Assessing Value in Ontario Health Links. Part 3: Measures of System Performance in Ontario's Health Links

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Executive Summary

Context

Ontario's Health Links (HL) initiative was launched in January 2013 to improve the coordination of care provided to patients with the most complex healthcare needs. This group of patients represents a small minority of the Ontario population (5%), but accounts for a majority of health system costs (66%). Health Links are a novel method of delivering integrated health care services to Ontarians. They are geographically defined, and each Health Link is given the flexibility to identify its target population and improve integration of care for complex, high-needs patients. Given the considerable efforts that are being invested in HLs, reporting on the system performance of HLs is an important priority.

Objective

This report responds to an Applied Health Research Question (AHRQ) from the Ontario Ministry of Health and Long-Term Care (MOHLTC) Transformation Secretariat, with specific interest in the identification of value that Health Links add to the health system, such as avoided hospitalizations, reduced complications of care, improved quality of life, etc. In this report we: 1) describe the characteristics of the population in Health Links regions; 2) measure health system performance in HL regions using data held at the Institute for Clinical Evaluative Sciences (ICES), creating a portrait of HLs that can be used in the future; and 3) compare system performance among HLs and to existing physician networks (PN), defined by referral patterns among primary care physicians.

Methods

Based on results from reports 1 and 2 in this series, twenty-two indicators were identified, defined, and categorized according to the Institute for Healthcare Improvement's (IHI) Triple Aim framework: better care and experience for individuals, better health for populations, and lower growth in healthcare costs. Six of these indicators are the focus of this report:

1. average monthly costs,
2. the rate of hospitalization,
3. the rate of emergency-department visits for non-critical patients,
4. rate of 30-day readmissions,
5. primary care follow-up within 7 days of hospital discharge,
6. and the proportion of individuals rostered to a primary care physician.

Ontario residents with a valid health card on April 1, 2012 were assigned to an HL according to the location of their usual provider of primary care (90.2%) or home residence (9.8%), based on geographical boundaries defined by the MOHLTC. Using cohorts of 1) all Ontarians and 2) the top 5% high-cost users, indicator values for HLs were determined with data from the 2012 fiscal year.

Individual Health Link performance was compared to the provincial average across HLs for each of the indicators. HLs were categorized according to whether they adopted the initiative early or not ('early adopters'), their degree of rurality according to the Rurality Index of Ontario (RIO), and measurable health inequities between geographical regions or populations according to the Ontario Marginalization Index (ON-Marg). A total Zscore using data from all indicators was created for HLs for both cohorts of interest to assess whether HLs were performing differently in the two populations.

Findings

Demographic measures among HLs were comparable to provincial data for both the full population of residents and the top 5% of users. For the six selected indicators, a general comparison of HL performance to the provincial average did not reveal differences between early and later adopter HLs, but did reveal pockets of high and low performance. With respect to rurality, urban HLs had lower cost and lower ED-visit rates compared to the provincial average. Alternatively, suburban and rural HLs had higher rates of primary care rostering compared to the provincial average. Socio-economic status was found to be highly related to system performance indicators, with high levels of marginalization corresponding to lower performance, and a strong relationship between performance in the full population and among the top 5% of health care users. Although rural and low SES groups have lower performance than urban and high SES, there is substantial variation within these groupings, offering opportunities for comparative performance and potential learning from peer groups of HLs with similar local challenges. Comparisons showed substantial variation and overlap across all performance indicators for both Health Link and Physician Networks. We also found that there was only a moderate degree of overlap in patient populations between specific pairs of Health Links and Physician Networks. We examined the proportion of residents common to both the Health Link and the Physician Network that had the highest degree of overlap with each Health Link. We found that an average of only 46% of patients in Health Links overlapped with the Physician Network that shared the most patients in common.

Conclusions

The performance of HLs on the indicators used for this report can inform benchmarking and be used for further analyses over time. Differences in performance based on rurality and marginalization highlight important contextual factors for HL leaders and decision makers to consider when comparing performance across HLs, particularly how to group HLs with appropriate peer-comparators.

Identifying the specific effect of HLs on patient care and outcomes requires the ability to identify which individuals are enrolled in HL programs. A registry of Health Links patients is essential to any measurement of value of HLs or evaluation of performance of HLs on the heath of individuals and populations. This was not possible at the time of this report. Instead, the present report describes the general population trends of patients in HL geographies, but does not evaluate the performance of HLs specifically in regard to the patients who are enrolled in HL programs.

The Triple Aim Framework highlights a gap in the current focus of HL assessment: there are no indicators being used to track the performance of HLs on population health measures. Population health can have significant effects on health system performance measures, especially considering the results of the analyses based on rurality and marginalization.

Achieving effective inter-organizational integration across the care continuum is a challenging and important goal for Ontario's health care system. Effective and timely approaches to identifying which patients to target for HL interventions and knowing which providers to engage will be key factors in the success of HLs. Differences in existing patterns of care for patients among PNs, compared to the geographic approach employed by HLs continue to present challenges for HLs to effectively manage care for complex patients. The model of Accountable Care Organizations described in the first report of this series could be pursued in Ontario based either on geographic boundaries, or enrolment models following existing practice patterns; it will be highly challenging to enable accountability and provide equitable funding with a hybrid approach. Full population-based accountability will require either that patients be willing to change primary care providers or that Health Links be reorganized to engage with providers in their referral network regardless of geography.

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Context

Health Links (HLs) were announced in December 2012 as a means to improve the delivery of coordinated health care services for Ontarians, with an initial focus on complex, high-needs patients. Each HL is geographically defined and has the flexibility to create its own strategies to identify a target high-needs population, as well as strategies to improve integration of care. The first set of 22 'early adopter' HLs commenced in late August 2013, and since then, more have been formed. Because HLs have flexibility in their design and each is at different stages of maturity, this report sought to measure HL performance on chosen indicators to establish a baseline portrait, which can be used to inform benchmarking.

Objectives

This report utilizes population-based health administrative data from the province of Ontario to assess the performance of HLs on measurable indicators using data held at the Institute for Clinical Evaluative Sciences (ICES). At the time of writing, 54 HLs were defined by the Ministry of Health and Long-Term Care (MOHLTC), and complete administrative data was available through March 31, 2013. We report values for each HL in reference to provincial averages, by rurality, by marginalization index, and in comparison to 78 physician networks or PHYSNETs (PNs). These PNs are virtual networks of integrated care, based on observed patterns of health care seeking behaviours of patients as well as referral patterns among primary care physicians , specialists and hospitals previously identified from retrospective health administrative data (Stukel et al, 2013).

This report builds on our two prior reports about Health Links. The first of these compared the organization, goals, structure and performance measures used in Accountable Care Organizations to Ontario's Health Links initiative. The second reported on data collected from interviews with Health Links leaders about what Health Links were doing to create value in the Ontario healthcare system. We used these reports to identify appropriate health system performance measures for Health Links.

We consider health system performance measurement following the Institute for Healthcare Improvement's (IHI) Triple Aim framework of quality improvement, which includes the experience of individuals (including better care for individuals), the health of populations, and lowering cost growth (Institute for Healthcare Improvement, 2014). This framework covers a broad scope of the health care system and requires coordination at different levels, making it useful for assessing HLs.

Methods

Indicator Selection

We identified relevant indicators, measurable with administrative data, within each category of the IHI Triple Aim framework. The indicators chosen to represent HL performance were informed by three sources:

1. Ministry of Health and Long-Term Care "indicators of success" for HLs,

2. Indicators used for Accountable Care Organizations (ACOs) in the United States, as outlined in the first report of this series (Mery and Wodchis, 2014), and
3. Areas of focus identified by HLs during interviews as outlined in the second report of this series (Mery, Kromm and Wodchis, 2015).

