the utilization of medical services from three earlier studies and compares these findings to the Manitoba results. There are some contradictory findings in these results. Utilization per capita was found to be strongly positively related to family income in Saskatchewan and less strongly related in Ontario, while negatively related to family income in Montreal. Differences in time period, sampling and adjustments for age and family size distributions within households across these studies are obstacles to comparison. In addition, while all four studies used a measure of household income to stratify households on a socioeconomic gradients, there was wide variation in the approach to categorization of income groups. For example, the Saskatchewan study articulated fine divisions at the high end of the income distribution, while this emphasis was inverted in the Ontario study, which chose to describe smaller partitions at the low end of the income spectrum. None of the three early studies provided a measure of individual or household educational attainment.

Table A.15
Comparison of Studies Describing the Utilization of Medical Services under Universal Insurance

Manitoba 1986 (a)		Q1	Q2	Q3		Q4
	N	11,390	11,064	10,587		10,352
	% of sample	26.2	25.5	24.3		23.8
Education	$ per capita	133.43	140.95	149.44		148.73
	Ratio Relative to Highest Quartile	0.89	0.95	1.00		1.00
Income	$ per capita	153.43	138.89	137.02		143.68
	Ratio Relative to Highest Quartile	1.06	0.96	0.95		1.00
Saskatchewan 1967 (71)		$000 Family Income				
		<2.5	2.5-4.9	5-9.9	10-14.9	15+
	N	6,166	7,497	8,370	2,111	840
	% of sample	24.5	29.9	33.3	8.4	3.3
	$ per capita	60.77	71.70	96.44	103.59	117.99
	Ratio Relative to Highest Income	0.51	0.60	0.81	0.87	1.00
Montreal 1970/71 (74)(b)		$000 Family Income				
		<3	3-4.9	5-8.9	9-14.9	15+
	N	1,590	2,400	6,921	3,889	1,372
	% of sample	8.6	12.9	37.3	21.0	7.4
	Mean Annual Visits per Capita	7.8	6.0	4.7	4.9	4.8
	Ratio Relative to Highest Income	1.60	1.25	0.97	1.02	1.00
Ontario 1974/75 (69)(c)		$000 Family Income				
		<3.9	4-7.9	8-13.9	14-19.9	20+
	N	157	188	629	704	447
	% of sample	7.5	9.0	30.2	33.8	21.4
	$ per capita	77.78	56.58	75.58	81.14	86.06
	Ratio Relative to Highest Income	0.90	0.66	0.87	0.94	1.00

(a) Estimated expenditures on ambulatory medical services stratified by socioeconomic quartile
(b) Income not reported for 2,360 respondents (12.7% of sample), observations excluded from table
(c) Medical services data reported in original study have been age-adjusted across income groups in this presentation

Despite evidence for equity, there remain persistent obstacles in accessing care in some populations. Recent Canadian research has documented income-related differences in the utilization of health care services which in part represent the higher burden of illness in lower income groups (9,81), but also represent instances of differences in access and treatment (87,88). For example, individuals in higher socio-economic strata have consistently higher use of specialist physicians (43,76), and members of lower-income households have been shown to use less preventive health care (89,90).

Methodological Issues

Validity of Treatment Prevalence as a Proxy Measure of Health Status:

This study has not directly validated the measure of treatment prevalence as an indicator of health status. Accordingly, caution must be exercised in drawing inferences beyond the immediate meaning of these data. Clearly, treatment prevalence is a measure based on that portion of the population who present for medical care. On an annual basis, this represents approximately 80% of Manitoba residents. The measure of treatment prevalence can be expected to be a biased indicator of health status under a number of conditions if, for example, care seeking behavior is related to socioeconomic status. But even within the group of persons seeking medical care, the measures may potentially underestimate or alternatively overestimate the true prevalence of disorder.

One important attribute of the medical care records used in this study may be expected to produce imprecision when used as a source of information concerning health status. As noted previously in the methods section, when submitting a claim

Table A.16
Comparison of Estimates of the Prevalence of Musculoskeletal Disorders By Age and Socioeconomic Status

	HALS Canada 1986 (1)		Manitoba 1986 (2)		SSSDW US 1978 (3)		GSS Canada 1991 (4)	
Prevalence of Disorder /1,000 population Age 15-64	47.6		138.7		200.0		210.0	
	Age	/1,000	Age	/1,000	Age	/1,000	Age	/1,000
Prevalence by Age Rate per 1,000	15-24	6	15-29	87	18-44	134	15-24	40
	25-34	17	30-49	146	45-54	285	25-44	110
	35-44	32	50-64	219	55-64	402	45-64	320
	45-54	53						
	55-64	98						
	%	/1,000	%	/1,000	%	/1,000	%	/1,000 *
Prevalence by Socioeconomic Status Rate per 1,000	35	51.0	24.8	155.7	9.8	367	5.2	370
	32	45.6	24.5	138.1	15.0	256	10.8	310
	32	45.6	25.6	141.7	38.4	191	31.5	230
			25.6	130.0	36.8	142	38.0	160
							14.3	120
Ratio Rate in Lowest Socioeconomic Group to Rate in Highest Group		1.13		1.20		2.58		3.08

* Data reported for all ages 15+

1) **Sample:** Health and Activity Limitation Survey (110), a representative national sample of household adults aged 15+. **Measures:** Self-reported presence of disability lasting six months or more attributed by the respondent to a musculoskeletal condition or disease. Socioeconomic status indicated by education: < grade 9, Grades 9-13, post-secondary education
2) **Sample:** Representative provincial sample of non-institutionalized residents (ages 15-64 reported in this table). **Measure:** Two or more physician services in a 365 day period or one or more hospitalizations recording a diagnosis in the range of ICD-9-CM 710-729. Socioeconomic status indicated by education: with educational attainment classified into 4 equal sized groups within age strata.
3) **Sample:** Social Security Survey of Disability and Work (109), a representative national sample of 'working age adults', ages 15-65. **Measure:** Self-reported presence of one or more of 37 conditions listed in a structured interview: musculoskeletal disorders include arthritis or rheumatism, chronic stiffness or deformity of hand, foot leg or arm, chronic stiffness or deformity of the back, or other trouble with back or spine. Socioeconomic status indicated by education: Grades 1-8, 9-11, 12 or greater than grade 12.
4) **Sample:** General Social Survey (97), a representative national sample, aged 15+, interviewed by telephone. **Measure:** Affirmative reponse to the question: "Do you have arthritis, rheumatism or bursitis". Socioeconomic status indicated by an ordinal measure of 'income adequacy'.

for payment, physicians must declare a single diagnosis responsible for the patient encounter. The medical care record does not indicate whether the physician is reporting a presumptive or established diagnosis. One motivation in implementing a requirement that a diagnosis must be present on two or more physician service claims in the observation period was to reduce the number of false positive classifications associated with the listing of presumptive diagnoses, on the assumption that presumptive diagnoses were unlikely to recur over extended periods of medical care.

Prevalence studies based on self-report of chronic disease often report higher rates of disorder and steeper socioeconomic gradients in the prevalence of disorder than studies based on clinical or administrative data measures. There are many obstacles to producing appropriate comparisons across studies in this area, including differences in the conceptual and operational definitions of the health conditions being measured, differences in the approach to measurement of socioeconomic status, and the diverse range of descriptive and analytic methods used. These conceptual and methodological differences can produce a wide range of estimated population rates of disorder. One example of this is provided in TABLE A.16, which reports estimates of the prevalence of musculoskeletal disorder from four contemporary North American studies (18,82,111). Based on approximately similar age groupings, the prevalence of musculoskeletal disorder in the Manitoba study, derived from measures of health care utilization, is in the mid-range of the tabled estimates. The HALS study implements the most restrictive definition, focused on conditions associated with chronic disability (111). In reviewing the prevalence rates reported by socioeconomic strata, it is important to note the substantial differences in strata composition: in the GSS survey, the lowest income group comprises less than 6% of the population, in contrast to the 33% of the sample in the lowest socioeconomic strata in the HALS sample. Decisions concerning the partitioning of socioeconomic status influence the magnitude of the differences in observed rates. In the GSS sample, a difference of 3.08 is reported between the lowest and highest prevalence rates, compared to 1.13 in the HALS study. In addition, most of these studies provide insufficient adjustment for the association of education or income level with age. Older cohorts in a population sample will have lower levels of attained education and especially after retirement ages, will have lower levels of household income. At the same time, age is clearly associated with an increasing prevalence of health deficits.

Some readers will be dissatisfied by the approach to categorizing disorders presented in this study. Within these broad categories there may be specific illness or disease processes which have associations with socioeconomic status which are not visible, given the comprehensive inclusion of many different disease processes within a disorder category. For example, the well known pattern of substantially elevated rates of rheumatoid arthritis among persons with lower levels of education is not visible in the category of musculoskeletal disorders implemented in this study (114). Similarly, a heterogeneous set of disorders and conditions are grouped in the mental illness category. We acknowledge that many meaningful details have been obscured in this analysis. The objective of the analysis presented in this report was to attempt to describe the magnitude of socioeconomic impacts on health states for a complete population.

Attentive readers will also have noted that the age groups formed in these analyses are not equal in size, and that in fact the largest age groups are those in the middle adults years. Sample size, in addition to the effect size or magnitude of the association, determines the statistical significance of a relationship. We would point the interested reader to the detailed data for confirmation that the finding that elevated rates of disorder in treatment in relation to lower socioeconomic status are concentrated among adults under the age of 65 is not simply due to the larger samples available for these age strata.

Socioeconomic Status: The approach to classification of socioeconomic status in this study has both strengths and limitations. The measurement of household income and individual attained education derived from the 1986 census is comprehensive and provides the opportunity to develop detailed partitions of income and education across age cohorts. The results of this study emphasize that aspects of the Manitoba population's health status and use of health care services are related both to income and to educational attainment.

Although there are clear conceptual reasons for doing so, we did not adopt approaches to adjusting household income for household size. For the purposes of analytic clarity, we formed quartiles of income and education which facilitated comparisons of equal sized groups. The principal reason for the choice of quartiles over a more detailed classification rested with the difficulty in forming more than four meaningful education categories in most age groups.

It is important to recognize three consequences of this approach. First, groups are ranked on a relative rather than an absolute scale. Approaches to defining absolute material deprivation, for example the low-income thresholds produced by Statistics Canada (112) were not used in this study. Second, the classification of the sample into only four ordinal categories within each socioeconomic measure can be expected to obscure important differences within groups, especially in the lowest and highest quartiles. Accordingly, the observed socioeconomic differences in this study should be interpreted as conservative estimates. Finally, our decision to form quartiles on an age-specific basis prevents the comparison of the association of a given level of income or education with health status at different points in the life course.

Health Care Utilization: One strength of this study is the very high quality longitudinal information on individual encounters with the insured health care system. With some exceptions (69-70,72,85), the majority of Canadian studies which have looked at the use of medical and hospital care in relation to household income have used self-reported measures of utilization derived from respondent recall. While there is very little information on the reliability and validity of this method of measuring use of medical care, available studies report a substantial degree of measurement error when self-reported utilization is compared to information contained in medical records, with the greatest magnitude of error occurring among high users (116-117). Boulet and Henderson, in finding that the total volume of care estimated from respondent recall in a representative national sample represented only 71% of actual medical expenditures and 75% of actual hospital expenditures, attributed this underestimation to measurement error (68). Another example is provided by recent work based on the Ontario Health Survey, which found self-report of emergency department utilization appeared to undercount actual utilization by approximately 40 percent (125). Specific to the objectives of this study, no evidence is available on the reliability of recall by household socioeconomic status.

The measures of health care utilization available to the Manitoba study do not include uninsured therapies, the most substantial components being pharmaceuticals and home care services. In addition, there is significant use of alternate therapies which are also not measured using the sources of secondary data available to this study (115).

Gender: While this study has described aspects of the reproductive health of women in relation to education and income, we acknowledge that this study is deficient in not undertaking a comprehensive assessment of socioeconomic differences in health and health care utilization in relation to gender. Analyses comparing and contrasting gender differences will be a priority in subsequent work.

Understanding the Determinants of Health

The results of this study emphasize that many aspects of the Manitoba population's health status and use of health care services are related independently to both income and to educational attainment. This study did not directly examine specific hypotheses concerning the pathways by which educational status or access to material resources influence or affect health. However, in describing the cross-sectional relationships among health states and two measures of social hierarchy, the study has reported results which emphasize the importance of recognizing educational status and income as having separate, if often parallel, influences on health. For example, the finding that the per capita use of ambulatory medical services increases with education level across all income groups reinforces perspectives which suggest that the effect of education on behaviors related to health is distinct from the role of income in determining what choices are possible.

What implications are to be drawn from the consistent inverse association of education with the proxy measures of health states used in this study? A number of different mechanisms have been proposed to account for the positive health effects associated with education. Higher levels of attained education may lead to a wider range of occupational opportunities, which in turn may confer economic advantage. An alternative perspective proposes that education may protect against disease by influencing values, life-style behaviors and problem-solving skills (23,31). These attributes may promote timely and frequent use of preventive health services and the association with peer groups which reinforce positive health behaviors (97).

Disparities in health states were observed in this study for both acute disorders such as respiratory and gastrointestinal infections or injury and chronic disorders such as diabetes or cardiovascular and cerebrovascular disorders. The consistency of these patterns across diverse disease processes has been found in many studies and has focused attention on processes which plausibly can be understood to initiate or mediate such a diversity of biological disorders. Three broad domains are generally emphasized in the literature which has examined this feature of the social epidemiology of disease: 1) poor health resulting from individual or community-level deficits in material resources, skills and knowledge, 2) poor access or delayed resort to medical care, and 3) the indirect effects of position in the social hierarchy on individual biological response to infection, demands and challenges (118-119).

