

New Brunswick Health Council Briefing

An Actuarial Model for Projecting Future Health Care Costs A CIA/NBHC Joint Project

Seeing Beyond Risk

Canadian
Institute of
Actuaries



Institut
canadien
des actuaires

Voir au-delà du risque

The Project

- NBHC's primary concerns:
 - Budgeting
 - Cost containment
 - Impact of lifestyle factors
- The Canadian Institute of Actuaries developed an *actuarial model* to help manage these factors



Demonstration Project

- Model uses CIHI data by age & gender
 - Does not cover all health care expenses
- Excludes normal testing of assumptions and data sources
- Excludes adjustments for any upcoming changes to provincial health care plan.



Key Findings

- From 2010 to 2020, healthcare costs are forecasted to increase from
 - \$2.9 billion to \$4.6 billion (in total)
 - \$3,866 to \$5,976 (per capita)
- There is a positive correlation between *risk profiles* and *per capital hospital costs*
- Reducing obesity to the Canadian average will over time *reduce* hospital costs by 8-10%



Healthcare Cost Forecast

- Based on public data
- Separate trends developed by age group, gender, and provider
- Utilization is highest at the oldest and youngest ages

Trends:

| | 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% |

Per Capita Costs:

| | 2000 | 2010 | 2020 |
|--------------|--------------|--------------|--------------|
| Hospitals+ | 1,219 | 2,339 | 3,599 |
| Physician+ | 354 | 717 | 1,105 |
| Drug | 104 | 247 | 452 |
| Other | 276 | 564 | 820 |
| Total | 1,954 | 3,866 | 5,976 |



Risk Profile Correlation

- Risk profile: chronic conditions + *obesity, smoking, and alcohol use*
- Developed for each zone and tested against per capita hospital costs
- 75% is considered a *strong* predictor

| Lifestyle Index | | | |
|---|-----------------------------|---------------|--------|
| Lifestyle | Canada | New Brunswick | Weight |
| | % of Population | | |
| 5+ alcohol drinks at least once per month | 17.3 | 20.0 | 1.0 |
| Smoker, daily or occasionally | 21.3 | 23.0 | 2.0 |
| BMI>30 | 17.1 | 24.2 | 3.0 |
| Index | 0.80 | 1.00* | |
| | * New Brunswick set to 1.00 | | |

Actual Correlation Results (Per Capita)

Acute Days - 78%

Nurse Inpatient Days - 87%

Inpatient Costs - 81%

Acute Care Costs - 82%



Impact on Hospital Costs

- Obesity levels:
 - Canada (Overall) 17.1%
 - New Brunswick 24.2%
- Reduction to the Canada overall level would reduce hospital acute days, over time, by 8-10%
- Utilization and technology (UT) forecasted to be +0.67% per year
 - This needs to be *reduced* to -3.55% per year to offset inflation and aging, to achieve a 0% increase in hospital costs



Why an Actuarial Analysis?

- Through modelling and analysis, actuaries help their clients understand and manage the *financial risk* associated with *future contingent events*
 - Examples – life insurance, pension plans, home and auto insurance
 - Can also be extended to health care
- Limited opportunities in Canada due to predominant public funding
 - Contrast with United States



