A Needs-based Funding Methodology for Regional Health Authorities: A Proposed Framework

October 1997

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ACKNOWLEDGEMENTS

A number of individuals made important contributions to the conceptual framework and analytic work of this project. The authors acknowledge, in particular, the participation of the members of the Methodology Advisory Committee in defining some of the key issues in the development of the need-based funding methodology. In addition, the work of Marian Shanahan in developing approaches to estimating the costs of hospital care was of fundamental importance to this project. The authors thank Eileen Pyke for editorial assistance in the preparation of this document.

The results and conclusions are those of the authors and no official endorsement by Manitoba Health is intended or should be implied. This report was prepared at the request of Manitoba Health as part of the contract between the University of Manitoba and Manitoba Health.

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. 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 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 MCHPE to contribute to improvements in the health policy process.

MCHPE undertakes several major research projects every year, such as this one, under contract to Manitoba Health. In addition, MCHPE researchers secure major funding through the competitive grants process. Widely published and internationally recognized, they collaborate with a number of highly respected scientists from Canada, the United States and Europe.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (CONTINUED)

LIST OF FIGURES

EXECUTIVE SUMMARY

There are precedents, both international and Canadian, for the initiative underway in Manitoba devolving the management and delivery of health care services to regional authorities. An important component of this devolved management initiative is the method by which resources are allocated to regional health authorities for the provision of health care to resident populations. At the request of Manitoba Health, the Manitoba Centre for Health Policy and Evaluation developed a framework for the funding of health care services for Regional Health Association populations, working in collaboration with members of the Methodology Advisory Committee.

The goal of the needs-based population funding methodology described in this report is to allocate health care resources to Regional Health Associations equitably in relation to the need for health care services in their populations. The key determinant of differences in need for health care across populations is age structure. Populations with a higher proportion of older individuals will have a greater requirement for health care services than populations with younger age structures. In addition, however, two populations with the same age structure may have very different health status profiles, again predicting differences in need for health care services. The funding methodology seeks to provide a method of allocating resources such that needs represented by different population age structures and health profiles are fairly met by the resources provided to Regional Health Authorities.

Defining Need for Health Care

The publicly funded health care system in Canada is based on the principle of insuring individuals for the cost of medically necessary care. While the definition of medically necessary care in the early period of medicare was generally limited to acute or chronic hospital care and physician services, over time most provincial programs have expanded the range of insured services to include nursing home care, some coverage for medications and supportive home care services. Need for medical care can conceptually be defined as the ability or capacity to benefit from health care interventions. These benefits may be in

the form of an improvement or restoration of health status, or alternatively, the benefits may come in the form of maintenance or protection of health status. In the former category are the many medical and surgical interventions which seek to cure disorder or reduce the symptoms of disorder. In the latter category are primary prevention interventions such as immunization or supportive services such as are provided by home care programs.

The Principle of Equity

One of the five principles of the universal health insurance programs in Canada is equity of access to care. This principle can be understood to have a number of applications: gender equity, equity across the age course and particularly, geographic equity. In general, the historic patterns of capital investment in health care facilities have reflected, in part, the idea that the distribution of health care facilities should be geographically balanced. At the same time, geographic inequities in the supply of health services do exist. For example, large urban centres have been the preferred location for establishing tertiary level hospital services. In addition, across most provinces in Canada, there has also been a strong tendency for physicians to establish practice in these large urban centres, leading to imbalance in the geographic distribution of physicians.

Some of these differences in the geographic distribution of health care resources have led to concerns that access to an equivalent range and quality of health care services may not be equivalent across geographic regions. One of the principles of a population-based funding methodology is to firmly embed a mechanism to assure that the geographic allocation of health care resources is determined primarily by the needs of populations, rather than by the historic distribution of facilities and providers.

How the Funding Methodology Works

In summary, the proposed methodology proceeds through the following steps. Six service categories (called service pools) were defined by Manitoba Health which grouped together health care services with similar roles and functions: 1) Institutional Acute Care services, 2) Institutional Long Term Care services, 3) Home-Based Continuing Care services, 4)

Health Promotion and Disease Prevention services, 5) Medical services and 6) Pharmacare benefits.

Within each of the six service pools, the use of services by the provincial population was counted in dollars, classifying individuals into five year age groups, separately for men and women. From these estimates, average per person resource use estimates were developed for each service pool, representing the average amount of services (in dollars) used per person in each five year age group.

In a separate process, a series of measures of the health status of Regional Health Authority populations evaluated for their suitability to be used as a measure of need for health care services. The selected need indicator for the needs-based funding methodology combines information on premature mortality and the social and economic characteristics of Regional Health Authority populations.

The measure of need for health care is used to adjust the age-specific per capita allocations within each service pool either upwards (in the case of poor health status) or downwards (in the case of good health status) for each Regional Health Authority. This step results in a need-adjusted per capita allocation amount which is specific to each Regional Health Authority, and which is then multiplied by the population count in each age group within each Regional Health Authority population to produce a total need-adjusted allocation of health care resources. Included in the body of the report is a simulated example of the application of this methodology.

A summary of the impact of need adjustment on the allocation of total service pool resources is reported in the following table. In the second column we report the total dollars reallocated as a result of need adjustment. Across the six service pools, the need adjustment reallocates between 1.3% and 5.2% of total pool resources. However, within individual Regional Health Authorities, the impact of need-adjustment to simple allocations based on age-specific per capita allocations alone can be substantial, ranging from

reductions of the order of 1% to 9% in Regional Health Authorities with low need to increases in the order of 19% to 34% in Regional Health Authorities with high need.

Service Pool	Total Resources $ 000	Need Adjustment Reallocation $ 000	%	Range (%)
Institutional Acute Care	608,929	13,778.5	2.3	-4.6 to 26.1
Institutional Long Term Care	254,969	3,310.0	1.3	-0.8 to 24.2
Continuing Care, Home-Based	101,607	1,919.0	1.9	-6.6 to 19.1
Health Promotion / Disease Prevention	59,440	3,103.6	5.2	-9.3 to 33.7
Medical Remuneration	315,637	9,351.4	3.0	-5.7 to 26.9
Pharmacare	37,591	534.0	1.4	-3.1 to 20.5

(See Tables 19-24 for further detail)

The proposed framework for a needs-based funding methodology for Regional Health Authorities in Manitoba is feasible. The methodology also accomplishes the central objective of ensuring that resources are allocate in proportion to need, both those needs which arise due to differences in age and needs which arise due to differences in health status. Part 4 of this report contains recommendations from the Methodology Advisory Committee concerning aspects of the funding methodology. The section also includes observations from the Methodology Advisory Committee on issues related to the implementation of the funding methodology and issues that warrant attention in future development of the funding methodology. Part 4 of the report concludes with observations from the Manitoba Centre for Health Policy and Evaluation authors of this report concerning some additional implementation issues.

While this report concludes that it is feasible to move to a population-based funding methodology at this time in Manitoba, it is important to declare that it is not an assumption of the population-based funding methodology that the resources allocated by this procedure are necessarily sufficient to meet all existing needs for health care. The resources allocated by this methodology are fixed by the process of government appropriation, which in turn are set within the constraints of revenue available to the federal and provincial

governments. As a result, the more constrained goal of this methodology is to apply a mechanism to ensure that available resources are distributed equitably relative to the distribution of need across populations. It follows that if the resources available to finance health care services are insufficient to meet all needs for health care, the funding methodology should distribute unmet need equitably across Regional Health Authority populations.

It is important to emphasize an additional aspect of the objectives of the population-based funding methodology. The equitable distribution of funds relative to need is, unfortunately, not synonymous with a goal of distributing health care funding to reduce inequalities or differences in need for health care across populations. The immediate goal of the population-based funding formula is to meet existing needs equitably. A strategic initiative to reduce inequalities in health across Regional Health Authority populations would no doubt require a different funding mechanism than is described in this document and would require the involvement of many public and private sector actors in addition to the Ministry of Health.

There are a number of important issues concerning the implementation of a needs-based population funding approach which must be integrated with the resource allocation methodology described in the report. These issues include a mechanism for incorporating adjustments for differences in the costs of health care services across regions, a framework for adjusting Regional Health Authority allocations to account for the provision of care to residents in regions other than the region of residence, an approach to funding tertiary care institutional acute care services in the province, and finally, a clear procedure for scheduling the transition from the historic practice of funding facilities to the new initiative of funding populations. These are important issues that Manitoba Health must consider in implementation. It will be important to proceed carefully and thoughtfully in order to ensure an equitable health care funding mechanism for all residents of Manitoba.

Part 1

INTRODUCTION

There are precedents, both international and Canadian, for the initiative underway in Manitoba to devolve the management and delivery of health care services to regional authorities. An important component of this devolved management initiative is the method by which resources are allocated to Regional Health Authorities for the provision of health care to resident populations (see Regional Resource Allocation References). A central principle of these funding mechanisms is the equitable distribution of resources. In the many jurisdictions which have devolved management authority, emphasis on this equity principle has led to the development of mechanisms to adjust resource allocations for differences in need for health care across regional populations.

The goal of the needs-based population funding methodology described in this report is to allocate health care resources equitably in relation to need for health care services. Within Manitoba, populations served by Regional Health Authorities differ substantially in age structure and in health status. The key determinant of differences in need for health care across populations is age structure. Populations with older age distributions will have a larger requirement for health care services than populations with younger age structures. In addition, however, two populations with the same age structure may have very different health status profiles, again predicting differences in need for health care services. The funding methodology seeks to provide a method of allocating resources such that needs represented by different population age structures and health profiles are fairly met by the resources provided to Regional Health Authorities.

This report describes the elements of a comprehensive methodology for the needs-based population funding of Manitoba is documented in this report. This methodology was developed by the Manitoba Centre for Health Policy and Evaluation (MCHPE), in collaboration with members of a Methodology Advisory Committee appointed by Manitoba Health. MCHPE was a member of the Methodology Advisory Committee (membership of the committee is listed in Appendix A). In the development of the needs-based funding methodology, members of the Methodology Advisory Committee participated in the

definition of goals and objectives of the funding methodology, reviewed and assessed information provided by MCHPE, and at selected places in the methodology where a number of options were seen to be available, made recommendations to Manitoba Health concerning the most appropriate or feasible solution. In the first phase of the project, conducted over the period January to April 1996, MCHPE evaluated existing sources of information on the use of insured health care services by the citizens of the province. The goal of this phase of the project was to develop precise age and sex specific estimates of provincial per capita use of health care services, valued in dollars. The objectives of this assessment were: 1) to identify methodologies for translating measures of service use into dollars, 2) to identify those areas of health service provision, termed service pools, where existing administrative information could not provide estimates of age and sex specific utilization and 3) to identify alternate sources of valid information on population use of health care services where it was absent in Manitoba. The draft report issued by MCHPE in April 1996, titled 'Phase 1: Population-based Resource Allocations'(available from the first author), summarized this first phase and concluded that current sources of information in Manitoba, if supplemented by reasonable assumptions in a small number of service pools, could be used to implement a population-based funding methodology for Regional Health Associations.

In the second phase of the project, MCHPE developed a series of analyses focused on the measurement of differences in population need for health care services and methodologies for adjusting resource allocations for these estimates of need. This work is documented in Part 1 to Part 3 of this report. A series of concluding recommendations are presented in Part 4.

In summary, the proposed methodology proceeds through the following steps. Six service pools were defined by Manitoba Health which aggregated health care services with similar roles and functions: 1) Institutional Acute Care services, 2) Institutional Long Term Care services, 3) Home-Based Continuing Care services, 4) Health Promotion and Disease Prevention services, 5) Medical services and 6) Pharmacare benefits. The specific services contained within each service pool are available on request from MCHPE. Within the six

service pools, estimates were developed of the use of services by discrete 5 year age groups, separately for men and women. From these estimates, mean per capita resource use estimates were developed for each service pool, representing the average dollars of services used per person in each five year age group. Separately, a series of measures of the health status of Regional Health Authority (RHA) populations were obtained and used to assign a measure of need for health care to each Regional Health Authority population. This measure of need for health care was used to adjust the age-specific per capita allocations within each service pool either upwards (in the case of poor health status) or downwards (in the case of good health status) for each Regional Health Authority. This step resulted in a need-adjusted per capita allocation amount which is specific to each Regional Health Authority, and which is then multiplied by the population count in each age group within an RHA population to produce a total need-adjusted allocation of health care resources.

At the time this document was prepared, health care resources available for population-based funding in FY96/97 were defined within six service pool envelopes, as indicated in the following table. The Medical Remuneration service pool and the Pharmacare service pool were included in the methodology development but are not proposed to be population funded in the first phase of implementation.

Institutional Acute Care	$608,929,000
Institutional Long Term Care	$254,969,000
Continuing Care, Home-Based	$101,607,000
Health Promotion / Disease Prevention	$59,440,000
Medical Remuneration	$315,637,000
Pharmacare	$37,591,000

Defining Need for Health Care

The publicly funded health care system in Canada is based on the principle of insuring individuals for the cost of medically necessary care. While the definition of medically necessary care in the early period of medicare was generally limited to acute or chronic hospital care and physician services, over time most provincial programs have expanded the range of

insured services to include nursing home care, some coverage for medications and supportive home care services. Need for medical care can conceptually be defined as the ability or capacity to benefit from health care interventions. These benefits may be in the form of an improvement or restoration of health status, or alternatively, the benefits may come in the form of maintenance or protection of health status. In the former category are the many medical and surgical interventions which seek to cure disorder or reduce the symptoms of disorder. In the latter category are primary prevention interventions such as immunization or supportive services such as are provided by home care programs.

While the concept of need is closely related to the idea of health status, it is this fundamental requirement of a capacity to benefit which conceptually distinguishes measures of population health status from measures of population need for health care. A particularly clear example of this distinction can be seen in the case of the degenerative cognitive disorder of Alzheimer's disease. Individuals with this condition have a serious health deficit. Unfortunately, there is no effective medical therapy which can prevent, mitigate or resolve this disorder. There are, of course, interventions associated with the diagnosis of this condition, with the treatment of conditions secondary to this illness or the provision of supportive care which are effective and which generally meet criteria for needed care.

In a perfect health care system, all effective health interventions would be provided and all ineffective health interventions would not be provided. In reality, a proportion of all care provided is inappropriate. This represents the provision of care which cannot be expected to protect, restore or maintain health status. Similarly, there will be health care needs which will be unmet. This represents persons who would benefit from the provision of therapy but for whom no therapy is provided. A vigilant and well-functioning health care system will aspire to minimize both inappropriate care and unmet need. The outcome of reducing both inappropriate care and unmet needs would be a health care system in which use of health care is concordant with need for health care.

Equity, Equitable Funding and Need

One of the five principles of the universal health insurance programs in Canada is equality of access to care. This principle can be understood to have a number of applications: gender equity, equity across the age course and particularly, geographic equity. In general, the historic patterns of capital investment in health care facilities have reflected, in part, the idea that the distribution of health care facilities should be geographically balanced. At the same time, geographic inequities in the supply of health services do exist. For example, large urban centres have been the preferred location for establishing tertiary level hospital services. In addition, across most provinces in Canada, there has also been a strong tendency for physicians to establish practice in these large urban centres, leading to imbalance in the geographic distribution of physicians. Some of these differences in the geographic distribution of health care resources have led to concerns that access to an equivalent range and quality of health care services may not be equivalent across geographic regions. One of the principles of a population-based funding methodology is to firmly embed a mechanism to assure that the geographic allocation of health care resources is determined primarily by the needs of populations. It is the goal of the Manitoba population-based funding methodology to distribute health care funds such that all populations have equal opportunity to access health care, given that needs may differ across populations.

It is not an assumption of the population-based funding methodology that the resources allocated by this procedure are necessarily sufficient to meet all existing needs for health care. The resources allocated by this methodology are fixed by the process of government appropriation, which in turn are set within the constraints of revenue available to the federal and provincial governments. As a result, the more constrained goal of this methodology is to apply a mechanism to ensure that available resources are distributed equitably relative to the distribution of need across populations. It follows that if the resources available to finance health care services are insufficient to meet all needs for health care, the funding methodology should distribute unmet need equitably across Regional Health Authority populations.