Only indicators that are currently measurable at the level of Health Links were included in this report. Twenty-two indicators were identified and are listed in Table 1 along with the source of the indicator. The current list captures two domains of the Triple Aim framework: 'Better Care for Individuals' and 'Lower Growth in Health Care Costs'. We have not yet identified explicit measures for the third domain of 'Better Health for Populations'. There are good measures of population health but current data collection from community health surveys are not sufficient to allow for sub-LHIN (i.e. Health Link) reporting in the same time frames as other indicators. In order to provide a more concise and focused portrait of HLs, this report focuses on 6 selected indicators (shaded in Table 1):

1. Average government costs per month alive,
2. Acute hospitalization rate,
3. Emergency department visit rate: low acuity,
4. Readmissions within 30 days for selected case mix groups (CMGs),
5. Patients with a Primary Care visit within 7 days of acute discharge: all individuals, and
6. Proportion of individuals rostered to a primary care physician.

These measures were selected as a parsimonious set of indicators that represent outcomes that would be relevant to all patients enrolled in Health Links (as opposed to only those with specific ages or a specific condition). The exception is the readmission rate, which applies only to hospitalized patients with one of 25 specific (common) conditions. Most respondents to our interviews identified readmissions as a high priority area and used this specific indicator, which is measured and monitored by the Ontario MOHLTC. Readmissions are also thought to be amenable to improved care coordination and care transitions, both of which are common areas of interest and activity for many Health Links. Early follow-up by physicians after hospital discharge is also one of the important measurable factors that might affect readmissions.

Indicator Definitions

Administrative data housed at ICES were used to quantify all indicators. When possible, the MOHLTC Resource for Indicator Standards (RIS) website was used as a reference to define indicators from the available data (MOHLTC, 2014). This standardization of indicator definitions is important given the work that the MOHLTC is also carrying out with respect to quality measurement and assessing HLs and other areas of Ontario's health care system. When indicator definitions were not available from the RIS page we sought definitions from other valid sources such as the Association of Public Health Epidemiologists in Ontario (APHEO), the Canadian Institute for Health Information (CIHI), and previous work carried out by experts from HSPRN or ICES.

Table 1 Health System Performance Research Network (HSPRN) Health System Value Indicators for HLs

	Indicator/Metric	Source
	LOWER GROWTH IN HEALTH CARE COSTS	
1.	Average government costs per year (age-sex standardized)	ACO Report (Value indicators – cost containment)
2.	Average government costs per month alive (age-sex standardized)	ACO Report (Value indicators – cost containment)
3.	Percent change in cost	MOHLTC (Evaluation based metrics)
	BETTER CARE FOR INDIVIDUALS	
4.	Acute hospitalization rate (age-sex standardized)	ACO Report (Value indicators – appropriate resource use)
5.	Acute hospitalization days (risk-adjusted)	
6.	Avoidable ED visits for patients with conditions best managed elsewhere (age-sex standardized)	MOHLTC (Results based metrics) Interviews with HL leaders
	Emergency department visit rate (age-sex standardized):	ACO Report (Value indicators – appropriate use of resources)
7.	○ All ED visits	
8.	○ High acuity/urgent ED visits	
9.	○ Low acuity ED visits	
10.	Readmissions within 30 days for selected CMGs (risk-adjusted)	MOHLTC (Evaluation based metrics) Interviews with HL leaders
11.	Alternative Level of Care (ALC) days	MOHLTC (Evaluation based metrics) Interviews with HL leaders
	Health related quality of life (HRQL) utility score	ACO Report (Quality indicators – better care)
12.	○ Home Care Clients	
13.	○ Long-Term Care Clients	
14.	Proportion of individuals rostered to a primary care physician (age-sex standardized)	MOHLTC (Operational metrics) Interviews with HL leaders
	Patients with a Primary care visit within 7 days of acute discharge	MOHLTC (Evaluation based metrics)
15.	○ All individuals	
16.	○ Rostered individuals	
17.	Ambulatory Care Sensitive Conditions (ACSC) hospitalization rate (age-sex standardized)	MOHLTC (Results based metrics) Interviews with HL leaders
18.	ACSC hospital days (risk-adjusted)	
19.	Mental health & addictions hospitalization rate (age-sex standardized)	Interviews with HL leaders
20.	Long-term care admissions with a High/Very High MAPLe Score (risk-adjusted)	ACO Report (Value indicators – appropriate use of resources)
21.	Medication reconciliation within 14 days of hospital discharge (MedsCheck)	ACO Report (Quality indicators – better care)
22.	Appropriate care for diabetes (HbA1c, LDL, eye exam)	ACO Report (Quality indicators – better care)
	BETTER HEALTH FOR POPULATIONS	
	To Be Determined	

Crude rates were calculated for all indicators. However, to enable comparisons across regions (HLs) and over time, we present adjusted rates, when applicable. Age-sex standardization was used for indicators derived from a population-based denominator, using the 1991 population of Canada as the reference population as per the protocol followed by the MOHLTC Health Analytics Branch. Other indicators were risk adjusted to control for age, sex, and other population-level attributes, making indicator measurement comparable across HLs.

Each of the 6 selected indicators is described below. The complete list of indicators, their definitions (data sources used and inclusion/exclusion criteria), and any standardization/adjustments made is provided in Appendix 1.

1. *Average government costs (per month alive)*

The first selected indicator is the average age-sex standardized cost per month alive. Total costs for each individual are divided by the total number of months they were alive in fiscal year 2012 (also known as person-months). All costing indicators are adjusted for inflation and reported in 2011 Canadian dollars.

2. *Acute hospitalization rate*

The second selected indicator is the age-sex standardized acute hospitalization rate which is based on hospital separations (including discharges, transfers and deaths). This definition is used by APHEO[1] , and presented per 100,000 population. Mental health separations are excluded (a separate indicator is used to determine mental health-related admission rates).

3. *Emergency department visit rate: low acuity*

The third selected indicator is low-acuity emergency department (ED) visits. This indicator follows the MOHLTC definition[2] provided on the RIS website, and includes all non-scheduled visits that do not result in an inpatient admission.

4. *Readmissions within 30-days for selected case mix groups*

The fourth selected indicator is the percentage of hospital discharges for selected CMGs that result in a readmission (any cause) within 30 days. This indicator follows the MOHLTC definition[3]. The CMGs include patients with an acute inpatient hospital stay for cardiac conditions, congestive heart failure, chronic obstructive pulmonary disease, pneumonia, diabetes, stroke, and/or gastrointestinal disease. Consistent with past MOHLTC work, this indicator is risk-adjusted for age, sex, CMG, prior hospitalizations (within 1, 2, and 3 months), and comorbidity score (Charlson Index).

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[1] Association of Public Health Epidemiologists in Ontario (APHEO). (2009). "All-Cause Hospitalization." Available from: http://www.apheo.ca/index.php?pid=93

[2] Resource for Indicator Standards (RIS). (2010). Emergency visits by triage level. Available from: http://www.health.gov.on.ca/en/pro/programs/ris/docs/emergency_visits_by_triage_level_en.pdf

[3] Resource for Indicator Standards (RIS). (2011). Readmissions for selected case mix groups (CMGs). Available from: http://www.health.gov.on.ca/en/pro/programs/ris/docs/readmissions_for_selected_case_mix_groups_cmgs.pdf

5. ***Patients with a primary care visit within 7 days of acute discharge: all individuals***

This fifth indicator was selected to assess appropriate care transitions following discharge to reduce hospital readmissions (Baker, 2011) and was based on the MOHLTC definition[4] but differed by including *all individuals*, not just those rostered to physicians. This indicator quantifies the proportion of all individuals discharged from acute care for a selected CMG who had a primary care follow up visit within 7 days of discharge. Physicians included those with a main specialty in family practice, general practice or pediatrics.

6. ***Proportion of individuals rostered to a primary care physician***

The final selected indicator is the proportion of individuals rostered to a primary care physician, identified from the Client Agency Program Enrolment (CAPE) data. For this indicator we focus on individuals formally rostered to a physician, 70% of Ontarians. This aligns with step 1 of assigning individuals to HLs based on their rostered physician's postal code (see below) and follows Ontario's primary care reform initiative to increase continuity of care. We did not roster individuals to a usual provider of care (UPC) via virtual rostering (the physician seen most often by an individual two years prior to the index date) because we wanted to focus on formal rostering in order to determine whether there are differences between HLs and whether these differences could be correlated with performance on other indicators.