Limited access to medical care may plausibly account for only a portion of the social gradient in disease. While medical therapy is effective in the secondary prevention of some conditions which display strong socioeconomic gradients, such as the pharmaceutical control of hypertension in cardiovascular disease, medicine has very limited potential in preventing the onset of disorders such as non-insulin dependent diabetes or arthritis, which show a consistent pattern of increasing prevalence with decreasing socioeconomic status and which account for a substantial portion of the population burden of disability and health status deficit. Further evidence can be drawn from the social policy experiment conducted in those developed countries which have introduced universal health insurance. In these settings, there has been a limited impact on the reduction of social and economic inequalities in mortality and health status over time (9,14,95).

Efforts to understand the processes which produce gradients in health across the social hierarchy should not overlook the direct effect of poverty on health. In reviewing a number of large studies in the United States, Krieger has noted a pattern in these data suggesting that among persons below the poverty line, education seems to have little relation to health, or, as she states 'poverty is fundamental' (94). Conversely, among the large majority of persons with incomes above the poverty line, the level of education discriminates health states. While not consistent, this pattern of an absence of a relationship of education level to treatment prevalence among persons in the lowest income quartile could be seen in a number of disorder categories in the Manitoba study. We note, as discussed earlier, that the approach to the classification of household by income level did not use a poverty definition.

This study has focused on describing age-related patterns in mortality and the treatment prevalence of broad categories of disorder in relation to socioeconomic status. In finding that socioeconomic differences were most pronounced in early- and late-midlife, this study replicates results from a number of other investigations (18,121). Assuming the observed differences are true, two general questions are presented. First, to what extent are these differences due to selection effects, the process by which an individual's health influences their social mobility and their position in the social hierarchy. If these patterns can be attributed to processes other than social selection, the important question becomes whether these differences are the consequence of the latent effects of childhood experiences or are more immediately determined by an individual's adult life experiences (98-102).

While there is little disagreement that one consequence of illness may be involuntary withdrawal from the labour force and a loss of individual income earning potential, a long debate has engaged the question of relative importance of downward social mobility caused by ill health in understanding socioeconomic gradients in health. While social selection can be expected to be of little consequence in explaining socioeconomic health gradients among children or the elderly, both of whom are not in the labour force, it is a potentially plausible factor in explaining health differences across socioeconomic groups of working age (122-123). While the database on which this study is based contains information relevant to the examination of this question, including cross-sectional labour force participation status, we have not directly investigated evidence for social selection effects in this study. However, we can draw some indirect inferences from the analyses described in this report. Under the hypothesis that selection effects act during the adult life course, such that unhealthy individuals will withdraw from the labour force at a higher rate that healthy individuals, treatment prevalence should show strong differentials by income, but not in relation to education. This pattern, however, is only clearly evident for mental health disorders and for chronic obstructive pulmonary disease, suggesting as minor role for direct social selection in explaining these patterns.

If selection effects account for a minor portion of socioeconomic health disparities, it is then appropriate to consider the whether these differences have their origins principally in childhood or are primarily attributable to exposures and circumstances occurring in adult life. Studies of longitudinal British cohorts suggest that later experiences are more important that fetal or childhood experiences in determining health in early adulthood (98-99). This observations have not been reconciled with conflicting findings from other research in the United Kingdom which has found important relationships between markers of fetal and newborn health and mortality differentials at the end of the life course (101-102).

Policy Implications

Of what value are descriptions of mortality and health service utilization tabulated in relation to socioeconomic status? First, they give a quantified measure of the importance of these attributes, complementing the impressions and anecdotes frequently reported from clinical settings. Second, these data make observations and inferences drawn from health service utilization more realistic, by embedding health service use in social environments and improving the accuracy with which the social determinants and correlates of health are described. Finally, by making visible what is frequently invisible in routinely tabulated health data (94), these data can contribute to policy and program decisions about appropriate and effective responses.

One additional point deserves mention. This report has emphasized an approach to the analysis of health and socioeconomic status which intentionally emphasizes patterns in the entire population, rather than a contrast between those in poverty and the large majority of households whose income levels are above poverty thresholds. We have done this for a number of reasons. First, the definition of poverty is an arbitrary and elusive concept. For a significant number of people, poverty is a transient state. For an important group or households, however, poverty is a persistent state. Most approaches to defining poverty must rely on cross-sectional information on household income which doesn't permit this important distinction to be drawn. But more important, we have chosen to describe the health of the population in a way which makes visible the persistent gradient in health which is visible at every level of socioeconomic status. Those with the highest levels of education will generally have better states of health than those with median education levels. The importance of wide public recognition of this phenomena cannot be overemphasized. Promoting the recognition that these processes affect everyone has the potential to build a social commitment to a collective response.

Are socioeconomic differences in health amenable to intervention, and if so, what are the most effective strategies? Wilkins' study of changes in income-related mortality in urban Canada between 1971 and 1986 documented a gain of 3.2 years of life expectancy among men and 2.0 years for women over this fifteen year period. However, over this same period the relative mortality ratio comparing the lowest to the highest quintile of income did not change. This pattern of persisting socioeconomic inequalities in mortality against overall declines in population mortality have been observed in many settings (13,95). This does not imply that social and economic inequalities in health are immutable. Wilkins has also observed that regional disparities in mortality in Canada have declined from a maximum of 5 years in 1941 to approximately 1.5 years in 1986 (9). Over this interval there has been strong and diffused economic growth in the Canadian economy. There has also been a national investment in equalizing educational opportunities and, less successfully, the economic strength of regions of the country.

To varying degrees, the biological or behavioral risk factors which account for the disparities described in this report are amenable to intervention. Unfortunately cohort studies which might inform health policy decisions concerning priorities are rare in Canada. A mortality follow-up study of respondents to the 1970 Nutrition Canada survey estimated population attributable risks of mortality for three risk factors in males to be 39% for smoking, 8% for hypertension and 5.7% for diabetes over a ten year followup period among those aged 35-74 at the time of the survey. This study did not describe the distribution of these characteristics and mortality patterns by measures of socioeconomic status. More recent information on nutritional practices and cardiovascular risk factors are available from the national series of provincial Heart health Surveys conducted in 1988-1990, and show clear socioeconomic gradients in behavioral and physiological cardiovascular risk factors, most of which are theoretically amenable to intervention. What is lacking are comprehensive risk factor control strategies which give prominence to the reduction of socioeconomic disparities.

The results presented in this study reinforce the paradoxical experience of the public policy experiment with universal health insurance that has been observed in many countries (86,95), where the significant achievement of these programs in equalizing access to medical care across socioeconomic groups has not led to an appreciable moderation in disparities in health status which were often part of the rationale for introducing these programs. There are a number of public policy responses indicated by these data.

1. Consider directing an even greater share of health care services to lower socioeconomic groups.

It may be the case that health care services are not being used by persons in lower socioeconomic quartiles in proportion to need. For policy emphasis of this kind to be effective in reducing socioeconomic disparities, specific medical interventions must be assumed to be efficacious and adequate measures of need must be available.

2. More aggressively target preventive medical and health services, especially in early adulthood.

This approach would require inverting the emphasis of current health promotion activities, which are passive, are biased to middle and upper class social cultures and frequently require access to individual or household economic resources. There are limited experiences in Canada with successful models for organizing and delivering preventive services in non-medical frameworks. Population-based health promotion units, such as exist in Ontario and Quebec may be effective, although the verdict is not in yet on the impact of these organizational reforms in these jurisdictions.

3. Formulate explicit public policies addressing health inequalities.

Health policies which articulate the reduction in inequalities as a principal goal and which are combined with explicit target objectives (103-107) offer one important mechanism for addressing this issue. This approach requires investments in research to determine what works, and the orientation of incentives across the system to see that it happens.

There are substantial pressures on the fiscal structure of publicly funded health services which demand attention. At the same time it remains important not to confuse the task of developing health targets with the task of reforming health services. These are two distinct public policy agendas which also share considerable common ground. The concerns of health services relate to the treatment of disease, while objectives for the health of the population may also include the prevention of illness and the promotion or protection of health.

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Appendix Table A1.1
Treatment Prevalence, Cardiovascular and Cerebrovascular Disorders By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	1.0	1.7	1.8	1.6	1.5	0.981	0.788
05-14	3.5	1.8	1.6	0.7	1.9	0.335	0.080
15-29	17.6	18.5	17.9	15.2	17.3	0.800	0.489
30-49	86.0	65.7	64.7	91.5	76.8	0.000	0.458
50-64	286.2	284.5	259.8	241.4	267.2	0.012	0.002
65-74	452.2	459.7	410.3	423.9	437.0	0.123	0.074
75-+	567.2	557.1	541.6	536.1	551.2	0.719	0.253
Total	135.9	129.0	118.7	121.7	126.3	0.001	0.000

Education Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	2.9	2.1	0.0	1.5	1.5	0.412	0.382
05-14	2.3	1.8	2.0	1.6	1.9	0.973	0.706
15-29	18.3	15.4	22.8	13.7	17.3	0.078	0.507
30-49	93.9	83.8	69.5	63.5	76.8	0.000	0.000
50-64	276.6	295.5	254.4	240.5	267.2	0.004	0.004
65-74	445.2	451.7	455.9	399.4	437.0	0.053	0.058
75-+	552.1	553.1	596.6	495.6	551.2	0.019	0.279
Total	135.5	138.6	127.4	104.9	126.3	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A1.2
Treatment Prevalence, Cardiovascular and Cerebrovascular Disorders By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	136.4	153.7	140.8	102.4	135.9
Q2	126.3	135.8	128.0	124.5	129.0
Q3	125.9	137.5	106.8	107.0	118.7
Q4	167.9	126.1	137.8	95.2	121.7
Total	135.6	138.6	127.4	104.9	126.3

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.06	NS	(0.97, 1.15)	1.32	<.001	(1.21, 1.43)
Q2	1.00	NS	(0.92, 1.09)	1.36	<.001	(1.26, 1.48)
Q3	0.93	NS	(0.86, 1.01)	1.24	<.001	(1.14, 1.35)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.03	NS	(1.00, 1.05)	1.09	<.001	(1.06, 1.12)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	1.33	NS	(0.83, 2.12)	1.08	NS	(0.68, 1.71)
15-29	1.04	NS	(0.91, 1.19)	1.04	NS	(0.91, 1.18)
30-49	0.94	NS	(0.88, 0.99)	1.18	<.001	(1.10, 1.25)
50-64	1.07	<.01	(1.02, 1.13)	1.06	<.05	(1.01, 1.12)
65+	1.04	NS	(0.99, 1.09)	1.06	<.01	(1.01, 1.11)
Overall	1.03	NS	(1.00, 1.05)	1.09	<.001	(1.06, 1.12)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A2.1
Treatment Prevalence, Diabetes
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
00-04	.	.	.	.	.	.	.
05-14	0.6	0.0	2.2	1.3	1.0	0.137	0.218
15-29	5.5	5.4	2.6	2.7	4.0	0.167	0.048
30-49	23.2	16.1	9.4	10.4	14.7	0.000	0.000
50-64	64.5	45.7	46.2	39.4	48.6	0.012	0.003
65-74	96.5	81.8	54.8	74.2	77.1	0.010	0.019
75-+	78.8	90.5	59.7	101.9	82.5	0.074	0.513
Total	28.9	23.5	17.4	19.9	22.4	0.000	0.000

Education Quartile

	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
00-04	.	.	.	.	.	.	.
05-14	0.0	2.0	0.5	1.5	1.0	0.157	0.410
15-29	5.1	4.8	2.2	3.8	4.0	0.325	0.254
30-49	22.6	14.9	9.5	12.8	14.7	0.000	0.000
50-64	55.7	51.6	49.0	36.9	48.6	0.099	0.022
65-74	73.3	87.8	75.1	71.4	77.1	0.560	0.587
75-+	95.0	73.1	74.8	88.3	82.5	0.467	0.659
Total	26.4	24.4	20.1	18.9	22.4	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A2.2
Treatment Prevalence, Diabetes By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	28.5	28.4	30.2	28.5	28.9
Q2	29.9	22.4	17.7	23.3	23.5
Q3	15.4	24.3	13.5	16.1	17.4
Q4	29.8	22.7	21.0	14.8	19.9
Total	26.4	24.4	20.1	18.9	22.4

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.37	<.001	(1.14, 1.64)	1.29	<.01	(1.07, 1.55)
Q2	1.12	NS	(0.93, 1.35)	1.25	<.05	(1.04, 1.51)
Q3	0.85	NS	(0.69, 1.03)	1.04	NS	(0.86, 1.26)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.14	<.001	(1.07, 1.21)	1.10	<.01	(1.03, 1.16)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	0.67	NS	(0.30, 1.46)	0.86	NS	(0.40, 2.47)
15-29	1.29	NS	(0.97, 1.72)	1.11	NS	(0.84, 1.47)
30-49	1.32	<.001	(1.14, 1.52)	1.19	<.01	(1.04, 1.37)
50-64	1.15	<.01	(1.03, 1.28)	1.10	NS	(0.98, 1.22)
65+	1.06	NS	(0.97, 1.16)	1.02	NS	(0.93, 1.12)
Overall	1.14	<.001	(1.07, 1.21)	1.10	<.01	(1.03, 1.16)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.