It is important to emphasize an additional aspect of the objectives of the population-based funding methodology. The equitable distribution of funds relative to need is, unfortunately, not synonymous with a goal of distributing health care funding to reduce inequalities or differences in need for health care across populations. The immediate goal of the population-based funding formula is to meet existing needs equitably. A strategic initiative to reduce inequalities in health across Regional Health Authority populations would no doubt require a different funding mechanism than is described in this document and would require the involvement of many public and private sector actors in addition to the Ministry of Health.

Conceptual Issues in Selecting Measures of Need for Health Care

This section presents a brief conceptual framework for understanding the characteristics of different approaches to measuring need for medical care in populations. This is an area of substantial conceptual controversy and equally substantial challenges of measurement. In this section, we introduce two separate frameworks for categorizing indicators of need: direct vs indirect measures and specific vs generic measures.

Direct Measures of Need for Health Care

One approach to identifying need for medical care in RHA populations would be based on a detailed measurement of specific morbidity and disability in these populations. An inventory of specific morbidity measures would include, for example, incidence rates of acute morbidity such as injury or respiratory and gastrointestinal infection, prevalence rates of chronic disorders such as cardiovascular disease, diabetes and arthritis and the prevalence of major and minor mental health disorders. An inventory of disability status of the population would include measures of specific functional impairments and impairments in the performance of roles. At this time in Manitoba, data describing the prevalence of these direct measures of morbidity and disability are not available.

An alternate approach to the direct measurement of need for medical care would rely upon generic measures of health status rather than specific measures of morbidity and disability.

Examples of generic measures would include measures of perceived health status, measures of disability or measures of health status obtained from instruments such as the recently developed Health Utility Index (Feeney et al. 1995; Torrance et al. 1995), which is included in the National Population Health Survey. Generic measures have the advantage of providing a common summary measure of health status for a population, capturing the impact of a wide range of disease and illness conditions in a population. Generic measures have been shown to be sensitive to change over time in the health of populations. The primary obstacle to the use of these measures in a need-based funding formula is the requirement to obtain these data from large-scale survey samples. The recent commitment of Manitoba Health to substantially increase the Manitoba sample size for the 1998 National Population Health Survey will provide the opportunity to obtain Regional Health Authority estimates of need for health care based on direct measures of health status.

Indirect Measures of Need for Health Care

Indirect measures of need for medical care include mortality measures and measures of the social and economic circumstances of populations. Mortality measures are classified as indirect measures of need for medical care primarily because a relatively rare event occurring to a minority of the population is used to characterize the health of the entire population. Measures of the social and economic status of a population can be considered proxy indicators of health status, in that a large body of evidence demonstrates that at all stages of the age course, individuals with fewer economic, educational and social resources have poorer health status (Mustard et al. 1997). Both mortality data and socioeconomic status measures are routinely available for the Manitoba population. Mortality measures can be developed for single year periods, while socioeconomic status measures, derived from the federal census, are available at five year intervals.

It is important to recognize one additional distinction between direct and indirect measures of need. Direct need indicators are measured at the individual level, while indirect measures are generally attributes of populations. One consequence of this distinction is that measures of need based on direct indicators, which are measured at the individual

level, can be related at the individual level to measures of the use of health care services. This is a crucial distinction. Having knowledge of which individuals in a population have diabetes, for example, provides the opportunity to estimate the average use of health services by these individuals and, through a comparison with members of the population without the disease, can lead to estimates of the increased need for health care resources associated with this condition. By contrast, indirect measures of need for health care such as mortality rates do not provide direct information on the relationship between need and health care resources. These issues are examined in more detail later in this document. Understanding the empirical relationship between need, however measured, and the requirement for health care resources is the single most intractable task in population-based funding methodologies.

Methodological Issues in Selecting Measures of Need for Health Care

In addition to the issues raised in the previous section concerning the validity of a population measure of need for medical care, there are also a series of functional characteristics that an indicator of need should possess. These functional characteristics would include:

Transparency and Face Validity: A need indicator should make sense, both to health care professionals and managers and to the general public.

Precision: The precision of a need indicator is determined by two characteristics: 1) the degree to which the indicator can be measured reliably and 2) the stability of the need estimate, which is a function of the prevalence of the characteristic in the population and the size of the sample from which the estimate is obtained.

Measurement reliability focuses on the control of random measurement error. An example of random measurement error would be an error in the Regional Health Authority residential classification of a death, or the classification as a diabetic of an individual person without diabetes. In general, mortality data and many measures derived from the

census are thought to have less measurement error than indicators developed from administrative health care records or self-reported survey responses.

The measurement stability of an estimate also has an influence on the precision of a need indicator. Estimates derived from very small samples of populations have very wide confidence intervals. Similarly, the confidence intervals around estimates obtained from population-based data sources are also determined by the size of the population: small populations have more unstable estimates than large populations. Finally, the estimates for events which are rare in populations, such as infant mortality, are more unstable than conditions such as diabetes which occur more frequently.

Independence: Indicators of need should be independent, in the sense that they should not be susceptible to efforts to report or measure need which might misrepresent the actual health status of the population.

Efficiency, Accessibility and Currency: Finally, the measurement of need should reflect the efficient use of resources and should be based on accepted methodologies which can be understood by Regional Health Authority Boards, managers and constituencies. Consistent with the face validity criteria, the need measure should be as current as possible.

Assessing Potential Measures of Need for Health Care

As a first step in the assessment of possible measures of need for health care, a series of measures of both direct health status and indirect indicators of health status were obtained from sources of information currently available in Manitoba. The criteria for inclusion of an indicator were that the measure was available at a level allowing description of Regional Health Authority populations and that the measure was reasonably current.

Two direct measures of need for health care, describing specific morbidity, were selected: body mass index scores for adults aged 20-74 and the prevalence of diabetes in treatment among adults aged 20-79. One direct measure of need descriptive of generic health status, self-reported disability, was identified. Finally, three indirect measures of health status

were obtained for Regional Health Authority populations: premature mortality, infant mortality and a composite measure formed from attributes of the social and economic characteristics of Regional Health Authority populations.

Body Mass Index (BMI) estimates were obtained from data collected by the Manitoba Heart Health Survey in 1990 from more than 2,600 respondents. Data are reported as the age-adjusted proportion of respondents in each RHA with BMI scores greater than 27. RHA population prevalences are reported in Table 1. It is important to recognize that the sample of the Manitoba Heart Health Survey was not designed to provide Regional Health Authority population estimates.

Diabetes Prevalence in persons aged 20-79 was derived from administrative health care records. A case of diabetes was defined as two or more health care encounters in a three year observation period which reported a diagnosis of diabetes. The one-year crude and age-adjusted treatment prevalence estimates are reported in Table 1. In Table 2, diabetes prevalence rates per 1,000 population, adjusted for age and sex, are reported for two three-year time periods, 1987-89 and 1992-94. The prevalence of diabetes in treatment in the province overall increased from 32.9/1,000 to 43.8/1,000 persons aged 20-79 over this time period. This increased prevalence was observed in all Regional Health Authority populations.

Self-reported Disability was obtained from responses to a question item included in the 1986 census to screen for subjects eligible to be sampled in the 1986 post-censal Health and Activity Limitation Survey (Statistics Canada 1988). Self-reported activity-limiting disability in the period prior to the June 1986 census was assessed by responses to the following question:

"Are you limited in the kind or amount of activity that you can do because of a long-term physical condition, mental condition or health problem: a) at home, b) at school, c) at work, or d) in other activities, eg., transportation to or from work, or leisure time activities?"

Disability prevalence for Regional Health Authority populations, based on responses from a total of 32,000 adults ages aged 20-79, are reported on a crude and age adjusted basis in Table 1.

Table 1
Measures of Need for Health Care Services
Regional Health Authority Populations

	Self-Reported Disability 1986 (2)		Body Mass Index >27 1990 (3)	Prevalence of Diabetes 1994 (5)		Premature Mortality Rate 1990-94		Infant Mortality 1990-94
	Adults 20-79		Adults 20-74	Adults 20-79		Adults < 75		
	Crude /1,000	Adjusted (1) /1,000	Adjusted (1,4) /100	Crude /1,000	Adjusted (1) /1,000	Crude /1,000	Adjusted (1) /1,000	Crude /1,000
Central	114.8	107.7	39.4	37.4	36.1	3.43	3.38	7.78
North Eastman	114.6	117.2	21.7	49.6	48.6	3.59	3.62	10.40
South Eastman	125.2	133.5	35.3	33.3	35.5	2.68	3.05	6.47
Interlake	127.9	120.7	43.1	50.5	47.8	4.15	3.89	9.39
Norman	115.4	136.2	61.0	58.2	68.4	4.01	5.40	7.42
Parkland	157.5	140.0	33.0	62.4	52.9	4.51	3.52	9.25
Burntwood	101.7	153.1	47.9	60.9	91.5	2.87	5.06	11.96
Churchill								
Brandon	97.9	98.1	27.2	36.6	36.5	3.26	3.32	4.59
Marquette	129.4	105.3	42.8	51.0	41.7	4.36	3.31	7.74
South Westman	112.1	93.5	45.7	48.6	40.4	3.83	3.01	7.94
Winnipeg	116.8	119.6	36.3	41.6	42.6	3.59	3.61	6.96
Manitoba	118.4	118.4	38.1	43.8	43.8	3.61	3.61	7.71

1) Age and sex adjusted to the provincial population by the direct method
2) Estimates based on a 5% sample of respondents to the 2B 1986 census, N=32,000 (/hals/tabdis.sas, June 3, 1996)
3) Measure of body mass index obtained from the 1990 Manitoba Heart Health Survey, estimated from 2,645 respondents
4) Sample weights adjusted to estimate Regional Health Authority populations
5) Estimates derived from health care utilization records, Manitoba Health

Table 2
Change in Prevalence of Diabetes, Adults aged 20-79, Between 1987-89 and 1992-94 Regional Health Authority Populations

	1987-89 Adjusted Prevalence /1,000	Standard Error	95% Confidence Interval	1992-94 Adjusted Prevalence /1,000	Standard Error	95% Confidence Interval	Significant Difference 1987-89 vs 1992-94
Central	27.25	0.68	(25.92, 28.57)	36.15	0.77	(34.63, 37.66)	*
North Eastman	42.87	1.34	(40.25, 45.49)	48.35	1.41	(45.57, 51.12)	*
South Eastman	28.55	0.96	(26.67, 30.43)	35.67	1.07	(33.58, 37.77)	*
Interlake	36.84	0.86	(35.16, 38.52)	47.84	0.97	(45.93, 49.75)	*
Norman	55.96	1.83	(52.36, 59.55)	68.74	2.01	(64.78, 72.70)	*
Parkland	36.17	1.08	(34.06, 38.28)	53.43	1.29	(50.89, 55.97)	*
Burntwood	79.07	1.77	(75.60, 82.54)	92.18	1.90	(88.46, 95.90)	*
Churchill	69.56	9.09	(51.73, 87.39)	75.38	9.44	(56.88, 93.88)	
Brandon	30.27	0.97	(28.37, 32.17)	36.61	1.06	(34.52, 38.70)	*
Marquette	31.58	1.08	(29.43, 33.73)	41.98	1.26	(39.51, 44.45)	*
South Westman	30.45	1.08	(28.33, 32.57)	40.28	1.23	(37.86, 42.70)	*
Winnipeg	31.37	0.26	(30.86, 31.87)	42.5	0.29	(41.91, 43.08)	*
Manitoba	32.92	0.20	(32.52, 33.32)	43.82	0.23	(43.36, 44.28)	*

Premature Mortality was defined as deaths occurring to persons under the age of 75 and is reported in Table 1 on a crude and on an age-adjusted basis. In Table 3, crude premature mortality rates per 1,000 population are reported for two consecutive five-year time periods, 1985-89 and 1990-94. Table 4 reports premature mortality, adjusted for differences in the age and sex distribution of Regional Health Authority populations within each time period. In the province overall, premature mortality declined, from 3.87 to 3.61 per 1,000 population. Reductions were also observed in six Regional Health Authority populations. Between these two time periods, premature mortality increased in two RHA populations, Burntwood and Norman.

Infant Mortality, defined as deaths occurring to live born infants in the first 365 days of life, is reported as a rate per 1,000 live births in Table 1, calculated over the period 1990-1994. The change in Regional Health Authority infant mortality rates between 1985-89 and 1990-94 is reported in Table 5.

Social and Economic Characteristics: Seven measures available from the 1986 and 1991 census were selected from public use data files, describing population characteristics at the geographic level of the municipality. The selected measures obtained for the 260 municipal units were: 1) the mean value of owner-occupied dwellings; 2) the proportion of the population aged 25-34 with a high school diploma; 3) the proportion of households with children aged 0-14 that were headed by a female single parent; 4) the proportion of women aged 15 years of age or older in the labour force; 5) the unemployment rate among persons aged 15-24; and 6) the unemployment rate among persons aged 45-54. Values for Regional Health Authority populations are reported in Table 6.

A principal components analysis was performed separately for the 1986 and the 1991 census measures, weighted by population. This procedure assesses common variance across the six variables in the analysis, and was used to create a composite measure combining information from the set of candidate measures. Summary results are reported in Table 7. Results for the two time periods were very similar: 47.2% of the variance among six factors could be explained by a single factor in 1986, and 45.1% was explained

by a single factor in 1991. The weighting coefficients from the Principal Components analysis for each of the six census measures were used to compute a single social and economic factor at the district level. These single factors were used in subsequent analyses to represent the relative social and economic circumstances of district populations.

Table 8 reports correlation coefficients at the RHA level among the selected need indicators at the RHA unit of analysis. The RHA of Churchill has been excluded from these analyses. There is a strong correlation among four of these indicators: self-reported disability, the prevalence of diabetes, the standardized measure of premature mortality, and the composite index of social and economic characteristics. It is important to recognize that this correlation is present for measures which represent different health status constructs and which have been obtained at different points in time. For example, the measure of self-reported disability, a direct measure of generic health status, is correlated with premature mortality (an indirect measure of need for medical care) which has been measured five to ten years following the assessment of disability. This pattern points to the strong persistence of regional health status differences over moderately long periods of time and to the general agreement in the health status profile of a regional population across a range of different measures of health status (Mays et al. 1992). Despite the strong pattern of agreement of the self-reported disability measure with the other candidate health status measures, disability was excluded from further consideration as an indicator of need for health care because a current measure of disability was not available. For similar reasons, the Body Mass Index measure was also excluded from further consideration.