Study Period and Population

The index date of April 1, 2012 was selected so that all indicators could be assessed and compared over a 1-year period using the most recent data available at ICES (fiscal year 2012, including data up to and including March 31, 2013). Our study included all residents of Ontario with a valid OHIP number as of April 1, 2012. Individuals were excluded if they were older than 105 years, or did not have any contact with the health care system after April 1, 2008. Indicator results were calculated for HLs and PNs based on two populations of interest:

1. All Ontarians
2. High-cost users – defined as the population with the top 5% of health care costs in the fiscal year prior to April 1, 2012

[4] Resource for Indicator Standards (RIS). (2012). Patients with a primary care visit within 7 days of acute discharge for Quality Improvement Plans – Primary Care. Available from: http://www.health.gov.on.ca/en/pro/programs/ris/docs/patients_with_primary_care_visit_within_7_days_of_discharge_qips_primary_care_en.pdf

Unit of Analysis: Health Links

The focus of this research is to understand the performance of the 54 HLs geographically defined by their postal codes at the time of writing. A list of the HLs and their geographical boundaries was obtained from the MOHLTC and linked to data housed at ICES. From this linkage we assigned each Ontarian in the above populations to a HL in a three step process (in order):

1. Based on the postal code of the primary care physician an individual is rostered to (this captured 71.5% of Ontarians).
2. For individuals not rostered to a primary care physician the postal code of the usual provider of care (UPC, either a general practitioner, family physician, or pediatrician) that an individual visits most frequently within the two years prior to the index date (this captured another 18.7% of Ontarians).
3. For individuals not rostered to a physician and without a UPC we used the postal code of the individual's residence (this captured the remaining 9.8% of Ontarians).

We linked Ontarians to a HL based on their primary care physician/UPC's postal code because it is possible for a person to live in one HL but always receive care based on the model of another HL (the HL their primary care physician/UPC practices in). This is often the case in urban areas. Our data revealed that only 43.5% of urban-residing individuals lived in the same HL that their primary care physician/UPC practices (compared to 76.0% and 80.0% in suburban and rural areas, respectively). In some cases these two HL may be similar, but in other cases there may be significant differences. Linking individuals to a HL based on their primary care provider's location allows us to capture the performance of HLs based on individuals receiving care from providers in that HL. The third step of this linking process, using the patient's residential location, helps ensure that individuals living within the geographical boundaries of a HL, but not rostered to a physician or without a UPC, are captured and not grouped with Ontarians who live in areas of the province without a HL.

Rurality Index of Ontario

Each of the 54 HLs was categorized as urban, rural, or suburban based on the Rurality Index of Ontario (RIO) (Kralj, 2009). Index scores were determined by assigning a RIO level to distinct Ontario postal codes in the Registered Persons Database (RPDB)as of May 2011 (to match the MOHLTC HL boundary files). If a given postal code was assigned more than one unique RIO value, a weighted average (based on the population count from the RPDB) was calculated to derive a single RIO value for that postal code. These values are accurate at the time of writing. Should the MOHLTC update or change boundaries of HLs (e.g., more HLs are created) the RIO levels for existing HLs may change.

A medical geographer at ICES used ArcGIS mapping software to determine the geographical size (km^2) of each postal code within a given HL. A weighted average RIO level was then determined for each of the HLs using the geographical size of the postal codes within the HL as weights. Following the rurality thresholds used by Stukel et al. (2013) for PNs, urban HLs were designated as those with an RIO score less than 10, suburban HLs as those with an RIO score of 10 to 39, and rural HLs as those with an RIO score greater than or equal to 40.

Ontario Marginalization Index

The Ontario Marginalization Index (ON-Marg) is used to show differences in marginalization between areas of Ontario and to understand inequalities between geographical areas (Matheson et al., 2012). The index takes four dimensions into account: residential instability, material deprivation, dependency, and ethnic concentration. Each dimension has a number of indicators used to provide a value for each dimension. These four dimensions can then be combined into a composite index or score. We followed the methodology of Matheson et al. (2012) to create a weighted average composite ON-Marg score for each HL using population counts as the weights. Five equal-sized groups (quintiles) were created based on the distribution of weighted values across the 54 HLs.

Physician Networks: Informal Networks for Comparison

In order to understand the performance of HLs in relation to other potential integrated-care models, we compared indicator values from HLs to those of PNs (n=78). PHYSNETs are defined based on utilization and referral patterns among patients, primary care physicians, specialists, and institutions observed in health administrative data (Stukel et al., 2013). These multispecialty networks are distinct from formal physician care models in Ontario, such as Family Health Networks, Family Health Organizations, and others. PNs include physician and hospital care. Unlike HLs, PNs are not exclusively regionally based and have no geographical boundaries. Rather, they are based on patterns of existing patient flow. However, since our approach to identifying the target population for Health Links and the Physician Networks both assign patients to primary care providers (regardless of patients' residence), HLs and PNs are similar in that they each include health care seeking behaviours of patients. The PN database at ICES provided RIO levels for all PNs.

Data Analysis

The administrative data were analyzed to provide descriptive characteristics of HLs, compare the performance of HLs individually and as groups based on RIO and ON-Marg, and compared to PNs. Each analysis is described below along with the question it addresses:

1. What are the characteristics of HLs in Ontario?

Baseline demographic information for HLs was found and reported for all of Ontario, early adopter HLs (n=22), other HLs (n=32), and for the group of Ontario residents who are not currently linked to a HL by either their provider's or own postal code. The demographic information is reported for the total population of Ontario and for the top 5% high cost users of Ontario's health care system.

2. How does the performance of HLs compare to the provincial average for the selected indicators?

A comparative approach was taken to assess baseline performance of HLs. For both cohorts of interest (all Ontarians and high cost users), indicator values were derived for each of the 54 HLs and

values were compared to the overall provincial average for that cohort. HLs were also compared to the provincial average based on whether the HL was an early or later adopter, their categorization according to RIO score (rural, suburban, or urban), and five levels of Ontario's marginalization index.

3. How do Health Links compare to PHYSNETs?

HLs were compared to the 78 PNs using a league table approach; each HL and PN were listed according to their indicator values for each of 6 selected indicators, from highest performer to lowest performer. We also examined the degree of overlap in the patient population between Health Links and PHYSNETs.

Findings

Data analysis findings are presented in sections according to the three research questions. Each section presents the findings of analyses related to its corresponding research question.

1. Health Link Characteristics

Baseline demographic information for the two populations of interest, early and later adopter HLs, and for individuals not linked to a HL are provided in Table 2 (see Appendix 2 for LHIN and individual HL level baseline demographic data). The current list of approved HLs captures 65.1% of the provincial population, and 65.6% of the cohort of top 5% high cost individuals. The data shows that HLs are comparable to provincial data for most criteria in both population cohorts (all Ontario and top 5%). The differences for the full cohort are that compared to individuals not linked to a HL, more individuals captured by a HL are enrolled in a primary care model, and the mean and median total costs for the fiscal year prior to April 1, 2012 are higher. For the top 5% cohort, the mean and median total costs for the fiscal year prior to April 1, 2012 are higher for individuals linked to a HL compared to those not linked to a HL.

Table 2 Demographics for both cohorts of Ontarians, IKN assigned to HL and not.

