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**MODELLING  
NEW BRUNSWICK'S  
FUTURE HEALTHCARE  
EXPENSES AND  
RESOURCE NEEDS**

**PHASE I**

## Summary

Based on Canadian Institute for Health Information (CIHI) data and the actuarial model developed in this report, the current trends in healthcare costs for New Brunswick suggest that the 2009 per capita healthcare costs of \$3,711 will increase to \$5,976 by 2020. For 2009, the average Canadian per capita healthcare cost was \$3,526—about 5% lower than New Brunswick's.

For New Brunswick, the annual projected increases are

- 1.99% for healthcare inflation;
- 1.27% for ageing; plus
- 1.10% for utilization.

How can New Brunswick reduce this annual increase in utilization? Understanding its sources may help.

The utilization comes from many sources. For example:

- Obesity, smoking, and alcohol usage contributed to an increased prevalence of chronic health conditions; and
- New medical innovation has a net effect—we can do more, along with efficiencies in current treatments.

Potential interventions could come either by way of medical innovation or lowering utilization trends.

The most obvious opportunity to lower utilization trends appears to be the reduction of obesity levels. Obesity is defined as having a BMI over 30. One target could be reducing obesity down to the overall Canada level at 17.1% versus 24.2% for New Brunswick. Based on our hospital model, that would **over time** reduce the hospital acute days by 8–10% and hence lower hospital costs. Reducing the number people with a BMI over 30 will also reduce the number of people with a BMI over 25.

Aside from hospital expenses, other service types (physicians and drugs) can be expected to be similarly affected to different degrees by high BMIs. Hence, modelling other healthcare

services may reveal similar potential reductions related to obesity.

Additional actuarial modelling will, no doubt, reveal other opportunities to lower the healthcare cost trends.

Ultimately, New Brunswick needs to decide what level of healthcare is sustainable fiscally and economically. This is not an easy question to answer. One way to initiate an exploration of this question is to develop models of the **value** of wellness promotion, healthy living, and prevention strategies. Relating such **values** to New Brunswick's current and future GDP then allows one to also view such promotion and wellness activities from an investment perspective using the time of value money.

**NOTE:** This is a demonstration report that focuses on current healthcare trends and costs as per CIHI data for New Brunswick's population and projects those trends to 2020.

**The vantage point is New Brunswick's population and its current and projected healthcare needs. The report does not review, measure, or project any operational efficiencies or possible future medical innovations for any component of the healthcare system.**

## Introduction

Budgeting for sustainable healthcare in the future will, of necessity, need to become more complex to take into account many more factors contributing to the ever-changing technology and delivery of public healthcare in Canada.

At the same time, the populations of most provinces are becoming older, contributing to increased healthcare needs.

While actuaries have typically been applying their mathematical modelling and analytical tools to private insurance, private pension plans, and public workers' compensation and pension plans, we have had little, if any, input into developing models of sustainable public healthcare systems. And this is true in most countries, aside from those which have some form of pre-funded insurance for seniors—e.g., U.S. Medicare Part A.

The Canadian Institute of Actuaries (CIA) has developed significant analytical tools which can be applied to modelling the future needs of sustainable healthcare systems. In order to demonstrate that capability, the CIA is funding the development of a model for the Province of New Brunswick, which will be able to project **steady state healthcare costs** by year until 2020, as described in the next sections.

By **steady state healthcare costs** we assume that no material changes to New Brunswick's healthcare coverage, financing, or technology are introduced during the projection period. And similarly no major changes in the economic environment as measured by the GDP and inflation rate.

Data used in the models are mostly limited to publicly available data up to 2009 from the Statistics Canada and CIHI websites. However, we feel the model still adds significant value by demonstrating actuarial techniques.

The models developed in this report have been designed to be **transparent and relatively easy to understand** in order to assist with the communication of results.

**NOTE:** Since this report is designed to demonstrate the application of actuarial techniques to the projection of provincial healthcare expenses, it does not include a number of steps normally part of a full actuarial analysis.

A full analysis would typically include:

- Extensive testing of data and sources;
- Detailed discussions with the Ministry of Health and other parties regarding future plans for the provincial plan;
- Deeper analysis of assumptions and the possible range of their values and any dependencies among the assumptions; and
- Multiple scenarios to test the possible range of outcomes suitable for the purpose of the actuarial report.

## Report Overview

The report is split into four sections as follows:

Section 1 Page 5

Development of a healthcare expenses projection model which can be used for each of the main service types as defined by CIHI: hospitals, other institutions, physicians, drugs, and other. All of the data used are publicly available from CIHI and Statistics Canada.

Section 2 Page 25

Development of a more detailed model to project hospital costs by health zone. This model adds costs and statistics from the annual reports of hospital services for the last five years.

Section 3 Page 31

An exploration of the effect of lifestyle and chronic health conditions on actual hospital costs by health zone. This is accomplished by creating separate risk profiles for lifestyle and chronic conditions and then combining them to produce an overall risk profile for each health zone. This is then compared with actual hospital statistics and expenses.

Section 4 Page 40

This section outlines a few ideas for further exploration to assist in the identifying of opportunities to improve the health of the people of New Brunswick and to explore ways of curtailing the continuing annual increases in healthcare costs.

Appendix A Page 42

Detailed development of projections of the hospital costs for each health zone.

## **SECTION 1**

### **Modelling Future Healthcare Expenses For New Brunswick**

This section outlines the development of an actuarial model which can be used to project future provincial healthcare expenses.

## Model Overview

The model uses the CIHI 1998–2009 healthcare cost data for New Brunswick by age group, gender, and service type, along with Statistics Canada New Brunswick population data by age and gender for the same period.

Reference is also made to economic projections contained in the Canadian Parliamentary Budget Office publications as well as those from the Conference Board of Canada.

Two types of projection models were developed:

1. An aggregate model that does not use service type and age/gender splits. This serves to develop approximate future cost to verify assumptions and overall model results of the detailed model.
2. Detailed models by year, age/gender, and service type. These models allow for the testing of various assumptions—e.g., inflation, utilization, and their trends into the future.

Actuarial projections normally include developing best estimate plus lower and higher costs, with their range depending on how projections will be used and the confidence level required.

For purposes of this report and to avoid complicating the discussions, this report only shows the results of a **best estimate scenario** using the detailed models.

Once the models are calibrated to current costs and trends, later phases can include the development of range of values using additional scenarios.

## Model Results

The detail model projects that per capita healthcare costs will increase from \$3,711 in 2009 to \$5,976 in 2020. This represents average annual increases of 4.43%, split as:

- 1.27% for ageing;
- 1.10% for increased utilization and new processes and technology; and
- 1.99% for healthcare inflation.

**NOTE:** 4.43% is the product of the three rates applied separately in any order.

New Brunswick's population is projected to increase modestly from 749,983 in 2009 to 769,500 in 2020.

Total healthcare costs are projected to increase from \$2.8 billion in 2009 to \$4.6 billion in 2020.

**With ageing alone** the per capita costs are projected to increase from \$3,711 to \$4,261 in 2020.

**Before inflation** the per capita costs are projected to increase from \$3,711 to \$4,811 in 2020.

See the next page for trends split by healthcare service type.

The table below shows the resulting trends from 2009 to 2020 on **per capita** basis.

Annual Projected Increase 2009 - 2020				
	Ageing	Utilization	Inflation	All
Hospitals	1.55%	0.67%	2.00%	4.28%
Oth Institut	1.89%	0.80%	2.00%	4.76%
Physician+	0.82%	1.13%	2.40%	4.40%
Drug	1.83%	3.26%	1.00%	6.19%
Other	0.00%	1.80%	2.00%	3.82%
Total	1.27%	1.10%	1.99%	4.43%

**The Canada Health Transfer (CHT)** is guaranteed to increase annually at 6% until 2016–2017 and is projected to increase at 3.9% beyond that.

Those numbers are Canadian aggregates, which after adjusting for Canada’s projected population growth, of about 1% per year, reduces the projected 2009–2020 average annual increase in CHT per capita to just 4.38%. And this is just less than the projected annual per capita increase of 4.43% in healthcare costs for New Brunswick.

## Projected Healthcare Costs

The model projects **per capita** costs by type as follows:

	2000	2010	2020
Hospitals+	1,219	2,339	3,599
Physicians+	354	717	1,105
Drugs	104	247	452
Other	276	564	820
<b>Total</b>	<b>1,954</b>	<b>3,866</b>	<b>5,976</b>

The projected **total** costs by type are as follows:

(\$ millions)

	2000	2010	2020
Hospitals+	915	1,761	2,769
Physicians+	266	540	850
Drugs	78	186	348
Other	207	424	631
<b>Total</b>	<b>1,466</b>	<b>2,911</b>	<b>4,599</b>

All model input costs for 1999–2009 are based on CIHI reports. So how do the model projections compare with actual budgets and incurred costs?

Below are the actual costs for hospitals, physicians and drugs for fiscal year 2010–2011 along with the modelled costs. This only represents a 15-month projection period but the results are very close. Hence, for now, this serves to calibrate the model for those services.

Calibration for the other service types will occur in the later phases depending on the particular model and task.

The projected costs by **fiscal year** and type are as follows:

(\$ millions)

	NB 2010–2011	Model 2010–2011
Hospitals	1,429	1,429
Physicians	547	546
Drugs	189	189

Other tables and charts of the projected healthcare costs are shown later in this section, starting at page 16.



## Model Methodology

The detailed model projects future per capita costs by year, service type, age group, and gender from 2009 to 2020. Then, using one of Statistics Canada’s future population models, it develops the aggregate costs for New Brunswick’s whole population. The per capita costs were developed by projecting the 2009 per capita cost cells using utilization and inflation assumptions. The various steps were as follows:

### STEP ONE: REMOVE INFLATION COMPONENT

First, the per capita CIHI cost data for each of the years 1998–2009 by service type, age group, and gender were modelled by removing the increase in per capita costs due to healthcare inflation. The remaining change (+ or -) then represents the combined change in utilization and technology (UT).

The inflation component represents the annual price increase in medical equipment or drug prices, administration costs, fee schedules, and wages.

The UT component is the net effect of utilization and technology changes. It represents the combined change in population utilization of the healthcare system, the addition of new procedures, and the removal of old procedures from the standards of medical practice. For many years this component has been positive. The hope is that someday this will turn negative, thereby indicating overall improved productivity of the healthcare system and/or improved population health.

The inflation component was derived by using the aggregate CIHI healthcare inflation, by year, multiplied by factors felt to represent the approximate inflation increase for each service type with reference to Conference Board of Canada reports. Actual drug price inflation was assumed to be 50% and physician inflation was assumed to be 150% of the overall healthcare inflation.

Using these inflation assumptions, the total increase from inflation from 1998 to 2009 for each service type becomes:

Hospitals+	45.42%
Physicians+	74.51%
Drugs	20.79%
Other	45.42%

+ To simplify the development of the UT trends, Hospital costs were combined with Other Institutions, and Physician costs were combined with Other Professions.

It was further assumed that this inflation component did not vary by age and gender.

### STEP TWO: GROUP PER CAPITA COSTS

Once the inflation component was removed (see page 12 for **Hospitals+**) from each year, age, gender, and type cell, an average per capita cost was calculated by grouping three calendar years and three age groups together (nine adjacent cells)—see page 13.

Example: per capita costs for ages 5–19 and for years 2007–2009 were developed by totalling the costs for this grouping using the population data and simply calculating the average cost for these nine adjacent cells.

### STEP THREE: AVERAGE WEIGHTED TRENDS

From the nine cell groupings, one can develop the annual UT increases. Weighting factors were introduced such that the more recent UT increases are given higher weightings. The more recent increases are likely more representative of the near future increases. The increase from:

- 2004–2006 to 2007–2009 was given a weight of 50%;
- 2001–2003 to 2004–2006 was given a weight of 30%; and
- 1998–2000 to 2001–2003 was given a weight of 20%.

**STEP FOUR: DEVELOP GRADUATED UT TRENDS**

Graduation is an actuarial tool which takes raw data, typically bumpy, and produces smooth results without changing the overall results. Through statistical theory we expect that raw data point results will be bumpy unless we have a very large set of data for all data points.

By inspection of the Step Three raw unadjusted UT annual trends, we developed a smoother set of trends by age/gender which removes the normally expected bumpiness from the raw data results. The results are tested such that, in aggregate, the graduated UT increases are similar to the raw data results.

Trends for other age groups were then derived by interpolation.

**STEP FIVE: MODEL FUTURE UT TRENDS**

For this model and scenario, the future UT trends for years 2010–2020 are assumed to be similar to the trends developed in Step Four.

**STEP SIX: ADD ANNUAL INFLATION**

Going forward to the year 2020, most economists and governments are assuming an overall price inflation rate of 2.00% in their projections.

Hence, for this scenario, an overall annual healthcare price inflation rate of 2% has been used with variations by expense type with Hospitals+ at 2.00%, Physicians+ at 2.40%, and drugs at 1.00%.

**STEP SEVEN: FUTURE PER CAPITA COSTS**

Add inflation and UT trends to 2009 per capita cost age group, gender, and service type to produce 2010 per capita costs and then repeat, each year, until 2020.

**STEP EIGHT: AGGREGATE COSTS BY YEAR**

Use the projected New Brunswick population to derive aggregate healthcare costs by service type and year for the period 2010–2020.

