A Mutually Exclusive Classification for a Canadian Population Grouping Methodology

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Introduction
In April 2015 the Canadian Institute for Health Information (CIHI) released the alpha (initial) version of its population grouping methodology and software. It is the first grouping methodology developed in Canada that has every person registered for public medicare as its target population, and looks at the population over an extended period of time and over multiple healthcare settings. The methodology consists of a case mix classification accompanied by predictive indicators of morbidity burden.

The case mix classification in the alpha release consists of 214 health condition categories, age categories, and sex. These 214 health condition categories are considered to be an "additive classification", since a person can be assigned to multiple health condition categories.

Building upon the foundation provided by the 214 health condition categories, a mutually exclusive clinical classification is also being developed for release in the beta release of the population grouping methodology. In the mutually exclusive classification, each patient is attributed to only one case mix group, determined through a hierarchical assessment of clinical and cost factors.

Methods
The alpha version of the additive classification contains 214 health condition categories. These categories were used as the starting point for the mutually exclusive classification. The 214 health condition categories were first rolled up to form 111 grouper cells. This was done to ensure high volumes at the cell level but also leave room for further adjustments without dramatically increasing the number of cells. The 111 cells were also vetted with a physician panel to ensure clinical meaningfulness.

One of the key elements in the creation of a mutually exclusive grouper is establishing a clinical/cost hierarchy for tagging and ranking the key diagnoses for each person. The hierarchy orders all of the grouper cells and provides a logic through which a person with multiple diagnoses can be assigned the most significant cell.

Each of the 111 cells was also linked to a higher level category. The categories provide divisions between chronic and acute conditions, cancers and mental health. They also split between major, moderate and minor diagnoses. The creation of these categories allowed for the testing of all 111 cells to determine if the presence of comorbid conditions in specific categories impacts expected resource consumption. The first set of results provided evidence that a number of the cells should be split in the presence of any major or moderate comorbidity. This brought the number of cells up to 177 and provided a substantive increase in the explanatory power of the grouper.

The next stage was to investigate cost distinctions between patients with varying numbers of overall conditions, irrespective of what those conditions are. The theory in this analysis was that patients with many problems might require more frequent and complex care than those that have single, or few, diagnoses. Analysis did in fact show a very strong correlation between the number of comorbid conditions and cost, so a number of possible splits were considered based on the number of comorbid conditions. The implementation of these count splits resulted in a total cell count of around 143 and provided a very substantial increase in the explanatory power of the classification.

Results
Initial results show good explanatory power for the mutually exclusive classification, with $R^2$ as high as 46% on retrospective costs. This compares favourably with similar classifications internationally.
Conclusions

The mutually exclusive classification will be a valuable addition to the Canadian population grouping methodology. It has been built with the traditional principles of case mix design in mind: mutually exclusiveness, clinical meaningfulness, cost homogeneity, and manageable number of groups. While it is still in its preliminary stages, the structure and results look very promising and work will continue leading up to its release in the spring of 2016.

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