Table 3
Change in Crude Premature Mortality (< 75 years of age)
Between 1985-89 and 1990-94
Regional Health Authority Populations

Standard error estimates based on person years

	1985-89			1990-94			Significant
	Crude Mortality /1,000	Standard Error	95% Confidence Interval	Crude Mortality /1,000	Standard Error	95% Confidence Interval	Difference 1985-89 vs 1990-94
Central	3.55	0.09	3.37, 3,73	3.43	0.09	3.25, 3.61	
North Eastman	3.89	0.15	3.60, 4.18	3.59	0.14	3.29, 3.88	*
South Eastman	2.84	0.11	2.62, 3.06	2.68	0.11	2.46, 2.89	
Interlake	4.32	0.11	4.10, 4.53	4.15	0.11	3.93, 4.36	
Norman	3.79	0.18	3.44, 4.14	4.01	0.18	3.66, 4.36	
Parkland	5.00	0.15	4.70, 5.29	4.51	0.15	4.22, 4.80	*
Burntwood	2.74	0.11	2.52, 2.95	2.87	0.11	2.65, 3.08	
Churchill							
Brandon	4.00	0.13	3.74, 4.25	3.26	0.12	3.02, 3.49	*
Marquette	4.88	0.17	4.54, 5.21	4.36	0.16	4.02, 4.69	*
South Westman	4.29	0.15	3.99, 4.58	3.83	0.15	3.53, 4.12	*
Winnipeg	3.86	0.03	3.80, 3.92	3.59	0.03	3.53, 3.65	*
Manitoba	3.87	0.03	3.80, 3.92	3.61	0.03	3.55, 3.67	*

Table 4

Change in Adjusted Premature Mortality (< 75 years of age)
Between 1985-89 and 1990-94
Regional Health Authority Populations

Estimates standardized to the provincial population by the direct method
Standard error estimates based on person years

	1985-89			1990-94			Significant
	Adjusted Mortality /1000	Standard Error	95% Confidence Interval	Adjusted Mortality /1,000	Standard Error	95% Confidence Interval	Difference 1985-89 vs 1990-94
Central	3.44	0.09	3.26, 3.62	3.38	0.09	3.20, 3.56	
North Eastman	4.01	0.15	3.72, 4.30	3.62	0.14	3.34, 3.89	*
South Eastman	3.23	0.11	3.01, 3.45	3.05	0.11	2.83, 3.27	
Interlake	4.06	0.11	3.84, 4.27	3.89	0.11	3.67, 4.10	
Norman	4.96	0.18	4.61, 5.31	5.40	0.18	5.04, 5.75	*
Parkland	3.91	0.15	3.62, 4.20	3.52	0.15	3.26, 3.81	*
Burntwood	4.63	0.11	4.41, 4.84	5.06	0.11	4.84, 5.27	*
Churchill							
Brandon	4.12	0.13	3.86, 4.37	3.32	0.12	3.08, 3.55	*
Marquette	3.75	0.17	3.42, 4.08	3.31	0.16	2.99, 3.62	*
South Westman	3.43	0.15	3.13, 3.72	3.02	0.15	2.73, 3.31	*
Winnipeg	3.89	0.03	3.83, 3.95	3.61	0.03	3.55, 3.67	*
Manitoba	3.87	0.03	3.80, 3.92	3.61	0.03	3.55, 3.67	*

Table 5
Change in Infant Mortality
Between 1985-89 and 1990-94
Regional Health Authority Populations

	1985-89 Crude Mortality /1,000	Standard Error	95% Confidence Interval	1990-94 Crude Mortality /1,000	Standard Error	95% Confidence Interval	Significant Difference 1985-89 vs 1990-94
Central	7.60	1.05	5.54, 9.65	7.78	1.08	5.66, 9.89	
North Eastman	9.74	2.02	5.78, 13.69	10.40	2.02	6.44, 14.35	
South Eastman	11.19	1.78	7.70, 14.67	6.47	1.34	3.84, 9.09	*
Interlake	8.01	1.35	5.36, 10.65	9.38	1.47	6.49, 12.26	
Norman	10.94	2.43	6.17, 15.70	7.41	1.90	3.68, 11.13	
Parkland	7.80	1.78	4.31, 11.28	9.25	1.88	5.56, 12.93	
Burntwood	12.32	1.49	9.39, 15.24	11.96	1.48	9.03, 14.88	
Churchill							
Brandon	6.90	1.46	4.03, 9.76	4.59	1.22	2.19, 6.98	
Marquette	10.58	2.14	6.38, 14.77	7.74	1.99	3.83, 11.64	
South Westman	8.64	1.83	5.05, 12.22	7.94	1.91	4.19, 11.68	
Winnipeg	8.54	0.45	7.65, 9.42	6.96	0.40	6.17, 7.74	*
Manitoba	8.89	0.34	8.22, 9.55	7.71	0.32	7.08, 8.33	*

Table 6
Measures of Need for Health Care Services
Regional Health Authority Populations

	Average Dwelling Value 1991	Unemployment Rate 1991	Unemployment Rate 1991	High School Diploma 1991	Single Parent Households 1991	Female Labour Force Participation 1991
		Adults 15-24	Adults 45-54	Adults 25-34	Households with Children	
	$	/100	/100	/100	/100	/100
Central	69,300	8.61	3.04	59.4	8.1	58.5
North Eastman	86,800	13.76	4.62	63.3	8.4	57.6
South Eastman	84,600	9.71	4.89	55.0	6.3	60.7
Interlake	86,600	11.75	4.94	63.2	9.8	59.9
Norman	65,300	22.91	4.58	65.0	16.6	58.6
Parkland	51,000	14.40	5.69	61.9	12.1	51.2
Burntwood	74,600	27.98	12.52	52.7	17.1	52.5
Churchill	45,100	32.26	0.00	60.6	17.2	
Brandon	81,500	13.88	5.84	73.4	19.2	62.2
Marquette	60,700	6.99	2.27	60.5	7.8	55.7
South Westman	58,800	4.03	1.51	66.8	6.0	56.8
Winnipeg	98,400	13.96	5.80	75.5	17.7	61.2

Table 7
Principal Component Analysis of Six Census Measures
Analysis Weighted by Population

N=260 Municipalities

1986	Mean	SD	Weighting on Factor 1	Proportion of Variance: Factor 1
Dwelling Value ($)	62,747	20,472	.415	.472
High School Dimploma, ages 25-34 (%)	65.0	13.0	.472	
Female Single Parents (%)	9.6	8.1	-.168	
Female Labour Force Participation (%)	56.1	8.5	.472	
Unemployment, ages 15-24 (%)	13.8	9.1	-.437	
Unemployment, ages 45-54 (%)	5.6	7.1	-.403	

1991	Mean	SD	Weighting On Factor 1	Proportion of Variance: Factor 1
Dwelling Value ($)	85,658	26,890	.375	.451
High School Diploma, ages 25-34 (%)	69.8	14.0	.404	
Female Single Parents (%)	14.9	8.6	-.288	
Female Labour Force Participation (%)	59.9	8.9	.504	
Unemployment, ages 15-24 (%)	13.8	9.4	-.420	
Unemployment, ages 45-54 (%)	6.0	6.1	-.426	

Table 8

Correlation of Candidate Measures of Need for Medical Care
Regional Health Authority Populations (N=11, excluding Churchill)

Underlined coefficients significant at $p < 0.10$

	Disability	Body Mass	Diabetes	Premature Mortality	Infant Mortality
Disability (1986)	1.00	.28	.75	.66	.54
High Body Mass Index (1990)		1.00	.50	.64	.12
Diabetes (1994)			1.00	.88	.69
Premature Mortality (1990-94)				1.00	.43
Infant Mortality (1990-94)					1.00
Composite Social/Economic Factor	.81	.34	.85	.75	.51
Selected Social and Economic Characteristics					
Mean Household Income 1991	.45	.21	.13	.65	.13
Unemployment, 1991	.75	.38	.89	.92	.43
High School 25-44, 1991	-.47	-.23	-.39	-.15	-.58
High School 45-64, 1991	-.42	-.32	-.28	-.04	-.46
Single Parent Households, 1991	.23	.15	.46	.54	-.13
Living Alone, 1991	-.52	-.08	-.63	-.34	-.67
Female Labour Force, 1991	-.46	-.17	-.57	-.24	-.71
Composite Need Indicators					
Social Economic Factor and Premature Mortality and Diabetes	.76	.58	.96	.96	.56
Social Economic Factor and Premature Mortality and Infant Mortality	.76	.59	.93	.96	.58
Social Economic Factor and Premature Mortality	.73	.60	.90	.97	.45

Assessing the Performance of Indicators of Need for Health Care

In this section, we consider the performance of three indicators: premature mortality (both crude and adjusted), the prevalence of diabetes and infant mortality. Specifically, these indicators are evaluated for their ability to detect change in the health of populations over time. For the two mortality indicators, measures have been obtained for two five year time periods: 1985-89 and 1990-94. Diabetes prevalence has been compared for two three year time periods 1987-89 and 1992-94.

Table 3 and 4 report the comparison of premature mortality measures over the two time periods. In the province overall, there was a statistically significant reduction in premature mortality between 1985-89 and 1990-94, from 3.87 / 1,000 population to 3.61 / 1,000. Changes could also be detected at the RHA level over this period. In six RHA populations, the age and sex standardized premature mortality rate showed a statistically significant decrease between 1985-89 and 1990-94 (North Eastman, Parkland, Brandon, Marquette, South Westman and Winnipeg) (Table 4). In the RHA populations of Burntwood and Norman, the age and sex standardized premature mortality rate increased. These data indicate that regional inequalities in health status increased in Manitoba over this time period.

A different attribute of the precision of estimates is presented in the representation of infant mortality data. Again, we have reported infant mortality rates for RHA populations consolidated over two time periods, 1985-89 and 1990-94 (Table 5). Infant mortality is a rare event, with fewer than 1 death in the first year of life per 100 live births. Over the two time periods, provincial infant mortality declined from 8.89/1,000 live births in 1985-89 to 7.71/1,000 live births in the period 1990-94. However, statistically significant differences in RHA infant mortality rates could only be detected for Winnipeg and South Eastman. Despite the fact that the relative reduction in infant mortality over the two time periods was greater than that observed for premature mortality (13.3% vs 6.7%), the small population base in which these deaths occurred (live births vs the total population aged 0-74) result in wider confidence intervals on the infant mortality point estimates.

In Table 2, change in the age-adjusted prevalence of diabetes in treatment among adults aged 20 or older is reported. Between the period 1987-89 and 1992-94, the age-adjusted prevalence of diabetes increased from 32.9 / 1,000 population to 43.8 / 1,000. The prevalence of diabetes in treatment is clearly higher in northern RHA populations, and the increase over these two time periods was observed in all RHA populations.

In a series of analyses not reported in this document, we compared the ability of indicators measured on a single year basis to those measured over multiple years of observation. Each of the three indicators performed less well in detecting change over time when measured on the basis of a single year of observation. For this reason, the methodology adopted the criteria of measurement of mortality events over a five year period.

In summary, each of the three indicators, premature mortality, infant mortality and the prevalence of diabetes, appear to be viable measures of need for medical care on the basis of their measurement characteristics. These measures consistently ranked RHA populations from low to high need and were also able to document change in health status over time.

Combining Indicators of Need for Health Care:
A Blended Indicator

It is unlikely that a single health status indicator would be satisfactory as a measure of need for health care. For reasons associated with both face validity and with measurement precision, an indicator of need that combines information from multiple measures of health status should more accurately represent a population's need for health care than any single measure. A need-adjustment methodology based on multiple health status measures has been developed in both Saskatchewan and British Columbia. There are a number of methodological approaches which permit the combination of need measures, resulting in a composite index of need formed from multiple independent measures (Frohlich and Mustard 1996; Cronbach 1967; Nunnally 1978; Birch et al. 1995).

To examine the options available to construct a composite indicator of need, pooling information from different health status measures, we explored the use of factor analytic

methods as a strategy for combining information contained in the candidate health status indicators. In brief summary, the following procedure was followed.

In the first step, measures of premature mortality, the prevalence of diabetes, the composite measure of six social and economic characteristics and a measure of infant mortality which included counts of stillbirths were obtained for 62 geographic areas in the province, termed 'districts' in this analysis. In the second step, a factor analysis procedure was used to identify the contribution of each of these measures to a common need factor. Three combinations of health status measures were examined: 1) premature mortality, the prevalence of diabetes and the composite social and economic factor, 2) infant mortality, premature mortality and the composite social and economic factor and 3) a combination of premature mortality and the composite social and economic factor. In the third step, a Regional Health Authority need score was computed for each of these combinations from the mean of district scores within each Regional Health Authority, weighted for population. The resulting need indicator is expressed in units of standard deviations from a provincial mean of 0. Negative values of the need measure indicate Regional Health Association populations which are healthier than the provincial mean, and positive values of the need measure indicate populations which are less healthy than the provincial mean.

The results of this series of procedures are described in Table 9, which presents the need indicator score for each of the three combinations for 10 Regional Health Authorities, Brandon and Winnipeg. The rank order of presentation of RHAs in this table is from poor to good health status on the basis of the first blended need indicator, which combines information on the composite social and economic factor, premature mortality and the prevalence of diabetes. The table also reports the composite measure of social and economic characteristics, the age and sex adjusted diabetes prevalence rate, the rate of infant mortality and stillbirth and the age and sex adjusted premature mortality rate for these populations.

On the basis of all three blended indicators, the three northern RHA populations, Burntwood, Norman and Churchill have markedly greater need for health care than the

Table 9
Composite Indicators of Need for Health Care and Component Measures
Manitoba Regional Health Authorities, 1995

Regional Health Authority Composite Need Indicator scores computed from mean of district level values, weighted for population

Regional Health Authority	Composite Need Indicators			Component Indicators			
	Need Indicator #1 Combining A, B & C	Need Indicator #2 Combining A, C & D	Need Indicator #3 Combining A & C	A. Social Economic Factor	B. Diabetes Prevalence /1,000 Age/Sex Adjusted	C. Premature Mortality /1,000 Age/Sex Adjusted	D. Infant Mortality and Stillbirths /1,000 Births
Burntwood	2.071	1.568	2.005	-3.626	92.95	5.21	20.62
Norman	1.797	1.455	1.595	-1.211	70.79	5.54	12.97
Churchill	1.739	3.006	1.115	-1.0533	75.38	4.88	46.72
Parkland	0.489	0.339	0.332	-1.4138	52.71	3.57	14.47
Interlake	0.239	0.258	0.143	0.136	49.46	3.90	15.81
North Eastman	0.134	0.069	0.025	-0.0848	49.52	3.64	15.03
Winnipeg	-0.091	-0.069	-0.105	0.2795	42.64	3.58	13.89
Marquette	-0.164	-0.195	-0.162	-0.0275	42.04	3.38	13.10
Central	-0.285	-0.025	-0.181	0.1949	36.18	3.44	16.17
Brandon	-0.295	-0.436	-0.231	0.0618	36.62	3.31	8.86
South Westman	-0.467	-0.569	-0.581	0.5321	40.28	2.97	12.05
South Eastman	-0.493	-0.464	-0.475	0.1982	35.12	3.00	12.30
Mean				0.0916	44.4	3.59	14.09
Standard Deviation (N=62)				1.5670	14.2	0.84	4.09

nine southern jurisdictions. The need scores for the southern jurisdictions are within one half of a standard deviation of the provincial mean. Within this group of southern RHAs, Parkland, Interlake and North Eastman populations have greater need for health care than the provincial norm, while the populations of Winnipeg, Marquette, Central, Brandon, South Westman and South Eastman have less need for health care than the provincial norm.

In evaluating the selection of a single blended need indicator from the three available options, the Methodology Advisory Committee considered a number of criteria. While all three indicators generally provided a similar rank ordering of RHA populations, the Committee was concerned that the inclusion of a measure of the prevalence of diabetes in treatment would be seen to emphasize a specific disease state, rather than function as a marker of chronic disease burden which was the perspective of the Committee. This measure was also thought to be vulnerable to screening and detection biases, where an RHA may succeed in elevating its need score through a focus on diabetes screening activities. The Committee also identified a limitation of the infant mortality measure due to the relatively instability of this measure for some RHAs with relatively small populations. Accordingly, the Committee recommended selection of the blended need indicator which combined information on premature mortality and the social and economic characteristics of RHA populations.

Need scores for the blended indicator recommended for selection are reported in Figure 1, which also incorporates the underlying values for the blended need indicator observed at the district level within each Regional Health Authority. District level scores on the blended need indicator score are reported in Appendix Table 1.