	Total NB Per Capita Hospital+ Costs with Inflation Removed - 1997 Dollars											
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Females</b>												
0 to 4	863	908	911	888	944	1,033	973	957	996	966	1,012	1,014
5 to 9	149	151	139	147	136	129	136	137	135	134	123	117
10 to 14	144	167	163	153	158	143	152	136	143	178	167	173
15 to 19	383	382	408	416	377	365	365	375	348	341	366	403
20 to 24	643	675	644	653	663	596	582	609	621	616	614	591
25 to 29	815	881	857	868	886	867	871	860	868	844	799	830
30 to 34	715	770	752	785	816	786	781	781	811	786	855	802
35 to 39	532	538	523	531	551	566	604	616	619	577	570	590
40 to 44	487	509	527	563	533	560	532	551	543	519	530	529
45 to 49	654	673	674	653	609	650	685	687	670	713	677	683
50 to 54	756	825	766	782	781	796	881	806	852	853	878	869
55 to 59	930	929	959	1,042	1,049	1,088	1,166	1,090	1,110	1,125	1,099	1,136
60 to 64	1,238	1,334	1,306	1,435	1,321	1,281	1,437	1,419	1,515	1,599	1,586	1,563
65 to 69	2,049	2,149	2,128	2,070	2,101	2,145	2,055	2,163	2,129	2,219	2,202	2,334
70 to 74	2,842	2,925	3,189	3,280	3,286	3,330	3,299	3,260	3,220	3,516	3,649	3,405
75 to 79	4,002	4,174	4,448	4,653	4,524	4,543	4,963	5,111	5,571	5,550	5,587	5,840
80 to 84	6,218	6,440	6,426	6,732	6,921	6,950	6,975	7,070	7,644	8,353	8,172	8,475
85 to 89	11,393	11,255	11,121	11,993	12,224	11,827	11,808	11,511	12,752	13,408	13,577	13,775
90 and over	11,956	11,736	11,713	12,822	12,775	14,030	14,199	13,511	13,717	15,856	16,964	17,344
<b>Males</b>												
0 to 4	1,058	1,081	1,035	1,074	1,130	1,120	1,185	1,192	1,190	1,174	1,196	1,148
5 to 9	171	169	159	164	165	166	154	159	158	167	150	137
10 to 14	160	181	153	135	142	158	141	134	151	160	171	198
15 to 19	226	231	242	262	273	247	241	248	267	276	283	275
20 to 24	218	249	260	253	220	266	288	305	290	292	317	310
25 to 29	223	258	259	267	264	293	296	261	268	331	309	309
30 to 34	279	303	269	254	258	272	309	341	349	372	296	415
35 to 39	304	314	301	321	321	357	383	382	397	388	364	446
40 to 44	414	424	430	433	439	436	486	462	492	492	493	499
45 to 49	556	586	607	585	618	626	638	642	628	664	659	712
50 to 54	755	810	824	840	889	898	924	895	925	1,051	992	1,117
55 to 59	1,099	1,166	1,198	1,219	1,207	1,226	1,248	1,290	1,289	1,326	1,405	1,359
60 to 64	1,655	1,789	1,706	1,786	1,770	1,834	1,914	1,903	1,946	1,965	1,977	1,991
65 to 69	2,616	2,641	2,579	2,656	2,764	2,848	2,721	2,777	2,655	2,849	2,983	2,863
70 to 74	3,573	3,842	3,900	4,006	3,937	4,041	4,031	3,940	3,974	4,247	4,458	4,364
75 to 79	4,917	5,154	5,216	5,402	5,797	5,836	5,931	5,911	5,979	5,989	6,394	6,706
80 to 84	6,747	7,045	7,152	7,421	7,240	7,291	7,647	7,776	8,186	8,249	8,502	8,954
85 to 89	10,018	10,878	10,465	11,352	11,363	11,446	11,286	11,189	11,814	11,739	11,669	12,130
90 and over	11,180	11,517	11,515	13,126	12,878	10,920	11,847	13,133	13,924	15,065	14,965	15,305

Hospitals+		Weighting Factors				Annual Increase	JHave	Annual Proposed	Annual Proposed
		0.20	0.30	0.50					
		3 Year Average per Capita Costs							
		1998-00	2001-03	2004-06	2007-09				
<b>Females</b>									
0 to 4	0-4	894	903	914	954	0.91%	1.00%	1.00%	
5 to 9		-	-	-	-			0.50%	
10 to 14	5 - 19	236	241	239	231	-0.52%	0.00%	0.00%	
15 to 19		-	-	-	-			0.05%	
20 to 24		-	-	-	-			0.10%	
25 to 29	20-34	750	765	769	769	0.18%	0.15%	0.15%	
30 to 34		-	-	-	-			0.18%	
35 to 39		-	-	-	-			0.22%	
40 to 44	35-49	566	575	573	579	0.25%	0.25%	0.25%	
45 to 49		-	-	-	-			0.35%	
50 to 54		-	-	-	-			0.45%	
55 to 59	50-64	965	996	1,002	1,019	0.56%	0.55%	0.55%	
60 to 64		-	-	-	-			0.58%	
65 to 69		-	-	-	-			0.62%	
70 to 74	65-79	3,033	3,152	3,223	3,250	0.62%	0.65%	0.65%	
75 to 79		-	-	-	-			0.73%	
80 to 84		-	-	-	-			0.82%	
85 to 89	80+	8,803	9,021	9,264	9,551	0.94%	0.90%	0.90%	
90 and over		-	-	-	-			0.98%	
<b>Males</b>						1,581,290	1,582,727		
0 to 4	0-4	1,058	1,063	1,079	1,108	0.62%	0.60%	0.60%	
5 to 9		-	-	-	-			0.40%	
10 to 14	5 - 19	189	190	190	192	0.21%	0.20%	0.20%	
15 to 19		-	-	-	-			0.18%	
20 to 24		-	-	-	-			0.17%	
25 to 29	20-34	258	264	256	261	0.13%	0.15%	0.15%	
30 to 34		-	-	-	-			0.33%	
35 to 39		-	-	-	-			0.52%	
40 to 44	35-49	432	440	447	459	0.71%	0.70%	0.70%	
45 to 49		-	-	-	-			0.72%	
50 to 54		-	-	-	-			0.73%	
55 to 59	50-64	1,143	1,178	1,194	1,223	0.74%	0.75%	0.75%	
60 to 64		-	-	-	-			0.75%	
65 to 69		-	-	-	-			0.75%	
70 to 74	65-79	3,645	3,747	3,832	3,935	0.85%	0.75%	0.75%	
75 to 79								0.75%	
80 to 84								0.75%	
85 to 89	80+	8,449	8,796	8,942	9,042	0.62%	0.75%	0.75%	
90 and over		-	-	-	-			0.75%	
						1,255,698	1,253,312		

The above shows the development of the graduated annual UT increases for Hospitals+ using the weighting factors.

Physicians+		Weighting Factors				Annual Increase	JHave	Annual Proposed	Annual Proposed
		0.20	0.30	0.50					
		3 Year Average per Capita Costs							
		1998-00	2001-03	2004-06	2007-09				
<b>Females</b>									
0 to 4	0-4	269	275	299	340	3.19%	3.00%	3.00%	
5 to 9		-	-	-	-			1.55%	
10 to 14	5 -19	161	162	160	162	0.10%	0.10%	0.10%	
15 to 19		-	-	-	-			0.30%	
20 to 24		-	-	-	-			0.50%	
25 to 29	20-34	344	352	355	366	0.76%	0.70%	0.70%	
30 to 34		-	-	-	-			0.73%	
35 to 39		-	-	-	-			0.77%	
40 to 44	35-49	326	334	339	348	0.74%	0.80%	0.80%	
45 to 49		-	-	-	-			0.87%	
50 to 54		-	-	-	-			0.93%	
55 to 59	50-64	426	441	450	465	0.98%	1.00%	1.00%	
60 to 64		-	-	-	-			1.07%	
65 to 69		-	-	-	-			1.13%	
70 to 74	65-79	648	669	683	713	1.15%	1.20%	1.20%	
75 to 79		-	-	-	-			1.43%	
80 to 84		-	-	-	-			1.67%	
85 to 89	80+	715	744	776	830	1.82%	1.90%	1.90%	
90 and over		-	-	-	-			2.13%	
<b>Males</b>						707,270	707,772		
0 to 4	0-4	311	315	330	369	2.47%	2.50%	2.50%	
5 to 9		-	-	-	-			1.45%	
10 to 14	5 -19	134	135	134	137	0.36%	0.40%	0.40%	
15 to 19		-	-	-	-			0.47%	
20 to 24		-	-	-	-			0.53%	
25 to 29	20-34	119	122	122	126	0.65%	0.60%	0.60%	
30 to 34		-	-	-	-			0.67%	
35 to 39		-	-	-	-			0.73%	
40 to 44	35-49	198	203	206	213	0.86%	0.80%	0.80%	
45 to 49		-	-	-	-			0.85%	
50 to 54		-	-	-	-			0.90%	
55 to 59	50-64	387	398	405	418	0.92%	0.95%	0.95%	
60 to 64		-	-	-	-			1.00%	
65 to 69		-	-	-	-			1.05%	
70 to 74	65-79	727	754	768	801	1.13%	1.10%	1.10%	
75 to 79								1.23%	
80 to 84								1.37%	
85 to 89	80+	878	913	944	994	1.46%	1.50%	1.50%	
90 and over		-	-	-	-			1.63%	
						548,660	548,499		

Development of the graduated annual UT increases for Physicians+.

Drugs		Weighting Factors				Annual Increase	JHave	Annual Proposed	Annual Proposed
		0.20	0.30	0.50					
		3 Year Average per Capita Costs							
		1998-00	2001-03	2004-06	2007-09				
<b>Females</b>									
0 to 4	0-4	10	9	9	8	-1.74%	0.00%	0.00%	
5 to 9		-	-	-	-			1.00%	
10 to 14	5 -19	14	16	16	18	2.38%	2.00%	2.00%	
15 to 19		-	-	-	-			2.33%	
20 to 24		-	-	-	-			2.67%	
25 to 29	20-34	37	41	45	50	3.44%	3.00%	3.00%	
30 to 34		-	-	-	-			3.33%	
35 to 39		-	-	-	-			3.67%	
40 to 44	35-49	59	69	79	88	4.31%	4.00%	4.00%	
45 to 49		-	-	-	-			4.00%	
50 to 54		-	-	-	-			4.00%	
55 to 59	50-64	93	106	120	134	4.04%	4.00%	4.00%	
60 to 64		-	-	-	-			3.64%	
65 to 69		-	-	-	-			3.26%	
70 to 74	65-79	420	443	480	522	2.57%	2.90%	2.90%	
75 to 79								2.87%	
80 to 84								2.83%	
85 to 89	80+	655	729	798	863	2.97%	2.80%	2.80%	
90 and over		-	-	-	-			2.77%	
<b>Males</b>						873,807	876,683		
0 to 4	0-4	10	9	9	9	-1.23%	0.00%	0.00%	
5 to 9		-	-	-	-			1.50%	
10 to 14	5 -19	14	17	18	20	3.06%	3.00%	3.00%	
15 to 19		-	-	-	-			3.33%	
20 to 24		-	-	-	-			3.67%	
25 to 29	20-34	24	28	32	36	4.49%	4.00%	4.00%	
30 to 34		-	-	-	-			4.07%	
35 to 39		-	-	-	-			4.13%	
40 to 44	35-49	47	54	61	68	4.10%	4.20%	4.20%	
45 to 49		-	-	-	-			4.27%	
50 to 54		-	-	-	-			4.33%	
55 to 59	50-64	73	86	99	111	4.58%	4.40%	4.40%	
60 to 64		-	-	-	-			4.09%	
65 to 69		-	-	-	-			3.76%	
70 to 74	65-79	308	329	368	411	3.46%	3.45%	3.45%	
75 to 79								2.84%	
80 to 84								2.21%	
85 to 89	80+	453	469	484	499	1.05%	1.60%	1.60%	
90 and over		-	-	-	-			0.99%	
						717,064	719,184		

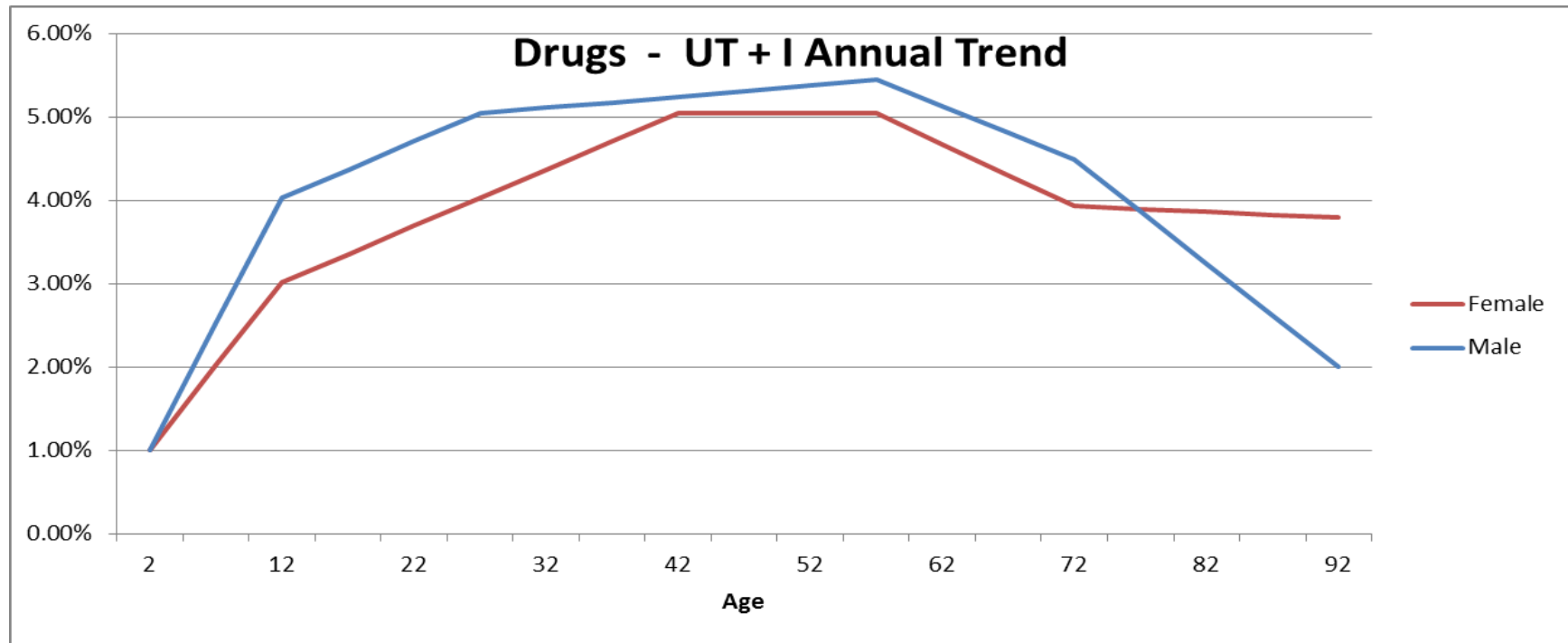
Development of the graduated annual UT increases for Drugs.