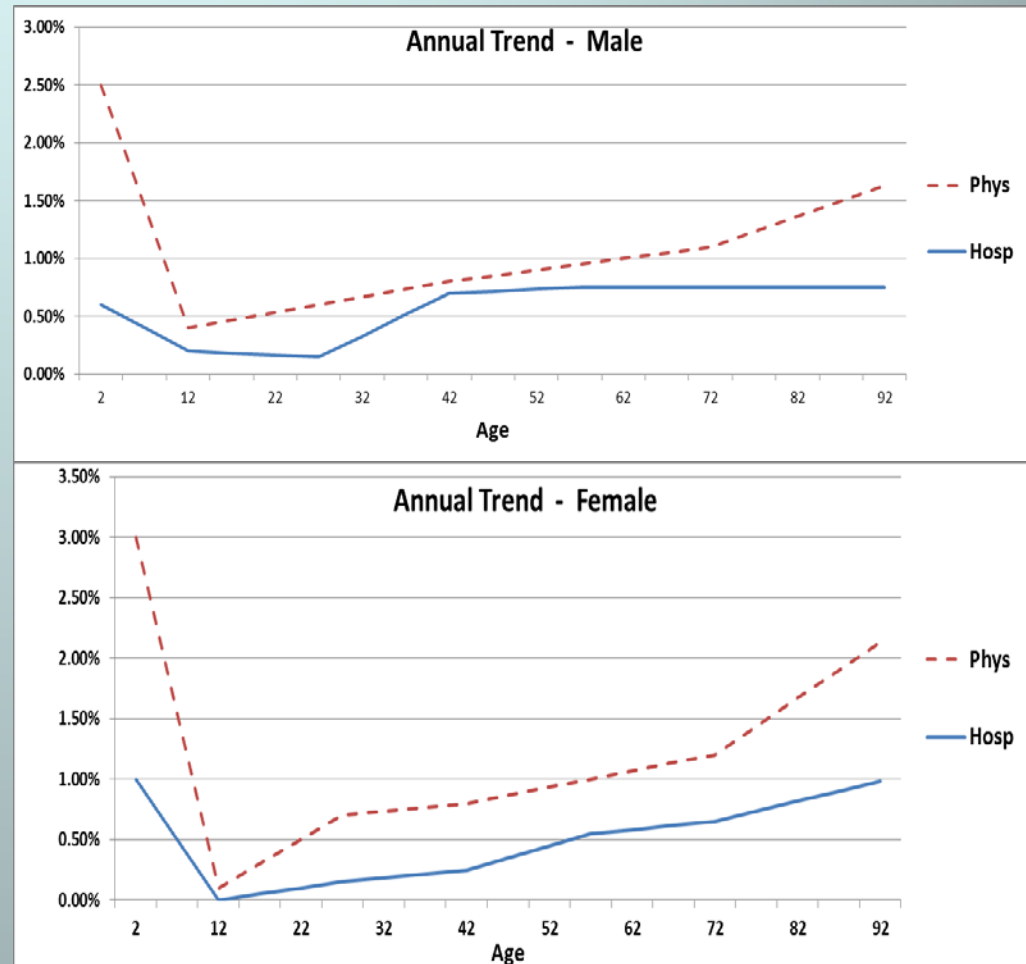
Modelling Approach

- Per capita basis
- Remove price inflation
- Develop trends by
 - Age group
 - Gender
 - Provider type (hospitals, physicians, drugs, other)
 - Calendar year
- Project inflation by year and service type
- Project population by age and gender