(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A3.1
Treatment Prevalence, Mental Illness
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	4.9	17.5	0.3	5.8	7.1	0.001	0.313
05-14	23.0	12.7	14.8	14.6	16.2	0.109	0.099
15-29	73.9	45.7	52.8	36.2	51.9	0.000	0.000
30-49	115.7	81.8	77.3	84.0	89.4	0.000	0.000
50-64	132.9	83.0	82.8	75.3	92.7	0.000	0.000
65-74	134.2	95.8	84.0	81.2	99.2	0.001	0.000
75-+	160.6	129.0	133.4	94.8	130.6	0.014	0.003
Total	91.0	62.6	61.3	56.1	67.6	0.000	0.000

Education Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	8.4	4.5	10.7	4.9	7.1	0.470	0.785
05-14	16.6	11.5	16.0	20.9	16.2	0.200	0.206
15-29	68.9	41.9	54.2	45.0	51.9	0.000	0.003
30-49	99.8	92.9	82.3	84.7	89.4	0.069	0.017
50-64	97.4	92.2	94.2	86.2	92.7	0.768	0.369
65-74	108.1	115.7	106.3	69.9	99.2	0.003	0.004
75-+	155.4	136.7	149.8	67.6	130.6	0.000	0.000
Total	78.1	66.3	68.2	58.5	67.6	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A3.2
Treatment Prevalence, Mental Illness By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	96.2	91.2	95.0	74.2	91.0
Q2	62.9	66.0	64.8	54.5	62.6
Q3	68.3	55.3	61.6	61.7	61.3
Q4	77.3	51.9	55.1	52.1	56.1
Total	78.2	66.3	68.2	58.5	67.6

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.61	<.001	(1.44, 1.79)	1.22	<.001	(1.09, 1.37)
Q2	1.08	NS	(0.96, 1.22)	1.08	NS	(0.97, 1.21)
Q3	1.07	NS	(0.96, 1.20)	1.13	<.05	(1.01, 1.18)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.17	<.001	(1.13, 1.21)	1.05	<.01	(1.02, 1.09)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	1.22	<.05	(1.03, 1.45)	0.86	NS	(0.73, 1.03)
15-29	1.22	<.001	(1.13, 1.33)	1.08	<.05	(1.00, 1.17)
30-49	1.12	<.001	(1.05, 1.18)	1.04	NS	(0.98, 1.10)
50-64	1.23	<.001	(1.13, 1.33)	0.99	NS	(0.91, 1.07)
65+	1.17	<.001	(1.08, 1.26)	1.17	<.001	(1.08, 1.26)
Overall	1.17	<.001	(1.13, 1.21)	1.05	<.01	(1.02, 1.09)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A4.1
Treatment Prevalence, Cancer
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	0.7	4.0	4.9	0.0	2.4	0.098	0.912
05-14	4.4	5.6	4.6	5.0	4.9	0.966	0.951
15-29	13.9	6.2	12.4	8.2	10.1	0.018	0.224
30-49	21.4	27.0	24.7	33.4	26.7	0.035	0.011
50-64	49.2	57.1	40.7	47.7	48.5	0.210	0.393
65-74	92.2	79.5	102.2	78.9	88.3	0.263	0.707
75-+	97.3	118.6	129.9	97.8	111.0	0.238	0.770
Total	29.6	30.6	31.0	29.5	30.2	0.887	0.996

Education Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	2.7	0.3	5.0	1.6	2.4	0.302	0.868
05-14	1.6	4.0	4.1	9.7	4.9	0.009	0.002
15-29	8.1	7.8	13.6	11.4	10.1	0.127	0.078
30-49	27.4	28.4	23.8	27.5	26.7	0.691	0.758
50-64	45.2	51.1	47.0	51.2	48.5	0.828	0.596
65-74	66.5	98.1	105.2	81.4	88.3	0.025	0.337
75-+	113.7	110.6	106.7	112.8	111.0	0.984	0.890
Total	27.9	31.7	31.0	30.0	30.2	0.382	0.469

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A4.2
Treatment Prevalence, Cancer
By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	28.3	31.9	29.0	29.8	29.6
Q2	27.4	27.7	34.5	34.4	30.6
Q3	26.6	33.1	29.6	33.6	31.0
Q4	29.9	35.1	30.9	25.7	29.5
Total	27.9	31.7	31.0	30.0	30.2

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.02	NS	(0.87, 1.20)	0.92	NS	(0.78, 1.08)
Q2	1.05	NS	(0.89, 1.23)	1.05	NS	(0.90, 1.23)
Q3	1.05	NS	(0.90, 1.23)	1.03	NS	(0.88, 1.20)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.00	NS	(0.95, 1.06)	0.98	NS	(0.93, 1.03)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	1.17	NS	(0.87, 1.56)	0.60	<.01	(0.43, 0.83)
15-29	1.15	NS	(0.96, 1.37)	0.83	<.05	(0.70, 0.99)
30-49	0.87	<.01	(0.78, 0.96)	1.05	NS	(0.95, 1.16)
50-64	1.05	NS	(0.95, 1.17)	0.96	NS	(0.86, 1.07)
65+	1.01	NS	(0.93, 1.09)	0.98	NS	(0.90, 1.06)
Overall	1.00	NS	(0.95, 1.06)	0.98	NS	(0.93, 1.03)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A5.1
Treatment Prevalence, Respiratory/Gastrointestinal Infections By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	556.1	465.0	542.6	547.4	527.7	0.002	0.558
05-14	281.5	288.5	274.3	273.3	279.4	0.745	0.432
15-29	193.3	184.8	176.8	169.3	180.9	0.131	0.018
30-49	190.9	162.7	171.0	142.4	166.6	0.000	0.000
50-64	138.5	140.7	128.9	111.9	129.6	0.064	0.016
65-74	141.9	124.4	104.7	102.0	118.6	0.036	0.005
75-+	127.4	146.0	152.7	154.5	144.7	0.551	0.187
Total	213.5	198.6	199.0	186.2	199.2	0.000	0.000

Education Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	517.4	516.0	556.0	518.3	527.7	0.365	0.647
05-14	256.2	302.7	289.9	267.4	279.4	0.013	0.712
15-29	162.6	189.0	192.5	179.8	180.9	0.029	0.136
30-49	165.1	161.5	170.7	167.8	166.6	0.813	0.576
50-64	156.2	132.1	111.6	119.7	129.6	0.001	0.001
65-74	136.0	121.2	98.0	120.5	118.6	0.121	0.201
75-+	151.4	146.5	130.5	149.5	144.7	0.760	0.699
Total	193.7	203.7	202.4	197.0	199.2	0.225	0.644

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A5.2
Treatment Prevalence, Respiratory/Gastrointestinal Infections By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	210.0	210.0	222.8	213.5	213.5
Q2	184.3	207.9	210.2	190.9	198.6
Q3	192.3	208.3	197.0	196.6	199.0
Q4	172.4	184.8	182.0	193.7	186.2
Total	193.7	203.7	202.4	197.0	199.2

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.20	<.001	(1.12, 1.29)	0.94	NS	(0.87, 0.99)
Q2	1.09	<.01	(1.02, 1.17)	1.02	NS	(0.95, 1.09)
Q3	1.09	<.01	(1.02, 1.16)	1.01	NS	(0.95, 1.08)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.06	<.001	(1.03, 1.08)	0.98	NS	(0.96, 0.99)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	1.02	NS	(0.97, 1.06)	0.97	NS	(0.93, 1.01)
15-29	1.07	<.01	(1.02, 1.12)	0.96	<.05	(0.91, 1.00)
30-49	1.11	<.001	(1.06, 1.16)	0.96	NS	(0.92, 1.01)
50-64	1.06	NS	(0.99, 1.13)	1.11	<.01	(1.04, 1.19)
65+	1.04	NS	(0.96, 1.11)	1.04	NS	(0.97, 1.12)
Overall	1.06	<.001	(1.03, 1.08)	0.98	NS	(0.96, 0.99)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A6.1
Treatment Prevalence, Musculoskeletal Diseases
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	2.0	11.4	7.1	9.7	7.5	0.145	0.214
05-14	30.2	30.2	34.2	52.0	36.7	0.003	0.001
15-29	85.7	87.6	88.9	86.9	87.3	0.982	0.853
30-49	155.7	147.6	145.4	137.9	146.6	0.292	0.058
50-64	249.0	217.1	208.1	206.3	219.5	0.018	0.004
65-74	250.2	239.6	211.1	253.4	238.5	0.149	0.736
75-+	256.6	280.8	233.2	243.5	254.3	0.295	0.301
Total	136.4	131.3	125.0	128.5	130.2	0.086	0.039

Education Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	4.2	9.1	7.7	8.5	7.5	0.719	0.469
05-14	28.9	34.6	37.3	45.3	36.7	0.095	0.013
15-29	84.5	89.3	93.1	83.1	87.3	0.574	0.910
30-49	181.2	142.8	147.4	118.6	146.6	0.000	0.000
50-64	229.2	206.9	232.1	206.8	219.5	0.160	0.439
65-74	257.2	234.5	242.7	223.7	238.5	0.428	0.162
75-+	243.6	273.4	247.9	249.0	254.3	0.630	0.938
Total	141.3	129.1	134.9	116.6	130.2	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A6.2
Treatment Prevalence, Musculoskeletal Diseases By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	138.2	145.1	143.1	110.6	136.4
Q2	145.4	125.1	132.0	118.4	131.3
Q3	132.2	123.9	131.3	114.2	125.0
Q4	154.3	122.3	134.6	119.7	128.5
Total	141.3	129.1	134.9	116.6	130.2

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.02	NS	(0.94, 1.10)	1.24	<.001	(1.14, 1.34)
Q2	0.98	NS	(0.91, 1.07)	1.12	<.01	(1.03, 1.22)
Q3	0.94	NS	(0.87, 1.02)	1.18	<.001	(1.09, 1.28)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.01	NS	(0.98, 1.04)	1.06	<.001	(1.03, 1.09)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	0.84	<.01	(0.74, 0.94)	0.93	NS	(0.82, 1.22)
15-29	0.99	NS	(0.93, 1.06)	1.01	NS	(0.94, 1.07)
30-49	1.01	NS	(0.96, 1.06)	1.16	<.001	(1.10, 1.21)
50-64	1.08	<.01	(1.02, 1.14)	1.00	NS	(0.95, 1.06)
65+	1.02	NS	(0.96, 1.08)	1.03	NS	(0.97, 1.09)
Overall	1.01	NS	(0.98, 1.04)	1.06	<.001	(1.03, 1.09)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A7.1
Treatment Prevalence, Injury and Poisoning
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
00-04	173.2	181.8	138.1	167.5	165.0	0.143	0.335
05-14	207.7	193.1	190.2	189.4	195.0	0.524	0.190
15-29	223.7	206.7	218.8	213.9	215.7	0.497	0.640
30-49	184.1	143.8	137.9	126.2	147.7	0.000	0.000
50-64	148.5	146.9	125.5	125.3	136.1	0.089	0.020
65-74	142.6	136.4	129.6	121.4	132.8	0.602	0.175
75-+	166.5	164.7	163.6	136.9	158.5	0.501	0.213
Total	187.1	169.4	163.8	159.7	169.9	0.000	0.000

Education Quartile

	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
00-04	158.7	178.8	162.5	159.8	165.0	0.740	0.791
05-14	191.2	211.0	203.4	174.1	195.0	0.041	0.171
15-29	238.4	240.9	197.3	186.3	215.7	0.000	0.000
30-49	168.8	151.2	153.9	120.3	147.7	0.000	0.000
50-64	150.9	128.4	134.6	130.2	136.1	0.265	0.161
65-74	140.2	143.0	127.7	121.4	132.8	0.483	0.155
75-+	146.6	142.6	169.9	183.4	158.5	0.223	0.057
Total	182.3	180.6	167.0	151.2	169.9	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A7.2
Treatment Prevalence, Injury and Poisoning By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	201.1	192.4	186.2	151.0	187.1
Q2	184.9	171.5	161.8	154.1	169.4
Q3	161.8	174.5	164.1	154.2	163.8
Q4	156.9	186.7	158.3	148.0	159.7
Total	182.3	180.6	167.0	151.2	169.9

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.15	<.001	(1.07, 1.24)	1.21	<.001	(1.12, 1.30)
Q2	1.03	NS	(0.96, 1.11)	1.22	<.001	(1.13, 1.31)
Q3	1.00	NS	(0.93, 1.08)	1.11	<.01	(1.03, 1.19)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.04	<.001	(1.02, 1.07)	1.06	<.001	(1.04, 1.09)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	1.03	NS	(0.98, 1.08)	1.02	NS	(0.97, 1.08)
15-29	0.98	NS	(0.94, 1.03)	1.13	<.001	(1.08, 1.18)
30-49	1.13	<.001	(1.08, 1.18)	1.09	<.001	(1.04, 1.14)
50-64	1.07	<.05	(1.01, 1.15)	1.03	NS	(0.96, 1.10)
65+	1.06	NS	(0.99, 1.14)	0.99	NS	(0.92, 1.06)
Overall	1.04	<.001	(1.02, 1.07)	1.06	<.001	(1.04, 1.09)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A8.1
Treatment Prevalence, Disorders of Eye and Ear
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	431.9	431.4	455.8	507.0	456.2	0.019	0.004
05-14	262.9	263.4	301.3	323.2	287.8	0.000	0.000
15-29	185.7	160.6	170.5	185.0	175.5	0.048	0.783
30-49	182.7	163.4	164.1	175.3	171.2	0.144	0.504
50-64	209.8	198.0	223.3	239.9	218.3	0.031	0.013
65-74	263.0	292.1	272.2	291.2	279.5	0.442	0.349
75-+	316.7	333.2	367.8	387.4	349.7	0.061	0.007
Total	229.0	218.7	231.5	248.3	231.9	0.000	0.000

