

## **Providing Meaningful and Actionable Health System Performance Information: CIHI's 'Your Health System' Tools**

Jeanie Lacroix and Kristine Cooper<sup>1</sup>

### **Abstract**

How can we bring together multidimensional health system performance data in a simplified way that is easy to access and provides comparable and actionable information to accelerate improvements in health care?

The Canadian Institute for Health Information has developed a suite of tools to meet performance measurement needs across different audiences, to identify improvement priorities, understand how health regions and facilities compare with peers and support transparency and accountability. The pan-Canadian tools [Your Health System (YHS)] consolidates reporting of 45 key performance indicators in a structured way, and are comparable over time and at different geographic levels. This paper outlines the development and the methodological approaches and considerations taken to create a dynamic tool that facilitates benchmarking and meaningful comparisons for health system performance improvement.

Key Words: clinical administrative data, health system performance, visualization of multidimensional complex data

## **1. Introduction**

### **1.1 Background**

Performance measurement is important to ensure transparency, promote accountability and support better decision-making to improve the quality of care within the health system (Smith et al., 2008). The Canadian Institute for Health Information (CIHI) is a leading source of unbiased, credible and comparable information about health and health care in Canada. As part of its mandate, the organization aims to develop tools and deliver health information that is relevant and actionable for stakeholders to accelerate improvements in health care, health system performance and population health across the continuum of care.

### **1.2 Your Health System**

The Your Health System (YHS) tools were developed as part of a 3-year (2012 to 2015) program of work at CIHI to strengthen pan-Canadian health system performance reporting. These interactive one-of-a-kind tools present an array of health system indicators and contextual information on hospitals, long-term care facilities and health regions across the country. Using engaging visuals and easy to understand graphics, supported by rigorous performance methodologies, YHS is a resource for health system performance measurement and identifying areas for improvement. YHS is made up of both a public access (<http://yourhealthsystem.cihi.ca/>) and a restricted access tool. The tools are

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<sup>1</sup> Jeanie Lacroix, Canadian Institute for Health Information, 4110 Yonge Street, Suite 300, Toronto ON M2P 2B7, Canada ([jlacroix@cihi.ca](mailto:jlacroix@cihi.ca)); Kristine Cooper, Canadian Institute for Health Information, 4110 Yonge Street, Suite 300, Toronto ON M2P 2B7, Canada ([kcooper@cihi.ca](mailto:kcooper@cihi.ca))

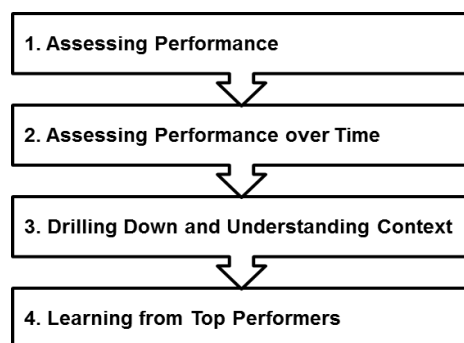
tailored for different audiences based on their health system performance reporting needs. The public tool is comprised of two sections for either an In Brief or In Depth look at the Canadian health care system. **In Brief**, targeted at the general public, is intended to provide a high-level exploration of the health system and the health status of Canadians by focusing on 15 core indicators around 5 key health themes identified by the Canadian public as most important to them. Information is presented through easy-to-read and engaging infographics. **In Depth**, targeted at regional and facility-level stakeholders, allows for detailed performance monitoring and benchmarking in the form of peer comparisons. It presents 45 health indicators on more than 600 Canadian hospitals and 1,200 long-term care facilities. The restricted access tool, **Insight**, is intended for use by health care providers and analysts to allow for deeper exploration into facility-level results and drill down to patient-level records.

## 2. Developing the Your Health System Tools

The goal of the YHS suite of products is to build an integrated health system performance measurement system with cascading sets of indicators to support performance improvement efforts at varying levels, from facilities to health regions and provinces/territories. Performance measures were identified for inclusion in the website that focused on the overall performance goals of the health system, such as improved health status and better value for money. Indicator selection was carried out using the CIHI Health System Performance (HSP) Framework based on feedback from public engagement sessions and expert consultations (Hill + Knowlton Strategies, 2013). The comprehensive HSP framework ensured selected measures provided a system-level perspective of the main dimensions of health system performance, demonstrating how they interconnect and relate to each other, and how they contribute to the overall performance goals. Within YHS, indicators are organized by 7 health themes or dimensions from the HSP framework: access, appropriateness and effectiveness, person-centredness, safety, efficiency, social determinants of health, and health status (Canadian Institute for Health Information (CIHI), 2012).