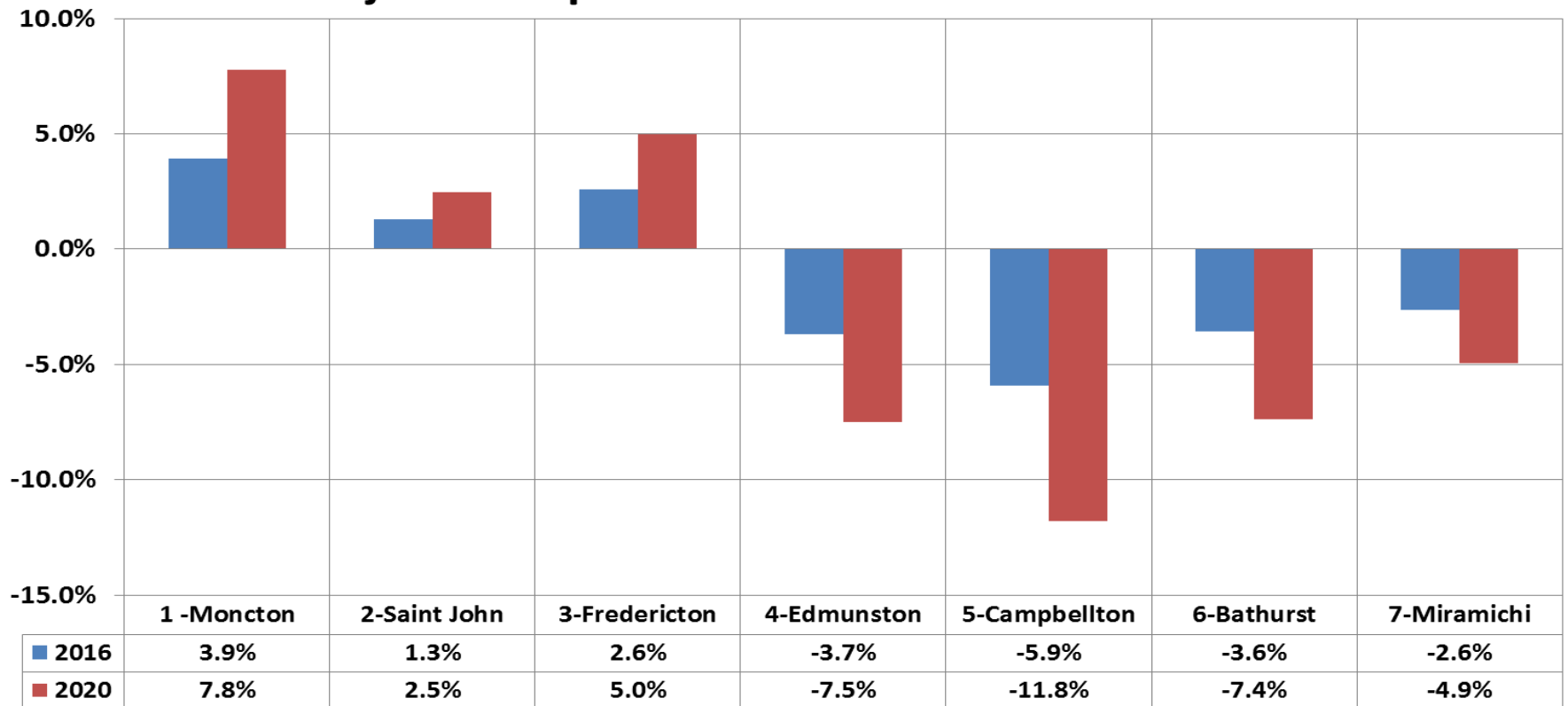
Utilization Trends by Age

- Utilization higher for older age groups
- Highest for very young, but decreases rapidly
- Implications for future costs in an ageing society



Population Change by Zone

Projected Population Growth Relative to 2012



Health Zone



Lifestyle by Zone

Lifestyle Risk Index by Zone

| | Canada | NB | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Zone 6 | Zone 7 | | Weight |
|------------------|---------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--|--------|
| Lifestyle | Percentage of Population | | | | | | | | | | |
| Alcohol | 17.3 | 20.0 | 24.5 | 18.3 | 17.7 | 18.7 | 23.1 | 18.0 | 19.1 | | 1.0 |
| Smoking | 21.3 | 23.0 | 23.1 | 22.6 | 22.6 | 26.6 | 22.9 | 21.9 | 23.4 | | 2.0 |
| Obesity | 17.1 | 24.2 | 24.8 | 23.7 | 23.8 | 23.7 | 25.5 | 23.3 | 26.6 | | 3.0 |
| Index | 0.80 | 1.00 | 1.05 | 0.97 | 0.97 | 1.03 | 1.05 | 0.95 | 1.05 | | |



Chronic Health Conditions

Major Clinical Categories – Hospital Patients*

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

Total 60.5% related to chronic disorders

For ages 8-59, mental disorders are largest cause at 17%

* CIHI's Patient Cost Estimator for 2008-2009 after pregnancy, childbirth, and newborns removed.