Education Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	394.4	462.4	495.0	461.8	456.2	0.004	0.011
05-14	215.8	284.1	320.9	324.8	287.8	0.000	0.000
15-29	155.6	164.6	178.1	201.2	175.5	0.000	0.000
30-49	160.6	171.6	174.8	176.6	171.2	0.347	0.094
50-64	185.7	210.6	247.5	226.8	218.3	0.000	0.000
65-74	242.2	265.2	303.7	301.9	279.5	0.011	0.002
75-+	301.5	357.6	363.1	386.6	349.7	0.024	0.005
Total	198.5	229.9	249.1	247.6	231.9	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A8.2
Treatment Prevalence, Disorders of Eye and Ear By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	215.7	229.7	241.8	238.7	229.0
Q2	174.8	230.8	243.8	232.0	218.7
Q3	191.9	233.9	245.3	243.4	231.5
Q4	213.4	223.5	265.5	261.2	248.3
Total	198.5	229.9	249.1	247.6	231.9

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	0.95	NS	(0.90, 1.02)	0.76	<.001	(0.72, 0.82)
Q2	0.88	<.01	(0.83, 0.94)	0.92	<.01	(0.86, 0.98)
Q3	0.93	<.05	(0.87, 0.99)	1.02	NS	(0.96, 1.09)
Q4	1.00	-	- -	1.00	-	- -
Trend	0.98	NS	(0.96, 1.00)	0.92	<.001	(0.89, 0.93)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	0.95	<.01	(0.91, 0.99)	0.88	<.001	(0.84, 0.91)
15-29	1.01	NS	(0.97, 1.07)	0.90	<.001	(0.86, 0.94)
30-49	1.02	NS	(0.98, 1.07)	0.96	NS	(0.92, 1.00)
50-64	0.95	NS	(0.90, 0.99)	0.92	<.01	(0.86, 0.97)
65+	0.96	NS	(0.91, 0.99)	0.92	<.01	(0.94, 0.96)
Overall	0.98	NS	(0.96, 1.00)	0.92	<.001	(0.89, 0.93)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A9.1
Treatment Prevalence, Chronic Obstructive Pulmonary Disease
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
00-04	38.3	24.2	19.7	30.4	28.1	0.188	0.315
05-14	30.9	36.8	36.9	34.3	34.8	0.756	0.610
15-29	14.0	17.5	16.7	10.9	14.7	0.174	0.332
30-49	15.8	16.6	16.8	9.7	14.7	0.055	0.070
50-64	46.5	35.6	32.0	25.1	34.5	0.013	0.001
65-74	64.2	101.0	74.4	64.7	76.3	0.014	0.564
75-+	61.1	93.8	75.7	70.6	75.5	0.204	0.798
Total	29.8	33.9	29.6	24.3	29.4	0.000	0.004

Education Quartile

	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
Age							
00-04	33.4	28.6	28.1	23.2	28.1	0.743	0.286
05-14	23.9	37.9	38.3	38.2	34.8	0.049	0.036
15-29	11.5	15.1	15.6	16.4	14.7	0.461	0.157
30-49	20.3	10.6	15.0	12.8	14.7	0.022	0.061
50-64	44.4	37.7	25.2	31.4	34.5	0.020	0.012
65-74	71.6	91.3	79.3	63.2	76.3	0.136	0.278
75-+	74.7	85.9	66.9	71.9	75.5	0.662	0.591
Total	29.9	32.4	28.5	27.0	29.4	0.116	0.079

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A9.2
Treatment Prevalence, Chronic Obstructive Pulmonary Disease By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	27.8	32.9	30.6	28.1	29.8
Q2	32.1	40.3	33.1	28.7	33.9
Q3	32.2	31.9	28.3	26.8	29.6
Q4	27.2	21.8	22.3	25.8	24.3
Total	29.9	32.4	28.5	27.0	29.4

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.22	<.01	(1.03, 1.44)	1.04	NS	(0.88, 1.23)
Q2	1.39	<.001	(1.18, 1.63)	1.15	NS	(0.98, 1.35)
Q3	1.21	<.05	(1.03, 1.43)	1.02	NS	(0.87, 1.20)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.07	<.01	(1.01, 1.12)	1.03	NS	(0.98, 1.08)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	1.03	NS	(0.92, 1.15)	0.93	NS	(0.83, 1.03)
15-29	1.10	NS	(0.95, 1.27)	0.88	NS	(0.76, 1.02)
30-49	1.11	NS	(0.96, 1.27)	1.11	NS	(0.97, 1.27)
50-64	1.19	<.01	(1.05, 1.36)	1.13	NS	(0.99, 1.29)
65+	1.00	NS	(0.91, 1.09)	1.05	NS	(0.96, 1.15)
Overall	1.07	<.01	(1.01, 1.12)	1.03	NS	(0.98, 1.08)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A10.1
Treatment Prevalence, Digestive System Disorders
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	109.7	73.3	69.9	75.0	81.9	0.033	0.023
05-14	22.0	19.2	13.8	16.4	17.8	0.312	0.129
15-29	59.7	51.6	39.4	35.3	46.3	0.000	0.000
30-49	85.1	72.5	70.3	56.6	71.1	0.000	0.000
50-64	130.8	106.1	96.3	95.6	106.6	0.006	0.001
65-74	144.9	147.9	129.3	117.6	135.3	0.219	0.055
75-+	147.5	178.9	183.1	154.8	166.1	0.295	0.661
Total	85.6	75.9	68.2	61.4	72.7	0.000	0.000

Education Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	101.8	77.7	95.6	55.8	81.9	0.008	0.013
05-14	21.9	16.1	18.3	15.1	17.8	0.486	0.222
15-29	53.6	47.1	46.9	38.8	46.3	0.078	0.013
30-49	94.8	63.3	72.0	55.4	71.1	0.000	0.000
50-64	121.7	100.1	100.1	105.6	106.6	0.173	0.163
65-74	154.3	132.0	139.8	119.2	135.3	0.197	0.065
75-+	184.2	160.7	176.9	137.7	166.1	0.196	0.104
Total	87.7	69.8	74.3	60.0	72.7	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A10.2
Treatment Prevalence, Digestive System Disorders By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	97.9	79.9	81.5	73.4	85.6
Q2	78.7	81.1	78.9	60.3	75.9
Q3	87.7	59.2	72.1	59.0	68.2
Q4	79.7	57.1	65.5	55.2	61.4
Total	87.7	69.8	74.3	60.0	72.7

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.33	<.001	(1.19, 1.47)	1.40	<.001	(1.26, 1.56)
Q2	1.18	<.01	(1.06, 1.32)	1.13	<.05	(1.01, 1.26)
Q3	1.08	NS	(0.97, 1.21)	1.21	<.001	(1.09, 1.36)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.10	<.001	(1.06, 1.14)	1.10	<.001	(1.06, 1.13)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	1.12	<.05	(1.01, 1.24)	1.08	NS	(0.97, 1.17)
15-29	1.20	<.001	(1.10, 1.30)	1.07	NS	(0.98, 1.16)
30-49	1.10	<.01	(1.03, 1.18)	1.16	<.001	(1.08, 1.23)
50-64	1.12	<.01	(1.04, 1.21)	1.03	NS	(0.95, 1.11)
65+	1.02	NS	(0.95, 1.09)	1.09	<.01	(1.02, 1.17)
Overall	1.10	<.001	(1.06, 1.14)	1.10	<.001	(1.06, 1.13)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A11.1
Treatment Prevalence, Genitourinary Disorders By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

Income Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	50.6	45.0	43.5	36.7	44.0	0.672	0.228
05-14	34.2	20.5	18.2	19.7	23.0	0.011	0.006
15-29	200.5	170.4	166.4	127.3	165.7	0.000	0.000
30-49	172.6	141.0	146.8	155.9	153.8	0.005	0.149
50-64	143.5	129.7	113.6	132.6	129.6	0.099	0.226
65-74	116.3	133.9	128.7	133.3	128.0	0.657	0.365
75-+	117.8	192.4	151.2	148.6	152.7	0.006	0.416
Total	138.9	124.2	119.4	115.5	124.4	0.000	0.000

Education Quartile

Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	49.6	47.0	47.6	32.9	44.0	0.389	0.161
05-14	31.3	24.9	25.4	10.9	23.0	0.000	0.000
15-29	173.5	171.8	190.7	133.0	165.7	0.000	0.001
30-49	163.9	152.8	155.0	144.6	153.8	0.219	0.054
50-64	117.9	135.3	142.6	119.4	129.6	0.106	0.656
65-74	139.4	127.6	133.1	114.5	128.0	0.449	0.171
75-+	145.8	147.2	173.8	145.4	152.7	0.520	0.648
Total	130.2	126.5	132.2	109.4	124.4	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square Test for equality
P(2) = Chi-Square Test for trend

Appendix Table A11.2
Treatment Prevalence, Genitourinary Disorders
By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	139.5	147.9	145.8	115.0	138.9
Q2	125.2	116.0	137.3	116.8	124.2
Q3	117.1	124.8	124.4	110.3	119.4
Q4	135.7	117.8	123.6	103.1	115.5
Total	130.2	126.5	132.2	109.4	124.4

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.19	<.001	(1.10, 1.29)	1.17	<.001	(1.07, 1.27)
Q2	1.05	NS	(0.96, 1.14)	1.16	<.001	(1.06, 1.26)
Q3	1.01	NS	(0.93, 1.10)	1.22	<.001	(1.13, 1.32)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.06	<.001	(1.03, 1.09)	1.03	<.01	(1.01, 1.07)

Age Specific Tests for Trend
Adjusted Odds Ratios (2)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
0-14	1.11	NS	(0.99, 1.25)	1.18	<.01	(1.05, 1.32)
15-29	1.17	<.001	(1.11, 1.22)	1.05	<.05	(1.00, 1.10)
30-49	1.02	NS	(0.98, 1.07)	1.04	NS	(0.99, 1.09)
50-64	1.05	NS	(0.98, 1.12)	0.97	NS	(0.91, 1.04)
65+	0.95	NS	(0.88, 1.02)	1.05	NS	(0.97, 1.12)
Overall	1.06	<.001	(1.03, 1.09)	1.03	<.01	(1.01, 1.07)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile, simultaneously testing for income and education.
(2) Odds of treatment with a 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from age-specific logistic regressions simultaneously testing for linear income and education trends.

Appendix Table A12.1
Treatment Prevalence, Congenital Anomalies
By Socioeconomic Status and Age

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

	Education Quartile						
Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	27.5	38.2	38.1	45.0	37.6	0.422	0.125

	Income Quartile						
Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	31.2	47.6	31.3	40.6	37.6	0.329	0.720

Appendix Table A13.1
Conditions in the Perinatal Period
By Socioeconomic Status

Weighted Analysis, Rate per 1,000. Imputed Records Excluded

	Education Quartile						
Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	272.6	251.6	308.8	286.0	280.7	0.697	0.531

	Income Quartile						
Age	Q1	Q2	Q3	Q4	TOTAL	P(1)	P(2)
00-04	295.3	238.4	224.9	366.5	280.7	0.017	0.206

Q1 = Lowest
P(1) = Chi-Square test for equality
P(2) = Chi-Square test for trend

Appendix Table A12.2
Treatment Prevalence, Congenital Anomalies
By Socioeconomic Status

Weighted Analysis, Rate per 1,000. Children Aged 0-4

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	27.8	11.6	51.6	35.8	31.2
Q2	34.5	56.7	46.2	50.0	47.6
Q3	27.7	39.9	20.8	36.6	31.3
Q4	0.0	29.1	39.0	51.7	40.6
Total	27.5	38.2	38.1	45.0	37.6

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	0.91	NS	(0.50, 1.88)	0.58	NS	(0.30, 1.11)
Q2	1.34	NS	(0.77, 2.33)	0.79	NS	(0.46, 1.37)
Q3	0.81	NS	(0.45, 1.48)	0.81	NS	(0.47, 1.38)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.02	NS	(0.84, 1.23)	0.86	NS	(0.71, 1.04)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile. Odds ratios estimated from logistic regression simultaneously testing for income and education.

Appendix Table A13.2
Conditions in the Perinatal Period
Children Aged < 1, By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	233.8	157.1	555.4	248.4	295.3
Q2	273.7	190.3	277.2	188.9	238.4
Q3	299.5	280.3	122.0	221.1	224.9
Q4	370.4	430.2	307.0	376.7	366.5
Total	272.6	251.6	308.8	286.0	280.7

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	0.72	NS	(0.44, 1.16)	1.07	NS	(0.64, 1.79)
Q2	0.54	<.01	(0.33, 0.87)	0.94	NS	(0.57, 1.56)
Q3	0.50	<.01	(0.31, 0.81)	1.21	NS	(0.76, 1.94)
Q4	1.00	-	- -	1.00	-	- -
Trend	0.91	NS	(0.79, 1.07)	0.98	NS	(0.84, 1.15)

Q1 = Lowest

(1) Odds of treatment relative to highest quartile. Odds ratios estimated from logistic regression simultaneously testing for income and education.