		FULL POPULATION COHORT				TOP 5%			
		Ontario	Early HL	Other HL	No HL	Ontario	Early HL	Other HL	No HL
Total Population (N)		13,727,824	4,224,381	4,718,210	4,785,233	686,392	212,661	237,545	236,186
Male (%)		49.2	49.0	49.2	49.4	43.9	44.5	43.5	43.7
Age	Median	39	40	39	40	66	66	66	67
	Mean	39.7	39.8	39.4	39.9	62.4	61.9	62.2	63.1
	Std	22.5	22.2	22.5	22.7	22.0	22.0	22.3	21.7
Enrolled in Primary Care model (%)		71.4	71.9	73.5	69.0	78.4	77.9	78.9	78.4
Resides in Long-Term Care (%)		0.6	0.6	0.7	0.6	12.4	11.9	12.8	12.4
Median income quintile		3	3	3	3	3	3	3	3
2+ chronic conditions (%)		26.6	26.4	26.7	26.8	80.0	79.2	79.8	80.8
Median total cost 1 year prior to index date		$375	$381	$375	$352	$16,760	$16,713	$16,760	$16,674
Mean (Std) total cost 1 year prior to index date		$2,261 ($9,744)	$2,291 ($9,984)	$2,277 ($9,745)	$2,219 ($9,526)	$28,717 ($33,586)	$28,895 ($34,650)	$28,736 ($33,393)	$28,537 ($32,796)
Top 5% high cost		5.0%	5.0%	5.0%	4.9%	100.0%	100.0%	100.0%	100.0%

2. Health Link Performance Compared to Provincial Average

We compared the performance of HLs to the provincial average to assess the baseline performance of HLs on the 6 selected population level indicators:

1. Average monthly per capita cost (age/sex standardized),
2. Acute hospitalization rate per 100,000 individuals (age/sex standardized),
3. Low acuity emergency department visits per 100,000 individuals (age/sex standardized),
4. Readmission rate per 100,000 individuals (for 25 CMG, risk adjusted),
5. Percentage of primary care follow-up visits within 7 days of acute discharge, and
6. Proportion of individuals rostered to a primary care physician (age/sex standardized).

Tables 3 and 4 compare early and later adopter HLs to the provincial average for the full cohort of Ontarians and Tables 5 and 6 present the findings for the top 5% cohort. The first row of the four tables is the provincial average for that cohort and the second row is the average for the group of Ontarians who are not linked to one of the 54 HLs. HLs are sorted by their Local Health Integration Network (LHIN) in each table. Colour shading and other notations listed below are used to show how well early and later adopter HLs are performing compared to the provincial average for all Ontarians (Tables 3 and 4) or to the top 5% high cost users of health care (Tables 4 and 5) as follows:

- Shades of RED = values worse than the provincial average for the cohort.
- Shades of GREEN = values better than the provincial average for the cohort.
- Red asterisk = Network performing in the bottom 10 percent of all networks for that indicator.
- Green asterisk = Network performing in the top 10 percent of all networks for that indicator.
- Values that are significantly higher (lower) than the average at a five percent level of significance are indicated by an 'H' ('L') beside their score.

Sorting HLs by LHIN reveals pockets or areas of high (shades of green) and low (shades of red) performance throughout the province for the selected indicators. The baseline trends revealed by the data from these tables are highlighted below. The complete set of indicator results are presented in Appendix 3.

Baseline Trends

For the group of all Ontarians not currently linked to a HL (first row of Tables 3 and 4), indicator performance is significantly lower than or equivalent to the provincial average for average cost, acute hospitalization rate, 30-day readmission rate, follow-up within 7 days of acute care discharge, and proportion of individuals rostered to a primary care physician. This cohort of non-HL individuals performs significantly higher than the provincial average for low acuity ED visit rate. The tables do not show a difference in performance between early and later adopter HLs. There are high and low performers for both groups for all 6 selected indicators.

The first row of Tables 5 and 6 shows that the non-HL group of Ontarians who are in the cohort of top 5% high cost individuals have results higher or equivalent to the provincial average for acute hospitalization rate, low acuity ED visit rate, 30-day readmission rate, and proportion of individuals

rostered to a primary care physician. These tables also do not show a difference in performance between early and later adopter HLs. There are high and low performers for both groups for all 6 selected indicators.

Results displayed in these four tables (HLs grouped by LHIN) reveals pockets of high and low performance within LHINs. This shows that HLs within LHINs may perform better than the provincial average for some indicators, but never for all indicators. This finding holds for both cohorts of Ontarians and shows that the performance of HLs varies across the different indicators. As well, individual HLs may perform well (in the top 10% of HLs) on some indicators, but then poorly on other indicators. No HL is consistently a high or low performer.

Table 3 Baseline performance of 22 early adopter HLs for 6 selected indicators: Full cohort.

H = Significantly higher at 5% L = Significantly lower at 5% Top 10% = * Better than average Worse than average * = Bottom 10%

LHIN	#	HEALTH LINK (**= early adopter)	Avg Std Monthly Cost ($/person)		Std Rate Acute Hospitalization (/100,000)		Std Rate ED Visit: Low Acuity (/100,000)		Risk-adj. Estimate (%) CMG Readmission Rate		Crude Estimate Proportion All Individuals PC Follow-Up W/IN 7 days Acute Discharge (%)		Std Proportion Rostered to PC Physician (%)	
		All Ontario Cohort Average	166		5,618		15,664		15.1		32.3		71.3	
		NOT ASSIGNED	159	L	5,526	L	16,997	H	14.9		30.3	L	67.5	L
South West	2	Huron-Perth County**	162	L	6,481	H	38,980	H	13.8		26.1	L	83.0	* H
Waterloo Wellington	3	Guelph**	155	L	5,644		13,480	L	14.7		30.8		72.3	H
HNHB	4	Hamilton Central**	202	* H	6,555	H	16,063		16.3	H	25.9	L	72.2	H
Central West	5	Dufferin**	165	H	6,550	H	20,169	H	13.0	*	27.1	L	80.8	H
Central West	5	North Etobicoke-Malton-West Woodbridge	157	L	5,700	H	7,345	* L	16.6	* H	39.9	H	66.2	L
Mississauga Halton	6	East Mississauga**	149	* L	4,957	* L	9,419	L	13.7	L	37.6	H	67.6	L
Toronto Central	7	Don Valley/Greenwood**	176	H	5,171	L	9,046	L	16.1		32.2		70.7	H
Toronto Central	7	East Toronto**	176	H	5,497		8,936	L	16.6	*	35.1	H	63.7	L
Toronto Central	7	Mid East Toronto**	177	H	5,193	L	10,731	L	14.9		32.8		54.5	* L
Toronto Central	7	Mid-West Toronto**	171	H	5,036	L	9,341	L	15.2		32.0		61.9	L
Central	8	North York Central**	145	* L	4,574	* L	7,997	* L	14.9		35.2	H	68.4	L
Central	8	South Simcoe and Northern York Region**	170	H	5,969	H	14,747	L	15.8		40.4	* H	79.1	H
Central East	9	Peterborough**	179	H	6,103	H	22,745	H	15.0		27.4	L	76.6	H
South East	10	Kingston**	180	H	5,386	L	26,462	H	16.3		33.0		81.2	H
South East	10	Quinte**	177	H	6,007	H	24,593	H	15.4		30.2		80.7	H
South East	10	Rural Hastings**	176	H	5,850	H	33,560	H	14.8		30.8		72.2	H
South East	10	Rural Kingston**	162	L	5,599		30,550	H	15.6		33.6		81.9	H
South East	10	Thousand Islands**	181	H	6,382	H	24,151	H	14.5		30.9		78.2	H
North Simcoe Muskok	12	Barrie Community**	171	H	5,835	H	15,420	L	14.8		25.7	L	73.9	H
North Simcoe Muskok	12	South Georgian Bay Community**	157	L	6,065	H	24,373	H	14.7		34.9	H	82.9	* H
North East	13	Cochrane South/Timmins**	203	* H	8,625	* H	55,546	* H	17.6	* H	24.9	* L	68.0	L
North East	13	Temiskaming**	194	H	8,807	* H	80,451	* H	15.2		15.1	* L	55.2	* L

Table 4 Baseline performance of 32 later adopter HLs for 6 selected indicators: Full cohort.