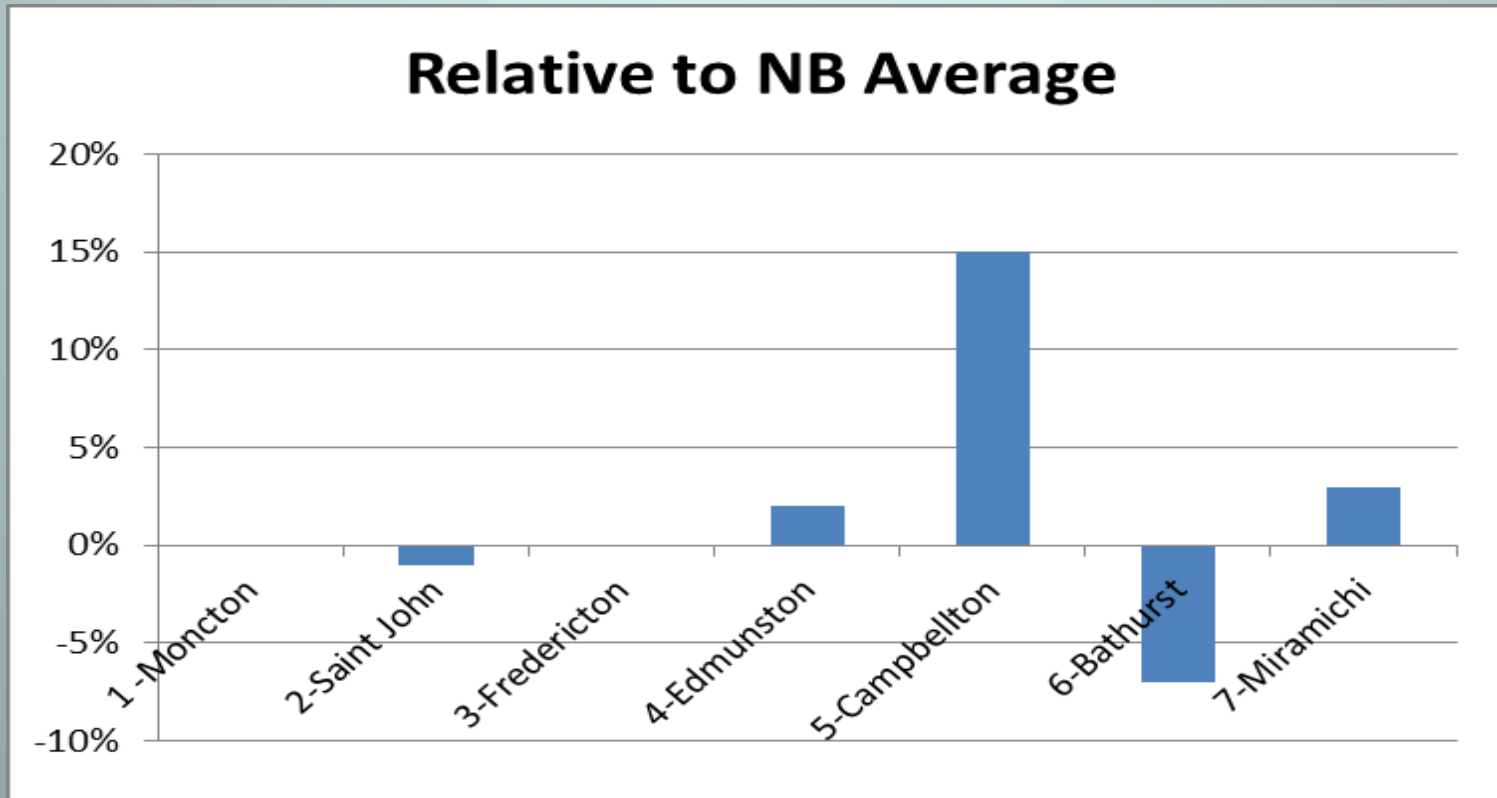
Chronic Conditions Index

Chronic Conditions Prevalence Rate Index by Zone

| | NB | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Zone 6 | Zone 7 | Weight** |
|---------------------------|---------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|----------|
| MCC Description | Percentage of Population | | | | | | | | |
| Nervous System | 2.00 | 1.58 | 1.91 | 2.10 | 2.26 | 2.28 | 2.42 | 2.55 | 17.9 |
| Respiratory | 13.04 | 11.80 | 13.75 | 13.75 | 11.65 | 13.14 | 14.39 | 12.21 | 38.6 |
| Circulatory | 50.15 | 48.28 | 49.07 | 49.30 | 52.09 | 59.31 | 52.08 | 53.78 | 63.6 |
| Muscul + Connect Tiss | 32.97 | 30.09 | 36.83 | 34.12 | 32.50 | 37.89 | 29.98 | 29.93 | 33.3 |
| Endo, Nutri, Metabol | 9.24 | 8.81 | 9.29 | 9.28 | 8.97 | 10.31 | 9.69 | 9.54 | 9.6 |
| Mental Disorders | 15.18 | 15.51 | 14.04 | 15.52 | 14.55 | 17.94 | 15.71 | 14.73 | 39.9 |
| Chronic Conditions | 1.00 | 0.95 | 1.01 | 1.00 | 1.01 | 1.16 | 1.02 | 1.02 | |



Lifestyle + Chronic Index



This is before ageing!



Future Steps

- **Additional Data**
 - 2010 CIHI data, 2011/12 provincial data, 2011 census
 - Additional expense categories (not just CIHI)
- **Updated Actuarial Models**
 - Updated mortality tables, model costs for multiple chronic conditions, sensitivity testing, test other scenarios in delivery and outcomes using expert opinions
- **Explore Economic Value of Wellness**
 - Additional GDP, lower health care costs



QUESTIONS



Appendix Slides



Healthcare Costs *

Millions

| | 2000 | 2010 | 2020 |
|--------------|--------------|--------------|--------------|
| Hospitals+ | 915 | 1,761 | 2,769 |
| Physician+ | 266 | 540 | 850 |
| Drug | 78 | 186 | 348 |
| Other | 207 | 424 | 631 |
| Total | 1,466 | 2,911 | 4,599 |