Appendix Table A14.1
Fertility Rates
By Socioeconomic Status and Maternal Age

Weighted Analysis, Rate of live and still births per 1,000 women

1. Attained Education

	Education Quartile						
	Q1	Q2	Q3	Q4	Total	P(1)	P(2)
Age							
15-29	94.5	104.3	83.6	49.9	82.1	0.000	0.000
30-49	21.0	33.8	31.7	57.4	36.1	0.000	0.000
Total	53.4	67.7	53.3	53.7	57.0	0.054	0.440

2. Household Income

	Income Quartile						
	Q1	Q2	Q3	Q4	Total	P(1)	P(2)
Age							
15-29	88.5	106.5	94.1	36.0	82.1	0.000	0.000
30-49	28.8	36.6	39.0	40.3	36.1	0.293	0.080
Total	56.2	69.0	64.2	38.4	57.0	0.000	0.004

Q1 = Lowest
P(1) = Chi-Square test for equality
P(2) = Chi-Square test for trend

Appendix Table A14.2
Fertility
Women Aged 15-49, By Socioeconomic Status

Weighted Analysis, Rate per 1,000

	Education Quartile				
	Q1	Q2	Q3	Q4	Total
Income Quartile					
Q1	57.8	78.5	37.7	47.9	56.2
Q2	66.9	74.8	65.3	69.3	69.0
Q3	47.1	68.9	68.0	67.6	64.2
Q4	18.8	43.1	40.2	40.5	38.4
Total	53.4	67.7	53.3	53.7	57.0

Test for Trend
Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Age 15-29	1.20	<.001	(1.09, 1.31)	1.19	<.001	(1.09, 1.30)
Age 30-49	0.96	NS	(0.84, 1.08)	0.73	<.001	(0.64, 0.84)
Overall	1.10	<.01	(1.03, 1.19)	1.01	NS	(0.93, 1.08)

Q1 = Lowest

(1) Odds of live or stillbirth with 1 level decrease in quartile, relative to highest quartile. Odds ratios estimated from logistic regression simultaneously testing for linear income and education trends.

Appendix Table A15.1
Pregnancy Complication Rates
By Socioeconomic Status and Maternal Age

Weighted Analysis, Rate of pregnancy complication per 1,000 live and still births

1. Attained Education

	Education Quartile						
	Q1	Q2	Q3	Q4	Total	P(1)	P(2)
Age							
15-29	461.9	288.9	343.7	297.8	347.6	0.030	0.051
30-49	436.6	281.2	173.8	306.2	286.0	0.074	0.329
Total	456.5	286.9	284.4	302.4	326.5	0.004	0.013

2. Household Income

	Income Quartile						
	Q1	Q2	Q3	Q4	Total	P(1)	P(2)
Age							
15-29	370.2	364.5	308.0	343.5	347.6	0.000	0.000
30-49	344.0	236.4	338.8	235.6	286.0	0.000	0.000
Total	363.8	327.6	318.1	280.1	326.5	0.000	0.000

Q1 = Lowest
P(1) = Chi-Square test for equality
P(2) = Chi-Square test for trend

Pregnancy Complication defined as diagnostic codes in the range 640-644, 646-648

Appendix Table A15.2
Pregnancy Complication
By Socioeconomic Status

Weighted Analysis, Rate per 1,000 Women Delivering a Live or Stillborn Infant.

	Education Quartile				
	Q1	Q2	Q3	Q4	TOTAL
Income Quartile					
Q1	458.7	305.4	239.0	419.6	363.8
Q2	389.9	377.0	297.0	205.1	327.6
Q3	531.0	215.0	292.6	350.9	318.1
Q4	699.2	205.1	291.1	258.2	280.1
Total	456.5	286.9	284.4	302.4	326.5

Adjusted Odds Ratios (1)

	Income Quartile			Education Quartile		
	OR	p	95%CI	OR	p	95%CI
Q1	1.23	NS	(0.71, 2.15)	1.85	<.01	(1.13, 3.06)
Q2	1.09	NS	(0.63, 1.87)	0.90	NS	(0.56, 1.44)
Q3	1.14	NS	(0.67, 1.96)	0.91	NS	(0.56, 1.48)
Q4	1.00	-	- -	1.00	-	- -
Trend	1.06	NS	(0.90, 1.18)	1.19	<.05	(1.02, 1.40)

Q1 = Lowest

(1) Odds of complication relative to highest quartile. Odds ratios estimated from logistic regression simultaneously testing for income and education.

Appendix Table B.1
Utilization of Ambulatory Medical Care
By Disorder, Age Group and Income Quartile

		Age 0-29			Age 30-64			Age 65+		
		Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population
Cardiovascular and Cerebrovascular	Q1	1554	33	617	3296	539	11114	4115	2117	42744
	Q2	2468	36	703	3186	489	10056	4075	2097	45022
	Q3	2394	37	842	3306	474	10212	4316	2070	44666
	Q4	2045	28	595	3062	494	11497	4280	2089	46039
	Total	2109	34	689	3210	499	10716	4191	2094	44601
Diabetes	Q1	3329	11	287	3771	142	3578	3733	350	7899
	Q2	3135	10	420	3193	87	1989	3918	349	8601
	Q3	2293	5	141	3428	83	2302	4021	248	5447
	Q4	3890	9	236	4309	95	2234	3817	333	8121
	Total	3179	9	271	3664	101	2517	3858	320	7530
Mental Illness	Q1	3508	197	7689	5345	707	24107	2498	413	8571
	Q2	1837	92	2532	3959	378	13569	2793	359	7537
	Q3	2702	119	4624	3413	314	10224	2191	267	7178
	Q4	4015	130	6263	4081	389	17228	3595	351	9866
	Total	3028	134	5277	4318	444	16202	2709	348	8277
Cancer	Q1	1213	17	734	1417	66	2794	2019	207	8820
	Q2	1092	16	758	2293	108	4109	3270	331	12112
	Q3	1095	20	657	2501	102	4086	2878	364	13527
	Q4	972	19	681	1972	108	4515	2582	257	10636
	Total	1100	18	707	2054	96	3886	2700	290	11264
Respiratory/ Gastrointestinal Infections	Q1	2398	786	13846	1887	456	8518	1523	310	5822
	Q2	2140	682	12232	1787	390	7415	1424	290	5485
	Q3	2157	695	12499	1647	375	7198	1528	291	5361
	Q4	2115	666	11941	1807	350	7204	1823	328	6876
	Total	2205	707	12624	1782	392	7575	1570	305	5878

Appendix Table B.1 cont'd
Utilization of Ambulatory Medical Care
By Disorder, Age Group and Income Quartile

		Age 0-29 Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Age 30-64 Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Age 65+ Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population
Musculoskeletal Diseases	Q1	1582	143	3249	2461	551	12686	2632	762	16413
	Q2	1586	139	3292	2251	469	11006	2412	713	16547
	Q3	1807	160	3634	2247	456	11185	2144	584	13277
	Q4	1641	162	3573	2067	422	10870	2243	657	17234
	Total	1655	151	3438	2261	474	11426	2368	680	15875
Injury and Poisoning	Q1	1934	556	11774	2007	468	9966	1472	336	8447
	Q2	2001	530	11099	2000	408	8991	1584	307	8062
	Q3	2006	534	10945	1980	375	8303	1451	289	6802
	Q4	2048	534	11650	1835	336	7405	1256	252	5721
	Total	1997	538	11368	1961	396	8653	1450	297	7282
Disorders of Eye and Ear	Q1	2208	705	14343	1938	569	14323	2386	883	28856
	Q2	2226	685	13833	1704	513	12341	2524	992	28842
	Q3	2290	758	15223	1838	562	13242	2535	994	31856
	Q4	2335	813	16706	1773	585	13832	2453	1011	28872
	Total	2268	740	15035	1814	557	13429	2476	969	29595
Chronic Obstructive Pulmonary Disease	Q1	2891	74	1385	3109	93	1999	4640	327	6671
	Q2	3047	87	1845	3558	98	2244	3471	365	7093
	Q3	2568	74	1701	4091	102	1833	3009	255	5239
	Q4	2522	64	1400	3627	64	1354	2964	233	5171
	Total	2762	75	1582	3579	89	1855	3504	296	6063
Digestive System Disorders	Q1	1800	144	3721	2064	262	7650	1766	324	10550
	Q2	2046	139	3563	1682	188	6675	1504	305	9152
	Q3	1506	100	2735	1709	183	6621	1729	325	10297
	Q4	1759	105	2432	1774	175	6239	1661	281	9275
	Total	1795	122	3109	1820	202	6788	1660	309	9819

Appendix Table B.1 cont'd
Utilization of Ambulatory Medical Care
By Disorder, Age Group and Income Quartile

		Age 0-29 Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Age 30-64 Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Age 65+ Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population
Genitourinary Disorders	Q1	2309	347	8073	2802	534	13610	1945	297	7975
	Q2	1994	263	6188	2576	436	11650	1643	335	10200
	Q3	1952	255	5841	2534	422	10863	2467	404	11802
	Q4	1921	211	4803	2330	435	11964	2578	439	13078
	Total	2062	268	6216	2564	456	12005	2141	367	10726
Other	Q1	3253	2051	44069	3558	2203	52958	3879	2738	61700
	Q2	3203	1929	41143	3172	1891	47905	3787	2842	64882
	Q3	3079	1914	41154	3129	1901	47319	3869	2885	64002
	Q4	3135	1909	41964	3102	1894	50425	3575	2572	63280
	Total	3168	1950	42078	3241	1970	49620	3779	2760	63467
Total	Q1	5539	5065	114560	7293	6592	172929	9289	9067	229280
	Q2	5023	4607	102130	5946	5456	148060	9287	9286	238838
	Q3	4984	4673	104523	5840	5351	143599	9089	8975	233509
	Q4	5006	4650	106631	5719	5350	156756	8849	8803	239572
	Total	5137	4748	106946	6195	5678	155162	9132	9037	235272

Appendix Table B.2
Utilization of Ambulatory Medical Care
By Disorder, Age Group and Education Quartile

		Age 0-29 Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Age 30-64 Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Age 65+ Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population
Cardiovascular and Cerebrovascular	Q1	2449	40	879	3236	549	11244	3863	1953	40137
	Q2	1639	25	495	3277	578	12148	4325	2213	46448
	Q3	2110	38	686	2979	445	9605	4447	2338	50812
	Q4	2176	32	700	3379	436	10121	4097	1862	40975
	Total	2108	34	689	3210	499	10716	4191	2094	44601
Diabetes	Q1	3767	10	354	3677	128	2929	3718	316	6389
	Q2	3149	12	338	3867	119	3056	3707	327	6974
	Q3	1820	3	86	3221	79	1868	4066	317	7675
	Q4	3324	9	294	3916	83	2329	3998	321	9158
	Total	3179	9	271	3664	101	2517	3858	320	7530
Mental Illness	Q1	2293	134	4008	3511	406	10690	2249	342	6988
	Q2	2477	98	2986	3871	409	13468	3117	440	10087
	Q3	2900	127	5057	4394	432	15133	2664	359	9094
	Q4	4498	177	8919	5593	526	25169	2811	241	6750
	Total	3028	134	5277	4318	444	16202	2709	348	8277
Cancer	Q1	642	9	304	1980	87	3440	2587	245	10350
	Q2	1590	18	932	2362	112	4329	3125	344	10815
	Q3	845	21	700	2209	95	4008	2783	326	13149
	Q4	1277	23	876	1671	92	3803	2165	237	10850
	Total	1100	18	707	2054	96	3886	2700	290	11264
Respiratory/ Gastrointestinal Infections	Q1	2415	700	12221	1975	436	7903	1533	326	5988
	Q2	2214	734	12824	1781	382	7426	1513	304	5363
	Q3	2182	745	13587	1692	375	7183	1436	263	5470
	Q4	2031	652	11934	1682	378	7801	1787	324	6740
	Total	2205	707	12624	1782	392	7575	1570	305	5878

Appendix Table B.2 cont'd
Utilization of Ambulatory Medical Care
By Disorder, Age Group and Education Quartile

		Age 0-29 Visits /1,000 In Treatment	Age 0-29 Visits /1,000 Population	Age 0-29 Dollars /1,000 Population	Age 30-64 Visits /1,000 In Treatment	Age 30-64 Visits /1,000 Population	Age 30-64 Dollars /1,000 Population	Age 65+ Visits /1,000 In Treatment	Age 65+ Visits /1,000 Population	Age 65+ Dollars /1,000 Population
Musculoskeletal Diseases	Q1	1663	141	3034	2380	553	12504	2414	689	15330
	Q2	1609	152	3513	2290	481	11815	2346	705	15736
	Q3	1460	145	3223	2208	468	11460	2435	691	16036
	Q4	1867	165	3940	2146	395	9985	2276	633	16421
	Total	1655	151	3438	2261	474	11425	2368	680	15875
Injury and Poisoning	Q1	1968	556	11483	2097	451	9562	1329	282	6041
	Q2	2043	590	12441	1825	376	8035	1215	253	6523
	Q3	2067	543	11522	1958	404	8928	1634	328	8596
	Q4	1903	467	10066	1930	352	8012	1657	330	8101
	Total	1997	538	11367	1961	396	8653	1450	297	7282
Disorders of Eye and Ear	Q1	2098	596	12014	1802	502	12383	2370	801	26282
	Q2	2286	719	14523	1809	552	12928	2304	920	29308
	Q3	2420	849	17421	1828	595	14130	2510	1033	30848
	Q4	2232	799	16225	1810	575	14147	2707	1131	32024
	Total	2268	740	15035	1814	557	13428	2476	969	29595
Chronic Obstructive Pulmonary Disease	Q1	3190	65	1290	3014	98	1972	3623	303	5632
	Q2	2311	69	1452	4167	103	2022	3912	375	7379
	Q3	2850	87	1944	3014	68	1638	3046	256	5567
	Q4	2840	79	1658	4476	91	1826	3251	241	5508
	Total	2762	75	1582	3579	89	1855	3504	296	6063
Digestive System Disorders	Q1	1919	143	3752	1641	230	6551	1796	360	10070
	Q2	1831	123	3094	1654	172	6057	1549	297	8983
	Q3	1956	137	3288	1945	202	6941	1746	332	11369
	Q4	1382	87	2352	2087	200	7502	1525	250	8994
	Total	1795	122	3109	1820	202	6788	1660	309	9819

Appendix Table B.2 cont'd
Utilization of Ambulatory Medical Care
By Disorder, Age Group and Education Quartile