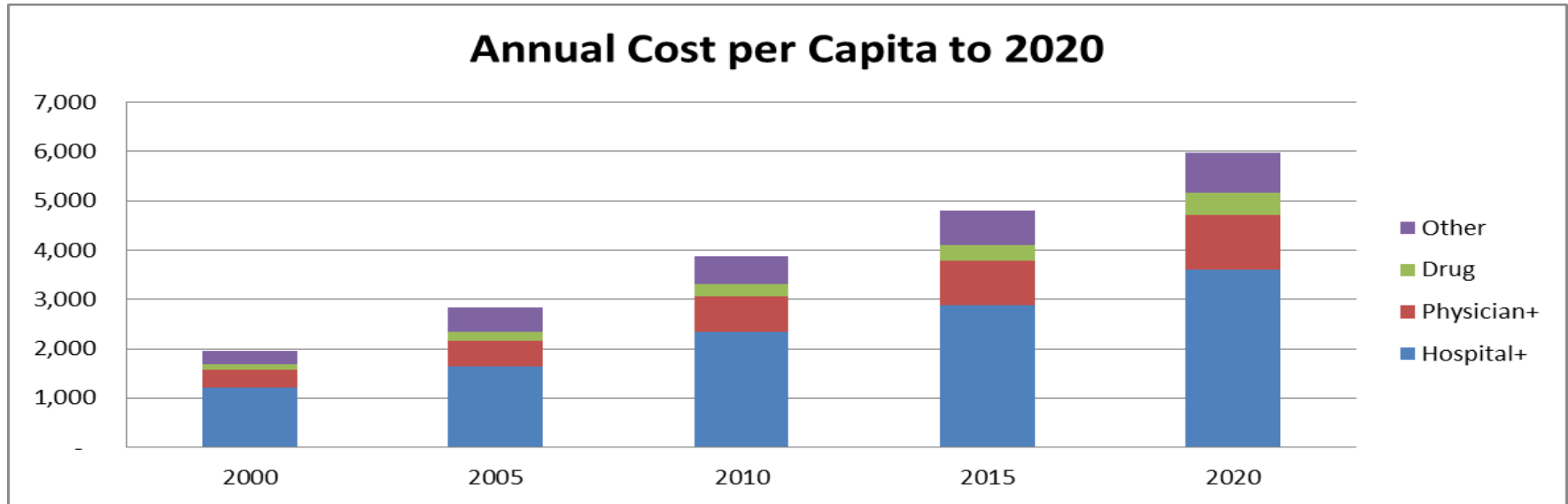
Other		Weighting Factors				Annual Increase	JHave	Annual Proposed	Annual Proposed
		0.20	0.30	0.50					
		3 Year Average per Capita Costs				Annual Increase	Annual Proposed	Annual Proposed	
		1998-00	2001-03	2004-06	2007-09				
<b>Females</b>									
0 to 4	0-4	242	261	274	288	1.83%	1.80%	1.80%	
5 to 9		-	-	-	-			1.80%	
10 to 14	5 - 19	260	278	291	304	1.67%	1.80%	1.80%	
15 to 19		-	-	-	-			1.80%	
20 to 24		-	-	-	-			1.80%	
25 to 29	20-34	240	260	273	286	1.81%	1.80%	1.80%	
30 to 34		-	-	-	-			1.80%	
35 to 39		-	-	-	-			1.80%	
40 to 44	35-49	240	260	272	286	1.81%	1.80%	1.80%	
45 to 49		-	-	-	-			1.80%	
50 to 54		-	-	-	-			1.80%	
55 to 59	50-64	240	260	272	285	1.79%	1.80%	1.80%	
60 to 64		-	-	-	-			1.80%	
65 to 69		-	-	-	-			1.80%	
70 to 74	65-79	239	259	271	285	1.82%	1.80%	1.80%	
75 to 79		-	-	-	-			1.80%	
80 to 84		-	-	-	-			1.80%	
85 to 89	80+	241	260	273	286	1.78%	1.80%	1.80%	
90 and over		-	-	-	-			1.80%	
<b>Males</b>						919,128	925,716		
0 to 4	0-4	242	261	274	288	1.84%	1.80%	1.80%	
5 to 9		-	-	-	-			1.80%	
10 to 14	5 - 19	259	277	290	303	1.67%	1.80%	1.80%	
15 to 19		-	-	-	-			1.80%	
20 to 24		-	-	-	-			1.80%	
25 to 29	20-34	239	259	272	285	1.84%	1.80%	1.80%	
30 to 34		-	-	-	-			1.80%	
35 to 39		-	-	-	-			1.80%	
40 to 44	35-49	240	259	272	285	1.82%	1.80%	1.80%	
45 to 49		-	-	-	-			1.80%	
50 to 54		-	-	-	-			1.80%	
55 to 59	50-64	240	260	272	285	1.79%	1.80%	1.80%	
60 to 64		-	-	-	-			1.80%	
65 to 69		-	-	-	-			1.80%	
70 to 74	65-79	239	258	271	285	1.82%	1.80%	1.80%	
75 to 79		-	-	-	-			1.80%	
80 to 84		-	-	-	-			1.80%	
85 to 89	80+	239	259	272	285	1.80%	1.80%	1.80%	
90 and over		-	-	-	-			1.80%	
						897,267	900,133		

Development of the graduated annual UT increases for Other HC expenses. CIHI appears to have allocated them on the basis of population count, rather than most likely HC utilization.

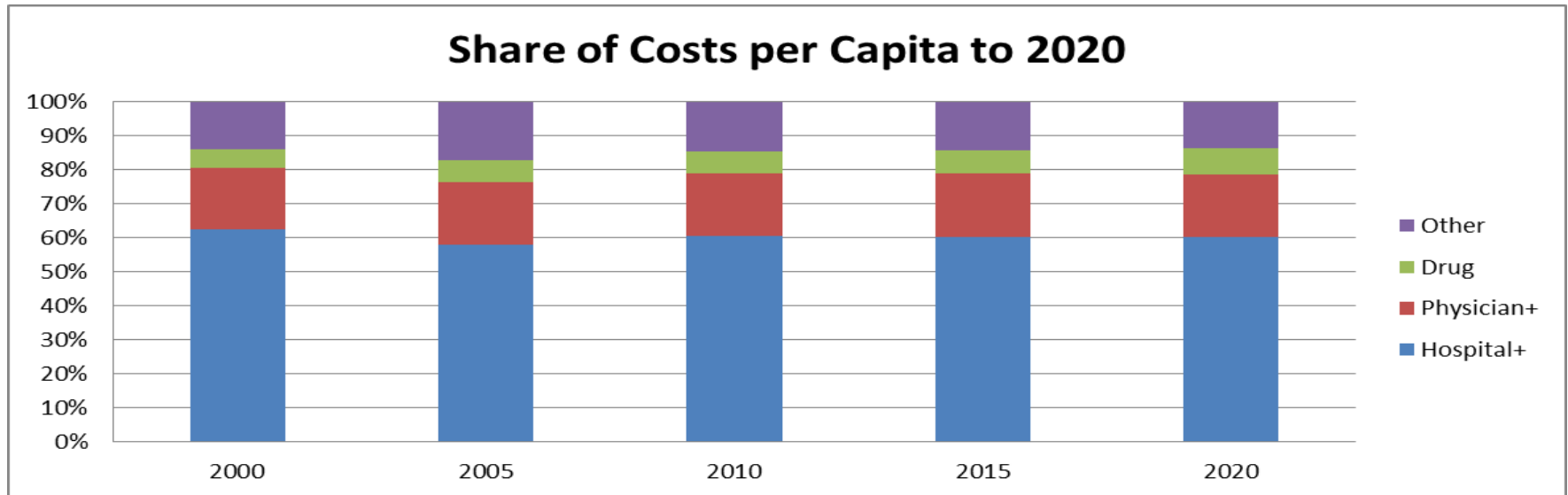


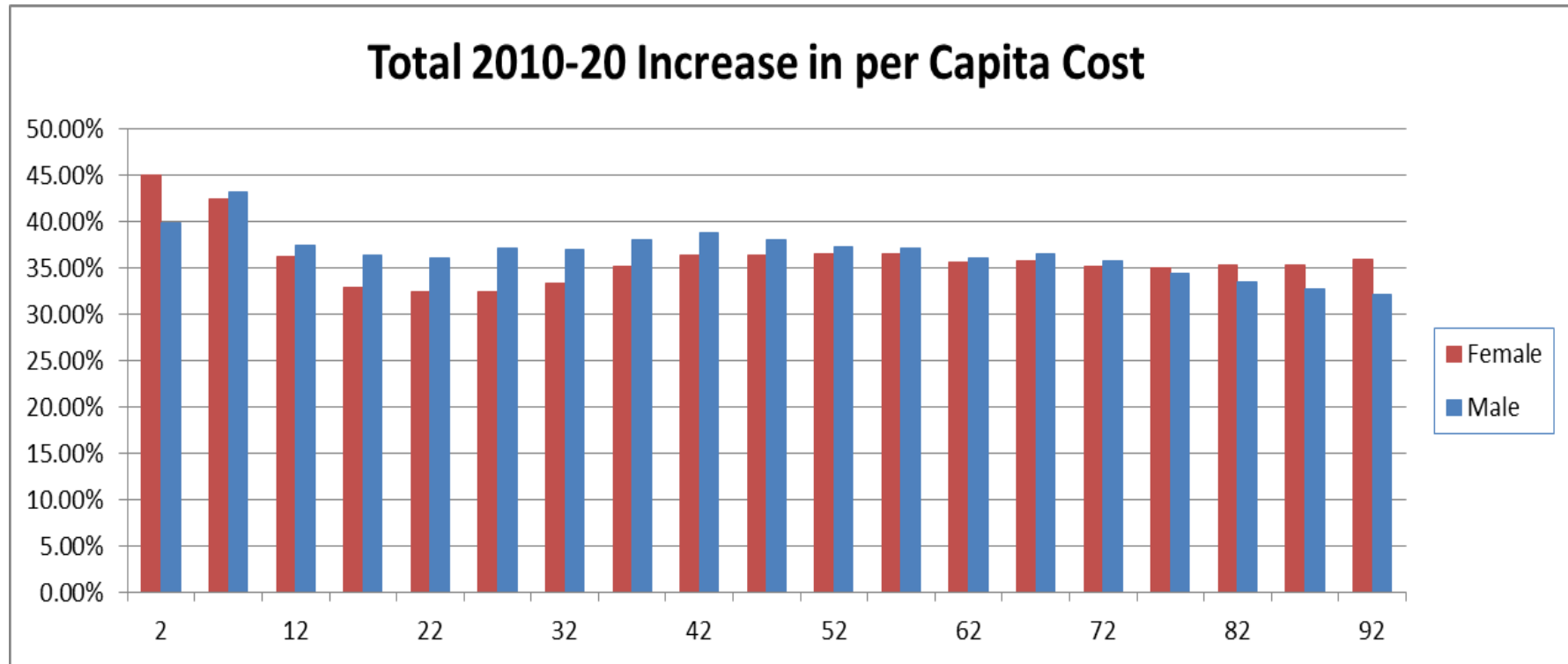






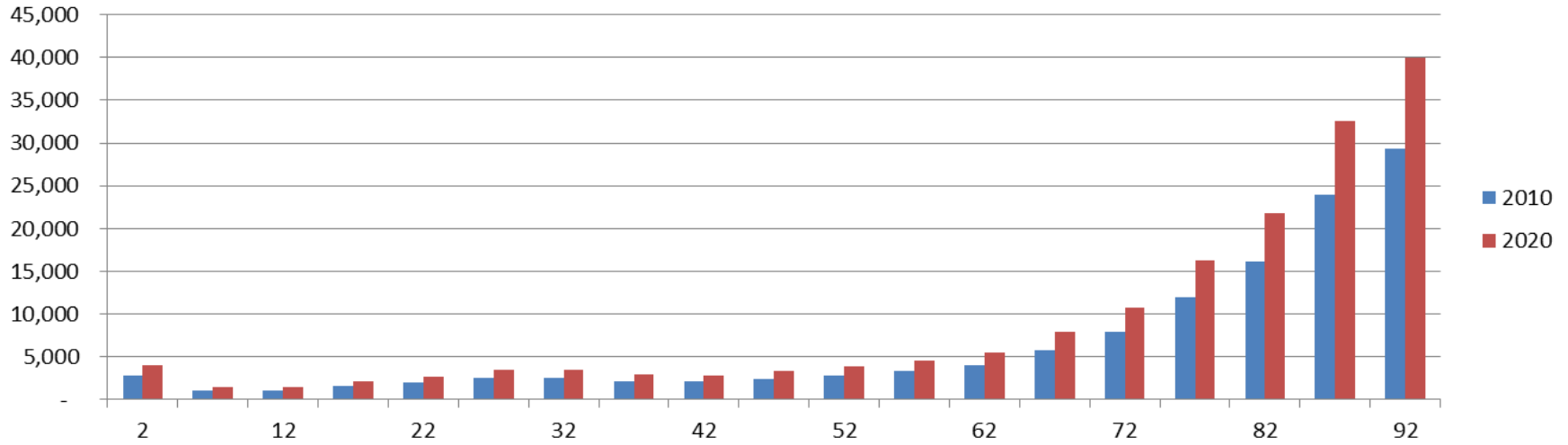
While the per capita costs have increased, the share of total per capita costs, by type, is almost unchanged.