H = Significantly higher at 5% L = Significantly lower at 5% Top 10% = * Better than average Worse than average * = Bottom 10%

LHIN	#	HEALTH LINK (**= early adopter)	Avg Std Monthly Cost ($/person)		Std Rate Acute Hospitalization (/100,000)		Std Rate ED Visit: Low Acuity (/100,000)		Risk-adj. Estimate (%) CMG Readmission Rate		Crude Estimate Proportion All Individuals PC Follow-Up W/IN 7 days Acute Discharge (%)		Std Proportion Rostered to PC Physician (%)	
		All Ontario Cohort Average	166		5,618		15,664		15.1		32.3		71.3	
		NOT ASSIGNED	159	L	5,526	L	16,997	H	14.9		30.3	L	67.5	L
Erie St. Clair	1	Chatham City Centre	193	H	6,659	H	28,793	H	13.7		29.0		80.3	H
South West	2	London-Middlesex County	173	H	5,856	H	19,542	H	16.7	* H	30.3		71.8	H
Waterloo Wellington	3	Cambridge	166	H	5,537		13,316	L	15.0		31.4		81.4	H
Waterloo Wellington	3	Kitchener-Waterloo	149	* L	4,784	* L	9,423	L	12.8	* L	28.4	L	71.9	H
Waterloo Wellington	3	Rural Wellington	156	L	5,984	H	34,765	H	13.2		30.2		83.2	* H
HNHB	4	Brantford, Brant & Six Nations	179	H	6,669	H	15,832	L	16.2		30.1		78.0	H
HNHB	4	Burlington	156	L	5,368	L	10,227	L	15.2		35.9	H	80.7	H
HNHB	4	Haldimand	185	H	6,533	H	38,379	H	14.3		33.4		81.9	H
HNHB	4	Hamilton East	187	H	6,131	H	16,394	H	14.8		25.4	L	75.3	H
HNHB	4	Hamilton West	182	H	5,751	H	14,225	L	15.3		28.9	L	80.4	H
HNHB	4	Niagara North East	178	H	6,203	H	14,954	L	15.0		37.6	H	72.2	H
HNHB	4	Niagara North West	159	L	5,870	H	19,384	H	15.4		42.2	* H	84.5	* H
HNHB	4	Niagara South East	178	H	5,755	H	15,065	L	13.7		37.1	H	71.7	H
HNHB	4	Niagara South West	173	H	5,990	H	22,238	H	12.7	* L	38.6	H	61.6	L
HNHB	4	Norfolk	177	H	6,663	H	27,154	H	14.6		30.6		84.0	* H
Central West	5	Bolton	157	L	5,555		11,464	L	12.8	*	41.8	* H	74.9	H
Central West	5	Bramalea	150	* L	5,614		7,323	* L	14.8		42.1	* H	68.9	L
Central West	5	Brampton	154	L	5,657		8,105	L	15.2		41.5	* H	73.6	H
Toronto Central	7	North Toronto East	161	L	4,866	* L	8,082	* L	16.3		32.9		60.7	* L
Toronto Central	7	South Toronto	173	H	5,506		11,439	L	15.8		33.6		55.0	* L
Central	8	South West York Region	150	* L	4,889	* L	8,067	* L	14.6		39.3	H	66.6	L
South East	10	Rideau Tay	169	H	5,746		54,556	* H	14.5		21.4	* L	65.0	L
South East	10	Salmon River	189	H	5,796		44,139	H	16.1		28.3		70.0	
Champlain	11	Arnprior Region and Ottawa West	152	L	5,007	L	16,157		14.1		31.0		73.5	H
Champlain	11	Prescott-Russell Regional	182	H	6,053	H	32,696	H	14.6		33.6		78.7	H
Champlain	11	South Renfrew	188	H	6,401	H	60,804	* H	12.2	*	28.7		64.7	L
Champlain	11	Upper Canada	164	H	5,876	H	16,526	H	15.4		31.4		80.4	H
North Simcoe Muskok	12	Muskoka Community	167	H	6,249	H	32,598	H	15.2		32.2		75.2	H
North Simcoe Muskok	12	North Simcoe Collaborative	197	* H	7,215	* H	39,560	H	14.0		27.4	L	78.1	H
North Simcoe Muskok	12	Orillia Community	176	H	6,100	H	36,870	H	14.1		28.5	L	77.3	H
North East	13	Cochrane North	203	* H	8,622	* H	119,934	* H	17.6	*	22.0	* L	61.2	* L
North West	14	City of Thunder Bay	205	* H	7,675	* H	26,391	H	16.1		20.9	* L	68.7	L

Table 5 Baseline performance of 22 early adopter HLs for 6 selected indicators: Top 5% cohort.

H = Significantly higher at 5% L = Significantly lower at 5% Top 10% = * Better than average Worse than average * = Bottom 10%

LHIN	#	HEALTH LINK (**= early adopter)	Avg Std Monthly Cost ($/person)	Std Rate Acute Hospitalization (/100,000)	Std Rate ED Visit: Low Acuity (/100,000)	Risk-adj. Estimate (%) CMG Readmission Rate	Crude Estimate Proportion All Individuals PC Follow-Up W/IN 7 days Acute Discharge (%)	Std Proportion Rostered to PC Physician (%)
		Top 5% Cohort Average	1,222	29,122	37,470	20.5	32.3	71.9
		NOT ASSIGNED	1,185 L	29,103	42,824 H	20.5	30.3 L	71.9
South West	2	Huron-Perth County**	1,212 H	37,705 * H	80,191 H	19.4	26.4 L	86.4 * H
Waterloo Wellington	3	Guelph**	1,135 L	27,638	31,340 L	18.7	30.8	67.6 L
HNHB	4	Hamilton Central**	1,542 * H	30,731	35,226 L	21.3	25.4 L	69.9
Central West	5	Dufferin**	996 * L	29,031	37,240	18.6	28.4	85.2 * H
Central West	5	North Etobicoke-Malton-West Woodbridge	1,110 L	31,132	17,893 * L	23.0 * H	37.4 H	71.0
Mississauga Halton	6	East Mississauga**	1,116 L	27,674	20,514 L	19.6	36.3 H	70.5
Toronto Central	7	Don Valley/Greenwood**	1,426 H	24,529 L	28,332 L	22.7 *	33.0	68.8
Toronto Central	7	East Toronto**	1,248 H	28,831	24,855 L	22.6	36.8 H	69.1
Toronto Central	7	Mid East Toronto**	1,347 H	27,600	29,990 L	20.5	34.2	63.1 * L
Toronto Central	7	Mid-West Toronto**	1,572 * H	33,081 H	22,301 L	20.9	32.6	58.0 * L
Central	8	North York Central**	1,160 L	25,904 L	18,659 * L	20.8	35.5 H	70.3
Central	8	South Simcoe and Northern York Region**	1,122 L	27,637	36,540 L	21.4	42.0 * H	84.2 H
Central East	9	Peterborough**	1,141 L	27,614	44,854 H	19.2	29.0	68.6
South East	10	Kingston**	1,292 H	30,606	68,139 H	22.4	34.5	80.0 H
South East	10	Quinte**	1,028 L	26,166 L	51,923 H	20.1	29.8	82.1 H
South East	10	Rural Hastings**	1,013 L	23,734 * L	62,029 H	20.9	31.9	75.9
South East	10	Rural Kingston**	830 * L	21,894 * L	82,219 H	21.4	32.5	82.3
South East	10	Thousand Islands**	1,157 L	27,969	62,885 H	19.9	34.5	75.9
North Simcoe Muskok	12	Barrie Community**	1,102 L	27,617	35,110 L	17.7 L	25.6 L	71.7
North Simcoe Muskok	12	South Georgian Bay Community**	983 * L	34,419 * H	40,346	17.9	33.8	86.1 * H
North East	13	Cochrane South/Timmins**	993 * L	32,884 H	127,562 * H	22.2	24.6 * L	70.0
North East	13	Temiskaming**	1,029 L	36,214 * H	160,097 * H	19.7	20.5 * L	59.8 * L

Table 6 Baseline performance of 32 later adopter HLs for 6 selected indicators: Top 5% cohort.