* CIHI costs basis



Per Capita Hospital Costs*

| Per Capita Hospital Costs | | | |
|---------------------------|--------|--------|-----------------|
| Male | 2010 | 2020 | Annual Increase |
| 10-14 | 294 | 365 | 2.2% |
| 30-34 | 584 | 736 | 2.3% |
| 50-54 | 1,562 | 2,048 | 2.7% |
| 70-74 | 5,804 | 7,624 | 2.8% |
| 90+ | 15,168 | 19,924 | 2.8% |

Costs increase annually .2% to .8% over inflation

* CIHI costs basis



Per Capita Hospital Costs*

| Per Capita Hospital Costs | | | |
|----------------------------------|-------------|-------------|------------------------|
| Female | 2010 | 2020 | Annual Increase |
| 10-14 | 246 | 300 | 2.0% |
| 30-34 | 1,145 | 1,421 | 2.2% |
| 50-54 | 1,187 | 1,513 | 2.5% |
| 70-74 | 4,250 | 5,527 | 2.7% |
| 90+ | 13,119 | 17,634 | 3.0% |

Costs increase annually .0% to 1.0% over inflation

* CIHI costs basis



Overall Data

Only Public Data

- Annual Report of Hospital Services 2006-2011
- Canadian Parliamentary Budget Office projections
- Statistics Canada population statistics/ projections
- CIHI 1997-2009
- NBHC reports



Data for Hospital Model

Actuarial Model I projections using CIHI data

+

Annual Report of Hospital Services costs

- Acute care facilities
- Extra-mural programs
- Public health
- Community mental health

- Total days stay



Hospital Model

Model Components

- Populations by health zone, year, age, and gender
- Model I per capita hospital costs for NB
= Model I hospital costs by year and health zone
- Actual costs by zone and hospital facility type
- Develop RATIO of actual costs to Model I by zone
- Project future hospital costs using RATIO

Ex: Zone 1 acute care costs = 129.7% of Model I costs



Hospital Cost by Zone

Millions

| Acute Care Costs | | | | |
|---------------------------|--|---------|---------|-----------------|
| Health Zone | | 2010-11 | 2019-20 | Annual Increase |
| Zone 1 (Moncton area) | | 505 | 768 | 4.8% |
| Zone 2 (Saint John area) | | 426 | 603 | 3.9% |
| Zone 3 (Fredericton area) | | 288 | 426 | 4.5% |
| Zone 4 (Edmunston area) | | 120 | 165 | 3.6% |
| Zone 5 (Campbellton area) | | 84 | 111 | 3.1% |
| Zone 6 (Bathurst area) | | 169 | 245 | 4.2% |
| Zone 7 (Miramichi area) | | 90 | 128 | 4.1% |
| Total | | 1,682 | 2,447 | 4.3% |

Annual increases vary from 3.1% to 4.8%



Hospital Cost by Zone

| Acute Care, Extra Mural, Health Centre, Public & Mental Health | | | | |
|--|--|---------|---------|-----------------|
| Health Zone | | 2010-11 | 2019-20 | Annual Increase |
| Zone 1 (Moncton area) | | 539 | 822 | 4.8% |
| Zone 2 (Saint John area) | | 457 | 650 | 4.0% |
| Zone 3 (Fredericton area) | | 318 | 472 | 4.5% |
| Zone 4 (Edmunston area) | | 134 | 185 | 3.6% |
| Zone 5 (Campbellton area) | | 92 | 122 | 3.2% |
| Zone 6 (Bathurst area) | | 188 | 273 | 4.3% |
| Zone 7 (Miramichi area) | | 99 | 143 | 4.2% |
| Total | | 1,828 | 2,669 | 4.3% |

Annual increases vary from 3.2% to 4.8%



Hospital Cost Trends

Per Capita

| Ageing and Utilization Increases from 2012 | | |
|---|-------------|-------------|
| | 2016 | 2020 |
| Zone 1 (Moncton area) | 7% | 16% |
| Zone 2 (Saint John area) | 5% | 13% |
| Zone 3 (Fredericton area) | 2% | 10% |
| Zone 4 (Edmunston area) | 17% | 31% |
| Zone 5 (Campbellton area) | 26% | 42% |
| Zone 6 (Bathurst area) | 26% | 44% |
| Zone 7 (Miramichi area) | 20% | 34% |
| NB | 9% | 19% |

- Inflation is projected, add another 8.2% every 4 years
- Zones 5 and 6 are ageing fast as their populations decline



Lifestyle + Chronic Index -> (Risk Profile Index)

Is the Risk Profile Index a good predictor of hospital costs by Zone?

Yes, after adjusting hospital costs by zone for

- Inflow/outflow patient ratios
- Case complexity
- Age/gender profiles