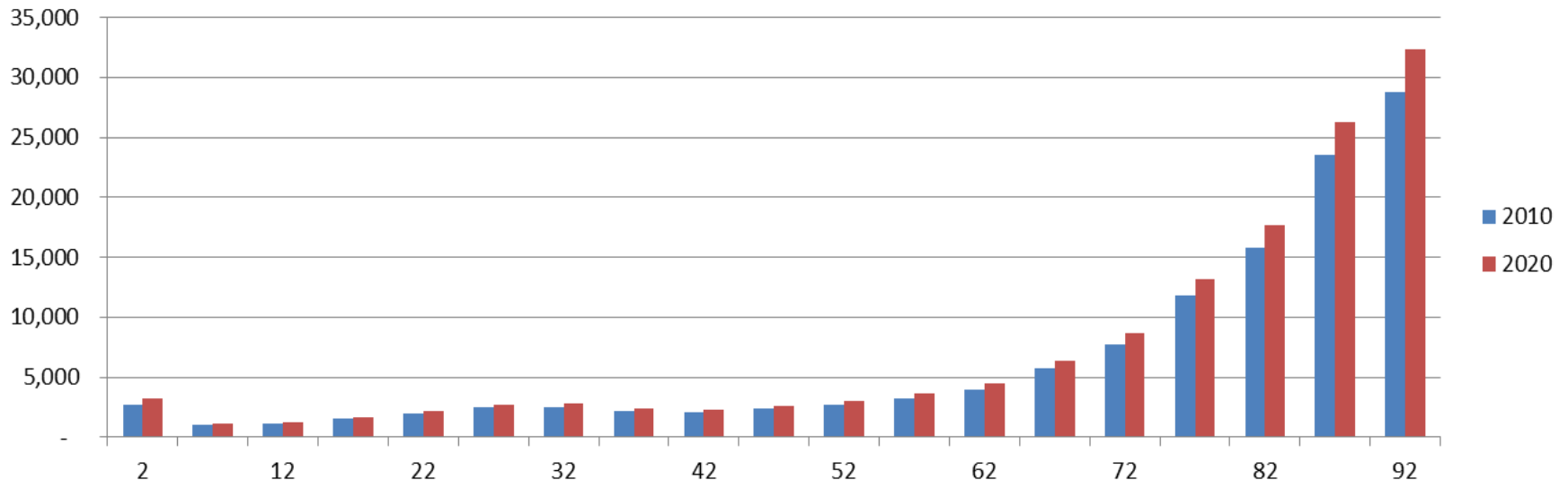


**The projected increase overall is fairly flat across the age groups and represents the total (UT and I) increases by age/gender groups.**

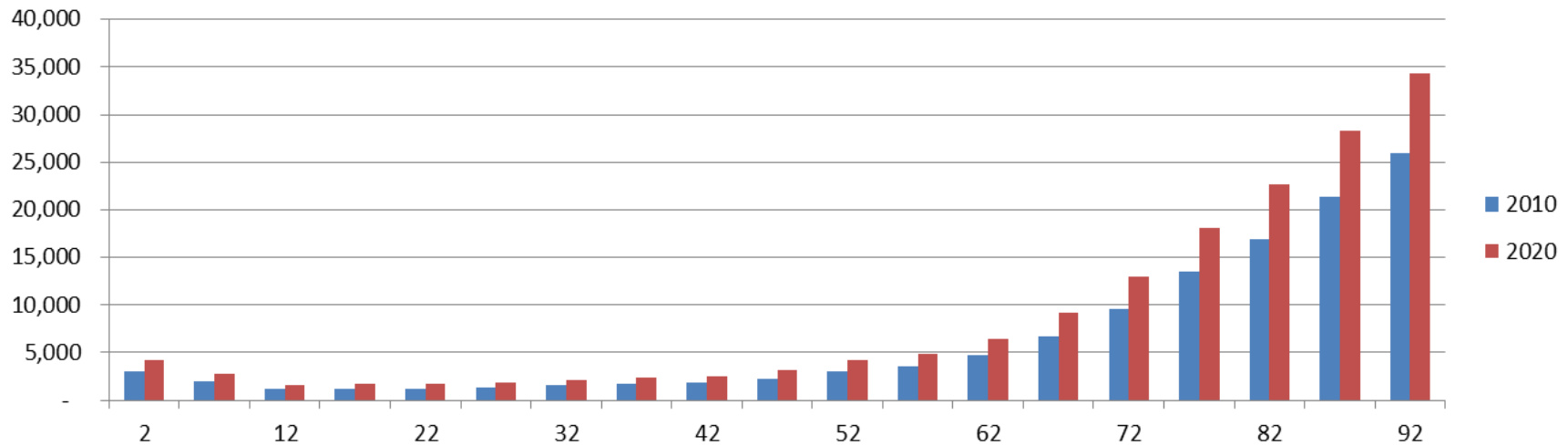
**Projected Annual Total Costs per Capita by Age - Female**



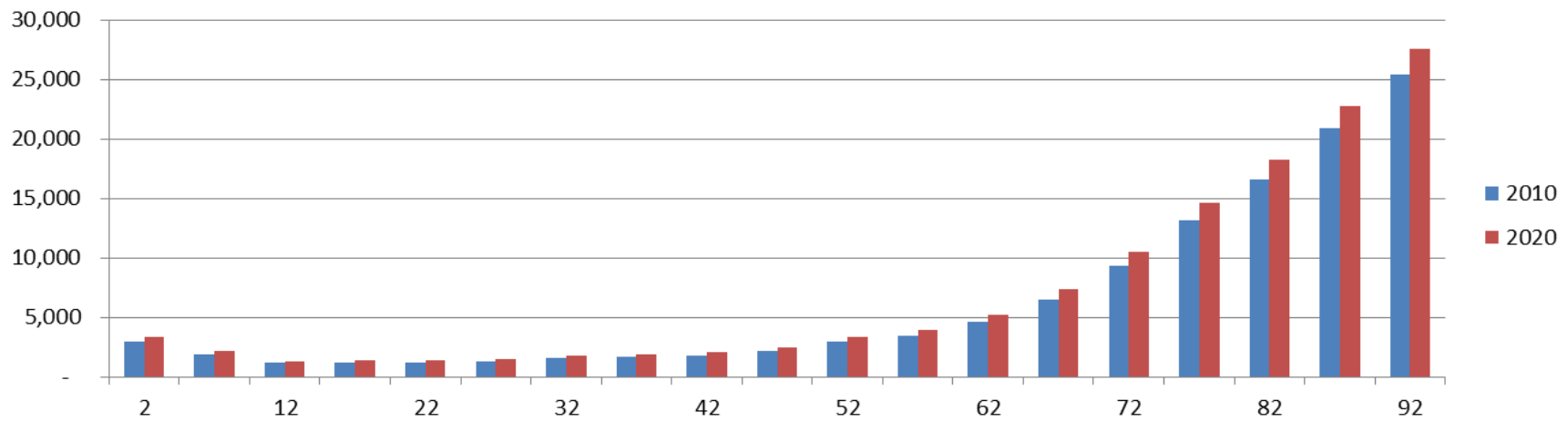
**Annual Total Costs per Capita by Age - Female - 2010 Dollars**



**Projected Annual Total Costs per Capita by Age - Male**



**Annual Total Costs per Capita by Age - Male - 2010 Dollars**



Per Capita All Health Expenses - Females						Per Capita All Health Expenses - Males					
	2000	2005	2010	2015	2020		2000	2005	2010	2015	2020
<b>0-4</b>	1,568	2,267	2,763	3,329	4,021	<b>0-4</b>	1,746	2,901	3,031	3,586	4,253
<b>5-9</b>	621	913	1,042	1,246	1,490	<b>5-9</b>	663	967	1,948	2,334	2,799
<b>10-14</b>	624	863	1,127	1,315	1,538	<b>10-14</b>	624	885	1,171	1,373	1,613
<b>15-19</b>	977	1,293	1,578	1,819	2,100	<b>15-19</b>	688	997	1,245	1,454	1,701
<b>20-24</b>	1,336	1,734	2,055	2,365	2,725	<b>20-24</b>	687	1,052	1,249	1,457	1,703
<b>25-29</b>	1,652	2,219	2,604	2,997	3,454	<b>25-29</b>	714	1,047	1,322	1,549	1,817
<b>30-34</b>	1,533	2,129	2,611	3,015	3,486	<b>30-34</b>	751	1,209	1,566	1,834	2,151
<b>35-39</b>	1,245	1,850	2,219	2,580	3,004	<b>35-39</b>	813	1,296	1,679	1,973	2,322
<b>40-44</b>	1,276	1,775	2,116	2,471	2,890	<b>40-44</b>	1,012	1,457	1,819	2,144	2,529
<b>45-49</b>	1,472	2,022	2,423	2,830	3,311	<b>45-49</b>	1,273	1,793	2,246	2,640	3,108
<b>50-54</b>	1,646	2,249	2,809	3,283	3,842	<b>50-54</b>	1,585	2,230	3,033	3,555	4,173
<b>55-59</b>	1,902	2,728	3,340	3,903	4,567	<b>55-59</b>	2,109	2,874	3,559	4,170	4,891
<b>60-64</b>	2,329	3,207	4,102	4,780	5,576	<b>60-64</b>	2,788	3,846	4,729	5,519	6,447
<b>65-69</b>	3,546	4,599	5,818	6,783	7,915	<b>65-69</b>	4,039	5,421	6,672	7,801	9,131
<b>70-74</b>	4,934	6,386	7,943	9,237	10,751	<b>70-74</b>	5,710	7,230	9,566	11,155	13,019
<b>75-79</b>	6,484	9,055	12,044	14,005	16,294	<b>75-79</b>	7,228	10,115	13,455	15,614	18,127
<b>80-84</b>	8,768	11,720	16,112	18,751	21,835	<b>80-84</b>	9,428	12,371	16,928	19,576	22,645
<b>85-89</b>	13,882	17,429	24,015	27,951	32,545	<b>85-89</b>	13,103	16,717	21,314	24,578	28,350
<b>90+</b>	14,435	19,885	29,365	34,259	39,983	<b>90+</b>	14,219	19,240	25,946	29,847	34,347

All Health Expenses by Age Group - Females						All Health Expenses by Age Group - Males					
(\$ millions)						(\$ millions)					
	2000	2005	2010	2015	2020		2000	2005	2010	2015	2020
0-4	30	39	49	53	62	0-4	36	53	57	60	69
5-9	14	18	19	22	25	5-9	16	20	37	44	48
10-14	15	20	22	24	28	10-14	16	21	25	27	31
15-19	25	31	36	36	39	15-19	18	25	30	31	34
20-24	33	42	48	56	56	20-24	18	26	31	37	39
25-29	42	52	59	70	81	25-29	18	24	30	38	45
30-34	41	53	61	71	83	30-34	20	29	36	43	54
35-39	40	49	55	62	72	35-39	26	34	40	46	55
40-44	40	56	56	62	70	40-44	32	46	46	51	60
45-49	44	63	77	75	83	45-49	37	55	68	68	75
50-54	44	66	88	103	101	50-54	43	63	91	107	106
55-59	37	73	98	121	143	55-59	42	76	100	123	146
60-64	37	63	107	138	172	60-64	43	75	121	151	186
65-69	52	71	110	172	222	65-69	53	80	123	190	237
70-74	67	87	113	166	258	70-74	62	84	126	187	289
75-79	79	107	146	181	264	75-79	62	88	129	175	261
80-84	76	116	156	188	238	80-84	49	76	109	141	195
85-89	73	104	167	196	241	85-89	33	48	79	98	130
90+	41	70	128	185	224	90+	13	22	39	60	76
<b>Female</b>	<b>828</b>	<b>1,177</b>	<b>1,595</b>	<b>1,979</b>	<b>2,464</b>	<b>Male</b>	<b>639</b>	<b>945</b>	<b>1,316</b>	<b>1,676</b>	<b>2,135</b>