Public engagement sessions were also essential to define a set of business questions that would guide the development of the tool and the types of visuals selected to display the information. Essentially, the business questions represent how a user might navigate through the YHS tools, from assessing their facility or health region's indicator results and comparing to peers, to drilling down deeper into understanding an indicator result and learning from others.

**Figure 2-1**  
**YHS business questions**



## 3. Answering the Business Questions

The following section examines the simple visuals and supporting performance methodologies that were developed to allow users to answer the key business questions.

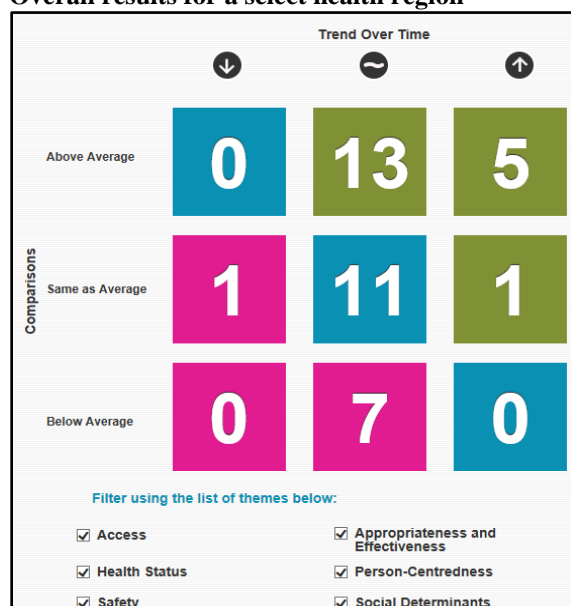
### 3.1 Assessing Performance

To assess performance a facility or health region considers the following questions: *What is my overall performance? Where can I improve? How do I compare to others?* Visuals such as the 3x3 matrix allow a facility or health region to examine their overall performance and identify potential improvement areas in a simple snapshot, while funnel plots and bar graphs can be used for making relative comparisons to others.

### 3.1.1 Overall Results - 3x3 Matrix

The **overall results** 3x3 matrix provides a summary of all the indicator results for a facility or health region, organized in a way that is simple and makes it easy for stakeholders to know where they are performing well and where they are lagging behind, both over time and in comparison to peers. By examining comparisons with either peers or national results (along the vertical axis) and trend over time (along the horizontal axis), the matrix can be used to identify potential priority areas within a facility or region. Indicator results falling within the upper-right quadrant (green colour-coded cells) (*see Figure 3.1-1*) represent those areas where a facility or region is doing well. Indicator results falling within the lower-left quadrant (pink colour-coded cells) are those that a facility or region may want to investigate. Results can be examined further by filtering according to health themes (CIHI, 2016b).

**Figure 3.1-1**  
**Overall results for a select health region**



#### 3.1.1-1 Vertical Axis: Comparisons Methodology

The comparisons methodology is used throughout YHS, benchmarking facility, regional and provincial/territorial results to a standard comparator. For acute care indicators at the facility-level, the standard comparator is the hospital peer group average. All other jurisdictions use the national average. Four standardized hospital peer groups are used; either a hospital is designated as a teaching hospital or is categorized by size (e.g., small, medium or large community hospital) based on the complexity and volume of their patients. 95% confidence intervals are used where possible to establish whether the difference between a result and its standard comparator is statistically significant. Results with confidence intervals that do not overlap with the standard comparator are defined as statistically above or below average performance. Depending on the desired direction of an indicator, above average performance may represent a higher than average indicator result (e.g., influenza immunization for seniors) or a lower than average indicator result (e.g., restraint use in long-term care). When confidence intervals are not available, such as the case with emergency department wait time indicators, comparisons are made relative to the 20th and 80th percentiles of all indicator values within the corresponding hospital peer group (CIHI, 2016b).