Estimating the Relationship Between Need for Health Care and Health Care Resources

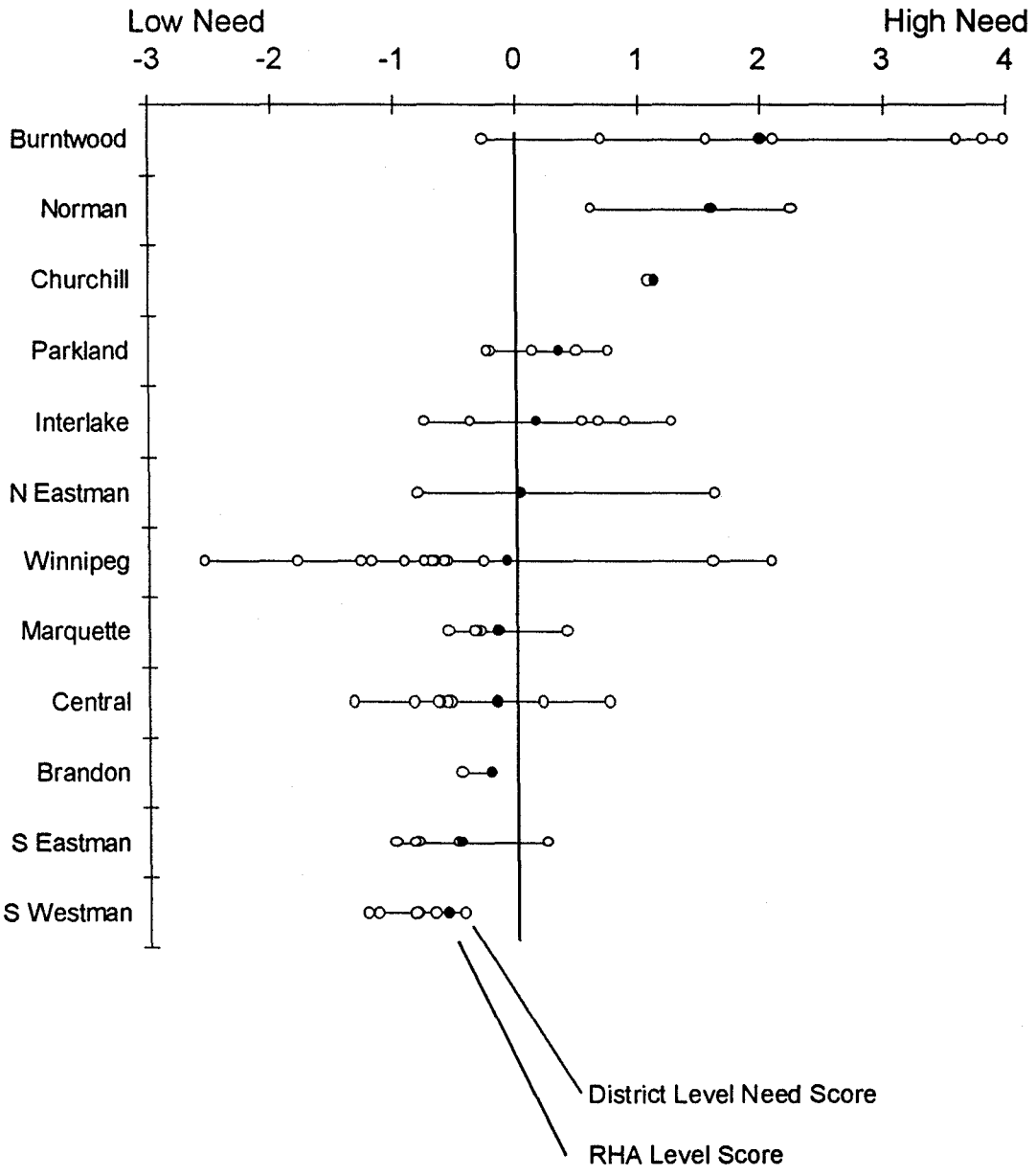
The units of measurement of the blended need indicator, expressed as standard deviations from the provincial mean, do not directly translate into estimates of relative difference in health status across Regional Health Authority populations. For example, it is not correct

to interpret the population of a region with a Blended Need Indicator score 2.0 standard deviations above the provincial mean as having mean population health status that is twice as poor as the provincial average health status or having twice the need for health care services as the provincial population mean. To further illustrate this measurement issue, consider the example of the RHA of South Eastman.

The age and sex adjusted premature mortality rate for this population, 3.05 / 1,000, represents a standardized mortality ratio of 84.4 relative to the provincial premature mortality rate (Table 1). This RHA population has a premature mortality rate 15% lower than the provincial average. The standardized morbidity ratio for diabetes in South Eastman is 0.81 (Table 2: 35.67/43.82), which describes a prevalence of diabetes which is approximately 18% lower than the provincial average. The blended need indicator score for this RHA is estimated to be -0.475. The negative sign expresses the RHA's need as less than the provincial average. All three indicators are consistent in the ranking for this region, while they vary in the units of measurement with which the region is compared to the provincial average.

Figure 1
Blended Indicator of Need for Health Care, 1995

Combining measures of premature mortality and
social and economic characteristics
Regional Health Authorities, Brandon and Winnipeg, Standardized Scores



None of the three indicators, however, directly and explicitly describe the relationship between the indicator and the need for health care. Should a region with an age-adjusted premature mortality rate 15% greater than the provincial average receive an additional 15% allocation of health care resources to meet this greater need? If a region has a blended need indicator score which is 0.50 (one half) of a standard deviation above the provincial average, should it receive an additional 50% in allocated health care resources? As noted early in this document, defining the empirical relationship between need, however measured, and the requirement for health care resources is the single most intractable task in population-based funding methodologies (Carr-Hill et al. 1994; Mays 1989; Smith et al. 1994; Carr-Hill and Sheldon 1992; Hobbs 1993; Sheldon and Carr-Hill 1992; Sheldon et al. 1993). The primary challenge is to establish the weight or ratio which is used to translate measure of need for health care into resource allocation adjustments. There are, in addition, a number of subsidiary issues. One issue is to establish if this weight or ratio value is to be applied equivalently across all service pools. For example, across Regional Health Authority populations, is the relationship between need for health care and the resource requirements in the Acute Care Hospital service pool the same as the resource requirements in the Physician service pool. A second issue is to establish if the weight or ratio value is constant across age groups within a service pool. It may, for example, be the case that differences in need for health care across Regional Health Authorities have a greater impact on health care resource requirements in children than in adults.

One approach to estimating the weight or ratio which would translate differences in need into allocations of health care resources is potentially available from direct measures of need. In the case of these measures, which are obtained at the individual level, the utilization of health services can be documented in relation to the health status of individual people. Table 10 provides an example of the relationship between self-reported all-cause disability and the use of medical care and inpatient hospital care. In this example, the sample has been restricted to residents of Winnipeg, in order to observe a population with access to a similar supply of health care services. Each person in the sample defined as disabled has been matched on age and sex to two individuals who did not self-report disability. The use of health services over a three year period was counted for each person

in the sample, and expressed in the table as per capita use, in dollars. Similar information describing differences between individuals with diabetes and persons without diabetes in the use of medical care and inpatient hospital care are reported in Table 11.

There are two key pieces of information in this analysis. The first is the ratio obtained by dividing per capita use of disabled persons by per capita use of non-disabled persons. This ratio expresses the additional health care resources consumed, on average, by persons with disability relative to persons without disability. Specifically, persons with disability will use 64% more medical care and 147% more inpatient hospital care than members of the population without disability. Persons with diabetes will, on average use 80% more medical care and 193% more inpatient hospital care than members of the population without diabetes. The second crucial piece of information in this analysis is that the ratios for medical care and inpatient hospital care are different. This pattern, if found to be consistent across most direct measures of need, indicates that different adjustment factors or weights, should be set for different health care service pools.

To pursue these issues, MCHPE completed a series of analyses which sought to develop estimates of the empirical relationship between the measure of need and the allocation of health care resources. These analyses were performed on the Winnipeg population, on the assumption that access to health care services was equivalent across geographic areas within the city. Under this assumption it seemed plausible to attempt to derive the relationship between a population's need for health care services and its use of health care.

To obtain information on this relationship, we stratified the Winnipeg city population into 15 geographic areas. Within each of these areas, age-specific per capita utilization of acute hospital care and physician services was computed in dollars for five age groups (See Table 12). Similarly, in the Long Term Care pool, per capita utilization was computed for two elderly age groups. These per capita utilization estimates derived from observed utilization were then regressed on the blended need indicator score for the 15 geographic areas in the city. Person-based information on the utilization of home care services, Pharmacare

Table 10
Use of Insured Medical and Inpatient Hospital Care by Disability Status
Winnipeg, 1986

Disability status obtained from the 1986 Health and Activity Limitation Survey. Information on health care use is obtained from the linked Statistics Canada / Manitoba research database. The utilization of 327 HALS respondents (cases) resident in Winnipeg is compared to utilization of 654 non-disabled controls resident in Winnipeg, matched to cases on age and sex. Utilization was observed over a three year period, April 1985 to March 1988 and expressed as mean per capita use, in dollars. Costs of inpatient hospital care estimated from RDRG case weights.

	Females			Males			Female	Male	Total
	20-39	40-59	60-79	20-39	40-59	60-79			
Medical Care	$	$	$	$	$	$	$	$	$
No Disability	703	803	960	330	615	836	859	688	779
Disability	1303	1240	1567	793	913	1333	1414	1100	1279
Ratio D:ND	1.85	1.54	1.63	2.40	1.48	1.59	1.65	1.60	1.64
Inpatient Hospital Care	$	$	$	$	$	$	$	$	$
No Disability	503	418	956	144	450	1027	708	727	717
Disability	1179	1656	2512	452	1446	2084	1951	1523	1768
Ratio D:ND	2.34	3.96	2.63	3.14	3.21	2.03	2.76	2.09	2.47
Sample Size									
No Disability	78	92	182	56	66	180	352	302	654
Disability	39	46	91	28	33	90	176	151	327

Table 11
Use of Insured Medical and Inpatient Hospital Care by Diabetes Status
Winnipeg, 1994

Diabetes status obtained from a review of diagnostic information on electronic medical claims and hospital separation abstracts. The utilization of 19,035 (cases) resident in Winnipeg is compared to utilization of 19,035 controls resident in Winnipeg, matched to cases on age and sex. Utilization was observed over a one year period, April 1993 to March 1994 and expressed as mean annual per capita use, in dollars. Costs of inpatient hospital care estimated from RDRG case weights.

	Females			Males			Female	Male	Total
	20-39	40-59	60-79	20-39	40-59	60-79			
Medical Care	$	$	$	$	$	$	$	$	$
No Diabetes	291	331	423	144	216	424	325	379	351
Diabetes633	630	701	426	492	691	670	596	633	
Ratio D:ND	2.18	1.90	1.66	2.96	2.28	1.63	2.06	1.57	1.80
Inpatient Hospital Care	$	$	$	$	$	$	$	$	$
No Diabetes	143	158	568	60	154	747	388	474	432
Diabetes1,299	813	1,625	908	795	1,516	1,327	1,204	1,264	
Ratio D:ND	9.08	5.15	2.86	15.1	5.16	2.03	3.42	2.54	2.93
Sample Size									
No Diabetes	1,057	3,005	5,269	864	3,472	5,368	9,331	9,704	19,035
Diabetes1,057	3,005	5,269	864	3,472	5,368	9,331	9,704	19,035	

Table 12
Summary of Regression Results Estimating the Age-Specific Relationships Between Blended Need Indicator and Use of Insured Health Care Services in Winnipeg Areas (N=15)

Coefficient value represents the increase in dollars with a 1.0 unit increase in the Blended Need Indicator Score

Institutional Acute Care Service Pool

Age group	Intercept ($)	Coefficient ($)	SE	p	Multiplier
0-14	312	60	8.4	.0001	.19
15-39	438	59	5.0	.0001	.13
40-59	532	68	7.7	.0001	.13
60-74	1443	92	18.2	.0003	.06
75+	2597	86	95.9	ns	.00
Overall	675	90	14.4	.0001	.13

Medical Remuneration

Age group	Intercept ($)	Coefficient ($)	SE	p	Multiplier
0-14	179	10	3.4	.01	.06
15-39	246	15	3.6	.001	.06
40-59	331	20	6.5	.009	.06
60-74	511	14	10.3	ns	.00
75+	652	19	22.0	ns	.00
Overall	307	18	8.1	.04	.06

Institutional Long Term Care (1)

Age group	Intercept ($)	Coefficient ($)	SE	p	Multiplier
60-74	176	34	15.5	.05	.19
75+	3,097	492	89.0	.01	.13

(1) Analyses based on the exclusion of one Winnipeg area with unusually high per capita utilization

benefits and the use of Health Promotion and Disease Prevention services was not available at the time this work was conducted.

As reported in Table 12, the regression results define an intercept value and a slope coefficient. The intercept value can be interpreted as the per capita utilization of a population with a blended need indicator score of 0.0, which is equivalent conceptually to the mean provincial need. This is also conceptually identical to an age and sex-specific mean provincial per capita utilization measure. Although not derived from a regression analysis, this measure is used throughout the funding model to build RHA allocations adjusted for age and sex. The coefficient defines the increase in dollars of services with a 1.0 unit increase in the blended need indicator score. For example, in children aged 0-14, a 1.0 unit difference in the need score translates into a $60.00 per capita difference in the use of acute hospital resources and a $10.00 difference in per capita use of physician services.

To apply these estimates of the relationship between need and resource allocation, the ratio of the slope to the intercept values obtained from the Winnipeg regressions was computed. This ratio is reported in Table 12 in the column headed 'Multiplier'. This multiplier is then used to need-adjust RHA age specific per capita allocations in the following procedure. The ratio of the slope to the intercept (the multiplier) is multiplied by the need score for each RHA. This value is then multiplied by the age-specific per capita allocation for each RHA. The product of this calculation represents the need adjustment (in dollars) to the per capita allocation within a specific age group. The need adjustment is added to the per capita allocation value and multiplied by the age-specific population count in the region to produce a total need-adjusted age/sex allocation for that age group. A detailed example of these calculations is provided in Table 18 (Part 3: p56).

There are a number of important observations concerning the multiplier values reported in Table 12. The magnitude of the multipliers are much greater in the Institutional Acute Care pool than in the Medical Remuneration pool, reflecting a current pattern in Manitoba which sees the use of hospital care much more strongly related to need than is the use of

physician services. In the Institutional Acute Care Pool, the magnitude of the multiplier declines with increasing age, indicating that the relationship between need and use of hospital care becomes weaker in older age groups. There is a similar pattern of diminishing multiplier values with rising age in the Medical Remuneration service pool. These results have important implications for the application of a need adjustment methodology, suggesting strongly that need adjustment should be performed on an age-specific.

This methodology cannot be used to obtain coefficients for the Health Promotion Disease Prevention service pool or the Home Care service pool at this time. The limitation in these two service pools is the absence of individual-level utilization measures which would support the estimation of the relationship between need and use of services. The Methodology Advisory Committee has recommended that the Institutional Acute Care service pool multipliers be applied to the Health Promotion / Disease Prevention pool, and that the Institutional Long Term Care multipliers be applied to the Home Care service pool, given the increasing integration of care between the institutional care sector and the community-based care sectors.

The committee also recommended that the Institutional Acute Care service pool coefficients be used to need-adjust the Medical Remuneration and Pharmacare service pools, rather than use the multipliers obtained from the observed relationship between need and the use of physician services across small areas of Winnipeg. It was the Committee's judgement that the observed use of physician services was sufficiently discordant with the profile of need in these areas and with the profile of use of hospital services to raise questions about the degree to which physician services were provided in relation to need in this setting. The consequence of applying this recommendation to the Medical Remuneration and Pharmacare service pools is to increase the magnitude of need-based reallocation.

Part 2

APPLYING THE NEEDS-BASED FUNDING METHODOLOGY TO THREE SIMULATED POPULATIONS

In this section, the needs-based funding methodology is applied to three simulated populations of equal size. The purpose of presenting these examples is to provide a clear illustration of the impact on Regional Health Authority funding allocations arising from two central features of populations: their age structure and their relative need for health care services.

To illustrate the impact of these two population features, three simulations based on populations of 100,000 persons are presented. There are three different age structures modelled in the simulations: a population distribution that is younger than the provincial population distribution, a population distribution similar to the provincial population distribution and a population that is older than the provincial population distribution. The younger distribution is typical of northern RHA populations, the provincial distribution is typical of Winnipeg and the older distribution is typical of many southern rural RHA populations.