Per Capita Hospital Expenses - Females						Per Capita Hospital Expenses - Males					
	2000	2005	2010	2015	2020		2000	2005	2010	2015	2020
<b>0-4</b>	985	1,206	1,519	1,763	2,046	<b>0-4</b>	1,119	1,503	1,713	1,949	2,217
<b>5-9</b>	151	173	174	197	223	<b>5-9</b>	171	200	204	230	259
<b>10-14</b>	172	172	246	272	300	<b>10-14</b>	161	167	294	328	365
<b>15-19</b>	433	464	578	639	708	<b>15-19</b>	253	302	392	437	487
<b>20-24</b>	683	749	845	938	1,040	<b>20-24</b>	269	365	421	469	522
<b>25-29</b>	909	1,058	1,192	1,326	1,475	<b>25-29</b>	268	312	423	471	524
<b>30-34</b>	798	961	1,145	1,275	1,421	<b>30-34</b>	277	408	584	656	736
<b>35-39</b>	555	757	846	945	1,054	<b>35-39</b>	311	457	620	703	796
<b>40-44</b>	559	677	757	847	947	<b>40-44</b>	444	552	682	780	892
<b>45-49</b>	678	802	936	1,052	1,182	<b>45-49</b>	620	758	991	1,134	1,297
<b>50-54</b>	770	943	1,187	1,340	1,513	<b>50-54</b>	842	1,061	1,562	1,788	2,048
<b>55-59</b>	965	1,273	1,563	1,774	2,013	<b>55-59</b>	1,223	1,527	1,873	2,147	2,460
<b>60-64</b>	1,314	1,657	2,146	2,439	2,772	<b>60-64</b>	1,741	2,258	2,763	3,166	3,629
<b>65-69</b>	2,022	2,468	3,041	3,463	3,942	<b>65-69</b>	2,527	3,226	3,935	4,510	5,169
<b>70-74</b>	2,832	3,541	4,250	4,846	5,527	<b>70-74</b>	3,782	4,451	5,804	6,652	7,624
<b>75-79</b>	3,630	4,922	6,378	7,304	8,363	<b>75-79</b>	4,717	6,304	8,476	9,714	11,133
<b>80-84</b>	4,402	6,105	8,039	9,244	10,630	<b>80-84</b>	5,906	7,857	10,120	11,598	13,293
<b>85-89</b>	5,201	7,041	10,118	11,683	13,489	<b>85-89</b>	6,562	8,974	12,191	13,973	16,014
<b>90+</b>	5,482	8,275	13,119	15,210	17,634	<b>90+</b>	7,236	10,505	15,168	17,384	19,924



## **SECTION 2**

### **Modelling**

#### **Future**

#### **Healthcare Expenses**

#### **For New Brunswick's**

#### **Hospitals**

This section outlines the development of an actuarial model which can be used to project New Brunswick's future healthcare expenses for the hospitals by health zone/health region.

## Section Introduction

The Section 1 Model projected all healthcare expenses, by type, up to the year 2020 for the province of New Brunswick using the CIHI information from 1998–2009 combined with Statistics Canada population information.

While some healthcare expenses are budgeted at the provincial level, expenses for hospitals are budgeted for at the health zone/health region level. New Brunswick has seven such zones, each with very different geographic environments, demographic makeups, expected population growth rates, healthcare status, and needs.

The goal of this section is to provide **approximations** for the expected future zone expenses for some of the hospital expenses.

As before, most of the data is public and available from the NBHC website, CIHI, and Statistics Canada. Exceptions to this are the last five years of annual reports of the hospital services which show various aggregate detailed costs and statistics by health zone.

Unfortunately, no detailed utilization information by age and gender was available at the zone level.

## Hospital Model Overview

The Section 1 Model developed expected future per capita costs by age and gender by calendar year for hospital expenses for the province of New Brunswick overall. These same per capita costs can then be applied to population projections by calendar year and zone to develop the expected hospital costs by zone.

CIHI's data set does not match New Brunswick's hospital budget structure exactly. However, it is close enough that it can be used as a base and then one can simply increase (or decrease) the expenses by a factor, for each zone, to adjust to their actual expenses.

In detail, the steps are as follows:

1. Acquire Statistics Canada's population from 2006–2011 by health zone.
2. Develop a population projection model for New Brunswick which takes into account births, deaths, and population movements such as migration or immigration.

For each zone, this was accomplished by calculating the total change for each five-year age group cohort of population over the last five years (2006 to 2011). The projection model then assumes that future changes for that zone, for each such age group, will be the same.

**NOTE:** This model produces the same total population, but it has a **slightly lower average age** than the Statistics Canada projection used for the main model. Later phases can refine this.

3. Develop total hospital expenses for 2006–2020 for each zone using New Brunswick's Section 1 Model per capita hospital expenses, by age, gender, and calendar year, combined with the population projections by zone.
4. Select cost and statistical items from the annual hospital reports which have entries for each zone. The reports are

extensive statistical reports which show many aggregate cost and statistical items by health zone—however, there are no age- or gender-related data.

Items selected from the hospital reports' Table I-3(a) of facility-type expenses include:

- Acute care facilities;
- Extra-mural programs;
- Public health; and
- Community mental health.

Items selected from Table III-1(a) of acute care inpatient statistics include:

- Total Days Stay.
5. For each zone, develop ratios of the selected cost items for years 2006–2011 to the Step 3 totals. Then average the ratios for the last two fiscal years (2009–2010 and 2010–2011) and use that ratio for projecting future costs related to the Section 1 Model costs developed in Step 3.

See page 28 for an example of the hospital cost projections for Zone 1. See page 29 for a summary for all zones.

See appendix A for the details of the other zones.

The hospital cost projections below use two data sets:

- a. *CIHI* data set using the Section I Model and the population projections by zone; and
- b. NB’s **actual** reporting and budget structure.

**NOTE: The projections are based on current and projected zone populations and budgets; hence, not adjusted for current and future Inflow/Outflow ratios-related services provided to residents of other zones.**

Using historical data, ratios of **actual** to **CIHI** results were developed with the average for the last two years, 2009–2011, used to project the actual zone costs, by type, to 2019–2020.

Projected Hospital Costs - Zone 1 (Moncton area)															
By Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Section I Model - CIHI Data</b>															
Projected Costs (\$millions)	290	318	344	366	385	405	424	444	465	487	510	534	559	585	612
Population	196,385	197,706	199,728	201,972	204,498	207,009	209,074	211,138	213,203	215,268	217,285	219,302	221,319	223,336	225,353
Per Capita	1,479	1,607	1,721	1,814	1,883	1,955	2,029	2,105	2,183	2,264	2,349	2,437	2,527	2,621	2,716
Per Capita - NB	1,462	1,591	1,708	1,804	1,876	1,953	2,033	2,117	2,203	2,293	2,387	2,484	2,584	2,689	2,797
Relative Age/Sx Factor	1.01	1.01	1.01	1.01	1.00	1.00	1.00	0.99	0.99	0.99	0.98	0.98	0.98	0.97	0.97
Costs by Fiscal Year (\$millions)		297	324	349	371	390	410	429	450	471	493	516	541	566	592
<b>NB Hospital Budget Structure</b>															
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Acute Care Facilities</b>															
Actual Cost (\$millions)		390	415	444	482	505									
Ratio to Section I Model		1.310	1.279	1.270	1.298	1.296	1.297	1.297	1.297	1.297	1.297	1.297	1.297	1.297	1.297
Projected Acute Care Costs (\$millions)		390	415	444	482	505	531	557	583	611	640	670	701	734	768
Annual Increase			6.4%	7.0%	8.6%	4.9%	5.1%	4.8%	4.8%	4.7%	4.7%	4.7%	4.7%	4.7%	4.6%
<b>Acute Care + Extra Mural + Health Centre + Public Health + Mental Health Facilities</b>															
Actual Cost (\$millions)		416	442	475	518	539									
Ratio to Section I Model		1.398	1.364	1.358	1.395	1.383	1.389	1.389	1.389	1.389	1.389	1.389	1.389	1.389	1.389
Projected Acute Care Costs (\$millions)		416	442	475	518	539	569	596	625	654	685	717	751	786	822
Annual Increase			6.4%	7.3%	9.1%	4.2%	5.5%	4.8%	4.8%	4.7%	4.7%	4.7%	4.7%	4.7%	4.6%
<b>Projections</b>															

The Relative Age/Gender Factor measures the difference in demographics for each zone relative to the whole province.

Projected Hospital Costs															
Fiscal Year	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Projected Acute Care Costs</b>						(\$millions)									
Zone 1 (Moncton area)	390	415	444	482	505	531	557	583	611	640	670	701	734	768	
Zone 2 (Saint John area)	337	368	388	404	426	440	457	476	495	515	536	557	580	603	
Zone 3 (Fredericton area)	224	241	258	272	288	299	313	328	343	358	374	391	408	426	
Zone 4 (Edmunston area)	95	99	104	112	120	123	128	133	138	143	148	154	159	165	
Zone 5 (Campbellton area)	68	71	75	80	84	86	89	92	95	98	101	104	108	111	
Zone 6 (Bathurst area)	134	140	153	158	169	175	182	190	199	207	216	225	235	245	
Zone 7 (Miramichi area)	72	78	84	87	90	94	98	102	106	110	114	119	123	128	
<b>Total</b>	<b>1,320</b>	<b>1,411</b>	<b>1,505</b>	<b>1,596</b>	<b>1,682</b>	<b>1,748</b>	<b>1,824</b>	<b>1,903</b>	<b>1,985</b>	<b>2,071</b>	<b>2,159</b>	<b>2,252</b>	<b>2,347</b>	<b>2,447</b>	
Annual Increase		6.9%	6.7%	6.1%	5.4%	3.9%	4.4%	4.3%	4.3%	4.3%	4.3%	4.3%	4.2%	4.2%	
<b>Acute Care Facilities + Extra Mural + Health Centre + Public Health + Mental Health</b>															
Zone 1 (Moncton area)	416	442	475	518	539	569	596	625	654	685	717	751	786	822	
Zone 2 (Saint John area)	364	395	417	437	457	473	493	512	533	554	577	600	625	650	
Zone 3 (Fredericton area)	249	266	287	303	318	332	347	363	380	397	415	433	453	472	
Zone 4 (Edmunston area)	106	111	117	127	134	138	143	149	155	161	166	173	179	185	
Zone 5 (Campbellton area)	75	78	83	89	92	95	98	101	105	108	111	115	119	122	
Zone 6 (Bathurst area)	150	156	170	178	188	195	204	213	222	231	241	251	262	273	
Zone 7 (Miramichi area)	81	86	93	98	99	105	109	114	118	123	128	133	138	143	
<b>Total</b>	<b>1,441</b>	<b>1,536</b>	<b>1,641</b>	<b>1,749</b>	<b>1,828</b>	<b>1,907</b>	<b>1,990</b>	<b>2,077</b>	<b>2,166</b>	<b>2,259</b>	<b>2,356</b>	<b>2,457</b>	<b>2,561</b>	<b>2,669</b>	
Annual Increase		6.6%	6.9%	6.6%	4.5%	4.3%	4.4%	4.3%	4.3%	4.3%	4.3%	4.3%	4.2%	4.2%	

While the annual increases vary by zone and year from 3.2% to 5.5%, the average long-term is 4.3%, which includes 2% inflation.

**Population Projections by Zone.** As already mentioned, each healthcare zone has very different future expected population growth rates, as demonstrated in the tables below.

Calendar Year	2008	2012	2016	2020
<b>Population Projection</b>				
Zone 1 (Moncton area)	199,728	<b>209,074</b>	<b>217,285</b>	<b>225,353</b>
Zone 2 (Saint John area)	174,189	<b>176,811</b>	<b>179,100</b>	<b>181,188</b>
Zone 3 (Fredericton area)	171,160	<b>176,215</b>	<b>180,780</b>	<b>185,021</b>
Zone 4 (Edmunston area)	50,012	<b>48,361</b>	<b>46,572</b>	<b>44,738</b>
Zone 5 (Campbellton area)	27,339	<b>25,733</b>	<b>24,211</b>	<b>22,694</b>
Zone 6 (Bathurst area)	78,915	<b>76,516</b>	<b>73,776</b>	<b>70,869</b>
Zone 7 (Miramichi area)	45,680	<b>44,765</b>	<b>43,589</b>	<b>42,554</b>
<b>Population Growth Relative to 2008</b>				
Zone 1 (Moncton area)		<b>4.7%</b>	<b>8.8%</b>	<b>12.8%</b>
Zone 2 (Saint John area)		<b>1.5%</b>	<b>2.8%</b>	<b>4.0%</b>
Zone 3 (Fredericton area)		<b>3.0%</b>	<b>5.6%</b>	<b>8.1%</b>
Zone 4 (Edmunston area)		<b>-3.3%</b>	<b>-6.9%</b>	<b>-10.5%</b>
Zone 5 (Campbellton area)		<b>-5.9%</b>	<b>-11.4%</b>	<b>-17.0%</b>
Zone 6 (Bathurst area)		<b>-3.0%</b>	<b>-6.5%</b>	<b>-10.2%</b>
Zone 7 (Miramichi area)		<b>-2.0%</b>	<b>-4.6%</b>	<b>-6.8%</b>
<b>Population Growth Relative to 2012</b>				
Zone 1 (Moncton area)			<b>3.9%</b>	<b>7.8%</b>
Zone 2 (Saint John area)			<b>1.3%</b>	<b>2.5%</b>
Zone 3 (Fredericton area)			<b>2.6%</b>	<b>5.0%</b>
Zone 4 (Edmunston area)			<b>-3.7%</b>	<b>-7.5%</b>
Zone 5 (Campbellton area)			<b>-5.9%</b>	<b>-11.8%</b>
Zone 6 (Bathurst area)			<b>-3.6%</b>	<b>-7.4%</b>
Zone 7 (Miramichi area)			<b>-2.6%</b>	<b>-4.9%</b>

Similarly, the age/gender factors vary by zone and year with the negative growth zones becoming older and the positive growth

zones becoming younger relative to the average age/gender factor, for hospital service, by year. The table below shows the average relative **per capita** age/gender factors by zone.