H = Significantly higher at 5% L = Significantly lower at 5% Top 10% = * Better than average Worse than average * = Bottom 10%

LHIN	#	HEALTH LINK (**= early adopter)	Avg Std Monthly Cost ($/person)	Std Rate Acute Hospitalization (/100,000)	Std Rate ED Visit: Low Acuity (/100,000)	Risk-adj. Estimate (%) CMG Readmission Rate	Crude Estimate Proportion All Individuals PC Follow-Up W/IN 7 days Acute Discharge (%)	Std Proportion Rostered to PC Physician (%)
		Top 5% Cohort Average	1,222	29,122	37,470	20.5	32.3	71.9
		NOT ASSIGNED	1,185 L	29,103	42,824 H	20.5	30.3 L	71.9
Erie St. Clair	1	Chatham City Centre	1,431 * H	33,248 *	57,515 H	17.6	30.6	80.0 H
South West	2	London-Middlesex County	1,367 H	33,050 H	45,519 H	22.7 * H	30.7	66.8 L
Waterloo Wellington	3	Cambridge	1,311 H	30,567	26,961 L	19.6	33.3	78.5 H
Waterloo Wellington	3	Kitchener-Waterloo	1,211 H	26,128 L	24,684 L	17.0 * L	27.5 L	69.3
Waterloo Wellington	3	Rural Wellington	1,194 L	25,253 L	72,310 H	17.0 *	29.1	82.8 H
HNHB	4	Brantford, Brant & Six Nations	1,151 L	31,347	32,145 L	20.2	31.1	76.3 H
HNHB	4	Burlington	1,095 L	26,525 L	24,742 L	21.4	33.8	83.3 H
HNHB	4	Haldimand	1,082 L	26,702	67,055 H	16.8 *	31.7	88.1 * H
HNHB	4	Hamilton East	1,404 H	30,554	25,791 L	19.5	24.2 * L	76.5 H
HNHB	4	Hamilton West	1,431 * H	28,728	31,422 L	19.5	27.9 L	77.4 H
HNHB	4	Niagara North East	1,198 L	30,943	39,469	21.7	38.8 * H	73.3
HNHB	4	Niagara North West	1,063 L	24,612 L	36,355	19.0	39.2 * H	84.9 H
HNHB	4	Niagara South East	1,181 L	25,960 L	33,316 L	18.7	36.4 H	73.6
HNHB	4	Niagara South West	1,102 L	30,412	41,479	16.3 * L	38.0 H	64.0 L
HNHB	4	Norfolk	1,192 L	31,060	52,217 H	18.6	33.0	90.6 * H
Central West	5	Bolton	920 * L	27,270	22,959 L	15.4 *	39.6 * H	79.7 H
Central West	5	Bramalea	1,056 L	30,751	15,791 * L	22.5	38.0 H	76.7 H
Central West	5	Brampton	1,050 L	29,778	18,350 * L	21.5	38.9 * H	78.0 H
Toronto Central	7	North Toronto East	1,297 H	24,943 L	18,231 * L	20.6	36.5 H	61.5 * L
Toronto Central	7	South Toronto	1,387 H	33,157 H	31,347 L	22.0	33.2	59.8 * L
Central	8	South West York Region	1,067 L	25,239 L	23,677 L	20.5	38.2 H	66.4 L
South East	10	Rideau Tay	1,203 L	30,057	109,482 * H	22.2	25.9 L	70.9
South East	10	Salmon River	1,456 * H	28,788	92,621 H	23.6 *	25.8	69.7
Champlain	11	Arnprior Region and Ottawa West	1,102 L	23,454 * L	32,741 L	18.3	32.1	75.1
Champlain	11	Prescott-Russell Regional	1,183 L	24,210 * L	61,070 H	20.1	35.9	79.6 H
Champlain	11	South Renfrew	1,220 H	23,059 * L	126,513 * H	16.8 *	31.0	71.6
Champlain	11	Upper Canada	1,123 L	28,197	32,852 L	21.2	30.9	80.6 H
North Simcoe Muskok	12	Muskoka Community	1,010 L	24,401 L	70,276 H	17.0	30.3	77.3
North Simcoe Muskok	12	North Simcoe Collaborative	1,271 H	29,616	73,686 H	18.7	28.1	76.2
North Simcoe Muskok	12	Orillia Community	1,135 L	25,367 L	87,272 H	17.6	25.1 L	77.6 H
North East	13	Cochrane North	1,149 L	30,393	268,008 * H	25.0 *	19.0 * L	65.6
North West	14	City of Thunder Bay	1,227 H	36,146 * H	56,065 H	22.3	20.6 * L	63.8 L

Rurality Index of Ontario

Each HL was given an RIO level as described in the methods. Table 7 shows the distribution of HLs in rural, suburban, and urban areas. The data for PNs is also provided for comparison purposes. A higher percentage of PNs are urban (56%) compared to HLs (33%), whereas the percentage of HLs that are rural and suburban is higher than for PNs.

Table 7 Number of HLs and PNs located in rural, suburban, and urban areas.

	Health Links				Physician Networks
	Early Adopter	Later Adopter	Total		
Rural (RIO≥40)	6	5	11		11
Suburban (10≤RIO<40)	8	17	25		23
Urban (RIO<10)	8	10	18		44
Total	22	32	54		78

Comparisons of urban HL performance to the provincial average using the full cohort of Ontarians reveals urban HLs were more likely to be high performers for the indicators of monthly costs and rates of low acuity ED. Suburban and rural HLs were more likely to be lower performers for these two indicators. Suburban and rural HLs were more likely to be high performers compared to the provincial average for primary care rostering, whereas urban HLs were more likely to be lower performers. Results for all indicators and HLs by rurality can be found in Appendix 4.

The cohort of top 5% high cost individuals revealed different patterns. For example, monthly costs were more likely to be lower (higher) than the provincial average in suburban and rural (urban) HLs. As well, primary care rostering for the top 5% cohort in urban HLs was more likely to be higher than the provincial average. Results for all HLs and indicators for the top 5% cohort are found in Appendix 4.

Comparing Health Links: Full Population versus Top 5% Population

In order to compare how urban, suburban, and rural HLs are performing in both the full and top 5% cohorts, we created an aggregate score based on the sum of HL indicator performance for their full population and their population of top 5% high cost individuals for the 6 selected indicators. We based this aggregate score on the Zscore commonly used in statistics. While the Zscore is used for normally distributed data, we are using it because it takes into account both the mean and standard deviation, controlling for difference and dispersion, creating a standardized score.

The total Zscore is found using equation 1. It is made up of two Zscore formulas in order to take into account whether being higher than the mean indicates higher performance or whether being lower than the mean indicates higher performance. For four of the selected indicators (Z_i) a below average performance is better, whereas for the other two indicators (Z_j) above average performance is better.