The health care resource allocations for each of these three populations is then simulated under two assumptions of need for medical care: high and low need. As described in Part 1 of this document, need for medical care in the needs-based funding methodology is measured by an indicator which combines information on premature mortality and the social and economic characteristics of regional populations. Table 13 describes the age structure of the three simulated populations (See also Figures 2-4). In this table, we have reported the ratio of the simulated population to the expected population (based on the provincial age distribution) for five year age groups. A value of 1.00 indicates that the regional population count within an age group is equivalent to the count of persons that would be expected in a similar sized population with the provincial age distribution profile. In the young population simulation, there are more persons at ages 29 or less than would be expected based on the provincial profile, and similarly, there are many fewer persons

Table 13
Age Distributions of Three Simulated Populations of 100,000

Age Group	Ratio of Simulated Population Count in Age Group to Expected Count Based on Provincial Age Distribution		
	Young Population Distribution	Balanced Population Distribution	Old Population Distribution
<1	1.88	0.96	0.86
01-04	1.79	0.94	0.88
05-09	1.59	0.92	0.99
10-14	1.42	0.89	1.07
15-19	1.34	0.91	1.05
20-24	1.27	1.03	0.84
25-29	1.27	1.08	0.72
30-34	1.00	1.07	0.76
35-39	0.85	1.05	0.90
40-44	0.80	1.05	0.87
45-49	0.81	1.05	0.95
50-54	0.75	1.01	1.01
55-59	0.64	0.99	1.12
60-64	0.44	1.00	1.21
65-69	0.28	1.00	1.34
70-74	0.22	1.02	1.35
75-79	0.18	0.99	1.50
80-84	0.15	0.98	1.57
85-89	0.17	0.98	1.72
90-94	0.18	0.97	1.70
95+	0.07	0.93	2.14

Figure 2
Age Distribution of Typical Young Population
Relative to Expected Provincial Distribution

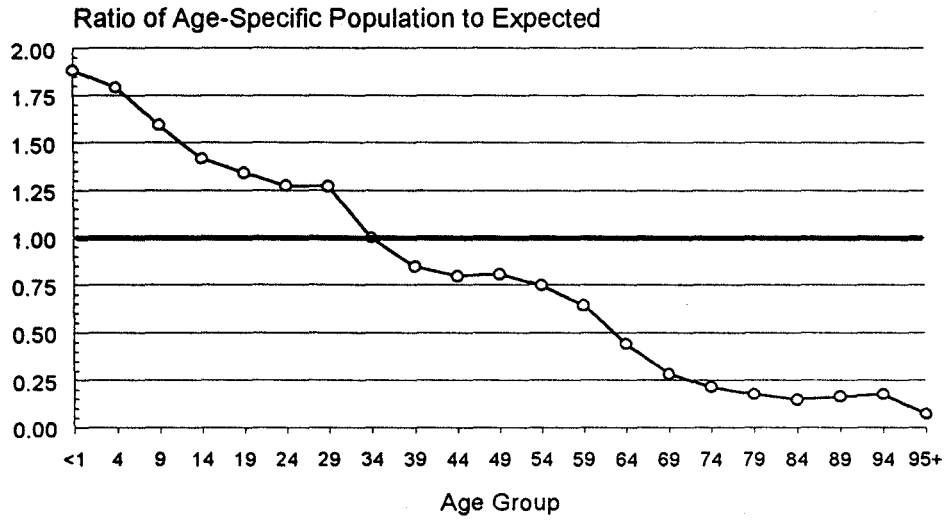
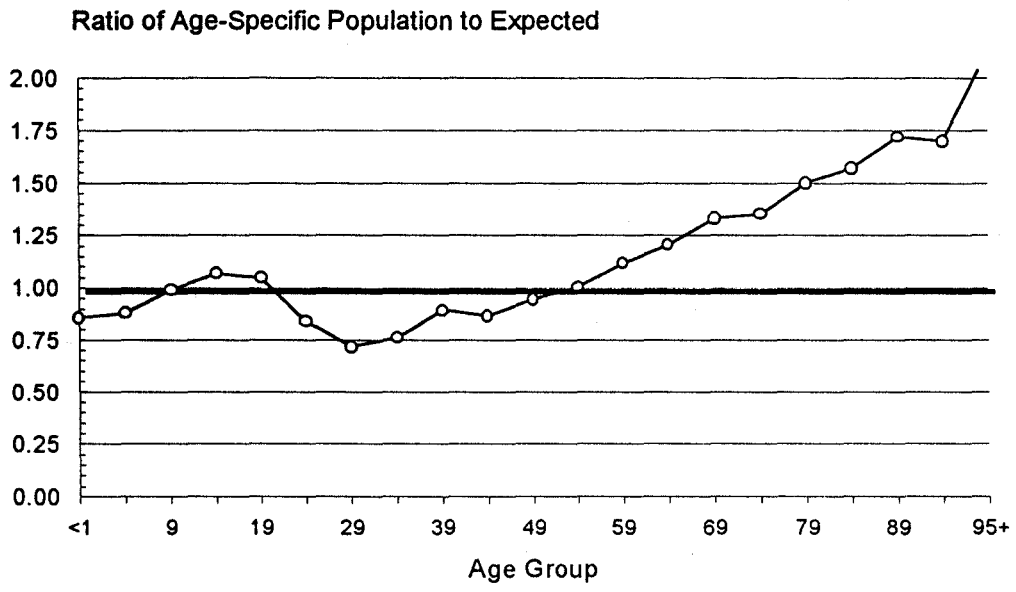


Figure 3
Age Distribution of Typical Balanced Population
Relative to Expected Provincial Distribution

Figure 4
Age Distribution of Typical Old Population Relative to Expected Provincial Distribution



over the age of 50 than would be expected. The inverse pattern is seen in the older population simulation, with an excess of older persons relative to the provincial population distribution. The use of health services is strongly related to age, and this profile of utilization differs across health care service pools. In this simulation, we have represented three service pools: Institutional Acute Care (hospitals), Institutional Long Term Care (nursing homes and extended care facilities) and Health Promotion / Disease Prevention services (community and public health services).

The mean provincial per capita use of institutional acute care services by five year age groups is tabled in the first column of Table 14. With the exception of the first year of life, when use of hospital care is valued at approximately $3,131 per infant, the age specific use of hospital resources rises over the age course, reaching amounts in the range of $3,000 per person by age 80 (all dollar amounts are estimated as of FY96/97). Similar age-specific resource utilization estimates are reported in Table 15 (Institutional Long Term Care) and Table 16 (Health Promotion and Disease Prevention). The use of long term care resources, estimated on a per capita basis, is concentrated among the elderly. The estimated per capita utilization of public health services is more evenly distributed over the age course, with the exception of a much higher allocation of resources to children in the first year of life.

Under an assumption that there is no difference in health status across populations, Regional Health Authority allocations can be calculated by multiplying each age-specific per capita allocation by the number of persons in that age group in each region and summing the product of this age-specific calculation over all age groups. In Table 17 we report these estimated total regional allocations under the first column of each of the three service pools (see also Figures 5-7). It can be appreciated from this table that the age distribution of a population has very large consequences for the allocation of health care resources. A young population of 100,000 people would receive approximately 30% fewer resources for institutional acute care than a population of 100,000 with an age distribution similar to the provincial profile ($53.1 million vs $77.2 million). Conversely, an old

Table 14

Simulation of the Impact of Need Adjustment on Per Capita Allocation for Populations with Poor and Good Health Status
Institutional Acute Care Pool

	Simulation of Per Capita Allocation to Population with Poor Health Status			Simulation of Per Capita Allocation to Population with Good Health Status		
	Age Specific Per Capita Allocation	Per Capita Need Adjustment	Need Adjusted Per Capita Allocation	Age Specific Per Capita Allocation	Per Capita Need Adjustment	Need Adjusted Per Capita Allocation
	$	$	$	$	$	$
<1	3,131.28	965.98	4,097.26	3,131.28	-297.93	2,833.35
01-04	261.92	80.80	342.72	261.92	-24.92	237.00
05-09	150.10	46.31	196.41	150.10	-14.28	135.82
10-14	150.28	46.36	196.63	150.28	-14.30	135.98
15-19	346.79	73.20	419.99	346.79	-22.58	324.21
20-24	499.46	105.42	604.88	499.46	-32.52	466.94
25-29	596.78	125.97	722.75	596.78	-38.85	557.93
30-34	540.77	114.14	654.91	540.77	-35.20	505.57
35-39	431.89	91.16	523.05	431.89	-28.12	403.77
40-44	431.97	91.18	523.15	431.97	-28.12	403.85
45-49	529.00	111.66	640.66	529.00	-34.44	494.56
50-54	640.19	135.13	775.32	640.19	-41.68	598.51
55-59	877.12	185.14	1,062.26	877.12	-57.10	820.02
60-64	1,163.86	113.38	1,277.24	1,163.86	-34.97	1,128.89
65-69	1,569.00	152.85	1,721.85	1,569.00	-47.14	1,521.86
70-74	2,118.11	206.34	2,324.45	2,118.11	-63.64	2,054.47
75-79	2,774.18	0.00	2,774.18	2,774.18	0.00	2,774.18
80-84	3,216.49	0.00	3,216.49	3,216.49	0.00	3,216.49
85-89	3,656.97	0.00	3,656.97	3,656.97	0.00	3,656.97
90-94	3,579.02	0.00	3,579.02	3,579.02	0.00	3,579.02
95+	3,121.05	0.00	3,121.05	3,121.05	0.00	3,121.05

Need adjustment for good health status based on blended need indicator score of -0.50
Need adjustment for poor health status based on blended need indicator score of 1.6

Table 15

Simulation of the Impact of Need Adjustment on Per Capita Allocation for Populations with Poor and Good Health Status
Institutional Long Term Care

	Simulation of Per Capita Allocation to Population with Poor Health Status			Simulation of Per Capita Allocation to Population with Good Health Status		
	Age Specific Per Capita Allocation	Per Capita Need Adjustment	Need Adjusted Per Capita Allocation	Age Specific Per Capita Allocation	Per Capita Need Adjustment	Need Adjusted Per Capita Allocation
	$	$	$	$	$	$
<1	0.00	0.00	0.00	0.00	0.00	0.00
01-04	0.00	0.00	0.00	0.00	0.00	0.00
05-09	0.00	0.00	0.00	0.00	0.00	0.00
10-14	0.00	0.00	0.00	0.00	0.00	0.00
15-19	0.00	0.00	0.00	0.00	0.00	0.00
20-24	0.82	0.00	0.82	0.82	0.00	0.82
25-29	1.61	0.00	1.61	1.61	0.00	1.61
30-34	5.18	0.00	5.18	5.18	0.00	5.18
35-39	6.87	0.00	6.87	6.87	0.00	6.87
40-44	12.50	0.00	12.50	12.50	0.00	12.50
45-49	16.00	0.00	16.00	16.00	0.00	16.00
50-54	26.17	0.00	26.17	26.17	0.00	26.17
55-59	46.39	0.00	46.39	46.39	0.00	46.39
60-64	98.24	30.31	128.55	98.24	-9.35	88.89
65-69	198.98	61.38	260.36	198.98	-18.93	180.05
70-74	493.74	152.32	646.06	493.74	-46.98	446.76
75-79	1,078.72	227.69	1,306.41	1,078.72	-70.22	1,008.50
80-84	2,577.78	544.11	3,121.89	2,577.78	-167.81	2,409.97
85-89	5,685.14	1,199.99	6,885.13	5,685.14	-370.10	5,315.04
90-94	10,716.84	2,262.06	12,978.90	10,716.84	-697.66	10,019.18
95+	17,918.42	3,782.13	21,700.55	17,918.42	-1,166.47	16,751.95

Need adjustment for good health status based on blended need indicator score of -0.50
Need adjustment for poor health status based on blended need indicator score of 1.6

Table 16

Simulation of the Impact of Need Adjustment on Per Capita Allocation for Populations with Poor and Good Health Status
Health Promotion, Disease Prevention

	Simulation of Per Capita Allocation to Population with Poor Health Status			Simulation of Per Capita Allocation to Population with Good Health Status		
	Age Specific Per Capita Allocation	Per Capita Need Adjustment	Need Adjusted Per Capita Allocation	Age Specific Per Capita Allocation	Per Capita Need Adjustment	Need Adjusted Per Capita Allocation
	$	$	$	$	$	$
<1	839.07	258.85	1,097.92	839.07	-79.83	759.24
01-04	134.68	41.55	176.23	134.68	-12.81	121.87
05-09	59.55	18.37	77.92	59.55	-5.67	53.88
10-14	49.16	15.17	64.33	49.16	-4.68	44.48
15-19	30.38	6.41	36.79	30.38	-1.98	28.40
20-24	22.78	4.81	27.59	22.78	-1.48	21.30
25-29	22.51	4.75	27.26	22.51	-1.47	21.04
30-34	22.74	4.80	27.54	22.74	-1.48	21.26
35-39	22.15	4.68	26.83	22.15	-1.44	20.71
40-44	21.36	4.51	25.87	21.36	-1.39	19.97
45-49	21.62	4.56	26.18	21.62	-1.41	20.21
50-54	21.51	4.54	26.06	21.51	-1.40	20.11
55-59	21.27	4.49	25.76	21.27	-1.38	19.89
60-64	20.95	2.04	22.99	20.95	-0.63	20.32
65-69	27.88	2.72	30.60	27.88	-0.84	27.04
70-74	28.31	2.76	31.07	28.31	-0.85	27.46
75-79	29.72	0.00	29.72	29.72	0.00	29.72
80-84	45.22	0.00	45.22	45.22	0.00	45.22
85-89	37.09	0.00	37.09	37.09	0.00	37.09
90-94	34.72	0.00	34.72	34.72	0.00	34.72
95+	0.00	0.00	0.00	0.00	0.00	0.00

Need adjustment for good health status based on blended need indicator score of -0.50
Need adjustment for poor health status based on blended need indicator score of 1.6

Table 17

Simulating Differences in the Age Distribution and Health Status of Regional Health Authority Populations and the Effect on Resource Allocations, Three Service Pools

Based on Populations of 100,000

	Institutional Acute Care			Institutional Long Term Care			Health Promotion, Disease Prevention		
	Total Age/Sex Allocation	Need Adjusted Age/Sex Allocation	Percent Difference	Total Age/Sex Allocation	Need Adjusted Age/Sex Allocation	Percent Difference	Total Age/Sex Allocation	Need Adjusted Age/Sex Allocation	Percent Difference
	$ 000	$ 000	%	$ 000	$ 000	%	$ 000	$ 000	%
Young Population									
High Need	53,181.7	64,460.1	21.2	4,220.9	5,082.4	20.4	6,281.4	8,051.5	28.2
Low Need	53,181.7	49,703.3	-6.5	4,220.9	3,955.2	-6.3	6,281.4	5,735.4	-8.7
Balanced Population									
High Need	77,261.4	88,265.8	14.2	23,062.0	28,080.7	21.8	4,489.9	5,607.5	24.9
Low Need	77,261.4	73,867.4	-4.4	23,062.0	21,514.2	-6.7	4,489.9	4,145.2	-7.7
Old Population									
High Need	90,397.2	100,923.4	11.6	37,526.1	45,693.9	21.8	4,458.4	5,525.5	23.9
Low Need	90,397.2	87,151.0	-3.6	37,526.1	35,007.1	-6.7	4,458.4	4,129.4	-7.4

Percent Difference: percent change in need-adjusted age/sex allocation relative to age/sex allocation
Need adjustment for low need population based on blended need indicator score of -0.50
Need adjustment for high need population based on blended need indicator score of 1.6

Figure 5
Simulation of Need-Adjustment in Three Populations
Institutional Acute Care Pool

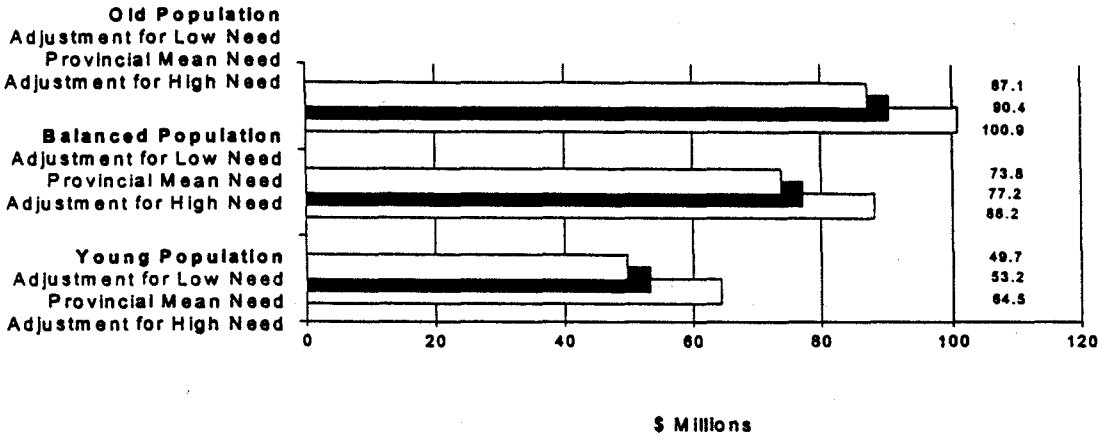


Figure 6
Simulation of Need-Adjustment in Three Populations
Institutional Long Term Care Pool