Calendar Year	2008	2012	2016	2020
<b>Age/Gender Factor Relative to NB Average of 1.00</b>				
Zone 1 (Moncton area)	1.01	<b>1.00</b>	<b>0.98</b>	<b>0.97</b>
Zone 2 (Saint John area)	0.99	<b>0.97</b>	<b>0.96</b>	<b>0.95</b>
Zone 3 (Fredericton area)	0.95	<b>0.94</b>	<b>0.93</b>	<b>0.92</b>
Zone 4 (Edmunston area)	1.02	<b>1.04</b>	<b>1.07</b>	<b>1.10</b>
Zone 5 (Campbellton area)	1.09	<b>1.12</b>	<b>1.15</b>	<b>1.19</b>
Zone 6 (Bathurst area)	1.05	<b>1.10</b>	<b>1.15</b>	<b>1.21</b>
Zone 7 (Miramichi area)	1.05	<b>1.07</b>	<b>1.10</b>	<b>1.12</b>
NB	1.00	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>

In addition, *ageing and utilization trends* add 2.22% each year to the above table. The table below shows the combined *per capita* results beyond 2012.

Calendar Year	2008	2012	2016	2020
<b>Age/Gender Factor with Ageing and Utilization Trends Included</b>				
Zone 1 (Moncton area)		<b>1.00</b>	<b>1.07</b>	<b>1.16</b>
Zone 2 (Saint John area)		<b>0.97</b>	<b>1.05</b>	<b>1.13</b>
Zone 3 (Fredericton area)		<b>0.94</b>	<b>1.02</b>	<b>1.10</b>
Zone 4 (Edmunston area)		<b>1.04</b>	<b>1.17</b>	<b>1.31</b>
Zone 5 (Campbellton area)		<b>1.12</b>	<b>1.26</b>	<b>1.42</b>
Zone 6 (Bathurst area)		<b>1.10</b>	<b>1.26</b>	<b>1.44</b>
Zone 7 (Miramichi area)		<b>1.07</b>	<b>1.20</b>	<b>1.34</b>
NB		<b>1.00</b>	<b>1.09</b>	<b>1.19</b>

Essentially the above table includes all of the trends except for **price inflation**.

## **SECTION 3**

### **Modelling**

### **Lifestyle and Prevailing Chronic Health Conditions**

### **Versus**

### **New Brunswick's**

### **Future Hospital Expenses**

This section will develop an actuarial model which looks at lifestyle and chronic health conditions, by health zone, and explores their correlations with hospital expenses.

## Major Healthcare Costs

In order to slow the growth of the hospital costs, one needs to understand what chronic health conditions are causing the increases. Based on CIHI’s Patient Cost Estimator for the 2008–2009 period, for New Brunswick, the top five major clinical categories of disorders by costs are shown below. The percentages were determined after the expenses related to pregnancy, childbirth, and newborns were removed.

- 17.6% circulatory disorders;
- 12.0% digestive disorders;
- 11.0% mental disorders;
- 10.7% respiratory disorders; and
- 9.2% musculoskeletal disorders.

For the 8–59 age group, mental disorders were the largest cause of hospital visits at 17% by cost.

It is worth noting that mental disorders are now the **number one** cause of group long-term disability claims in Canada, approaching 40% of all new claims (for some population segments it exceeds 50%).

**NOTE:** CIHI’s Patient Cost Estimator measures the inpatient portion only of hospital expenses at \$400 million of the \$1,641 million total hospital expenses for the 2008–2009 fiscal period.

It would be useful to also allocate the remaining expenses by illness.

## Health Profiles

Recent 2011 population surveys of New Brunswick reported on:

- Lifestyle risks like obesity, smoking, and alcohol use; and
- Prevalence of chronic health conditions.

It is expected that hospital costs will be affected by both lifestyle risks and prevalence of chronic health conditions; but by how much?

An additional key component of the risk profile is the age and gender profile of each zone’s population. Examples of the **2010 annual per capita hospital** expenses from the Section 1 Model (CIHI data) are shown below:

Age	Male	Female
10–14	294	246
30–34	584	1,145
50–54	1,562	1,187
70–74	5,804	4,250
90+	15,168	13,119

As can be seen from the above table, an older population can be expected to have much higher hospital expenses.

The overall level prevalence rates of chronic health conditions are in turn also affected by the age and gender profile of the population. However, the increase by age is less steep than the per capita hospital costs.



## Lifestyle Risk Profile

Lifestyle is an important predictor of current and future healthcare needs. The table below represents the results of surveys across Canada along with NB’s split health zones. By assigning weights to each measure, one can compare the overall expected healthcare needs by zone by creating a Lifestyle Index

for each zone. To make the comparisons easy, New Brunswick’s index was set to 1.00 and the health zones’ indices were calculated in relation to New Brunswick’s index.

It is worth noting that Canada’s index is 80% of New Brunswick’s—a big contributor is the higher prevalence of obesity among New Brunswick’s population.

Lifestyle Index by Zone										
	Canada	NB	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Weight**
<b>Lifestyle</b>	<b>Percentage of Population</b>									
5+ alcohol drinks at least once per month	17.3	20.0	24.5	18.3	17.7	18.7	23.1	18.0	19.1	1.0
BMI>30	17.1	24.2	24.8	23.7	23.8	23.7	25.5	23.3	26.6	3.0
FruitVeg 5+ servings per day	43.1	37.3	36.1	34.1	37.5	41.2	39.1	47.1	33.9	0.0
Moderate+ PhysActive during leisure time	51.9	48.3	48.1	50.5	48.1	47.0	47.9	46.5	45.9	0.0
Smoker, daily or occasionally	21.3	23.0	23.1	22.6	22.6	26.6	22.9	21.9	23.4	2.0
<b>LifeStyle Risk Index</b>	<b>0.80</b>	<b>1.00</b>	<b>1.05</b>	<b>0.97</b>	<b>0.97</b>	<b>1.03</b>	<b>1.05</b>	<b>0.95</b>	<b>1.05</b>	
** Weight reflects relative increase in healthcare cost for each lifestyle measure.										
No weights have been assigned to PhysActive or FruitVeg since they may already be included indirectly through the BMI measure.										

The above information is based self-reporting surveys. For BMI>30, actual clinically measured results are typically higher—up to 25% based on recent OECD numbers.

## Chronic Condition Prevalence Rates

The presence of chronic conditions is also an important predictor of current and future healthcare needs. The table

below represents the results of a survey across New Brunswick. Separate tables by health zone were used in the risk model.

NBHC 2011 Primary Health Care Survey										
<i>Self-reported prevalence rates of chronic conditions by gender, age group and health zone.</i>										
<i>Self-reported prevalence rates (weighted)</i>										
New Brunswick	Gender		Age group							Total
	Male	Female	18-29	30-39	40-49	50-59	60-69	70-79	80+	
Chronic health condition										
Arthritis	14.3%	21.4%	2.2%	7.4%	11.6%	22.2%	33.2%	40.0%	46.9%	18.0%
Asthma	8.6%	11.9%	14.9%	9.6%	9.1%	9.2%	9.8%	9.1%	10.2%	10.3%
Chronic pain	13.0%	16.9%	6.4%	9.9%	14.6%	20.2%	20.2%	21.1%	18.7%	15.0%
Emphysema or COPD	2.5%	3.0%	0.7%	0.6%	1.1%	3.0%	5.5%	7.5%	10.0%	2.7%
Cancer	6.3%	7.7%	1.5%	1.6%	3.4%	7.5%	13.9%	19.5%	22.3%	7.0%
Diabetes	9.9%	8.6%	1.0%	2.8%	7.1%	10.9%	18.5%	20.3%	20.5%	9.2%
Depression	9.1%	15.9%	10.5%	12.8%	13.3%	15.6%	13.4%	8.5%	8.9%	12.7%
A mood disorder other than depression	2.8%	2.2%	2.8%	2.8%	2.7%	3.2%	2.0%	1.4%	0.2%	2.5%
Heart disease	10.0%	6.7%	0.8%	1.7%	3.4%	8.1%	17.3%	25.0%	32.8%	8.3%
Stroke	2.0%	2.1%	0.1%	0.4%	0.4%	2.2%	4.1%	6.0%	11.1%	2.0%
High blood pressure or hypertension	25.5%	26.0%	5.3%	8.3%	18.0%	32.2%	47.3%	56.0%	61.5%	25.7%
Gastric reflux (GERD)	14.2%	17.9%	5.9%	12.7%	15.9%	19.6%	23.2%	22.9%	21.4%	16.1%

## An Index for Chronic Conditions Prevalence Rates

As with the Lifestyle Index, one can create a Chronic Conditions Index. The first step is to assign a Major Clinical Category (MCC) to each condition. A second step is to assign a weight to each MCC category. The cost by MCC, from CIHI's Patient Cost Estimator, can serve this purpose.

By again assigning a value of 1.00 to New Brunswick, one can develop an index for each zone relative to New Brunswick's.

Chronic Conditions Prevalence Rate Index by Zone										
	NB	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7		Weight**
<b>MCC Description</b>	<b>Percentage of Population</b>									
Nervous System	2.0	1.6	1.9	2.1	2.3	2.3	2.4	2.6		17.9
Respiratory	13.0	11.8	13.8	13.8	11.7	13.1	14.4	12.2		38.6
Circulatory	50.2	48.3	49.1	49.3	52.1	59.3	52.1	53.8		63.6
Muscul + Connect Tissue	33.0	30.1	36.8	34.1	32.5	37.9	30.0	29.9		33.3
Endo, Nutri, Metabol	9.2	8.8	9.3	9.3	9.0	10.3	9.7	9.5		9.6
Mental Disorders	15.2	15.5	14.0	15.5	14.6	17.9	15.7	14.7		39.9
<b>Chronic Conditions Index</b>	<b>1.00</b>	<b>0.95</b>	<b>1.01</b>	<b>1.00</b>	<b>1.01</b>	<b>1.16</b>	<b>1.02</b>	<b>1.02</b>		
<i>MCC - Major Clinical Category</i>										
<i>** The weights have been assigned using CIHI's Patient Cost Estimator for the 2008-9 period</i>										
They represent the actual costs by MCC.										

## Combining Lifestyle and Chronic Risk Profiles

A simple way to combine the indices is to simply multiply them together. This also makes sense since it can be expected that someone with a heart problem has higher current and future expected health needs if that person also has a BMI>30.

However, before combining them, one may be overstating the effect of age since the Chronic Risk Index tends to be higher for older populations. This overstatement occurs since the Age/Gender profile is part of the basic model already.

See below for relative the 2011 Age/Gender factors for each zone relative to New Brunswick.

Testing seems to indicate that adjusting the Chronic Risk Index by removing 50% of the Relative Age/Gender factor developed for the per capita hospital costs is satisfactory since about half of chronic conditions are caused by ageing.

		NB	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
<b>Risk Profile Factors</b>									
LifeStyle (BMI, Smoking, Alcohol)		1.00	1.05	0.97	0.97	1.03	1.05	0.95	1.05
Chronic Disease Prevalence Rates		1.00	0.95	1.01	1.00	1.01	1.16	1.02	1.02
- with 50% Relative Age/Sx Factor Removed **		1.00	0.95	1.02	1.04	0.99	1.10	0.98	0.98
<b>Combined Risk Profile Factor</b>	<b>( A )</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>	<b>1.00</b>	<b>1.02</b>	<b>1.15</b>	<b>0.93</b>	<b>1.03</b>
<i>** 50% reflects cumulative nature of chronic diseases</i>									
<i>(by age, prevalence curve only 1/2 as steep as cost curve)</i>									

		NB	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
<b>Age / Sx Factor - Phase I Model</b>		1.00	1.00	0.98	0.94	1.03	1.11	1.09	1.07
<i>relative to NB Age / Sx factor</i>									

## Adjusting Zone Hospital Costs and Statistics

Now that the relative Risk Profiles have been developed by zone, are they good predictors of the current experience for 2010–2011?

Before one can compare the numbers, one needs to make three adjustments to the hospital costs and statistics since the Risk Profiles relate to the patients’ **normal** health zone residency but hospital stats and budgets relate to **all patients** regardless of their zone of residency and case complexity. The more complex cases will typically go to the hospitals best equipped to deal with them in New Brunswick.