#### 3.1.1-2 Horizontal Axis: Trend Over Time Methodology

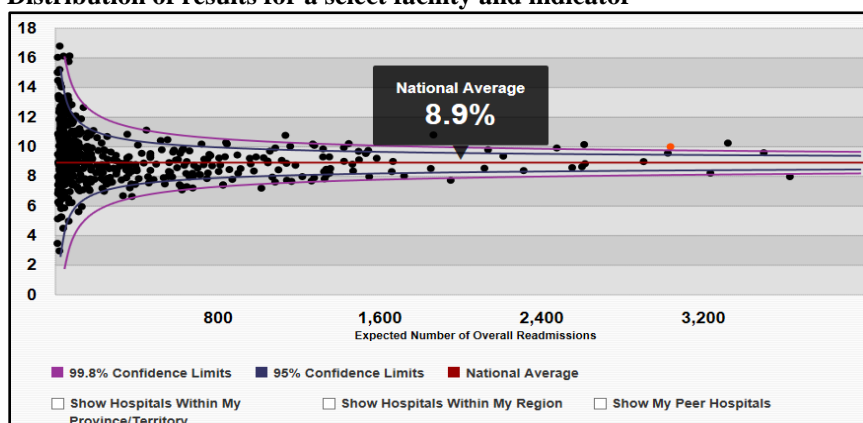
The trend over time methodology takes into consideration two types of indicators; lead indicators, those that can change relatively quickly as a result of a policy intervention (e.g., hospitalized heart attacks), and lag indicators, those for which the effect of policy interventions takes a relatively long time to materialize (e.g., smoking). 3 to 5 years of

data are used for trend analysis of lead indicators, while 5 to 10 years of data are used for lag indicators. Trends are determined using a linear regression model that is flexible in two ways. First, it allows for the capture of sustained increases or decreases in indicator results over time. Second, it takes into account the precision of the individual indicator estimates so that more-precise estimates contribute more toward fitting the trend than less-precise estimates. Results for individual years are weighted in the model using the inverse of the variance of the indicator estimate. The statistical significance of the regression coefficients are then used to determine whether or not a trend exists. Depending on the desired direction of an indicator, an increasing trend may be more (e.g., life expectancy) or less (e.g., avoidable deaths) desirable. Taking into account the directionality of each indicator, trends are labelled as improving (upward arrow), no change (tilde) or weakening (downward arrow) (CIHI, 2016a).

### 3.1.2 Distribution of Results - Funnel Plots

The funnel plot is a visual representation of the **distribution of results**. A facility or health region's indicator result is plotted to the national average among the results of others, allowing stakeholders to answer the question: *How do I compare to others?* Funnel plots are particularly useful for small hospitals and rural health regions. As lower service volumes typically create indicator results that are subject to more variation, funnel plots help to address this issue by providing a strong visual indication of whether results are statistically higher or lower than the national average in relationship to the overall service volume. Indicator values outside of the funnel indicate out-of-the-ordinary results, while indicator values inside the funnel have results within the expected variation, given the size of the facility or health region (CIHI, 2016c). Dots higher up the vertical axis show facilities or regions with a higher indicator value, regardless of the directionality of an indicator. As a result, the desired direction of an indicator must be considered when interpreting results.

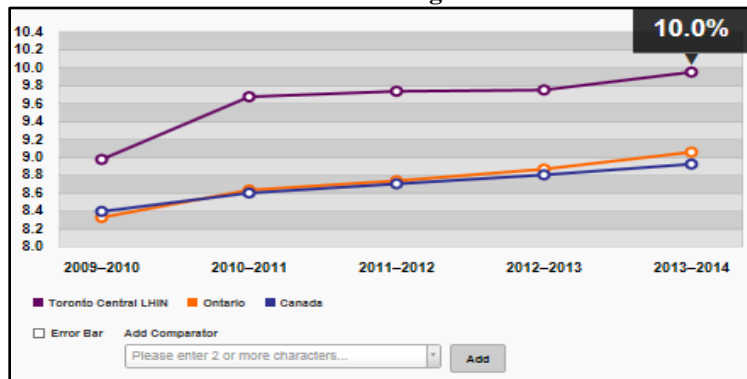
**Figure 3.1-2**  
Distribution of results for a select facility and indicator



### 3.2 Assessing Performance Over Time

After a facility or health region assesses their current performance and makes relative comparisons, they will want to examine how they have been performing over time to answer the following question: *Have I improved or worsened over time?* The **trend over time** graph displays how indicator results have changed over the reporting years. When examining a facility's results, the corresponding health region, province/territory and national results will also be shown on the graph as default comparators. When examining a regional result, the corresponding province/territory and national result will appear. Graphs can be further customized by adding peer facilities and regions.