Z_i = indicator i, below average is better

Z_j = indicator j, above average is better

x_k = Health Link k's performance

μ = mean

σ = standard deviation

$$Z_i = \frac{x_k - \mu_i}{\sigma_i}$$

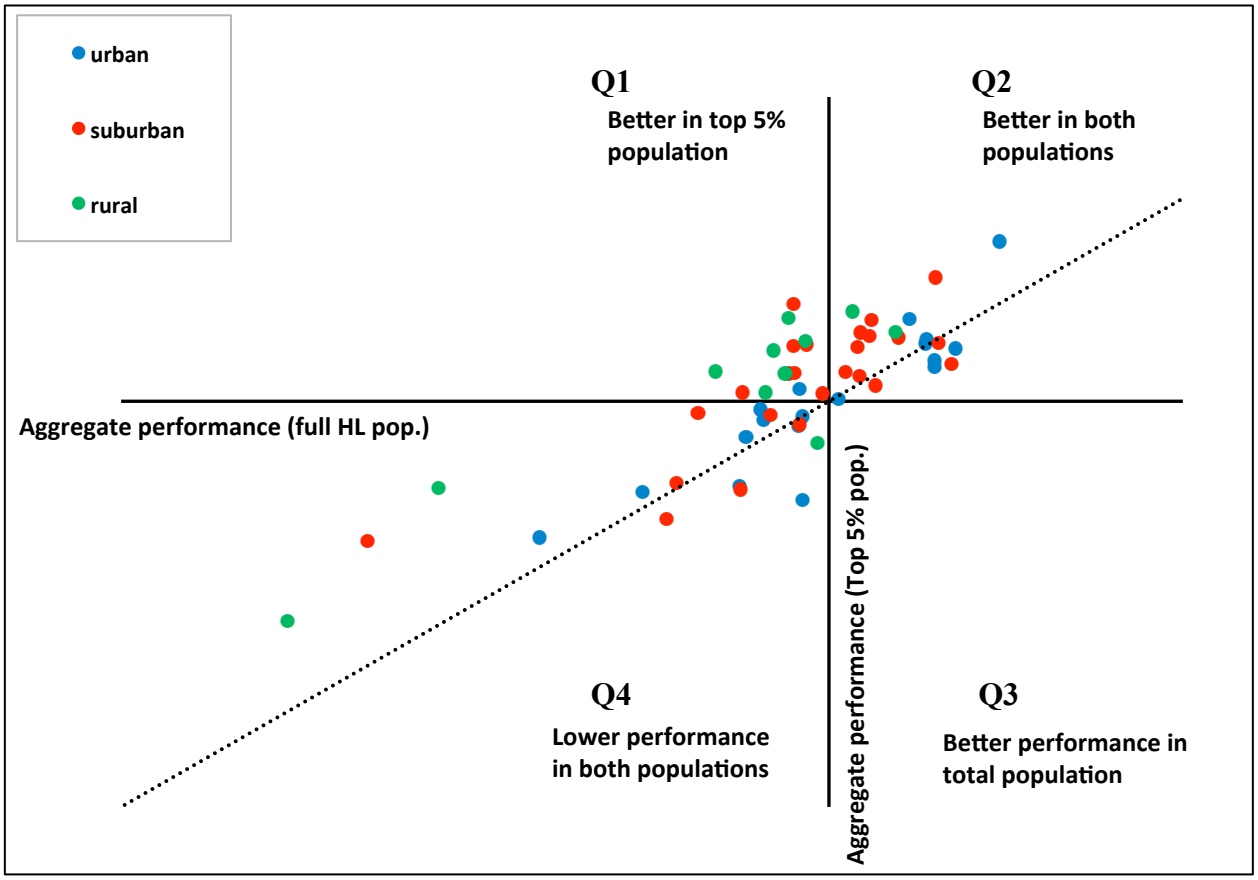
$$Z_j = \frac{x_k - \mu_j}{\sigma_j}$$

$$Zscore_{total} = \sum[(-1)Z_i + Z_j] \qquad \text{(Equation 1)}$$

The comparison based on the total Zscore for both populations of individuals is presented in Figure 1; the y-axis is the total Zscore for the top 5% population and the x-axis is total Zscore for the full population. When the results for both cohorts are plotted for all HLs we found that the majority of HLs fall in quadrants 1, 2, and 4. HLs in quadrant 1 are performing better than the provincial average in their top 5% cohort. HLs in quadrant 2 are performing better than the provincial average for both cohorts. HLs in quadrant 4 are performing worse than the provincial average for both cohorts. It is notable that there is more dispersion from the mean in quadrant 4 (poor performance) compared to the variation found in the other quadrants (points are closer to the origin, indicating performance closer to the provincial average).

Figure 1 also contains a 45 degree line (dotted) denoting when the total Zscore for the HL's cohort of top 5% high cost individuals is equal to the total Zscore for the HL's full population. This 45 degree line helps us compare the relative performance of HLs in these two cohorts. Points below the 45 degree line in quadrant 2 indicate that performance is better in the full population compared to the cohort of top 5% individuals in that HL based on the 6 selected indicators. Points above the 45 degree line in quadrant 4 indicate that those HLs are performing better in their top 5% populations compared to their full cohort for the 6 selected indicators. Our findings also show that urban HLs are more likely to perform comparably well in both populations (total Zscore points are close to the 45 degree line in all quadrants). Conversely, points for rural and suburban HLs are more likely to be in quadrants 1 and 2, indicating that they perform better in their top 5% population compared to their full cohort. Comparable results were found when all 22 indicators were used to calculate the total Zscore (see Figure A5.1 in Appendix 5).

Figure 1 Total Zscore comparison of HLs by rurality for 6 selected indicators: Both cohorts



Ontario Marginalization Index

Grouping HLs based on their marginalization index on a scale of 1 (lowest marginalization) to 5 (highest marginalization) revealed that marginalization is a predictor of performance in both populations of interest. HLs in the highest quintile of marginalization were more likely to perform lower than the provincial average for primary care follow-up and rostering, and higher than the provincial average for the other four selected indicators. The opposite is true for HLs in the lowest quintile of marginalization. In the cohort of top 5% high cost individuals, the effect of marginalization is not as strong. These findings can be found in Appendix 6.

3. Health Links compared to Physician Networks

The patient populations of PNs and HLs are not exactly the same: all 78 PNs together capture over 12 million Ontarians and the 54 HLs capture almost 9 million Ontarians. Even so, comparing indicator results from HLs to that of PNs can provide information that can be used when deciding how population level (as opposed to targeted population) models of care should be designed.

League Table Comparison of Health Links and Physician Networks

In order to explore how HLs and PNs rank in relationship to each other, with respect to their performance against the provincial average, we created combined league tables for each indicator. The league tables list HLs and PNs in order of performance, from highest to lowest performance. This comparison provides data regarding how the early and later HLs compare to the networks of providers across Ontario including in geographies where HLs are not yet implemented. For this table residents who are in HLs are also represented in PNs. The degree of this overlap is examined and displayed in Appendix 8. For the comparison of HL and PN we examined results in both the overall Ontario population and in the top 5% cohorts and stratified the results by rurality (urban, suburban and rural). Because of these multiple populations and stratifications, results for only 2 of the 6 selected indicators are presented in Tables 8 to 19. The two indicators, low acuity ED visits and primary care rostering, were chosen for the body of the report because they are examples of the variation in performance for HLs and PNs, for early adopter HLs, and HLs and PNs based on rurality. The remaining four indicator results are provided in Appendix 7.

The colour shading in the league tables corresponds to how well a HL or PN is performing at baseline compared to the provincial average for all Ontarians (Tables 8 to 13) or to the provincial average of all top 5% high cost individuals (Tables 14 to 19):

- Shades of RED = values worse than the provincial average for the cohort.
- Shades of GREEN = values better than the provincial average for the cohort.
- Red asterisk = Network performing in the bottom 10 percent of all networks for that indicator.
- Green asterisk = Network performing in the top 10 percent of all networks for that indicator.
- Values that are significantly higher (lower) than the average at a five percent level of significance are indicated by an 'H' ('L') beside their score.
- Early Adopter Health Links are indicated with shading and a double asterisk beside the name ('**')

HLs and PNs are listed in order of performance compared to the provincial average, from highest performance (darkest shade of green) to lowest performance (darkest shade of red). The names of the 78 PNs are in all caps and the names of the 22 early adopter HLs are shaded.

These tables show that both HLs and PNs are distributed throughout the rurality league tables regardless of type (HL or PN). Nonetheless, for the cohort of all Ontarians, HLs are more likely to be represented near the top (better performance) of the league table for ED visits in all geographic

groupings, and in the urban league table HLs are more likely to be represented near the bottom. It is notable that urban HLs and PNs are more likely to be shaded green, indicating baseline performance that is better than the provincial average – particularly for ED visits. Rural HLs and PNs are more likely to perform below the provincial average in the cohort of all Ontarians. This pattern of better performance in urban areas compared to suburban and rural areas for both HLs and PNs is also true for the full Ontario population for ACSC hospitalizations (Appendix 7). For other indicators there are few systematic differences across rurality.

In the cohort of top 5% high cost individuals, the same pattern of findings by geography (better performance in urban than rural areas) was observed for low-acuity ED visits (Tables 14-16) but for all other indicators (below and in Appendix 7) performance across urban, suburban, and rural groupings is more varied, with both high and low performers (green and red shading) found regardless of rurality. One exception being that early adopter HLs in urban areas tended to have lower rates of enrolment with PC in urban areas.

When individual PNs or HLs are observed across the different league tables (below and in Appendix 7), no HL or PN is the highest performer in both cohorts of Ontarians (full and top 5% high cost individuals), or for all indicators in either cohort.