The table on the right provides the information necessary for the adjustments.

The three adjustments are briefly as follows:

1. Adjust for the Inflow/Outflow Ratio for each health zone. This is the ratio of each zone’s hospital separations for their own zone residents to all separations which occur in the zone.
2. Adjust for case complexity using the Resource Intensity Weights Ratios (RIW) by health zone. The ratio represents a measure of average case complexity as determined by CIHI.
3. Adjust for Age/Gender effect on per capita hospital costs. For this model we have assumed that 50% is due to separations and 50% of due to patient severity.

2010-11 Values		
	Inflow /Outflow	RIW Ratio
<b>Zone 1</b>	1.11	1.53
<b>Zone 2</b>	1.15	1.76
<b>Zone 3</b>	0.92	1.33
<b>Zone 4</b>	0.97	1.36
<b>Zone 5</b>	1.04	1.19
<b>Zone 6</b>	0.92	1.34
<b>Zone 7</b>	0.83	1.25
<b>All Zones</b>	<b>1.01</b>	<b>1.41</b>

In the table on the next page, Inpatient Days by Zone have been redistributed such that all zones have an Inflow/Outflow ratio of 1.00.

Similarly, Acute Care Costs have been redistributed using both the Inflow/Outflow and RIW Ratios.

**After these adjustments have been made, one might assume that all separations have the same resource needs. However, it probably still understates the costs for some zones and overstating costs for other zones. An improved model would assign each patient’s actual costs/case complexity directly to their resident zone.**

## Adjusting Inpatient Acute Care Days and Costs

The table below has been adjusted as discussed on the prior page. The totals for the whole province remain the same.

**It is important to note that this table is a redistribution of inpatient days and costs such that all zones have the same Inflow/Outflow and same RIW. The focus is on zone residents. Hence, it is not an indicator of hospital efficiency.**

Actual 2010-11 Experience + Costs	NB	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	
<b>Acute Inpatient Days Only</b>	774,200	212,900	188,500	151,100	55,800	38,900	80,800	46,200	
- adjusted for Inflow/Outflow	774,200	195,700	167,200	167,500	58,700	39,700	88,600	56,800	
Per Capita Inpatient Days	1.02	0.95	0.95	0.96	1.20	1.52	1.15	1.26	
- with 50 % Relative Age/Sx Factor Removed **	1.02	0.95	0.96	0.99	1.18	1.44	1.10	1.22	
Relative to NB at 1.00	<b>( B )</b>	<b>1.00</b>	<b>0.92</b>	<b>0.94</b>	<b>0.96</b>	<b>1.16</b>	<b>1.41</b>	<b>1.07</b>	<b>1.19</b>
<b>Nursing Inpatient Days Excluding Psychiatry</b>	913,700	244,100	247,000	174,000	62,900	49,500	87,100	49,100	
In/Out Adjusted Inpatient Days	913,700	225,700	220,500	194,100	66,600	48,900	97,200	60,700	
Per Capita Inpatient Days	1.21	1.09	1.25	1.11	1.36	1.87	1.26	1.35	
- with 50 % Relative Age/Sx Factor Removed **	1.21	1.09	1.26	1.14	1.34	1.77	1.21	1.30	
Relative to NB at 1.00	<b>( C )</b>	<b>1.00</b>	<b>0.90</b>	<b>1.05</b>	<b>0.95</b>	<b>1.11</b>	<b>1.47</b>	<b>1.00</b>	<b>1.08</b>
<i>** 50% reflects 50% for each of separations and LOS</i>									
<b>Nursing Inpatient Costs Excluding Psychiatry (\$ millions)</b>	349	101	85	67	25	18	35	18	
In/Out & RIW Adjusted Costs	349	88	62	82	28	22	42	26	
Per Capita Acute Care Costs	462	425	352	468	574	842	544	577	
- with Relative Age/Sx Factor Removed	462	425	359	498	557	759	499	539	
Relative to NB at 1.00	<b>( D )</b>	<b>1.00</b>	<b>0.92</b>	<b>0.78</b>	<b>1.08</b>	<b>1.21</b>	<b>1.64</b>	<b>1.08</b>	<b>1.17</b>
<b>All Acute Care Hospital Costs (\$ millions)</b>	1,682	505	426	288	120	84	169	90	
- adjusted for Inflow/Outflow and RIW	1,682	444	314	351	136	106	203	129	
Per Capita Acute Care Costs	2,226	2,145	1,782	2,005	2,787	4,059	2,630	2,862	
- with Relative Age/Sx Factor Removed	2,226	2,145	1,818	2,133	2,705	3,657	2,413	2,675	
Relative to NB at 1.00	<b>( E )</b>	<b>1.00</b>	<b>0.96</b>	<b>0.82</b>	<b>0.96</b>	<b>1.22</b>	<b>1.64</b>	<b>1.08</b>	<b>1.20</b>

## Do the Risk Profiles Predict Healthcare Costs?

With the Risk Profiles and the actual results all adjusted such that all the health zone’s values relate to New Brunswick overall, one can test the Risk Profile’s ability to predict the relative healthcare costs by zone.

This can be done by determining correlations of the Risk Profile with the actual outcomes. See table below.

Correlations			
Risk Profile vs Per Capita Acute Days	<b>A vs B</b>	<b>0.78</b>	<i>Reflects strong effect of life style and presence of chronic diseases</i>
Risk Profile vs Per Capita Nurse Inpatient Days	<b>A vs C</b>	<b>0.87</b>	<i>Reflects strong effect of life style and presence of chronic diseases</i>
Risk Profile vs Per Capita Inpatient Costs	<b>A vs D</b>	<b>0.81</b>	<i>Reflects strong effect of life style and presence of chronic diseases</i>
Risk Profile vs Per Capita Acute Care Costs	<b>A vs E</b>	<b>0.82</b>	<i>Reflects strong effect of life style and presence of chronic diseases</i>

Hence, even though the hospital costs have been assigned at aggregate levels (not patient level), there appear to exist strong correlations of the Risk Profile by zone with both number of patient days and costs.

There appears to be significant value in reducing the obesity levels down to the overall Canada level at 17.1% versus 24.2% for New Brunswick. That would **over time** reduce the hospital acute days by 8–10% and hence hospital costs.

One would also expect that a targeted program to lower the BMI>30 category would also lower costs for the BMI>25 category.

New Brunswick’s Healthcare Utilization + Technology (UT) curve, as discussed with the Section 1 Model, is projected to

continue to increase year over year; the per capita annual hospital UT is currently at +.67% per year.

New Brunswick has a goal of at least lowering the annual per capita increase in the UT component to zero. Perhaps even decrease by 2% per annum to match the expected 2% annual inflation component. For hospitals, that still leaves an ageing component of 1.55% per annum; hence, for a ZERO \$ annual per capita increase in hospital costs one needs to **reduce the annual UT change to -3.55% compared to +.67% today.**

## **SECTION 4**

### **Future Phases**

This section will suggest some ideas for enhancing the actuarial model for projecting Brunswick's future healthcare costs.

In addition, it also includes some ideas for identifying opportunities for lowering the annual increase in healthcare costs.



**Future phases** can be focused on studies related to understanding and identifying opportunities to bend the annual trend in the combined utilization/technology curve. The curve has moved higher every year for many years, indicating more and more healthcare activities every year. The possibilities for bending the curve include:

- Improving the health status of the population;
- Identifying potentially costly illnesses early and with proper treatment incur lower overall expenses; and
- Identifying opportunities for improving productivity of the healthcare system through new technology.

The potential additional modelling includes:

1. Calibrating all the model assumptions to current utilization, costs, and trends. This includes testing of other scenarios for trends and future population models. Hence, producing a range of potential values.
2. Modelling the effect of lowering the BMI>30 lifestyle component for the non-hospital components. For example: senior drug costs are believed to be even more affected by lifestyle than hospital expenses.
3. Identifying successful BMI reduction models from other jurisdictions and reviewing their financial outcomes as well as overall improvement of various health measures; e.g., mortality rates and prevalence of chronic health conditions.
4. Splitting costs by regular healthcare and catastrophic life events. This would model end of life costs separately—very useful when projecting costs by major illnesses.

Splitting the projections of future utilization/cost by major illnesses using the CIHI and other data; this can be very informative for illnesses that are heavily influenced by lifestyle choices.

This then allows one to better model the **value** of wellness promotion, healthy living, and prevention strategies.

Relating such **values** to New Brunswick’s current and future GDP allows one to also view such promotion and wellness activities from an investment perspective using the time value of money.

5. Include the ability to allow input of various experts’ opinions when establishing model parameters, their values and expected trends in the near future—crucial for new technology likely to be introduced, along with supply-demand constraints. Such input will significantly improve the credibility of projections while also engaging local experts in the process and allowing for feedback loops leading to further improvements in the models.

This process is known as the “Delphi Method”. Making projections about future healthcare utilization is ideally suited for this since there are so many potential and changing factors to consider. Deriving future trends just using historical data and mathematical models will not capture all of these factors.

6. This model only looked at each chronic condition by itself. A cross-tabulation of persons with multiple chronic conditions by type would add more information.

## Appendix A

### Detailed Hospital Expenses

#### By Zone

This appendix shows the detailed hospital expense projection related to the other zones—see page 28 for Zone 1.

Projected Hospital Costs - Zone 1 (Moncton area)															
By Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Section I Model - CIHI Data</b>															
Projected Costs (\$millions)	290	318	344	366	385	405	424	444	465	487	510	534	559	585	612
Population	196,385	197,706	199,728	201,972	204,498	207,009	209,074	211,138	213,203	215,268	217,285	219,302	221,319	223,336	225,353
Per Capita	1,479	1,607	1,721	1,814	1,883	1,955	2,029	2,105	2,183	2,264	2,349	2,437	2,527	2,621	2,716
Per Capita - NB	1,462	1,591	1,708	1,804	1,876	1,953	2,033	2,117	2,203	2,293	2,387	2,484	2,584	2,689	2,797
Relative Age/Sx Factor	1.01	1.01	1.01	1.01	1.00	1.00	1.00	0.99	0.99	0.99	0.98	0.98	0.98	0.97	0.97
Costs by Fiscal Year (\$millions)		297	324	349	371	390	410	429	450	471	493	516	541	566	592
<b>NB Hospital Budget Structure</b>															
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Acute Care Facilities</b>															
Actual Cost (\$millions)		390	415	444	482	505									
Ratio to Section I Model		1.310	1.279	1.270	1.298	1.296	1.297	1.297	1.297	1.297	1.297	1.297	1.297	1.297	1.297
Projected Acute Care Costs (\$millions)		390	415	444	482	505	531	557	583	611	640	670	701	734	768
Annual Increase			6.4%	7.0%	8.6%	4.9%	5.1%	4.8%	4.8%	4.7%	4.7%	4.7%	4.7%	4.7%	4.6%
<b>Acute Care + Extra Mural + Health Centre + Public Health + Mental Health Facilities</b>															
Actual Cost (\$millions)		416	442	475	518	539									
Ratio to Section I Model		1.398	1.364	1.358	1.395	1.383	1.389	1.389	1.389	1.389	1.389	1.389	1.389	1.389	1.389
Projected Acute Care Costs (\$millions)		416	442	475	518	539	569	596	625	654	685	717	751	786	822
Annual Increase			6.4%	7.3%	9.1%	4.2%	5.5%	4.8%	4.8%	4.7%	4.7%	4.7%	4.7%	4.7%	4.6%
<b>Projections</b>															
<b>Projected Hospital Costs - Zone 2 (Saint John area)</b>															
By Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Section I Model - CIHI Data</b>															
Projected Costs (\$millions)	253	275	294	311	323	336	349	364	378	393	409	426	443	461	480
Population	173,430	173,767	174,189	175,218	175,713	176,222	176,811	177,400	177,989	178,578	179,100	179,622	180,144	180,666	181,188
Per Capita	1,457	1,581	1,690	1,776	1,840	1,906	1,976	2,049	2,124	2,202	2,285	2,371	2,460	2,552	2,647
Per Capita - NB	1,462	1,591	1,708	1,804	1,876	1,953	2,033	2,117	2,203	2,293	2,387	2,484	2,584	2,689	2,797
Relative Age/Sx Factor	1.00	0.99	0.99	0.98	0.98	0.98	0.97	0.97	0.96	0.96	0.96	0.95	0.95	0.95	0.95
Costs by Fiscal Year (\$millions)		258	280	299	314	326	339	353	367	382	397	413	430	448	466
<b>NB Hospital Budget Structure</b>															
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Acute Care Facilities</b>															
Actual Cost (\$millions)		337	368	388	404	426									
Ratio to Section I Model		1.305	1.314	1.299	1.286	1.305	1.295	1.295	1.295	1.295	1.295	1.295	1.295	1.295	1.295
Projected Acute Care Costs (\$millions)		337	368	388	404	426	440	457	476	495	515	536	557	580	603
Annual Increase			9.1%	5.5%	4.2%	5.5%	3.2%	4.0%	4.0%	4.0%	4.0%	4.1%	4.1%	4.1%	4.0%
<b>Acute Care + Extra Mural + Health Centre + Public Health + Mental Health Facilities</b>															
Actual Cost (\$millions)		364	395	417	437	457									
Ratio to Section I Model		1.410	1.413	1.396	1.390	1.400	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395
Projected Acute Care Costs (\$millions)		364	395	417	437	457	473	493	512	533	554	577	600	625	650
Annual Increase			8.5%	5.5%	4.8%	4.7%	3.6%	4.0%	4.0%	4.0%	4.0%	4.1%	4.1%	4.1%	4.0%