		Age 0-29 Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Age 30-64 Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population	Age 65+ Visits /1,000 In Treatment	Visits /1,000 Population	Dollars /1,000 Population
Genitourinary Disorders	Q1	2206	300	7065	3037	520	13316	1617	297	8535
	Q2	1935	270	5763	2381	441	10786	2222	381	11798
	Q3	2132	289	7059	2433	449	11920	2382	420	10656
	Q4	1965	219	5094	2394	414	11886	2378	371	11797
	Total	2062	268	6216	2564	456	12005	2141	367	10726
Other	Q1	3123	1792	38194	3282	2008	47908	3705	2629	54388
	Q2	3160	1963	41259	3411	2045	50117	3746	2797	61555
	Q3	3288	2094	45327	3204	1940	49663	3901	2931	71721
	Q4	3103	1957	43600	3093	1900	50812	3767	2685	66696
	Total	3168	1950	42078	3241	1970	49619	3779	2760	63467
Total	Q1	5132	4489	98194	6630	5970	149373	8863	8544	208555
	Q2	5115	4775	103759	6330	5770	153166	9404	9358	234005
	Q3	5363	5077	115179	5993	5553	153389	9592	9596	258084
	Q4	4953	4666	110858	5867	5445	164497	8634	8627	241331
	Total	5137	4748	106943	6195	5678	155161	9132	9037	235272

Appendix Table B.3
Hospital Utilization
By Disorder, Age Group and Income Quartile
Short Stay Hospitalizations (<60 Days)

		Age 0-29 Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Age 30-64 Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Age 65+ Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population
Cardiovascular and	Q1	23.32	0.26	0.79	103.98	15.49	122.08	151.91	75.34	814.47
Cerebrovascular	Q2	21.74	0.22	0.67	91.64	12.65	100.27	143.85	71.21	671.44
	Q3	229.84	2.46	12.34	67.03	8.67	62.03	195.45	90.16	958.94
	Q4	114.75	0.97	6.78	75.43	10.93	72.50	170.66	80.11	809.37
	Total	96.28	0.98	5.16	84.82	11.89	88.83	164.49	79.08	812.04
Diabetes	Q1	61.75	0.18	0.90	80.98	2.97	26.24	53.68	4.81	35.30
	Q2	.	.	.	50.02	1.31	4.76	30.19	2.60	33.27
	Q3	84.67	0.17	0.67	18.92	0.42	3.72	83.45	4.91	86.73
	Q4	271.20	0.54	2.16	56.66	1.20	4.88	69.11	5.89	66.43
	Total	93.22	0.22	0.94	55.21	1.46	9.75	56.55	4.53	54.98
Mental Illness	Q1	52.75	2.52	32.59	68.03	8.25	89.79	102.37	14.68	220.95
	Q2	64.21	2.03	17.46	48.00	3.96	46.12	118.74	12.92	218.18
	Q3	10.78	0.36	6.20	60.02	4.69	54.93	81.02	8.26	114.28
	Q4	31.96	0.82	8.10	37.26	3.05	48.65	61.32	5.24	36.31
	Total	41.42	1.43	16.03	54.71	4.96	59.61	93.95	10.36	149.21
Cancer	Q1	57.45	0.48	2.19	312.53	9.57	91.76	322.29	30.15	503.28
	Q2	116.26	0.65	3.03	388.09	13.81	144.22	417.24	39.03	398.32
	Q3	59.36	0.50	1.92	191.84	5.75	53.88	377.48	42.09	664.01
	Q4	127.03	0.81	3.06	227.31	8.71	87.57	396.01	33.37	339.34
	Total	85.05	0.61	2.55	280.64	9.44	94.17	377.69	36.15	476.09

Appendix Table B.3 cont'd

Hospital Utilization By Disorder, Age Group and Income Quartile

Short Stay Hospitalizations (<60 Days)

		Age 0-29 Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Age 30-64 Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Age 65+ Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population
Respiratory/ Gastrointestinal Infections	Q1	49.59	13.25	57.06	13.91	2.40	12.62	116.54	15.89	209.98
	Q2	26.46	6.71	22.26	16.54	2.57	23.43	94.04	12.36	86.71
	Q3	13.86	3.53	10.79	9.72	1.53	6.46	114.67	14.03	184.77
	Q4	13.92	3.47	11.98	13.80	1.82	7.02	57.75	7.35	69.44
	Total	26.21	6.71	25.41	13.46	2.07	12.34	96.21	12.45	138.02
Musculoskeletal Diseases	Q1	49.04	2.70	9.14	40.64	7.55	63.55	41.15	10.34	213.37
	Q2	30.92	1.78	6.51	41.22	7.06	38.90	36.44	9.30	137.73
	Q3	40.45	2.41	11.20	38.46	6.36	42.05	34.08	7.58	66.97
	Q4	29.94	1.96	9.47	38.58	6.26	45.48	32.23	7.97	103.62
	Total	37.18	2.21	9.08	39.75	6.80	47.35	36.11	8.82	131.30
Injury and Poisoning	Q1	78.24	16.60	80.73	76.99	13.40	65.14	133.28	20.13	193.56
	Q2	57.10	11.37	52.46	69.06	10.16	56.43	114.83	16.95	168.98
	Q3	42.47	8.41	31.05	51.69	6.83	66.41	90.72	12.88	95.43
	Q4	40.63	8.03	41.55	46.99	5.93	47.64	78.57	9.94	147.87
	Total	54.93	11.08	51.36	62.47	9.03	58.87	106.05	15.06	152.02
Disorders of Eye and Ear	Q1	13.58	3.25	7.64	15.19	2.88	10.76	88.55	25.11	81.13
	Q2	9.70	2.19	4.37	6.36	1.13	3.94	57.50	17.57	56.19
	Q3	3.31	0.82	3.48	5.94	1.10	3.47	49.54	15.33	35.09
	Q4	7.98	2.16	4.99	5.00	0.99	2.27	56.62	18.33	67.62
	Total	8.55	2.11	5.12	8.06	1.51	5.06	62.63	19.12	60.12
Chronic Obstructive Pulmonary Disease	Q1	135.06	2.95	6.49	63.20	1.62	6.53	305.30	19.42	230.07
	Q2	227.50	5.59	19.92	133.99	3.06	20.67	224.98	21.81	277.71
	Q3	46.68	1.14	4.26	40.62	0.89	3.25	120.04	8.89	41.66
	Q4	79.46	1.65	4.11	96.18	1.40	4.64	163.66	10.75	116.38
	Total	123.51	2.83	8.68	82.02	1.74	8.75	203.87	15.34	168.38

Appendix Table B.3 cont'd

Hospital Utilization By Disorder, Age Group and Income Quartile

Short Stay Hospitalizations (<60 Days)

		Age 0-29			Age 30-64			Age 65+		
		Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population
Digestive System Disorders	Q1	147.31	7.82	39.87	146.65	14.64	110.12	203.44	29.42	332.03
	Q2	209.71	9.19	38.62	172.14	14.38	92.97	233.54	37.43	404.79
	Q3	155.95	5.48	16.42	116.71	9.18	60.67	225.84	34.30	317.02
	Q4	189.68	6.56	27.64	194.12	13.75	86.28	244.97	31.93	303.79
	Total	174.49	7.26	30.62	156.06	12.96	87.23	226.50	33.29	340.18
Genitourinary Disorders	Q1	45.76	5.59	22.19	91.34	14.87	115.44	124.18	14.51	163.00
	Q2	43.99	4.45	15.47	71.91	9.82	50.24	112.59	17.74	152.03
	Q3	22.51	2.25	10.02	63.20	8.48	54.11	208.94	29.06	190.65
	Q4	42.70	3.53	11.12	79.00	11.66	67.91	210.41	29.34	201.52
	Total	38.97	3.95	14.67	76.98	11.17	71.53	162.86	22.52	176.33
Other	Q1	52.53	30.58	101.82	51.25	29.82	120.67	86.86	58.38	491.34
	Q2	46.18	25.32	67.68	52.60	28.63	129.17	69.48	50.06	376.96
	Q3	36.38	20.61	63.75	46.50	25.64	122.35	87.73	63.07	464.04
	Q4	34.35	19.14	64.68	32.43	17.96	75.11	68.78	47.66	400.43
	Total	42.38	23.88	74.39	45.67	25.47	111.73	78.15	54.80	433.19
Total	Q1	113.48	86.19	361.40	159.86	123.47	834.69	365.98	318.18	3488.47
	Q2	92.92	69.50	248.45	143.74	108.52	711.13	344.21	308.97	2982.32
	Q3	63.01	48.15	172.10	106.37	79.54	533.34	373.87	330.55	3219.59
	Q4	65.01	49.65	195.67	110.18	83.67	549.98	324.66	287.88	2662.13
	Total	83.38	63.28	244.00	129.87	98.51	655.22	352.20	311.50	3091.84

Appendix Table B.4
Hospital Utilization
By Disorder, Age Group and Education Quartile
Short Stay Hospitalizations (<60 Days)

		Age 0-29 Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Age 30-64 Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Age 65+ Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population
Cardiovascular and Cerebrovascular	Q1	314.16	3.53	19.83	102.22	15.74	131.16	190.23	92.61	869.91
	Q2	28.55	0.26	0.87	92.79	15.11	103.48	212.95	105.51	959.81
	Q3	15.30	0.18	0.18	60.82	8.07	63.57	138.86	70.49	931.93
	Q4	.	.	.	81.55	9.35	61.33	102.48	44.26	471.77
	Total	96.28	0.98	5.16	84.82	11.89	88.83	164.49	79.08	812.04
Diabetes	Q1	65.03	0.17	0.68	83.97	2.84	14.18	115.42	9.63	85.29
	Q2	114.95	0.35	2.14	55.58	1.65	6.30	67.70	5.71	57.21
	Q3	275.76	0.38	0.95	42.24	0.96	16.27	24.73	1.88	47.31
	Q4	.	.	.	22.84	0.46	1.47	8.64	0.66	29.50
	Total	93.22	0.22	0.94	55.21	1.46	9.75	56.55	4.53	54.98
Mental Illness	Q1	40.33	1.80	13.40	54.43	5.40	40.69	89.83	11.27	159.68
	Q2	35.84	0.96	4.21	57.41	5.28	115.15	92.35	11.43	185.57
	Q3	5.95	0.20	0.40	66.09	5.77	53.52	129.03	15.76	234.08
	Q4	79.30	2.65	44.26	39.90	3.37	35.66	43.70	2.98	15.35
	Total	41.42	1.43	16.03	54.71	4.96	59.61	93.95	10.36	149.21
Cancer	Q1	60.19	0.32	1.03	322.90	10.57	91.57	368.93	30.76	442.73
	Q2	106.78	0.58	2.79	320.17	11.99	119.32	504.65	52.13	633.02
	Q3	66.02	0.57	2.13	315.80	9.85	107.54	310.93	32.71	447.79
	Q4	101.64	0.96	4.14	166.91	5.63	60.24	299.10	27.03	361.57
	Total	85.05	0.61	2.55	280.64	9.44	94.17	377.69	36.15	476.09

Appendix Table B.4 cont'd

Hospital Utilization By Disorder, Age Group and Education Quartile
Short Stay Hospitalizations (<60 Days)

		Age 0-29			Age 30-64			Age 65+		
		Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population
Respiratory/ Gastrointestinal Infections	Q1	60.96	14.25	56.63	25.84	4.14	27.84	138.70	20.24	198.15
	Q2	22.69	6.06	22.29	14.67	2.19	12.87	124.09	16.47	220.30
	Q3	12.65	3.50	14.81	4.07	0.62	4.10	50.20	5.48	53.37
	Q4	12.71	3.16	8.57	9.67	1.50	5.46	53.70	6.92	67.93
	Total	26.21	6.71	25.41	13.46	2.07	12.34	96.21	12.45	138.02
Musculoskeletal	Q1	45.30	2.48	8.53	37.50	7.31	58.06	36.78	9.13	186.86
	Q2	33.05	2.02	8.56	56.67	9.48	62.72	38.91	9.85	158.60
	Q3	39.77	2.39	10.26	35.09	6.16	46.17	30.39	7.36	79.26
	Q4	32.10	1.98	9.03	31.58	4.61	24.54	37.78	8.75	95.57
	Total	37.18	2.21	9.08	39.75	6.80	47.35	36.11	8.82	131.30
Injury and Poisoning	Q1	86.90	18.38	84.88	85.04	13.84	81.32	103.91	14.87	97.96
	Q2	45.58	10.18	44.79	43.17	6.22	47.84	109.18	15.49	160.90
	Q3	47.31	9.17	48.39	62.65	9.23	63.27	126.54	18.06	188.38
	Q4	38.10	6.80	28.80	52.99	6.58	41.86	84.41	11.84	161.02
	Total	54.93	11.08	51.36	62.47	9.03	58.87	106.05	15.06	152.02
Disorders of Eye and Ear	Q1	18.87	3.77	10.15	13.52	2.25	7.54	94.25	24.88	87.86
	Q2	10.13	2.43	5.58	8.59	1.61	5.51	42.19	12.88	34.87
	Q3	6.10	1.67	3.48	5.28	1.06	5.10	62.66	20.28	50.88
	Q4	2.24	0.61	1.39	6.08	1.17	2.18	58.33	19.19	69.48
	Total	8.55	2.11	5.12	8.06	1.51	5.06	62.63	19.12	60.12
Chronic Obstructive Pulmonary Disease	Q1	226.53	3.96	15.66	90.24	2.50	10.43	292.22	21.25	181.07
	Q2	129.18	3.21	9.90	110.53	2.31	16.23	199.35	17.60	131.74
	Q3	130.31	3.31	6.97	49.62	0.93	4.13	223.26	16.35	319.19
	Q4	39.75	0.95	2.44	76.25	1.34	5.44	90.39	5.89	49.76
	Total	123.51	2.83	8.68	82.02	1.74	8.75	203.87	15.34	168.38