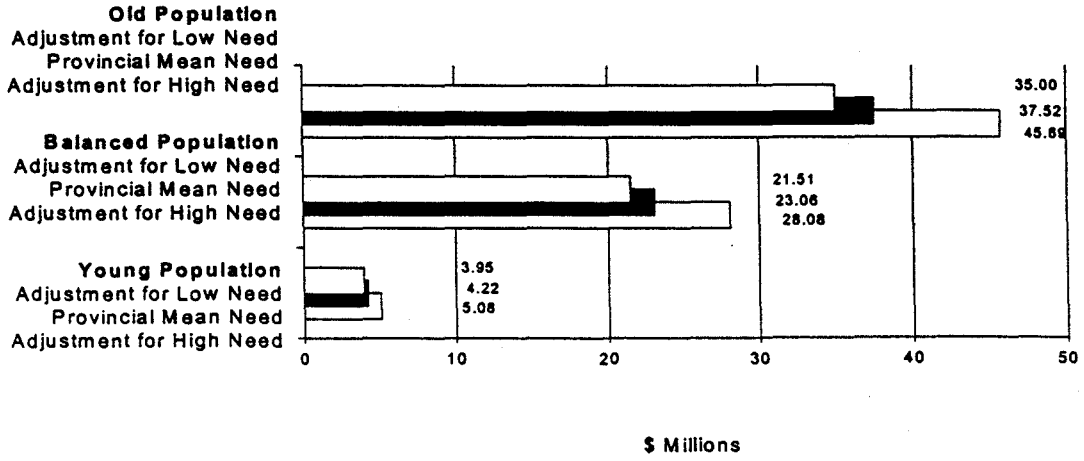
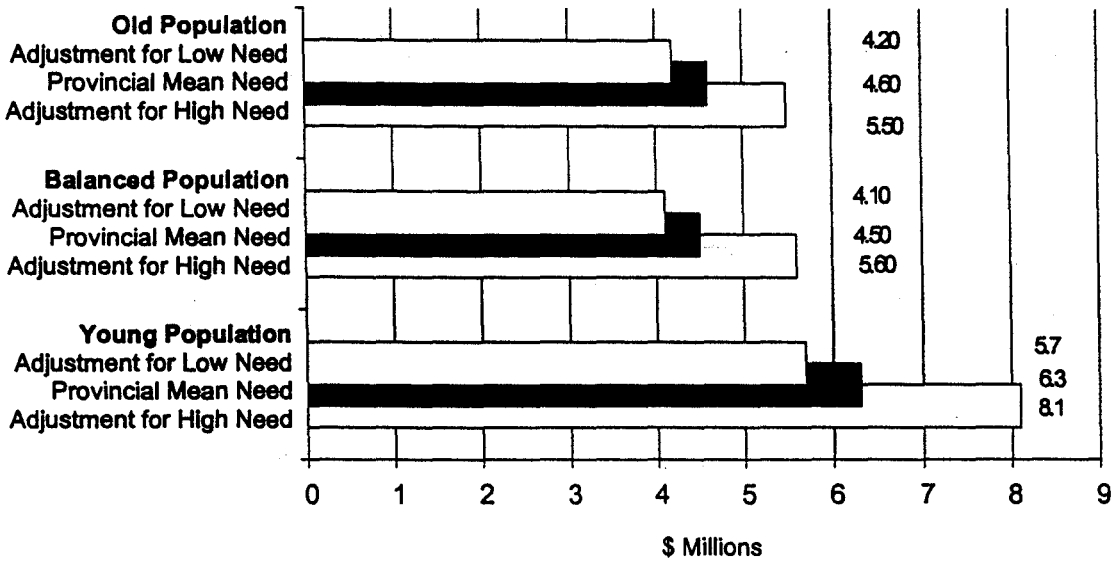


Figure 7
Simulation of Need-Adjustment in Three Populations
Health Promotion / Disease Prevention Pool



population of 100,000 people would receive approximately 17% more resources than the provincial age profile population ($90.4 million vs $77.2 million). The differences attributable to population age structure are even more dramatic in the Institutional Long Term Care pool. Regional Health Authority allocations in the Health Promotion and Disease Prevention pool is less strongly influenced by age structure differences, because the per capita provision of services across age groups is more similar.

The final step in the Regional Health Authority funding methodology involves the application of an adjustment for differences in health status across populations. In making this adjustment, the methodology explicitly implements an assumption that the need for health care, after accounting for age and sex differences in the composition of regional populations, may differ across regions. To state this issue another way, the funding methodology acknowledges that on average, women aged 50-54 in one region may not be as healthy as women of the same age in another region. To ensure an equitable allocation of resources in relation to need for health care, regions with less healthy populations are assigned more resources than regions with more healthy populations, after accounting for differences in population age structure.

The approach to need adjustment in the funding methodology is based on the following sequence of steps. For each region, a measure of need for health care is computed, based on integrating information on premature mortality and a set of social and economic characteristics of the population. This measure of need is used, in turn, to adjust the age and sex-specific per capita allocations within a service pool either upwards (if the region has higher need than the provincial average) or downward (if the region has lower need than the provincial average).

The need adjustment of the per capita age and sex allocation is based on multiplying the region's need score by a coefficient, or multiplier, obtained from analyses of the Winnipeg population's use of health care services. These multipliers were reported earlier in Part 1 (Table 12). In these analyses, the population of Winnipeg has been divided into 15 geographic areas, and need scores for each area are regressed on observed per capita

utilization of hospital services and long term care. The coefficient from these regressions indicates the additional dollars of resources used by a population with a 1.0 unit increase in need score. So, for example, at ages 0-14, the average per capita utilization of hospital resources in Winnipeg is estimated to be $312., and children in areas of the city with a need score 1.0 units above the city average would use $372. ($312 + $60). The multiplier term is simply the ratio of the coefficient to the intercept value.

In Tables 14-16, the second column reports the calculated need adjustment to the per capita age/sex allocation. To illustrate this need adjustment calculation, consider the example of institutional acute care resources for children less than one year of age (Table 16). For the simulated regions, the need score used in these analyses for poor health status is 1.6, and for good health status is -0.5.

Per Capita Need Adjustment, Poor Health Status
= (age-specific per capita allocation) x (Regional Health Authority need score) x (age-specific multiplier)
= $3,131.28 x 1.6 x 0.19
= $965.98

Per Capita Need Adjustment, Good Health Status
= (age-specific per capita allocation) x (Regional Health Authority need score) x (age-specific multiplier)
= $3,131.28 x -0.5 x 0.19
= -$297.93
(Examples do not multiply exactly due to rounding).

The final step in the need adjustment procedure is to increase or decrease the age/sex per capita allocation by the per capita need adjustment value. In this example, in a region with poor health status, the Regional Health Authority would be allocated $4,097.26 ($3,131.28 + $965.98) for each child under the age of 1. In a region with good health status, the Regional Health Authority would be allocated $2,833.35 ($3,131.28 - $297.93) for each

infant. A detailed example of calculations for a region with poor health status is provided in Table 18.

Multipliers derived from the Institutional Acute Care pool regression analyses have also been applied to the Health Promotion and Disease Prevention pool.

Table 17 reports the results of simulating adjustment for poor health status and good health status in each of the three population age structures. In the Institutional Acute Care pool, for example, a high need assumption in a young population would increase the regional allocation by 21.2%, from $53.2 million to $64.4 million. Conversely, a low need assumption would reduce the allocation by 6.5%, to $49.7 million. The impact of these two contrasting need assumptions can be observed in this table across three different age structures and three service pools.

It is clear from these data that differences in age composition and in need for medical care can have very large implications for resource allocation to regions with identical population sizes. For example, the extreme contrast in the Institutional Acute Care pool, between a young population of 100,000 people with low need and an old population of 100,000 with high need: $49.7 million vs $100.9 million. In the Institutional Long Term Care pool the differences are even more substantial: a young population of 100,000 people with low need would be allocated $3.9 million and an old population of 100,000 with high need would be allocated $45.7 million.

Table 18
Example of Need Adjustment Methodology
for a Population with Poor Health Status
Institutional Acute Care Pool

Simulation of Per Capita Allocation
to Population with Poor Health Status

	A. Age Specific Per Capita Allocation	B. Blended Need Indicator Score	C. Multiplier	D. Multiplier X Need Score	E.(1) Per Capita Need Adjustment (D x A)	F. Need Adjusted Per Capita Allocation (A+E)
	$				$	$
<1	3,131.28	1.624	0.19	0.31	965.98	4,097.27
01-04	261.92	1.624	0.19	0.31	80.80	342.72
05-09	150.10	1.624	0.19	0.31	46.31	196.41
10-14	150.28	1.624	0.19	0.31	46.36	196.63
15-19	346.79	1.624	0.13	0.21	73.20	419.99
20-24	499.46	1.624	0.13	0.21	105.42	604.89
25-29	596.78	1.624	0.13	0.21	125.97	722.75
30-34	540.77	1.624	0.13	0.21	114.14	654.92
35-39	431.89	1.624	0.13	0.21	91.16	523.05
40-44	431.97	1.624	0.13	0.21	91.18	523.14
45-49	529.00	1.624	0.13	0.21	111.66	640.65
50-54	640.19	1.624	0.13	0.21	135.13	775.32
55-59	877.12	1.624	0.13	0.21	185.14	1,062.26
60-64	1,163.86	1.624	0.06	0.10	113.38	1,277.24
65-69	1,569.00	1.624	0.06	0.10	152.85	1,721.85
70-74	2,118.11	1.624	0.06	0.10	206.34	2,324.45
75-79	2,774.18	1.624	0.00	0.00	0.00	2,774.18
80-84	3,216.49	1.624	0.00	0.00	0.00	3,216.49
85-89	3,656.97	1.624	0.00	0.00	0.00	3,656.97
90-94	3,579.02	1.624	0.00	0.00	0.00	3,579.02
95+	3,121.05	1.624	0.00	0.00	0.00	3,121.05

Need adjustment for poor health status based on blended need indicator score of 1.6
1) Column E does not multiply exactly due to rounding.

Part 3

APPLICATION OF THE NEEDS-BASED POPULATION FUNDING METHODOLOGY TO REGIONAL HEALTH AUTHORITY POPULATION

This section reports the results of an application of the needs-based population funding methodology to the 12 Regional Health Authority populations. The results are reported separately for the six service pools (Tables 19-24). In these tables we have reported the FY1994/95 population and the need score for each RHA. Column A reports a summary estimate of the per capita age and sex allocation for each RHA which incorporates adjustment for the differing age and sex profiles of the 12 populations. Column B reports the need-adjusted per capita age and sex allocation. As can be seen from the values in this column, the need-adjusted per capita age and sex allocation is increased relative to the per capita age and sex allocation in regions of high need and decreased in regions of low need.

It should be noted that the tables should be used only to understand the impact of need-based funding, and in particular, need-based allocations in comparison to allocations based only on age and sex. The per capita regional allocations in these tables are estimates only, and should not be understood to represent actual dollars that would be distributed by Manitoba Health. Moreover, these estimates do not consider the adjustments that would be required to adjust for cross-boundary service flows that would have a significant impact on the funding that would be made available to RHAs with the implementation of a need-based funding approach.

A summary of the estimated impact of need adjustment on the allocation of total service pool resources is reported in the following table. In the second column we report the total dollars that would be reallocated as a result of need adjustment. Across the six service pools, the need adjustment would reallocate between 1.3% and 5.2% of total pool resources. However, within individual regions, the impact of need-adjustment reallocation could be substantial, ranging from reductions of the order of 1% to 8% in regions with low need, to increases in the order of 14% to 25% in regions with high need.

Service Pool	Total Resources $ 000	Need Adjustment Reallocation $ 000	%	Range (%)
Institutional Acute Care services	608,929	13,778.5	2.3	-4.6 to 26.1
Institutional Long Term Care	254,969	3,310.0	1.3	-0.8 to 24.2
Continuing Care, Home-Based	101,607	1,919.0	1.9	-6.6 to 19.1
Health Promotion / Disease Prevention	59,440	3,103.6	5.2	-9.3 to 33.7
Medical Remuneration	315,637	9,351.4	3.0	-5.7 to 26.9
Pharmacare	37,591	534.0	1.4	-3.1 to 20.5

(See Tables 19-24 for further detail)

The relatively small impact of need adjustment on total pool resources is primarily attributable to the dominance of the RHA population of Winnipeg. This dominance is the result of two factors. First, the Winnipeg jurisdiction contains approximately 57% of the overall provincial population. Second, the need score for the population of the Winnipeg RHA is very close to the average provincial need score. In part this is to be expected given the dominance of the Winnipeg population in the overall provincial population. Because the need score of the Winnipeg population is very close to the provincial mean, a relatively small proportion of the very large proportion of total service pool resources allocated to Winnipeg are reallocated as a result of the needs adjustment. If the population of the province was distributed more equitably across RHAs, the impact of need adjustment on total pool resources would have been much more substantial.

Table 19

Estimated Acute Care Institution Based
Need-Adjusted Age and Sex Allocation for Regional Health Authorities (1)

Regional Health Authority	1994/95 Population	Need Indicator Score (2)	A. Estimated Per Capita Allocation Based on Age and Sex (1)	B. Estimated Need-Adjusted Per Capita Age and Sex Allocation (1)	Percent Difference B vs A
			$	$	
Burntwood	44,148	2.005	352.99	445.08	26.1
Norman	23,969	1.595	425.8	496.53	16.6
Churchill	1,098	1.115	379.23	429.33	13.2
Parkland	44,172	0.332	599.27	613.18	2.3
Interlake	72,860	0.143	508.27	514.18	1.2
North Eastman	37,369	0.025	479.88	480.64	0.2
Winnipeg	648,579	-0.105	512.85	507.73	-1.0
Marquette	37,193	-0.162	610.15	602.72	-1.2
Central	94,748	-0.181	516.66	508.35	-1.6
Brandon	45,988	-0.231	523.23	512.56	-2.0
South Eastman	51,029	-0.475	460.84	439.81	-4.6
South Westman	37,185	-0.582	600.04	574.58	-4.2
TOTAL/AVERAGE	1,138,338		534.93	534.93	0.0

1) The per capita allocation is an estimate only and should not be understood to represent actual dollars that would be distributed by Manitoba Health
2) Standardized Blended Need Indicator combining information on premature mortality and social and economic factors

Table 20

Estimated Long Term Care, Institution Based
Need-Adjusted Age and Sex Allocation for Regional Health Authorities (1)

Regional Health Authority	1994/95 Population	Need Indicator Score (2)	A. Estimated Per Capita Allocation Based on Age and Sex (1)	B. Estimated Need-Adjusted Per Capita Age and Sex Allocation (1)	Percent Difference B vs A
			$	$	
Burntwood	44,148	2.005	40.52	50.33	24.2
Norman	23,969	1.595	122.88	147.62	20.1
Churchill	1,098	1.115	51.73	58.65	13.4
Parkland	44,172	0.332	343.18	355.61	3.6
Interlake	72,860	0.143	202.21	204.46	1.1
North Eastman	37,369	0.025	154.57	153.85	-0.5
Winnipeg	648,579	-0.105	221.71	219.94	-0.8
Marquette	37,193	-0.162	370.8	367.83	-0.8
Central	94,748	-0.181	249.75	247.74	-0.8
Brandon	45,988	-0.231	247.68	245.70	-0.8
South Eastman	51,029	-0.475	165.63	164.31	-0.8
South Westman	37,185	-0.582	360.77	357.88	-0.8
TOTAL/AVERAGE	1,138,338		223.98	223.98	0.0