Projected Hospital Costs - Zone 3 (Fredericton area)															
By Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Section I Model - CIHI Data</b>															
Projected Costs (\$millions)	236	256	277	294	307	321	336	352	368	385	402	420	439	458	478
Population	169,558	169,956	171,160	172,603	173,876	175,047	176,215	177,383	178,551	179,719	180,780	181,840	182,900	183,960	185,021
Per Capita	1,391	1,509	1,616	1,704	1,768	1,836	1,909	1,985	2,062	2,142	2,225	2,311	2,399	2,490	2,584
Per Capita - NB	1,462	1,591	1,708	1,804	1,876	1,953	2,033	2,117	2,203	2,293	2,387	2,484	2,584	2,689	2,797
Relative Age/Sx Factor	0.95	0.95	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.93	0.93	0.92
Costs by Fiscal Year (\$millions)		241	261	281	297	311	325	340	356	372	389	407	425	444	463
<b>NB Hospital Budget Structure</b>															
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Acute Care Facilities</b>															
Actual Cost (\$millions)		224	241	258	272	288									
Ratio to Section I Model		0.931	0.920	0.919	0.915	0.926	0.920	0.920	0.920	0.920	0.920	0.920	0.920	0.920	0.920
Projected Acute Care Costs (\$millions)		224	241	258	272	288	299	313	328	343	358	374	391	408	426
Annual Increase			7.3%	7.3%	5.4%	5.8%	4.0%	4.7%	4.6%	4.6%	4.5%	4.5%	4.4%	4.4%	4.4%
<b>Acute Care + Extra Mural + Health Centre + Public Health + Mental Health Facilities</b>															
Actual Cost (\$millions)		249	266	287	303	318									
Ratio to Section I Model		1.034	1.019	1.021	1.019	1.022	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Projected Acute Care Costs (\$millions)		249	266	287	303	318	332	347	363	380	397	415	433	453	472
Annual Increase			6.9%	7.7%	5.6%	4.9%	4.4%	4.7%	4.6%	4.6%	4.5%	4.5%	4.4%	4.4%	4.4%
<b>Projections</b>															
<b>Projected Hospital Costs - Zone 4 (Edmunston area)</b>															
By Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Section I Model - CIHI Data</b>															
Projected Costs (\$millions)	75	81	87	92	95	99	102	106	110	115	119	123	128	132	137
Population	51,025	50,542	50,012	49,591	49,212	48,805	48,361	47,918	47,474	47,031	46,572	46,114	45,655	45,197	44,738
Per Capita	1,471	1,604	1,736	1,847	1,929	2,020	2,118	2,220	2,327	2,439	2,553	2,674	2,800	2,932	3,070
Per Capita - NB	1,462	1,591	1,708	1,804	1,876	1,953	2,033	2,117	2,203	2,293	2,387	2,484	2,584	2,689	2,797
Relative Age/Sx Factor	1.01	1.01	1.02	1.02	1.03	1.03	1.04	1.05	1.06	1.06	1.07	1.08	1.08	1.09	1.10
Costs by Fiscal Year (\$millions)		77	83	88	92	96	100	103	107	112	116	120	124	129	134
<b>NB Hospital Budget Structure</b>															
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Acute Care Facilities</b>															
Actual Cost (\$millions)		95	99	104	112	120									
Ratio to Section I Model		1.234	1.200	1.182	1.217	1.252	1.234	1.234	1.234	1.234	1.234	1.234	1.234	1.234	1.234
Projected Acute Care Costs (\$millions)		95	99	104	112	120	123	128	133	138	143	148	154	159	165
Annual Increase			4.8%	5.1%	8.1%	6.7%	2.4%	3.9%	3.9%	3.8%	3.8%	3.7%	3.7%	3.7%	3.7%
<b>Acute Care + Extra Mural + Health Centre + Public Health + Mental Health Facilities</b>															
Actual Cost (\$millions)		106	111	117	127	134									
Ratio to Section I Model		1.390	1.348	1.329	1.371	1.403	1.387	1.387	1.387	1.387	1.387	1.387	1.387	1.387	1.387
Projected Acute Care Costs (\$millions)		106	111	117	127	134	138	143	149	155	161	166	173	179	185
Annual Increase			4.5%	5.2%	8.4%	6.1%	2.7%	3.9%	3.9%	3.8%	3.8%	3.7%	3.7%	3.7%	3.7%

Projected Hospital Costs - Zone 5 (Campbellton area)															
By Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Section I Model - CIHI Data</b>															
Projected Costs (\$millions)	45	48	51	53	55	57	59	61	63	65	67	69	71	73	75
Population	28,206	27,723	27,339	26,933	26,537	26,114	25,733	25,352	24,971	24,590	24,211	23,832	23,452	23,073	22,694
Per Capita	1,578	1,725	1,866	1,980	2,072	2,177	2,281	2,390	2,506	2,627	2,753	2,885	3,024	3,172	3,327
Per Capita - NB	1,462	1,591	1,708	1,804	1,876	1,953	2,033	2,117	2,203	2,293	2,387	2,484	2,584	2,689	2,797
Relative Age/Sx Factor	1.08	1.08	1.09	1.10	1.10	1.11	1.12	1.13	1.14	1.15	1.15	1.16	1.17	1.18	1.19
Costs by Fiscal Year (\$millions)		45	49	52	54	55	57	59	61	63	65	67	69	71	74
<b>NB Hospital Budget Structure</b>															
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Acute Care Facilities</b>															
Actual Cost (\$millions)		68	71	75	80	84									
Ratio to Section I Model		1.493	1.460	1.457	1.495	1.519	1.507	1.507	1.507	1.507	1.507	1.507	1.507	1.507	1.507
Projected Acute Care Costs (\$millions)		68	71	75	80	84	86	89	92	95	98	101	104	108	111
Annual Increase			4.9%	5.9%	6.8%	4.8%	2.5%	3.2%	3.3%	3.3%	3.2%	3.2%	3.2%	3.2%	3.2%
<b>Acute Care + Extra Mural + Health Centre + Public Health + Mental Health Facilities</b>															
Actual Cost (\$millions)		75	78	83	89	92									
Ratio to Section I Model		1.649	1.609	1.607	1.652	1.667	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660
Projected Acute Care Costs (\$millions)		75	78	83	89	92	95	98	101	105	108	111	115	119	122
Annual Increase			4.6%	6.0%	7.1%	4.1%	2.9%	3.2%	3.3%	3.3%	3.2%	3.2%	3.2%	3.2%	3.2%
<b>Projections</b>															
<b>Projected Hospital Costs - Zone 6 (Bathurst area)</b>															
By Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Section I Model - CIHI Data</b>															
Projected Costs (\$millions)	121	132	142	150	157	164	171	178	186	194	202	211	220	229	239
Population	80,381	79,633	78,915	78,352	77,799	77,187	76,516	75,845	75,174	74,503	73,776	73,050	72,323	71,596	70,869
Per Capita	1,503	1,652	1,794	1,913	2,014	2,123	2,235	2,353	2,476	2,605	2,744	2,890	3,043	3,205	3,374
Per Capita - NB	1,462	1,591	1,708	1,804	1,876	1,953	2,033	2,117	2,203	2,293	2,387	2,484	2,584	2,689	2,797
Relative Age/Sx Factor	1.03	1.04	1.05	1.06	1.07	1.09	1.10	1.11	1.12	1.14	1.15	1.16	1.18	1.19	1.21
Costs by Fiscal Year (\$millions)		124	134	144	152	158	166	173	180	188	196	205	213	222	232
<b>NB Hospital Budget Structure</b>															
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Acute Care Facilities</b>															
Actual Cost (\$millions)		134	140	153	158	169									
Ratio to Section I Model		1.085	1.046	1.062	1.044	1.068	1.056	1.056	1.056	1.056	1.056	1.056	1.056	1.056	1.056
Projected Acute Care Costs (\$millions)		134	140	153	158	169	175	182	190	199	207	216	225	235	245
Annual Increase			4.7%	8.8%	3.7%	6.9%	3.4%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.2%
<b>Acute Care + Extra Mural + Health Centre + Public Health + Mental Health Facilities</b>															
Actual Cost (\$millions)		150	156	170	178	188									
Ratio to Section I Model		1.212	1.165	1.183	1.172	1.186	1.179	1.179	1.179	1.179	1.179	1.179	1.179	1.179	1.179
Projected Acute Care Costs (\$millions)		150	156	170	178	188	195	204	213	222	231	241	251	262	273
Annual Increase			4.4%	8.8%	4.5%	5.8%	3.9%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.2%

Projected Hospital Costs - Zone 7 (Miramichi area)															
By Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Section I Model - CIHI Data</b>															
Projected Costs (\$millions)	71	77	82	87	90	94	98	102	106	110	114	119	124	128	133
Population	46,689	46,188	45,680	45,314	45,203	45,071	44,765	44,459	44,153	43,848	43,589	43,330	43,071	42,813	42,554
Per Capita	1,515	1,663	1,799	1,912	1,999	2,084	2,184	2,288	2,397	2,512	2,626	2,745	2,869	2,999	3,134
Per Capita - NB	1,462	1,591	1,708	1,804	1,876	1,953	2,033	2,117	2,203	2,293	2,387	2,484	2,584	2,689	2,797
Relative Age/Sx Factor	1.04	1.05	1.05	1.06	1.07	1.07	1.07	1.08	1.09	1.10	1.10	1.11	1.11	1.12	1.12
Costs by Fiscal Year (\$millions)		72	78	83	88	91	95	99	103	107	111	116	120	125	130
<b>NB Hospital Budget Structure</b>															
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Acute Care Facilities</b>															
Actual Cost (\$millions)		72	78	84	87	90									
Ratio to Section I Model		1.002	0.994	1.004	0.999	0.981	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990
Projected Acute Care Costs (\$millions)		72	78	84	87	90	94	98	102	106	110	114	119	123	128
Annual Increase			7.3%	7.6%	4.6%	2.3%	4.9%	4.1%	4.1%	4.1%	4.0%	3.9%	3.9%	3.9%	3.9%
<b>Acute Care + Extra Mural + Health Centre + Public Health + Mental Health Facilities</b>															
Actual Cost (\$millions)		81	86	93	98	99									
Ratio to Section I Model		1.118	1.103	1.119	1.122	1.087	1.105	1.105	1.105	1.105	1.105	1.105	1.105	1.105	1.105
Projected Acute Care Costs (\$millions)		81	86	93	98	99	105	109	114	118	123	128	133	138	143
Annual Increase			6.7%	8.1%	5.4%	1.0%	5.7%	4.1%	4.1%	4.1%	4.0%	3.9%	3.9%	3.9%	3.9%
<b>Projections</b>															
<b>Summary Projected Hospital Costs by Zone</b>															
Fiscal Year	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	
<b>Projected Acute Care Costs</b> (\$ millions)															
Zone 1 (Moncton area)	390	415	444	482	505	531	557	583	611	640	670	701	734	768	
Zone 2 (Saint John area)	337	368	388	404	426	440	457	476	495	515	536	557	580	603	
Zone 3 (Fredericton area)	224	241	258	272	288	299	313	328	343	358	374	391	408	426	
Zone 4 (Edmunston area)	95	99	104	112	120	123	128	133	138	143	148	154	159	165	
Zone 5 (Campbellton area)	68	71	75	80	84	86	89	92	95	98	101	104	108	111	
Zone 6 (Bathurst area)	134	140	153	158	169	175	182	190	199	207	216	225	235	245	
Zone 7 (Miramichi area)	72	78	84	87	90	94	98	102	106	110	114	119	123	128	
Total	1,320	1,411	1,505	1,596	1,682	1,748	1,824	1,903	1,985	2,071	2,159	2,252	2,347	2,447	
Annual Increase		6.9%	6.7%	6.1%	5.4%	3.9%	4.4%	4.3%	4.3%	4.3%	4.3%	4.3%	4.2%	4.2%	
<b>Acute Care Facilities + Extra Mural + Health Centre + Public Health + Mental Health</b>															
Zone 1 (Moncton area)	416	442	475	518	539	569	596	625	654	685	717	751	786	822	
Zone 2 (Saint John area)	364	395	417	437	457	473	493	512	533	554	577	600	625	650	
Zone 3 (Fredericton area)	249	266	287	303	318	332	347	363	380	397	415	433	453	472	
Zone 4 (Edmunston area)	106	111	117	127	134	138	143	149	155	161	166	173	179	185	
Zone 5 (Campbellton area)	75	78	83	89	92	95	98	101	105	108	111	115	119	122	
Zone 6 (Bathurst area)	150	156	170	178	188	195	204	213	222	231	241	251	262	273	
Zone 7 (Miramichi area)	81	86	93	98	99	105	109	114	118	123	128	133	138	143	
Total	1,441	1,536	1,641	1,749	1,828	1,907	1,990	2,077	2,166	2,259	2,356	2,457	2,561	2,669	
Annual Increase		6.6%	6.9%	6.6%	4.5%	4.3%	4.4%	4.3%	4.3%	4.3%	4.3%	4.3%	4.2%	4.2%	