Appendix Table B.4 cont'd

Hospital Utilization By Disorder, Age Group and Education Quartile
Short Stay Hospitalizations (<60 Days)

		Age 0-29 Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Age 30-64 Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population	Age 65+ Separations /1,000 In Treatment	Separations /1,000 Population	Days /1,000 Population
Digestive System Disorders	Q1	175.66	8.75	40.56	159.65	16.52	104.01	256.41	42.45	452.38
	Q2	197.10	8.00	32.97	147.06	11.48	70.36	221.81	32.49	325.47
	Q3	154.90	6.74	25.74	144.04	11.56	88.30	229.63	34.85	353.07
	Q4	169.04	5.61	23.35	174.38	12.26	84.49	188.88	23.44	231.30
	Total	174.49	7.26	30.62	156.06	12.96	87.23	226.50	33.29	340.18
Genitourinary Disorders	Q1	69.64	7.58	28.63	90.71	13.33	86.22	190.60	27.72	204.06
	Q2	33.65	3.59	14.59	74.23	10.87	70.66	180.02	24.44	212.45
	Q3	26.55	2.85	8.86	77.95	11.66	90.60	176.41	26.09	189.82
	Q4	22.41	1.88	6.85	64.01	8.79	37.49	93.62	11.65	94.89
	Total	38.97	3.95	14.67	76.98	11.17	71.53	162.86	22.52	176.33
Other	Q1	59.81	31.56	95.90	59.83	34.10	161.95	97.58	66.86	588.13
	Q2	45.20	25.58	72.96	47.43	26.04	119.82	80.49	57.48	420.45
	Q3	34.80	20.36	81.93	40.32	22.25	77.18	77.84	56.33	500.08
	Q4	31.55	18.16	48.60	35.62	19.92	92.19	56.09	38.18	226.58
	Total	42.38	23.88	74.39	45.67	25.47	111.73	78.15	54.80	433.19
Total	Q1	134.87	96.53	375.86	169.51	128.57	814.97	429.90	371.66	3554.08
	Q2	82.50	63.21	221.66	137.97	104.26	750.26	405.44	361.50	3500.39
	Q3	65.57	51.32	204.10	115.67	88.13	619.75	339.30	305.64	3395.17
	Q4	55.47	42.75	177.45	99.03	74.99	452.34	228.03	200.79	1874.71
	Total	83.38	63.27	243.99	129.87	98.50	655.22	352.20	311.50	3091.84 /

Appendix Table B.5
Hospital Utilization
By Disorder Category and Income Quartile

Total short-stay (<60 days) hospital days and rate of days per 1,000 population

		Q1	Q2	Q3	Q4	Total
Cardiovascular & Cerebrovascular	Total Days	39,680	33,180	38,871	34,145	145,876
	Days/1,000	157.0	129.1	151.2	132.2	142.3
Diabetes	Total Days	3,981	1,618	3,259	2,880	11,738
	Days/1,000	15.7	6.3	12.7	11.1	11.4
Mental Illness	Total Days	20,376	14,243	10,321	7,325	52,265
	Days/1,000	80.6	55.4	40.1	28.4	51.0
Cancer	Total Days	26,400	28,981	27,321	20,463	103,165
	Days/1,000	104.5	112.8	106.2	79.2	100.7
Respiratory & Gastrointestinal Infections	Total Days	14,903	8,001	7,880	4,378	35,162
	Days/1,000	59.0	31.1	30.6	16.9	34.3
Musculoskeletal Diseases	Total Days	14,690	9,499	7,998	9,276	41,463
	Days/1,000	58.1	36.9	31.1	35.9	40.4
Injury & Poisoning	Total Days	22,530	17,800	13,865	14,741	68,936
	Days/1,000	89.2	69.3	53.9	57.1	67.3
Disorders of Eye & Ear	Total Days	4,689	2,811	1,907	2,976	12,383
	Days/1,000	18.5	10.9	7.4	11.5	12.1
Chronic Obstructive Pulmonary Disease	Total Days	9,055	13,823	2,183	4,665	29,726
	Days/1,000	35.8	53.8	8.5	18.1	29.0
Digestive System Disorders	Total Days	27,002	27,940	18,634	22,141	95,717
	Days/1,000	106.9	108.7	72.5	85.7	93.4
Genitourinary Disorders	Total Days	19,890	12,231	13,127	14,968	60,216
	Days/1,000	78.7	47.6	51.1	57.9	58.7
Fertility	Total Days	18,717	19,538	19,294	13,589	71,138
	Days/1,000	74.1	76.0	75.1	52.6	69.4
Pregnancy Complications	Total Days	6,583	5,758	4,789	1,862	18,992
	Days/1,000	26.0	22.4	18.6	7.2	18.5

Appendix Table B.6
Hospital Utilization
By Disorder Category and Education Quartile

Total short-stay (<60 days) hospital days and rate of days per 1,000 population

		Q1	Q2	Q3	Q4	Total
Cardiovascular & Cerebrovascular	Total Days	43,980	44,096	36,191	21,609	145,876
	Days/1,000	173.2	175.7	140.5	82.4	142.3
Diabetes	Total Days	4,305	2,892	3,446	1,095	11,738
	Days/1,000	16.9	11.5	13.4	4.2	11.5
Mental Illness	Total Days	10,965	18,074	13,458	9,767	52,264
	Days/1,000	43.2	72.0	52.2	37.22	50.9
Cancer	Total Days	23,961	34,214	26,493	18,497	103,165
	Days/1,000	94.4	136.3	102.8	70.5	100.6
Respiratory & Gastrointestinal Infections	Total Days	15,847	11,741	3,774	3,800	35,162
	Days/1,000	62.4	46.8	14.6	14.5	34.3
Musculoskeletal Diseases	Total Days	13,107	12,644	8,919	6,793	41,463
	Days/1,000	51.6	50.4	34.6	25.9	40.4
Injury & Poisoning	Total Days	21,588	15,664	18,515	13,168	68,935
	Days/1,000	85.0	62.4	71.9	50.2	67.3
Disorders of Eye & Ear	Total Days	4,783	2,435	2,550	2,615	12,383
	Days/1,000	18.8	9.7	9.9	10.0	12.1
Chronic Obstructive Pulmonary Disease	Total Days	8,705	7,422	11,131	2,468	29,726
	Days/1,000	34.3	29.6	43.2	9.4	29.0
Digestive System Disorders	Total Days	30,171	22,240	23,975	19,331	95,717
	Days/1,000	118.8	88.6	93.1	73.7	93.4
Genitourinary Disorders	Total Days	18,970	16,040	17,306	7,900	60,216
	Days/1,000	74.7	63.9	67.2	30.1	58.7
Fertility	Total Days	14,798	21,662	16,418	18,259	71,137
	Days/1,000	58.3	86.3	63.7	69.6	69.4
Pregnancy Complications	Total Days	6,440	5,347	4,560	2,645	18,992
	Days/1,000	25.4	21.3	17.7	10.1	18.5

Appendix Table B.7
Utilization of Ambulatory Medical Care
By Disorder Category and Education Quartile

		Q1	Q2	Q3	Q4	Total
Cardiovascular & Cerebrovascular	Total Dollars ($000)	2,574	2,868	2,756	2,479	10,679
	Dollars per capita	10.14	11.42	10.70	9.45	10.42
Diabetes	Total Dollars ($000)	555	579	462	578	2,175
	Dollars per capita	2.19	2.30	1.79	2.20	2.12
Mental Illness	Total Dollars ($000)	1,820	2,001	2,589	4,024	10,434
	Dollars per capita	7.17	7.96	10.05	15.33	10.18
Cancer	Total Dollars ($000)	730	909	947	863	3,449
	Dollars per capita	2.87	3.62	3.67	3.29	3.36
Respiratory & Gastrointestinal Infections	Total Dollars ($000)	2,446	2,440	2,511	2,520	9,917
	Dollars per capita	9.63	9.72	9.74	9.60	9.67
Musculoskeletal Diseases	Total Dollars ($000)	2,166	2,107	2,176	2,083	8,532
	Dollars per capita	8.53	8.39	8.45	7.93	8.32
Injury & Poisoning	Total Dollars ($000)	2,538	2,493	2,578	2,357	9,966
	Dollars per capita	9.99	9.93	10.01	8.98	9.72
Disorders of Eye & Ear	Total Dollars ($000)	3,544	4,019	4,524	4,535	16,623
	Dollars per capita	13.96	16.01	17.56	17.28	16.22
Chronic Obstructive Pulmonary Disease	Total Dollars ($000)	538	629	577	575	2,312
	Dollars per capita	2.12	2.51	2.24	2.19	2.26
Digestive System Disorders	Total Dollars ($000)	1,450	1,268	1,518	1,383	5,621
	Dollars per capita	5.71	5.05	5.89	5.27	5.48
Genitourinary Disorders	Total Dollars ($000)	2,502	2,139	2,490	2,282	9,414
	Dollars per capita	9.85	8.52	9.66	8.69	9.18
Other	Total Dollars ($000)	11,241	11,923	12,994	12,951	49,111
	Dollars per capita	44.28	47.49	50.43	49.36	47.91

Appendix Table B.8
Utilization of Ambulatory Medical Care
By Disorder Category and Income Quartile

		Q1	Q2	Q3	Q4	Total
Cardiovascular & Cerebrovascular	Total Dollars ($000)	2,634	2,655	2,632	2,756	10,679
	Dollars per capita	10.42	10.33	10.24	10.67	10.42
Diabetes	Total Dollars ($000)	664	548	439	524	2,175
	Dollars per capita	2.62	2.13	1.71	2.02	2.12
Mental Illness	Total Dollars ($000)	3,664	1,988	1,875	2,905	10,434
	Dollars per capita	14.50	7.74	7.29	11.25	10.18
Cancer	Total Dollars ($000)	665	930	951	900	3,449
	Dollars per capita	2.63	3.62	3.70	3.48	3.36
Respiratory & Gastrointestinal Infections	Total Dollars ($000)	2,683	2,406	2,411	2,416	9,917
	Dollars per capita	10.61	9.36	9.38	9.35	9.67
Musculoskeletal Diseases	Total Dollars ($000)	2,230	2,107	2,058	2,135	8,532
	Dollars per capita	8.82	8.20	8.00	8.27	8.32
Injury & Poisoning	Total Dollars ($000)	2,678	2,526	2,395	2,366	9,966
	Dollars per capita	10.59	9.83	9.31	9.16	9.72
Disorders of Eye & Ear	Total Dollars ($000)	4,103	3,898	4,232	4,390	16,623
	Dollars per capita	16.23	15.17	16.46	17.00	16.22
Chronic Obstructive Pulmonary Disease	Total Dollars ($000)	588	691	564	475	2,312
	Dollars per capita	2.32	2.69	2.19	1.84	2.26
Digestive System Disorders	Total Dollars ($000)	1,571	1,432	1,365	1,251	5,621
	Dollars per capita	6.22	5.57	5.31	4.84	5.48
Genitourinary Disorders	Total Dollars ($000)	2,607	2,303	2,234	2,268	9,414
	Dollars per capita	10.31	8.96	8.69	8.78	9.18
Other	Total Dollars ($000)	12,635	12,083	11,976	12,415	49,111
	Dollars per capita	50.00	47.02	46.59	48.08	47.91

Appendix Table C.1
Validation of the Record Linkage: Comparison of Agreement on Name and Address Information

N=2,102

Match Status	Agree		Disagree		Total	
	N	%	N	%	N	%
Below Threshold (1)	166	40.1	252	59.9	418	100.0
Above Threshold (1)						
Private Dwelling	1,476	95.5	123	4.5	1,599	100.0
Collective Dwelling	42	62.9	26	37.1	68	100.0

(1) Threshold value of total of weights in linkage phase. Linked records with weights below the threshold were exlcuded from the sample phase of the project

Appendix Table C.2
Comparison of Actual Mortality with Mortality Estimated from Sample

June 1986 to May 1988

Age	Population Deaths	Annual Mortality / 1,000	Sample Deaths (1)	Annual Mortality / 1,000	95% Confidence Interval	
0-4	395	2.37	1	0.04	(0.00,	0.56)
5-9	34	0.21	-	-	-	-
10-14	47	0.28	4	0.38	(0.00,	1.24)
15-19	136	0.78	3	0.43	(0.00,	1.02)
20-24	202	1.01	10	0.82	(0.15,	2.25)
25-29	166	0.81	5	0.17	(0.00,	1.33)
30-34	160	0.85	6	0.44	(0.00,	1.65)
35-39	187	1.13	10	1.57	(0.18,	2.74)
40-44	264	2.01	17	2.31	(0.99,	5.04)
45-49	358	3.37	13	3.20	(0.66,	5.07)
50-54	501	5.07	19	4.22	(1.64,	7.35)
55-59	793	8.02	37	8.12	(4.78,	12.74)
60-64	1,277	12.84	48	10.18	(6.87,	15.97)
65-69	1,736	19.96	79	21.11	(14.68,	27.77)
70-74	2,354	31.58	92	27.45	(20.66,	37.12)
75-79	2,555	48.30	115	45.51	(36.88,	61.74)
80+	6,692	111.34	301	91.98	(76.15,	107.81)
Total	17,857	7.97	760	7.30	(6.50,	8.10)

(1) Includes residents of collective dwellings, who are excluded from analysis by income and education reported elsewhere in this report.