1) The per capita allocation is an estimate only and should not be understood to represent actual dollars that would be distributed by Manitoba Health
2) Standardized Blended Need Indicator combining information on premature mortality and social and economic factors

Table 21

Estimated Continuing Care, Home-Based
Need-Adjusted Age and Sex Allocation for Regional Health Authorities (1)

Regional Health Authority	1994/95 Population	Need Indicator Score (2)	A. Estimated Per Capita Allocation Based on Age and Sex (1)	B. Estimated Need-Adjusted Per Capita Age and Sex Allocation (1)	Percent Difference B vs A
			$	$	
Burntwood	44,148	2.005	25.83	30.42	17.8
Norman	23,969	1.595	56.03	66.72	19.1
Churchill	1,098	1.115	33.24	36.98	11.2
Parkland	44,172	0.332	126.83	133.53	5.3
Interlake	72,860	0.143	84.42	86.72	2.7
North Eastman	37,369	0.025	70.91	71.79	1.2
Winnipeg	648,579	-0.105	89.31	88.99	-0.4
Marquette	37,193	-0.162	133.03	131.47	-1.2
Central	94,748	-0.181	95.08	93.81	-1.3
Brandon	45,988	-0.231	95.91	94.04	-1.9
South Eastman	51,029	-0.475	70.06	66.71	-4.8
South Westman	37,185	-0.582	129.55	120.97	-6.6
TOTAL/AVERAGE	1,138,338		89.26	89.26	0.0

1) The per capita allocation is an estimate only and should not be understood to represent actual dollars that would be distributed by Manitoba Health
2) Standardized Blended Need Indicator combining information on premature mortality and social and economic factors

Table 22

Estimated Health Promotion / Disease Prevention and Primary Health Care Need-Adjusted Age and Sex Allocation for Regional Health Authorities (1)

Regional Health Authority	1994/95 Population	Need Indicator Score (2)	A. Estimated Per Capita Allocation Based on Age and Sex (1)	B. Estimated Need-Adjusted Per Capita Age and Sex Allocation (1)	Percent Difference B vs A
			$	$	
Burntwood	44,148	2.005	71.03	94.97	33.7
Norman	23,969	1.595	57.25	71.59	25.0
Churchill	1,098	1.115	57.19	67.03	17.2
Parkland	44,172	0.332	50.74	52.80	4.0
Interlake	72,860	0.143	50.14	50.83	1.4
North Eastman	37,369	0.025	53.46	53.24	-0.4
Winnipeg	648,579	-0.105	50.78	49.56	-2.4
Marquette	37,193	-0.162	49.01	47.47	-3.1
Central	94,748	-0.181	54.78	52.80	-3.6
Brandon	45,988	-0.231	51.81	49.57	-4.3
South Eastman	51,029	-0.475	54.38	49.85	-8.3
South Westman	37,185	-0.582	50.42	45.72	-9.3
TOTAL/AVERAGE	1,138,338		52.22	52.22	0.0

1) The per capita allocation is an estimate only and should not be understood to represent actual dollars that would be distributed by Manitoba Health
2) Standardized Blended Need Indicator combining information on premature mortality and social and economic factors

Table 23

Estimated Medical Remuneration

Need-Adjusted Age and Sex Allocation for Regional Health Authorities (1)

Regional Health Authority	1994/95 Population	Need Indicator Score (2)	A. Estimated Per Capita Allocation Based on Age and Sex (1)	B. Estimated Need-Adjusted Per Capita Age and Sex Allocation (1)	Percent Difference B vs A
			$	$	
Burntwood	44,148	2.005	234.55	297.54	26.9
Norman	23,969	1.595	265.62	314.58	18.4
Churchill	1,098	1.115	252.73	287.34	13.7
Parkland	44,172	0.332	304.36	313.17	2.9
Interlake	72,860	0.143	279.2	283.06	1.4
North Eastman	37,369	0.025	270.57	270.93	0.1
Winnipeg	648,579	-0.105	276.24	272.85	-1.2
Marquette	37,193	-0.162	307.17	301.80	-1.7
Central	94,748	-0.181	278.67	272.82	-2.1
Brandon	45,988	-0.231	283.3	275.95	-2.6
South Eastman	51,029	-0.475	263.27	248.70	-5.5
South Westman	37,185	-0.582	303.6	286.23	-5.7
TOTAL/AVERAGE	1,138,338		277.28	277.28	0.0

1) The per capita allocation is an estimate only and should not be understood to represent actual dollars that would be distributed by Manitoba Health
2) Standardized Blended Need Indicator combining information on premature mortality and social and economic factors

Table 24

Estimated Pharmacare

Need-Adjusted Age and Sex Allocation for Regional Health Authorities (1)

Regional Health Authority	1994/95 Population	Need Indicator Score (2)	A. Estimated Per Capita Allocation Based on Age and Sex (1)	B. Estimated Need-Adjusted Per Capita Age and Sex Allocation (1)	Percent Difference B vs A
			$	$	
Burntwood	44,148	2.005	14.40	17.36	20.5
Norman	23,969	1.595	23.95	27.00	12.8
Churchill	1,098	1.115	18.31	20.13	10.0
Parkland	44,172	0.332	42.18	43.03	2.0
Interlake	72,860	0.143	33.95	34.33	1.1
North Eastman	37,369	0.025	30.94	31.05	0.4
Winnipeg	648,579	-0.105	33.17	32.99	-0.5
Marquette	37,193	-0.162	43.55	43.22	-0.8
Central	94,748	-0.181	33.42	33.10	-1.0
Brandon	45,988	-0.231	33.88	33.43	-1.3
South Eastman	51,029	-0.475	28.21	27.30	-3.2
South Westman	37,185	-0.582	42.28	40.96	-3.1
TOTAL/AVERAGE	1,138,338		33.02	33.02	0.0

1) The per capita allocation is an estimate only and should not be understood to represent actual dollars that would be distributed by Manitoba Health
2) Standardized Blended Need Indicator combining information on premature mortality and social and economic factors

Part 4

RECOMMENDATIONS, IMPLEMENTATION ISSUES AND FUTURE DEVELOPMENT ISSUES

In this section, we report the primary recommendations of the Methodology Advisory Committee concerning the approach to the measurement of the need for health care and the approach to need adjustment of RHA resource allocations. In addition, important implementation issues and future development issues identified by the committee are reported. This section concludes with a series of observations from the MCHPE authors of this report, identifying some additional issues concerning the implementation of a needs-based population funding methodology.

Methodology Advisory Committee Recommendations

Measuring Need for Health Care

Recommendations

Until such time as the availability of direct measures of population health status may be available in Manitoba on a routine basis, the Methodology Advisory Committee recommended that the source of information on population need for health care be derived from indirect measures of health status, specifically, premature mortality and the social and economic characteristics of Regional Health Authority populations.

Implementation Issues

The Methodology Advisory Committee recommended that the measure of need for health care be updated as frequently as information permits. Specifically, the Committee recommended that the measure of need be renewed annually by the inclusion of mortality information for the most current year (replacing the oldest year in the five year mortality series used to compute RHA age-adjusted premature mortality rates). In addition, the composite measure of social and economic characteristics would need revision on a five year cycle, as information becomes available from the Canadian census. Information from the 1996 census is expected to be available in the spring of 1998.

Future Development Issues

The Ministry of Health has invested in a large sample of survey respondents in the 1996 National Population Health Survey (NPHS). This investment will provide for the unique and important opportunity to obtain direct measures of health status for Regional Health Authority populations. The Ministry should undertake a commitment to examine the range of measures of health status available from this survey, to confirm that the indicator of need for health care developed for the needs-based funding methodology is consistent with the health status profiles which may be developed from the NPHS. Because the Ministry of Health has not made a commitment to repeat the large NPHS sample at this time, it may not be feasible to consider replacing the component elements of the need indicator with measures from the NPHS.

At the same time, the availability of enhanced information in the future (from the NPHS or other sources) may indicate the selection of need measures which are specific to each service pool. For example, a measure of disability in populations may be a more valid and useful measure of need for community-based home care services than the need indicator developed for the initial implementation of the needs-based funding methodology. The use of a common need indicator across all service pools in the initial implementation of the funding methodology was guided primarily by the absence of information on population health status, rather than by a conceptual or utilitarian preference for a single, common indicator of need.

Need-Adjusting RHA Resource Allocations

Recommendations

A core component of the needs-based funding methodology is the procedure by which differences in the measure of need for health care are translated into adjustments to the base per capita age and sex allocation of resources. This issue can be simply stated as the problem of determining how many additional dollars of resources should be allocated on the basis of a one unit change in the need indicator. The Methodology Advisory Committee developed a clear and coherent approach to addressing this component of the funding methodology. At the same time, the Committee recognized that this issue cannot

be resolved by reliance solely on empirical approaches. As noted early in this document, defining the empirical relationship between need, however measured, and the requirement for health care resources is the single most intractable task in population-based funding methodologies. While the specific range of multiplier values proposed by the Methodology Advisory Committee resulted in a redistribution of resources which is consistent with the experience in many other jurisdictions, it is important to emphasize that the body of scientific information which might be used to try to quantify the relationship between health status and need for health care is not sufficiently mature to resolve this issue. Accordingly, the Ministry of Health should recognize that the choice of 'weights' or multiplier values by which measures of need are translated into resource allocation adjustments is a component of the methodology which allows policy discretion.

The Methodology Advisory Committee recommended that the need indicator be applied on an age-specific basis, reflecting evidence that differences in need across RHA populations appeared to have different implications for health care use which are dependent on age. Further, the Committee recommended that the 'weight' of need adjustment should vary across service pools. The Committee's recommendations are detailed in the body of the report.

As noted earlier in this report, pool-specific estimates of the multiplier term cannot be developed for the Health Promotion / Disease Prevention service pool or the Home Care service pool at this time. The limitation present in these two service pools is the absence of individual-level utilization measures which would support the estimation of the relationship between need and use of services. The Methodology Advisory Committee has recommended that the Institutional Acute Care service pool multipliers be applied to the Health Promotion / Disease Prevention pool and that the Institutional Long Term Care multipliers be applied to the Home Care service pool. This recommendation reflects the increasing integration of care between the institutional care sector and the community-based care sectors.

The Committee also recommended that the Institutional Acute Care service pool multipliers be used to need-adjust the Medical Remuneration and Pharmacare service pools, rather than use the multipliers obtained from the observed relationship between need and the use of physician services across small areas of Winnipeg. It was the Committee's judgement that the observed use of physician services was sufficiently discordant with the profile of need in these areas and with the profile of use of hospital services to raise questions about the degree to which physician services were provided in relation to need in this setting. The consequence of applying this recommendation to the Medical Remuneration and Pharmacare service pools is to increase the magnitude of need-based reallocation.

A summary of the impact of need adjustment on the allocation of total service pool resources is reported in Part 3 of this report. Across the six service pools, the need adjustment reallocates between 1.3% and 5.2% of total pool resources. However, within individual regions, the impact of need-adjustment reallocation can be substantial, ranging from reductions of the order of 1% to 9% in regions with low need to increases in the order of 19% to 34% in regions with high need.

Additional Implementation Issues identified by MCHPE

There are a number of significant issues in the implementation of the protocol for funding Regional Health Authorities which would need to be integrated with the needs-based population funding methodology described in this report, in order to ensure that resource allocation would be equitable and that the routine administration of this protocol would be feasible. These observations are provided by the Manitoba Centre for Health Policy and Evaluation authors of this report. These issues are:

1) a mechanism for incorporating adjustment for differences in the costs of health care inputs across regions;
2) a framework for adjusting Regional Health Authority allocations to account for the provision of care to residents in regions other than the region of residence;
3) an approach to funding tertiary care institutional acute care services in the province;

4) a clear procedure for scheduling the implementation of population-based funding, which represents the transition from the funding of facilities to the funding of populations;
5) distortions in the equity of RHA funding that may arise if implementation of population-based funding is accomplished in phases;
6) future development issues.

1. Adjusting for Differences in the Costs of Inputs

In each of the six service pools incorporated in the needs-based funding methodology, there is the potential for the true cost of health care inputs to be different across Regional Health Authorities. One example is the provision of home care services, where RHAs with substantial rural populations will incur a higher transportation cost for each hour of actual home care service than an RHA with a predominantly urban population. Another example can be found in the Medical Remuneration services pool, where tariff supplements are provided to physicians who practice in rural or northern setting.

Throughout the health care system, there are cost differentials associated with both material inputs and labour inputs which must be accounted for in the allocation of health care resources. In the needs-based funding methodology, we have recommended that these adjustments would be implemented following the calculation of each region's needs-adjusted population allocation. The measurement of the specific scope and scale of these cost differentials was not within the mandate of this project.

2. Accounting for Cross-Boundary Service Flows

In some service pools, particularly the Institutional Acute Care pool, there will be very large flows of patients across regional boundaries to receive services. Some jurisdictions have adopted purchasing mechanisms to facilitate the transfer of resources associated with these cross-boundary migrations of patients to service sites. The Ministry of Health in Manitoba has chosen, appropriately, not to use a purchaser/provider contracting relationship to transfer resources among Regional Health Authorities. Instead, the Ministry of Health is proposing to retain the accounting of inter-regional patient migration as a core

responsibility of the Ministry and will transfer the associated resources administratively. This is a decision consistent with the current policy frameworks in all four western Canadian provinces.

There are a number of issues in the implementation of a mechanism for the accounting and adjustment of cross-boundary service flows which would need to be resolved with the agreement of the Regional Health Authorities. One issue is whether the accounting is based on utilization patterns observed in the previous fiscal year or the current fiscal year. In the former case, resource allocations might be adjusted prospectively, prior to the beginning of a fiscal year. In the latter case, resource allocations would be adjusted retrospectively. In either case, it would be important for each Regional Health Authority to have a current estimate of the total resource allocation in each service pool which can be anticipated to be assigned to other regions.

In addition, the Ministry of Health would need to develop a framework of policies to ensure that obstacles to the flow of patients across Regional Health Authority boundaries did not develop. In many circumstances, achieving the principle of equitable access to health care can only be accomplished if there are no barriers to patients travelling across RHA boundaries to obtain care.

3. Funding Tertiary Care Services and Tertiary Care Facilities

There are two prominent issues that would need to be considered in the integration of tertiary care services in a regional funding methodology. One issue focuses on the option of segregating or integrating the resources associated with tertiary care services in the funding methodology. Given that tertiary level acute care hospital services are formally provided by facilities located in only two Regional Health Authorities in the province (Brandon and Winnipeg), one option in the funding methodology is to withhold or segregate the resources associated with this care from the needs-based population funding procedure. Under this scenario, resources to fund tertiary care would be allocated by the Ministry of Health directly to RHAs which operate tertiary care facilities, with the understanding that these resources are to be used to provide services to all residents of the

province. Alternatively, resources associated with tertiary level hospital care would be allocated to RHAs in the funding formula, but would then be assigned back to the RHA of service by the Ministry of Health.

A separate issue concerns the estimation of the resource requirements of tertiary level care. The case weight methodology used in the funding formula to translate estimates of resource intensity of categories of hospital care into dollars is generally understood to adequately compensate facilities for costs of inputs across the spectrum of levels of care. However, there are a number of factors which may increase the resource requirements associated with tertiary care which are not accounted for in this methodology. One example are the costs associated with the teaching function, which in Manitoba is largely integrated within the tertiary care role. In the United States, HFCA's DRG Medicare payment schedule currently provides a supplement of approximately 10% for hospital care provided in teaching hospitals. It would be important for Manitoba Health to assess the degree to which supplements would need to be incorporated in the funding methodology to sustain the tertiary care sector in Manitoba. These issues are developed in more detail in the section of the Appendix describing the estimation of resource requirements in the Institutional Acute Care service pool.

4. The Schedule for Implementation of Population-Based Funding

The transition from funding based on historical patterns to funding based on need-adjusted age and sex allocations would not be appropriate to achieve in a single fiscal year. The opportunities for significant disruptions to existing service delivery would be very great. Instead, need-adjusted age and sex allocations should be considered funding targets. It is a policy decision to determine the rate at which the transition from the historical funding methods to the new population-based funding methodology is scheduled. The Committee recommends that these transition schedules would be negotiated directly with individual Regional Health Authorities.

