Small Area Rate Variation:
Small area rate variation in the prevalence and characteristics of high-cost users of health services in Nova Scotia

George Kephart PhD
and the SARV Study Team

Department of Community Health and Epidemiology
Email: george.kephart@dal.ca

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http://www.spor-maritime-srap.ca/news/all/mssu-research-reports
Research Team

Collaboration between the MSSU and the Nova Scotia Primary and Integrated Health Care Innovations Network (NS-PIHCI)

Interdisciplinary Team:
Yukiko Asada, Department of Community Health and Epidemiology
Frank Atherton, Department of Health and Wellness, Province of Nova Scotia
Fred Burge, Department of Family Medicine
Leslie Anne Campbell, Department of Community Health and Epidemiology
Meredith Campbell, Nova Scotia Health Research Foundation
Laura Dowling, Maritime SPOR SUPPORT Unit
Jonathan Dyer, Maritime SPOR SUPPORT Unit
Beverley Lawson, Department of Family Medicine
Lynn Lethbridge, Maritime SPOR SUPPORT Unit
Adrian Levy, Nominated Principal Investigator, Maritime SPOR SUPPORT Unit
Mikiko Terashima, School of Planning

Project Consultants:
Health Navigators from Your Way to Wellness, Cancer Care Nova Scotia and Nova Scotia Diabetes Centres

Research Team and Capacity

- **Maritime SPOR SUPPORT Unit (MSSU):** Evidence synthesis, patient engagement, knowledge translation, privacy and ethics, economic evaluation, epidemiology and study design, database and statistical analysis
- **NS Primary and Integrated Health Care Innovations Network:** Support, identify, and scale-up new approaches to the delivery of health services for individuals with complex needs across the life course
- **Inter-disciplinary study team:** university researchers, representatives from NS Dept. of Health and Wellness, and MSSU staff
- **Health Data Nova Scotia (HDNS):**
  - Maintains administrative health data available for research purposes
  - Data access procedures and protocols
  - Analytic expertise and tools
- **Patients and Health Navigators**
  - Your Way to Wellness
  - Diabetes Education Centres
  - Cancer Care NS Navigators
Why study small area rate variation?

- Striking small area rate variation (SARV) in health services use, care patterns and outcomes.
- SARV evidence can help increase accountability and provide impetus for targeted change.
- Studies have consistently shown that less than 5% of users account for the majority of health care spending in most jurisdictions.
  - These people are defined as High Cost Users (HCU).

Study objectives

- To estimate small area variations (SARV) in the prevalence rates of high-cost healthcare use among persons age 30 and older in Nova Scotia.
- To determine the extent to which SARV in prevalence rates of high-cost healthcare use are explained by age, sex and chronic disease patterns (type and multiple morbidities) of area residents.
The study

<table>
<thead>
<tr>
<th>Health Data Sets</th>
<th>Patient Engagement</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data for all persons age 30+, 2010–2012 costs, disease indicators, multi-morbidity, end-of-life, care patterns</td>
<td>Engaged early in study design and through analysis of results.</td>
<td>Identify areas of high and low rates of high cost use</td>
</tr>
<tr>
<td>Geo-coding of Communities</td>
<td>Provided highly valuable contribution</td>
<td>Categorize regions by possible contributing cause of high or low rate of high cost use</td>
</tr>
<tr>
<td>Postal Code FSAs</td>
<td>• contextualizing high cost service use by area</td>
<td>• demographic, disease pattern and other/s</td>
</tr>
<tr>
<td>Estimation of area rates of high cost users</td>
<td>• info on chronic disease management programs by area</td>
<td>• began high level inquiry on other contributing causes for high cost use</td>
</tr>
<tr>
<td>demography, end-of-life, disease patterns and multi-morbidity, type of care, determinants of health</td>
<td>• recommend further research areas</td>
<td></td>
</tr>
</tbody>
</table>

Data and Linkage

- **Health Data Nova Scotia:**
  [http://medicine.dal.ca/departments/department-sites/community-health/research/hdns.html](http://medicine.dal.ca/departments/department-sites/community-health/research/hdns.html)

- Provincial health services registration file:
  - Eligibility dates
  - Demographics
  - Place of residence: postal code

- Vital statistics: end-of-life

- Physician: fee-for-service (or “shadow billing”) physician claims

- Hospital discharge abstracts
Costing

- Physician: fee-for-service claims
- Inpatient Hospital:
  - Resource intensity weights
  - Average cost per weighted case
- Annualized annual combined cost
  - Exclusion: <365 days exposure over 3 years
- High cost users: top 5% of average annualized costs