Appendix Table C.3
Age, Sex and Income Distribution of Unlinked Records

3,274 individuals in linked census households who could not be linked to MHSC records

		Income Quartile				
Males		Q1	Q2	Q3	Q4	Total
0-4	Sample N	55	49	20	40	164
	Estimate (%)	(33.2)	(18.9)	(9.0)	(38.8)	1,558
5-14	Sample N	69	60	54	43	226
	Estimate (%)	(28.7)	(26.9)	(21.3)	(23.1)	2,070
15-29	Sample N	197	204	167	176	744
	Estimate (%)	(25.9)	(26.1)	(21.9)	(26.2)	13,345
30-49	Sample N	115	77	88	87	367
	Estimate (%)	(30.3)	(17.5)	(25.9)	(26.3)	6,627
50-64	Sample N	44	36	38	40	158
	Estimate (%)	(26.7)	(21.2)	(19.1)	(33.0)	2,704
65-74	Sample N	4	11	17	18	50
	Estimate (%)	(5.2)	(17.3)	(33.3)	(44.2)	604
75 +	Sample N	3	5	7	24	39
	Estimate (%)	(2.3)	(7.6)	(19.6)	(70.5)	660
Total	Sample N	487	442	391	428	1,748
	Estimate (%)	(26.7)	(22.5)	(22.0)	(28.9)	27,568
Females		Q1	Q2	Q3	Q4	Total
0-4	Sample N	45	36	26	35	142
	Estimate (%)	(31.5)	(26.5)	(17.9)	(24.1)	1,441
5-14	Sample N	71	53	35	43	202
	Estimate (%)	(39.1)	(20.7)	(17.5)	(22.7)	1,929
15-29	Sample N	174	132	131	172	609
	Estimate (%)	(29.6)	(19.8)	(20.2)	(30.4)	10,305
30-49	Sample N	103	66	62	48	279
	Estimate (%)	(36.7)	(22.9)	(21.8)	(18.5)	5,289
50-64	Sample N	44	51	46	34	175
	Estimate (%)	(25.3)	(29.5)	(23.0)	(22.2)	2,931
65-74	Sample N	10	11	15	30	66
	Estimate (%)	(5.9)	(20.1)	(18.8)	(55.1)	958
75 +	Sample N	7	7	12	27	53
	Estimate (%)	(11.6)	(9.0)	(24.4)	(55.0)	992
Total	Sample N	454	356	327	389	1,526
	Estimate (%)	(29.8)	(21.7)	(20.8)	(27.7)	23,845

Appendix Table C.4
Mortality, By Education Quartile

Estimated Annual Mortality /1,000 June 1986 - May 1988
Imputed Records and Residents of Collective Dwellings Included in Total

	Education Quartile					
Age	Q1	Q2	Q3	Q4	NA(1)	Total
0-4	0.18	-	-	-	-	0.04
5-14	0.07	-	-	0.44	-	0.12
15-29	1.00	0.46	0.04	0.16	2.54	0.46
30-49	2.93	1.01	1.86	0.99	2.87	1.73
50-64	8.50	7.23	5.09	8.93	8.81	7.36
65-74	22.18	25.92	23.95	17.73	58.45	23.24
75+	51.48	73.37	54.00	38.83	159.60	69.29
Total	6.69	7.85	5.62	4.45	58.21	7.30

(1) Residents of Non-Institutional and Institutional Collective Dwellings were excluded from analysis by education.

Appendix Table C.5

Impact of Long Stay Hospital Separations (> =60 days) on the Precision of the Sample Estimate of Population Utilization of Hospital Care

Personal Care Home Residents Excluded

Short Stay Separations (< 60 days)	Population	Sample Estimate	Difference	% Difference
Hospital Days				
Age < 65	538,912	498,568	40,344	-7.5
Age > =65	453,348	420,700	32,648	-7.2
Total Short Stay Days	992,260	919,268	72,992	-7.4
Total Separations	143,447	137,410	6,037	-4.2
Long Stay Separations (> =60 days)	Population	Sample Estimate	Difference	% Difference
Hospital Days				
Age < 65	129,236	79,725	49,511	-38.3
Age > =65	473,728	229,322	244,406	-51.6
Total Long Stay Days	602,964	309,047	293,917	-48.7
Total Separations	3,206	2,491	715	-22.3

Appendix Table C.6
Age-Specific Thresholds for the Definition of Quartiles of Attained Education

Level of Education	Age Group 0-4	5-14	15-29	30-49	50-64	64-74	75+
No School	⊤	⊤	⊤	⊤	⊤	⊤	⊤
Grades 1-5							Q1
						Q1	
Grade 6							
					Q1		⊥
Grade 7						⊥	
	Q1	Q1	Q1	Q1			Q2
Grade 8						Q2	
					⊥		⊥
Grade 9							
						⊥	
Grade 10			⊥	⊥	Q2		
	⊥	⊥					Q3
Grade 11			Q2	Q2		Q3	
	Q2	Q2					
Grade 12					⊥		
	⊥	⊥	⊥	⊥			
High School Certificate						⊥	⊥
	Q3	Q3	Q3	Q3	Q3		
Trades Certificate/Diploma	⊥	⊥	⊥	⊥	⊥		
University Bachelor Degree							
	Q4	Q4	Q4	Q4	Q4	Q4	Q4
University Master's Degree							
University Doctorate	⊥	⊥	⊥	⊥	⊥	⊥	⊥

Education quartiles for children 0-4 and 5-14 are based on mean attained education of household adults

Appendix Table C.7
Age and Region Specific
Income Thresholds for Quartiles of Household Income

Urban	Q1	Q2	Q3	Q4
Age Group				
0-4	0-21,500	21,500-32,500	32,500-43,500	43,500+
5-14	0-21,500	21,500-32,500	32,500-43,500	43,500+
15-29	0-20,500	20,500-34,000	34,000-49,500	49,500+
30-49	0-21,000	21,000-34,000	34,000-51,000	51,000+
50-64	0-20,500	20,500-35,000	35,000-53,000	53,000+
65-74	0-13,000	13,000-20,000	20,000-32,000	32,000+
75+	0-13,000	13,000-19,500	19,500-31,000	31,000+
Rural				
Age Group				
0-4	0-14,500	14,500-25,000	25,000-36,500	36,500+
5-14	0-14,500	14,500-25,000	25,000-36,500	36,500+
15-29	0-16,000	16,000-27,000	27,000-40,000	40,000+
30-49	0-18,000	18,000-30,000	30,000-43,000	43,000+
50-64	0-18,000	18,000-30,000	30,000-43,000	43,000+
65-74	0-12,500	12,500-20,000	20,000-25,000	25,000+
75+	0-14,000	14,000-20,000	20,000-25,000	25,000+

Appendix Table C.8
Sample Size and Population Estimates
By Education Quartile

Including 3,306 imputed records

	Education Quartile					
	Q1	Q2	Q3	Q4	NA	Total
Sample						
0-4	1,069	735	717	668	19	3,208
5-14	2,537	1,736	1,722	1,528	51	7,574
15-29	3,871	2,926	2,336	2,847	214	12,194
30-49	3,532	2,449	3,198	3,130	177	12,486
50-64	1,810	1,492	1,612	1,266	131	6,311
65-74	868	886	774	855	117	3,500
75+	623	605	467	411	556	2,662
Total	14,310	10,829	10,826	10,705	1,265	47,935
Population Estimates						
0-4	14,510	15,719	16,345	16,009	521	63,104
5-14	37,788	37,254	39,600	37,419	1,385	153,446
15-29	63,711	67,251	55,446	69,310	5,398	261,116
30-49	69,163	59,319	75,344	76,553	4,016	284,395
50-64	36,734	35,933	39,941	31,310	2,696	146,614
65-74	18,091	20,833	19,051	21,333	1,905	81,213
75+	13,855	14,731	11,899	10,450	7,556	58,491
Total	253,852	251,040	257,626	262,384	23,478	1,048,381

Appendix Table C.9
Sample Size and Population Estimates For Fertility Analysis By Education Quartile

Female Residents of Private Dwellings, Aged 15-49

	Education Quartile				
	Q1	Q2	Q3	Q4	Total
Sample Size					
Age					
15-29	1,468	1,330	1,112	1,308	5,218
30-49	1,584	1,324	1,571	1,413	5,892
Total	3,052	2,654	2,683	2,721	11,110
Population Estimate					
Age					
15-29	25,418	30,340	27,029	32,068	114,856
30-49	32,184	32,805	38,171	34,173	137,335
Total	57,062	63,145	65,200	66,242	252,191

Appendix Table C.10
Sample Size and Population Estimates For Pregnancy Complication Analysis By Education Quartile and Maternal Age

Pregnancies Resulting in a Live or Stillbirth, Residents of Private Dwellings Only

	Education Quartile				
	Q1	Q2	Q3	Q4	Total
Sample Size (1)					
Age					
15-29	159	140	92	66	457
30-49	37	45	48	85	215
Total	198	185	140	151	672
Population Estimate (1)					
Age					
15-29	2,400	3,163	2,260	1,599	9,425
30-49	675	1,108	1,211	1,959	4,955
Total	3,086	4,272	3,472	3,559	14,390

Q1 = Lowest

(1) Excludes pregnancies to women residing in collective dwellings and 2 pregnancies to women under the age of 15

Appendix Table C.11
Sample Size and Population Estimates
Stratified By Education and Income Quartiles

Unlinked Records Excluded, Residents of Private Dwellings

Sample

	Education Quartile				
	Q1	Q2	Q3	Q4	Total
Income Quartile					
Q1	4,911	3,663	2,348	1,577	12,499
Q2	2,517	2,844	2,730	2,144	10,235
Q3	2,321	2,617	2,859	2,596	10,393
Q4	1,641	1,940	2,650	4,035	10,266
Total	11,390	11,064	10,587	10,352	43,393

Population Estimates

	Education Quartile				
	Q1	Q2	Q3	Q4	Total
Income Quartile					
Q1	85,410	68,900	47,212	31,645	233,167
Q2	58,021	66,266	65,103	50,162	239,552
Q3	54,930	63,048	69,058	61,292	248,328
Q4	39,852	47,344	64,672	100,553	252,421
Total	238,213	245,558	246,045	243,652	973,468

APPENDIX D:
Methodological Issues in Variance Estimation in Stratified Sample Designs

The impact of sample design effects on variance estimates is an important issue in these analyses. As described in the methods section, the sampling unit for this sample was the household, with households selected using a stratified random sampling method. Design effects at the household level are estimated to be in the range of 0.55-0.65 for census characteristics, with these effects attributable to the enhanced efficiency of stratified sampling relative to a simple random sample design. Analysis in this report, however, is performed at the individual level, with individuals understood to be cluster sampled within households. Intra-household correlations may be expected among individual members of households on both social and economic characteristics, on health service utilization (54) and perhaps on health status, with consequences for the precision of variances estimates. Design effect estimates at the individual level are in the range of 1.00 for census measures and 1.3 for health service utilization measures. Because these design effects are estimated to have a negligible impact on variance estimates and also because the sample was close to self-weighting, SUDAAN (55) was not used to adjust variance estimates.

<u>Derivation of Variance for Rates per Person</u>

We derive the variance expression for rates per person (user) here. Sample subjects are cross-classified (post-stratification) by their age and treatment disease. Within each age stratum for a given treatment disease, possibility of double counting of several family members from the same family was considered (cluster effect of family). Also, across the age strata for a given treatment disease, it is possible for several members from the same family to have the disease in question (correlation across the strata). However, it seems highly unlikely to have significant cluster effect within a stratum and significant level of correlation across the strata, as we divided the sample subjects according to various treatment diseases. Therefore, as a first-order approximation to the true variance, we considered a simple random sample (SRS) design within each stratum and a uncorrelated stratified sample design across the age strata.

The rates per person for the hth stratum can be estimated as $\hat{R}_h = \Sigma_i w_{hi} f_{hi} / \Sigma_i w_{hi}$, where f_{hi} is the event of interest and w_{hi} is the weight for the ith person (user) in the hth stratum. Then, an approximate variance for the rates per person or per user for the hth stratum can be estimated as $v\hat{a}r(\hat{R}_h) = S_h^2 = \Sigma_i w_{hi}^2 v\hat{a}r(f_{hi}) / (\Sigma_i w_{hi})^2$, where $v\hat{a}r(f_{hi}) = \Sigma_i (f_{hi} - \bar{f}_h)^2 / (n_h - 1)$, where n_h is the number of persons in the hth stratum.

The average rate per person in the sample for the treatment disease in question can be estimated as $\hat{R} = \Sigma_h W_h \hat{R}_h$, where W_h is the hth stratum weight. The stratum weight is typically a ratio of population units in the hth stratum to the whole population, i.e, $W_h = N_h / N$. When the sample is an unbiased representative of the population, we can replace W_h by its sample estimate, n_h / n, where $n = \Sigma_h n_h$ is the total number of subjects in the sample. In our analysis, we will use the sum of the sample weights in the hth stratum relative to the total sample weights as the hth stratum weight, i.e., $W_h = \Sigma_i w_{hi} / (\Sigma_h \Sigma_i w_{hi})$. Then, an approximate variance for the average rate per person (user) for the treatment disease in question can be estimated as $v\hat{a}r(\hat{R}) = \Sigma_h W_h^2 v\hat{a}r(\hat{R}_h) = \Sigma_h W_h^2 (1 - r_h) S_h^2 / n_h$, where $r_h = n_h / N_h$ is the sampling fraction in the stratum, which may be assumed zero.

A better variance estimator which takes account for the poststratification is available; this approach will accommodate the possibility that the rate per person, and especially the rate per user, may vary randomly according to the sample size. A first order

Taylor series approximation can be used along with the variance expression given above. However, for this study, there was no significant cluster/stratification/random sample size effect; the full design effect compared to the simple random sample design was essentially 1.