5. Potential Distortions in Allocation Equity Arising from Phased Implementation

There are a number of clear patterns in the use of health care services by RHA populations in Manitoba that arise from features of history and geography that had influenced the distribution of the supply of health care resources across regions. One distinct pattern of health care use is the higher per capita use of physician services in Winnipeg relative to rural residents of the province, after adjusting for differences in age and other measures of need for health care. Another distinct pattern is a higher per capita use of short stay acute hospital care by rural residents relative to residents of Winnipeg. The complete explanation for these patterns is not entirely clear, but most observers attribute a substantial component of these patterns to differences in the supply of health care facilities and providers.

One of the effects of the needs-based funding methodology is to remove these differences in historic patterns of health care resource use, by funding RHAs on the basis of the characteristics of their populations. And one consequence of this change is that within a specific service pool, some regions would receive fewer resources and some regions more resources than their populations have historically used. Two of the most substantial adjustments relative to historic use patterns will be: 1) a re-allocation of physician service resources from urban to rural populations, and 2) conversely, a re-allocation of acute care hospital resources from rural to urban populations. If both these service pools are population funded, on balance, the funding formula will produce equity in RHA resource allocation relative to the needs of the populations they serve. However, if the implementation of needs-based funding were phased, such that the Institutional Acute Care pool was population-funded prior to the medical services pool, there would be distortions in the achievement of equity. There would be a need to incorporate adjustments for these effects during the interim implementation period.

6. Future Development Issues

The development work described in this report incorporates an assessment of the degree to which current sources of information in Manitoba are sufficient to accurately describe the population's use of health care services. There are two service pools for which

information is not currently available on the use of services by individuals: Home Care services and services provided in the Health Promotion / Disease Prevention service pool. On an interim basis, the Methodology Advisory Committee recommended that per capita utilization information for these service be obtained from other provinces, until such time as information becomes available in Manitoba. When available, per capita utilization information based on current Manitoba practices should be incorporated in the needs-based population funding methodology.

In developing the funding methodology, a number of obstacles were encountered to clearly partition care between the institutional acute care sector and the institutional long term care sector. These obstacles arose in attempting to identify care in the acute care sector which was either explicitly or implicitly more correctly defined as long term care. There are numerous examples of this category of acute care utilization: an individual admitted to hospital for the treatment of an acute disorder who is then panelled for admission to a personal care home or an individual admitted to hospital for an acute condition who then goes on to receive an extended course of rehabilitation in the acute care facility. It was the ambition of the funding methodology both to accurately enumerate the number of days of care in this category and to estimate accurately the resource requirements of this care, in order to re-assign these resources from the institutional acute care sector to the institutional long term care sector. Unfortunately, at this time there are substantial obstacles to achieving both accurate enumeration and accurate estimates of resource use. Accordingly, this category of care has been retained in the Institutional Acute Care pool. There is no reason to expect that this decision will distort the allocation of resources to Regional Health Authorities. However, as information sources improve, the clarity of the boundary between acute and long term care in the institutional sector should be an area of future attention.

In the future, if enhanced information becomes available concerning aspects of population health status or need for health care (from the NPHS or other sources), it appropriate to assess the performance of need measures which are specific to each service pool. For example, a measure of disability in populations may be a more valid and useful measure of

need for community-based home care services than the need indicator developed for the initial implementation of the needs-based funding methodology. The use of a common need indicator across all service pools in the initial implementation of the funding methodology was guided primarily by the absence of information on population health status, rather than by a conceptual or utilitarian preference for a single, common indicator of need.

Finally, Manitoba Health should continue to review the original designation of the six service pools. Specifically, there are strong arguments for integrating the array of services provided in the area of mental health within a dedicated funding envelope. Current mental health policy initiatives in most settings have emphasized the importance of the coordination of care across the spectrum of mental health services in inpatient acute care psychiatric services, psychiatric facilities, ambulatory mental health services provided by physicians and community mental health programs. This coordination is more likely to be successfully accomplished if funding is allocated to a common service pool.

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Appendix A
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Appendix B
An Interface between "A Needs-based Funding Methodology for Regional Health Associations" and "A Project to Investigate Expenditures on Health Care for Manitobans"

There are two reports which will be released by MCHPE at or about the same time. While these two reports have different mandates, there are sufficient similarities between the two that readers may wonder why the findings are not the same. The authors felt it would be beneficial for the readers to include this brief insert which highlights some of the key differences in methods and assumptions between the two.

The two projects are: *A Project to Investigate Expenditures on Health Care* (Shanahan et al.) and *A Needs-based Funding Methodology for Regional Health Associations* (Mustard et al.). The first is one of a series reports referred to as POPULIS. The POPULIS reports examine the utilization of health services, or in this instance the expenditure on health services by the populations in various areas of the province. The second project was done in support of a Methodology Advisory Committee at Manitoba Health which was asked to consider options for a needs-based funding methodology and to recommend a methodology to Manitoba Health.

Each project had its own purpose and therefore the methods were different. The POPULIS project's mandate was to attempt to devise methodologies to describe how much the province spent providing health services to residents of different areas, separately for each sector (hospital, physician, long term care etc.) and then in total across all sectors. This project was limited by the availability of data, primarily the lack of utilization data for public health, home care, and other outpatient services. The year of 1993/94 was chosen and expenditures were attributed to individuals sector by sector, and then finally totalled for each Regional Health Authority (RHA) and nine areas of Winnipeg. For example, inpatient expenditures were attributed to individuals based on actual hospitalizations, using case weights which were adjusted for factors which affect costs including: length of stay, severity of illness, whether the patient was acute or non-acute, transfer or death. This attempted to account for all measurable factors which affect the costliness of a specific stay. The actual costs at each hospital were also factored into this estimation.

Expenditures in each sector included in the report, outpatient hospital; personal care home; long-term care; physician remuneration; mental health; and home care were estimated and allocated using separate methodologies. At the end of this project, the expenditures by the populations in each of the various areas of the province for the year of 1993/94 were described.

The goal of the needs-based funding methodology project was different. Here, the purpose was to devise a method to allocate future total provincial government expenditures, from each of six service pools, equitably to the RHAs in relation to their area's need for health care services. Within each of the service pools, per capita estimates were developed on the use of services by men and women of different ages and were converted to dollar estimates. Next, these per capita resource estimates were then used to allocate health care resources to each RHA based on the age and sex distribution of its population. Separately, a series of measures of health status for the RHA populations were determined and these were used to adjust the age-specific per capita allocations within each service pool either upwards (in the case of poor health status) or downwards (in the case of good health status) for each RHA.

The methods for estimating per capita expenditures within each of the service pools was different than the methods used in the POPULIS report to a greater or lesser degree depending upon assumptions made by the investigators and committee members. For example, the first step in the allocation of the Institutional Acute Care pool (hospitals) in the needs-based funding project was to determine the average expenditure on hospital services across the province in each of the age-sex strata. The was done using case weights but unlike the POPULIS project there were no adjustments for long length of stay, non-acute care or deaths. Also once the weights were attributed the total acute hospital budgets were allocated based on mean provincial rather than hospital specific costs. These differences reflect differences in purpose, the POPULIS report goal was to estimate expenditures which occurred in 1993/94 whereas the needs-based funding project's objective was to distribute provincial government dollars equitably to the RHAs in relation to need for health care services.

In summary, an important difference is that there are no needs adjustment in the POPULIS project and it is paramount to the needs-based funding project. Another major difference stems from the fact that the POPULIS project is looking at what actually occurred in 1993/94 and the needs -based funding methodology project is building a methodology for the future. Key differences between the two projects are listed in the table below.

	POPULIS	**RHA Needs-based Funding Methodology**
Purpose	Sum expenditures across regions	Devise funding methodology for the future
Needs -adjusted	No	Yes
Age adjusted	yes	yes
Year of data used	1993/94	1994/95
Adjustment for case mix	yes	yes
Adjustment for long stay cases	yes	no
Weights applied to cases	Case weights (RDRGs)	Typical weights (CMGs)
Hospital Specific costs	Yes	No
Outpatient Hospital Expenditure allocation	Mixture of inpatient -outpatient utilization data	Inpatient utilization data
Length of Hospital Stay	Short Stay - only if transfer or death otherwise received the Typical weight	Short Stay - adjustment if the LOS was less than half of the average LOS for that CMG and the ALOS was >6 days
	Long Stay - adjustment only if LOS was longer than the Trim	Long Stay - no adjustment
Sectors of Health Services Included	Acute care hospitals, Long-term hospitals, PCH, Mental Health, Medical Remuneration and Home Care	Institutional Acute Care, Institutional Long Term Care, Continuing Care, Home-Based, Health Promotion / Disease Prevention, Medical Remuneration, and Pharmacare

Appendix Table 1

Blended Indicator of Need for Medical Care

and Component Measures Evaluated in the Development of the Measure of Need

Physician Service Area Scores, 1995

Blended Need Indicator combines information on social/economic factor and premature mortality

	1995 Blended Need Indicator	Social/ Economic Factor	Premature Mortality 1990-95 Age Adjusted /1,000	Premature Mortality 1990-95 Standardized Rate	Diabetes Prevelance 1992-95 Age Adjusted /1,000	Diabetes Prevelance 1992-95 Standardized Rate	Stillbirth and Infant Mortality 1990-95 /1,000 Births	Stillbirth and Infant Mortality 1990-95 Standardized Rate
Brandon								
Brandon	-0.461	0.257	3.311	-0.396	36.62	-0.544	8.87	-0.820
Burntwood								
Norway/Cross	3.963	-2.932	6.145	2.672				
Oxford House	3.798	-3.234	5.651	2.137				
Island Lake	3.587	-3.674	4.969	1.398				
Lynn Lake	2.101	-1.494	5.042	1.478	34.26	-0.67	17.70	0.479
Thompson	1.548	-0.409	5.322	1.78	95.13	2.568	23.01	1.260
Gillam	0.691	0.176	4.742	1.153	108.76	3.293	19.61	0.759
Leaf Rapids	-0.276	-0.976	2.415	-1.366	79.38	1.731	0.00	-2.124
Central								
Seven Regions	0.747	-0.521	4.171	0.535	68.21	1.136	18.66	0.620
Portage	0.187	0.127	4.038	0.391	42.04	-0.256	15.32	0.129
Altona	-0.551	0.429	3.353	-0.351	21.26	-1.361	15.44	0.147
Lorne	-0.586	0.243	3.135	-0.586	37.52	-0.496	16.13	0.248
Carman	-0.642	0.254	3.073	-0.654	26.13	-1.102	23.85	1.383
Morris/Montcalm	-0.664	0.434	3.21	-0.506	31.95	-0.793	8.89	-0.817
Morden/Winkler	-0.859	0.267	2.801	-0.948	31.26	-0.829	17.79	0.492
C Wpg adjacent	-1.351	1.505	3.302	-0.406	30.94	-0.846	11.51	-0.432
Churchill								
Churchill	1.076	-0.215	4.884	1.307	75.39	1.518	46.73	4.748
Interlake								
Grahamdale	1.253	-0.891	4.491	0.881	91.48	2.374	14.31	-0.019
Coldwell	0.868	-0.343	4.494	0.884	51.31	0.238	10.00	-0.654
East Interlake	0.662	-0.438	4.138	0.499	71.84	1.33	18.37	0.578
Gimli	0.525	-0.329	4.059	0.413	42.71	-0.22	8.11	-0.932
Selkirk	-0.4	0.723	3.822	0.157	39.53	-0.389	16.36	0.282
Rockwood	-0.765	0.842	3.454	-0.241	40.58	-0.333	18.66	0.620
Marquette								
Neepawa	0.407	-0.453	3.79	0.122	48.56	0.091	8.65	-0.853
Sioux Valley	-0.317	0.513	3.737	0.065	39.66	-0.382	0.00	-2.124
North Cypress	-0.35	0.27	3.469	-0.225	41.19	-0.301	21.05	0.972
Russell	-0.364	0.068	3.264	-0.447	44.11	-0.146	15.01	0.083
Minnedosa	-0.577	0.321	3.22	-0.495	38.27	-0.456	14.78	0.050
Norman								
The Pas	2.249	-0.619	6.043	2.561	85.97	2.081	14.64	0.029
Flin Flon	0.593	0.277	4.708	1.116	45.67	-0.063	10.20	-0.624
North Eastman								
East Lake Winnipeg	1.611	-1.117	4.75	1.161	85.06	2.033	20.28	0.858
Springfield	-0.818	0.673	3.231	-0.483	36.55	-0.548	13.12	-0.195

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	1995 Blended Need Indicator	Social/ Economic Factor	Premature Mortality 1990-95		Diabetes Prevelance 1992-95		Stillbirth and Infant Mortality 1990-95	
			Age Adjusted /1,000	Standardized Rate	Age Adjusted /1,000	Standardized Rate	/1,000 Births	Standardized Rate
Parkland								
Roblin	0.731	-0.864	3.842	0.179	51.41	0.243	11.28	-0.466
Swan River	0.49	-0.415	3.934	0.279	66.75	1.059	21.96	1.105
Dauphin	0.116	-0.359	3.497	-0.194	44.47	-0.126	12.76	-0.248
Gilbert Plains	-0.233	-0.223	3.167	-0.552	37.49	-0.498	20.69	0.918
Alonsa	-0.265	-0.115	3.224	-0.49	55.8	0.476	2.70	-1.728
South Eastman								
Piney District	0.224	-0.205	3.78	0.112	49.8	0.157	13.84	-0.089
De Salaberry	-0.509	-0.31	2.725	-1.03	36.48	-0.551	9.83	-0.679
Steinbach	-0.813	0.823	3.375	-0.327	34.02	-0.682	10.10	-0.639
E Wpg adjacent	-0.852	0.322	2.861	-0.883	31.17	-0.834	21.80	1.081
Tache	-0.999	0.556	2.885	-0.857	32.33	-0.772	12.25	-0.323
South Westman								
Souris	-0.445	0.449	3.51	-0.18	54.73	0.419	15.70	0.184
Virden	-0.689	0.306	3.059	-0.668	36.37	-0.557	7.94	-0.957
Melita/Deloraine	-0.825	0.248	2.827	-0.92	31.23	-0.831	6.62	-1.150
Boissevain	-0.839	0.438	2.986	-0.748	36.46	-0.553	8.40	-0.889
Killarney	-1.154	0.648	2.767	-0.985	39	-0.418	17.27	0.416
Victoria/S Norfolk	-1.236	0.604	2.62	-1.144	45	-0.098	10.58	-0.568
Winnipeg								
Wpg 316	2.063	-0.92	5.522	1.998	57.72	0.578	16.81	0.347
Wpg 315	1.599	-1.057	4.79	1.205	58.53	0.622	19.02	0.673
Wpg 147	-0.288	0.403	3.673	-0.004	42.7	-0.221	15.88	0.211
Wpg 312	-0.59	0.631	3.489	-0.203	45.72	-0.06	16.67	0.327
Wpg 308	-0.608	0.523	3.365	-0.337	38.26	-0.457	13.30	-0.168
Wpg 320	-0.683	0.538	3.281	-0.428	40.76	-0.324	12.61	-0.269
Wpg 317	-0.704	0.529	3.246	-0.466	36.21	-0.566	12.23	-0.325
Wpg 303	-0.776	0.501	3.125	-0.597	39.38	-0.397	11.33	-0.459
Wpg 310	-0.944	0.774	3.159	-0.561	37.97	-0.472	11.93	-0.370
Wpg 305	-1.197	0.919	2.962	-0.774	34.54	-0.654	11.83	-0.385
Wpg 313	-1.282	1.326	3.226	-0.488	26.99	-1.056	20.62	0.908
Wpg 319	-1.8	0.994	2.243	-1.552	45.27	-0.084	19.91	0.804
Wpg 318	-1.806	1.495	2.698	-1.059	30.96	-0.845	9.48	-0.731
Wpg 304	-2.565	1.699	1.895	-1.929	26.08	-1.158	9.85	-0.675

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