**Figure 3.2-1**  
Trend over time for a select health region and indicator



### 3.3 Drilling Down and Understanding Context

After assessing performance and having identified an area that may require further investigation, users with access to YHS: Insight can drill down into their indicator results and gain a better understanding to answer the following questions: *What factors are driving performance? What contextual information do I need to consider?* Within the tool, the **indicator exploration** dashboard allows users to visually explore and further investigate an indicator to uncover potential performance drivers. Users can gain further context and understanding by creating custom bar graphs and bubble charts that breakdown their indicator results by relevant patient and facility characteristics such as the main reason for a hospital visit, the urgency of the visit, and patient age and sex.

**Figure 3.3-1**  
Indicator exploration for a select facility



### 3.4 Learning from Top Performers

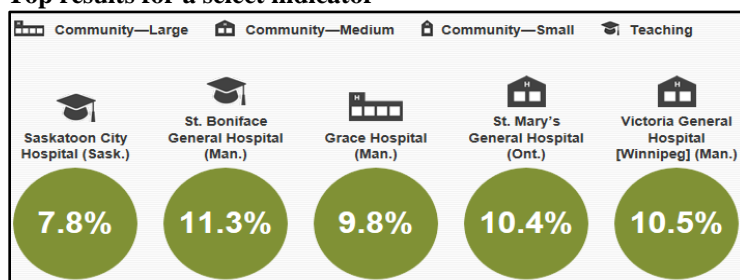
Identifying **top results** or “high performers” for facilities and health regions for a given indicator helps to facilitate best practice sharing by allowing stakeholders to answer the question: *Who can I learn from?*

#### 3.4.1 Top Results Methodology

The top results methodology identifies facilities or regions that have had an indicator result in the top decile and have been statistically significantly different from the hospital peer group or national average for the last 3 years. A result is considered in the top decile if the confidence interval of the rate overlaps or exceeds the 90<sup>th</sup> percentile. The requirement for results to have fallen in the top decile for each of the last 3 consecutive years greatly reduces the number of high performers reported to fewer than 10% for a number of indicators. This restrictive methodology ensures that facilities and regions being identified truly have superior results that are not due to random variability or

chance. Facility-level indicator results must also be stable to be considered. Stability is established by satisfying at least one of two conditions, either there are no observed outcome events and there are at least 50 denominator cases or at least one outcome event is observed but increasing the numerator by one event increases the facility's adjusted rate by less than 10%. Any rate that is statistically significantly different from the hospital peer group average is also considered stable (CIHI, 2016a).

**Figure 3.4-1**  
**Top results for a select indicator**



## 4. Key Challenges and Considerations

One of the key challenges in developing the YHS tools was consolidating many different types of indicators across various facilities, health care sectors, and geographic levels. As a large majority of facilities are small in size, methodologies needed to be developed that took into consideration small counts and indicator results with greater variation. A centralized, publicly accessible source known as the CIHI Indicator Library was created to detail these methodologies and provide metadata for each indicator presented in the tools. Indicator selection, as well as key messages and functionalities were customized for each tool (i.e., In Brief, In Depth, and Insight) to acknowledge the different needs of our three targeted audiences: the general public, health system managers and care providers.

Other important considerations for the tool were relevance, timeliness and usability. YHS tools present the most recently available indicator data and CIHI continues to look for ways to increase timeliness. Users with access to YHS: Insight receive more timely results through open year data, which is refreshed monthly. To ensure information remains relevant, indicators undergo annual evaluation so that new indicators are only added if another indicator is retired. Most importantly, the usability of the tool is enhanced through exportability features that facilitate next steps for knowledge sharing. Users can manipulate data further and create graphs through downloadable Excel spreadsheets, as well as share visuals and presentations in PowerPoint and PDF.

## 5. Conclusion

Given the complexity and diversity of the health care data that is reported, careful methodological consideration has been taken to enable benchmarking and comparisons through the tools in a meaningful way for facility- and regional-level stakeholders. The use of simple and effective visuals supported by these rigorous performance methodologies helps to summarize complex information and aids users to interpret their results and draw inferences with the confidence that the information is reliable and credible. The ultimate success of the YHS tools centres on their usability and relevance as a tool to not only support health system performance measurement but to help identify and facilitate the next steps for managing health system performance for improvement.

Recognition has already been received attributing to the success of the tools. CIHI was given the 2014 eHealthcare Leadership Award for YHS: In Brief. CIHI has also heard encouraging examples of use stories where organizations have developed action improvement strategies, for example to reduce rates of in-hospital sepsis, based on information in YHS: In Depth. Positive feedback and enquiries have also come from other organizations such as the World Bank who are working on similar initiatives for presenting health information.

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