Cost Predictors

- Area: 78 small geographic areas (Postal code FSA)
- Demographics: Age X sex
- End-of-life: proportion of each person’s observation time which is in the last year of life
- Chronic disease patterns
  - Canadian Chronic Disease Surveillance system case definitions (9 common chronic conditions)
  - Dementia
  - Injury
  - Multi-morbidity: number of conditions
- Area level variables
Modeling

- Individual-level data
- Random intercept logistic regression models predicting high-cost use
- Estimated small area rates from area random effect: 78 areas based on postal codes
- Sequential models with incremental adjustment
  - Crude rates
  - + Age-sex adjustment
  - + End-of-life adjustment
  - + Chronic disease adjustment

KEY FINDINGS
Key Finding # 1

Most health spending is consumed by a small proportion of the population

- Top 1% of healthcare users account for 33% of total inpatient hospital and physician costs.

- Top 5% of healthcare users account for 64% of total inpatient hospital and physician costs.

<table>
<thead>
<tr>
<th>Centile</th>
<th>% of total spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 1%</td>
<td>33.4</td>
</tr>
<tr>
<td>Top 5%</td>
<td>63.8</td>
</tr>
<tr>
<td>Top 10%</td>
<td>77.3</td>
</tr>
</tbody>
</table>

Key Finding # 2

Increasing efficiency of care delivery to HCUs could have a big impact on health care costs

<table>
<thead>
<tr>
<th>Reduction in Costs by High Cost Users</th>
<th>Potential Annual Returns to Provincial Health System ($million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>$35</td>
</tr>
<tr>
<td>10%</td>
<td>$71</td>
</tr>
<tr>
<td>15%</td>
<td>$106</td>
</tr>
<tr>
<td>20%</td>
<td>$142</td>
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</table>
Key Finding #3
**Striking variations in HCU rates by geographic region of NS**

Red areas depict higher rates of HCUs in relation to provincial average.

Blue areas depict lower rates of HCUs in relation to provincial average.

Key Finding #4
**Areas have high or low rates of HCUs for different reasons**

- Demographics
  - Age-sex distribution, end-of-life
- Disease patterns & multi-morbidity
- Unexplained by demographics and disease patterns
Changes in Area Estimates of Rates of High Cost Use with Sequential Adjustment for Demographics and Chronic Disease

SARV in Rates of High-Cost Health Care Use Before Adjustment
SARV in Rates of High-Cost Health Care Use After Adjustment for Demographics

SARV in High-Cost Health Care Use After Adjustment for Demographics and Disease Patterns
### Contributing Factor:

<table>
<thead>
<tr>
<th>Areas with High Rates of High Cost Use:</th>
<th>Demographics</th>
<th>Disease Patterns</th>
<th>Other Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Breton North (Ingonish Area) - Rural South East (Halifax County Area) - Rural West - Digby – Rural Port Morien Louisbourg East Bay North Sydney South Central Truro Central</td>
<td>Cape Breton West (Inverness Area) - Rural North East (Cape Breton Area) - Rural South (Caledonia) - Rural Glace Bay Reserve Mines Dominon New Waterford Sydney North Sydney North Central North Sydney North Eskasoni</td>
<td>North Shore (Tatamagouche Area) - Rural Valley (Middleton) - Rural South West (Yarmouth Area) - Rural New Glasgow Dartmouth North Halifax Central Halifax South Kentville Bridgewater Yarmouth</td>
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### Targeted Policy Response:

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<tr>
<th>Areas with Low Rates of High Cost Use:</th>
<th>Planning for ageing populations</th>
<th>Disease Prevention Interventions</th>
<th>Disease Management Programs</th>
</tr>
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Key Finding # 5

Patient experiences and characteristics of areas shed light on the ‘other’ factors that contribute to rate of HCUs

Potential ‘other’ factors:
- Multi-morbidity
- Socio-economic health determinants
- Care coordination & continuity of care
- ALC & discharge planning
- Chronic disease management
- Inter-provincial health care use

Multi-Morbidities among HCUs
- 75% of high-cost users have ≥ 2 conditions
- 25% of high-cost users have ≥ 4 conditions

Summary

1. Inequality in health care use: Concentration of healthcare spending in a small segment of the population

2. Variation: Rates of high cost use by area to uncover regional patterns

3. Types of areas: Areas have high or low rates of high cost use for different reasons
Next Steps

• **Constructive Tension**: Identify types of areas to guide targeted policies and resource allocation.
• **Hot Spotting**: Identify and learn from HCU at point of care (e.g. EDs, hospitals)
• **Atlas project**
• **Further SARV work**
• Design dedicated programs/services for high-cost users, and evaluate their impact