Table 8 Urban HLs and PNs ranked by low acuity ED visit rate: Full cohort

Health Link / PHYSICIAN NETWORK	Std Rate ED Visit: Low Acuity (/100,000)		
All Ontario cohort	16,123		
SCARBOROUGH HOSPITAL (THE)-GRACE SITE	6,774	*	L
Bramalea Health Link	7,323	*	L
North Etobicoke-Malton-West Woodbridge Health Link**	7,345	*	L
WILLIAM OSLER HEALTH SYSTEM-ETOBICOKE	7,899	*	L
North York Central Health Link **	7,997	*	L
North Toronto East Health Link	8,082	*	L
Brampton Health Link	8,105	*	L
HUMBER RIVER REGIONAL HOSP-YORK-FINCH	8,312	*	L
YORK CENTRAL HOSPITAL	8,331	*	L
WILLIAM OSLER HEALTH CENTRE-BRAMPTON	8,373	*	L
HOSPITAL FOR SICK CHILDREN (THE)	8,468	*	L
CREDIT VALLEY HOSPITAL (THE)	8,493	*	L
NORTH YORK GENERAL HOSPITAL	8,788		L
East Toronto Health Link**	8,936		L
Don Valley/Greenwood Health Link**	9,046		L
SUNNYBROOK HEALTH SCIENCES CENTRE	9,219		L
TORONTO EAST GENERAL HOSPITAL	9,331		L
Mid-West Toronto Health Link**	9,341		L
East Mississauga Health Link**	9,419		L
HUMBER RIVER REGIONAL HOSP-HUMBER MEM	9,547		L
UNIVERSITY HEALTH NETWORK	9,588		L
SCARBOROUGH HOSPITAL (THE)-SCAR.GEN.SITE	9,708		L
MOUNT SINAI HOSPITAL	9,927		L
Burlington Health Link	10,227		L
GRAND RIVER HOSPITAL CORP-WATERLOO SITE	10,228		L
ROUGE VALLEY HEALTH SYSTEM-CENTENARY	10,361		L
Mid East Toronto Health Link**	10,731		L
TRILLIUM HEALTH CENTRE-MISSISSAUGA	10,793		L
ST MICHAEL'S HOSPITAL	10,815		L
OTTAWA HOSPITAL (THE)-GENERAL SITE	10,856		L
MARKHAM STOUFFVILLE HOSPITAL	10,878		L
JOSEPH BRANT MEMORIAL HOSPITAL	11,070		L
CHILDREN'S HOSPITAL OF EASTERN ONTARIO	11,078		L
WINDSOR REGIONAL HOSPITAL-METROPOLITAN	11,303		L
HALTON HEALTHCARE SERVICES CORP-OAKVILLE	11,371		L
ST JOSEPH'S HEALTH CENTRE	11,428		L
South Toronto Health Link	11,439		L
Bolton Health Link	11,464		L
OTTAWA HOSPITAL (THE)-CIVIC SITE	12,089		L
HOTEL-DIEU GRACE HOSPITAL-ST JOSEPH'S	12,533		L
ROUGE VALLEY HEALTH SYSTEM-AJAX SITE	13,640		L
HOPITAL REGIONAL DE SUDBURY-LAURENTIAN	13,786		L
CAMBRIDGE MEMORIAL HOSPITAL	13,934		L
QUEENSWAY-CARLETON HOSPITAL	14,051		L
Hamilton West Health Link	14,225		L
NIAGARA HEALTH SYSTEM-GREATER NIAGARA	15,513		L
Hamilton Central Health Link**	16,063		
Arnprior Region and Ottawa West Health Link	16,157		
Hamilton East Health Link	16,394		H
ROYAL VICTORIA HOSPITAL OF BARRIE (THE)	16,766		H
BRANT COMMUNITY HEALTHCARE SYS-BRANTFORD	16,803		H
NIAGARA HEALTH SYSTEM-ST CATHARINES GEN	16,878		H
LAKERIDGE HEALTH CORPORATION-OSHAWA SITE	16,927		H
HAMILTON HEALTH SCIENCES CORP-MCMASTER	16,937		H
ST JOSEPH'S HEALTH CARE SYSTEM-HAMILTON	17,282		H
HOPITAL MONTFORT	17,729		H
CENTRE FOR ADDICTION & MENTAL HEALTH-ARF	18,729		H
LONDON HLTH SCIENCES CTR-UNIVERSITY HOSP	20,521		H
GUELPH GENERAL HOSPITAL	20,748		H
City of Thunder Bay Health Link	26,391		H
THUNDER BAY REGIONAL HLTH SCIENCES CTR	27,861		H
KINGSTON GENERAL HOSPITAL	29,406		H

**early adopter Health Link

Table 9 Suburban HLs and PNs ranked by low acuity ED visit rate: Full cohort

Health Link / PHYSICIAN NETWORK	Std Rate ED Visit: Low Acuity (/100,000)		
All Ontario cohort	16,123		
South West York Region Health Link	8,067	*	L
Kitchener-Waterloo Health Link	9,423		L
Cambridge Health Link	13,316		L
Guelph Health Link**	13,480		L
South Simcoe and Northern York Health Link**	14,747		L
Niagara North East Health Link	14,954		L
Niagara South East Health Link	15,065		L
SOUTHLAKE REGIONAL HEALTH CENTRE	15,397		L
Barrie Community Health Link**	15,420		L
Brantford, Brant & Six Nations Health Link	15,832		L
Upper Canada Health Link	16,526		H
LEAMINGTON DISTRICT MEMORIAL HOSPITAL	18,460		H
HEADWATERS HEALTH CARE CENTRE-DUFFERIN	18,833		H
Niagara North West Health Link	19,384		H
London-Middlesex County Health Link	19,542		H
Dufferin Health Link**	20,169		H
NORTHUMBERLAND HILLS HOSPITAL	21,149		H
Niagara South West Health Link	22,238		H
BROCKVILLE GENERAL HOSPITAL	23,934		H
Thousand Islands Health Link**	24,151		H
Quinte Health Link**	24,593		H
COLLINGWOOD GENERAL AND MARINE HOSPITAL	25,078		H
Kingston Health Link**	26,462		H
QUINTE HEALTHCARE CORPORATION-BELLEVILLE	26,794		H
NORFOLK GENERAL HOSPITAL	26,827		H
PETERBOROUGH REGIONAL HEALTH CENTRE	26,892		H
Norfolk Health Link	27,154		H
NIAGARA HEALTH SYSTEM-WELLAND COUNTY	27,666		H
ST THOMAS-ELGIN GENERAL HOSPITAL	28,128		H
SAULT AREA HOSPITAL-SAULT STE MARIE	28,223		H
Chatham City Centre Health Link	28,793		H
PUBLIC GENERAL HOSP SOCIETY OF CHATHAM	32,100		H
CORNWALL COMMUNITY HOSPITAL	33,227		H
Rural Wellington Health Link	34,765		H
OTTAWA SATELLITE NETWORK	34,829		H
WOODSTOCK GENERAL HOSPITAL	36,543		H
ORILLIA SOLDIERS' MEMORIAL HOSPITAL	37,541		H
Haldimand Health Link	38,379		H
North Simcoe Collaborative Heath Link	39,560		H
ROSS MEMORIAL HOSPITAL	40,040		H
Salmon River Health Link	44,139		H
BLUEWATER HEALTH-SARNIA GENERAL SITE	45,464		H
TIMMINS & DISTRICT GENERAL HOSPITAL	46,428		H
NORTH BAY GENERAL HOSP-CIVIC/ST JOSEPH'S	48,349		H
Rideau Tay Health Link	54,556	*	H
PERTH & SMITHS FALLS DISTRICT HOSPITAL	56,791	*	H
WEENEEBAYKO GENERAL HOSPITAL	60,706	*	H
Temiskaming Health Link**	80,451	*	H

Table 10 Rural HLs and PNs ranked by low acuity ED visit rate: Full cohort

Health Link / PHYSICIAN NETWORK	Std Rate ED Visit: Low Acuity (/100,000)	
All Ontario cohort	16,123	
Peterborough Health Link**	22,745	H
South Georgian Bay Community Health Link**	24,373	H
Rural Kingston Health Link**	30,550	H
Muskoka Community Health Link	32,598	H
MUSKOKA ALGONQUIN HEALTHCARE-HUNTSVILLE	32,650	H
Prescott-Russell Regional Health Link	32,696	H
Rural Hastings Health Link**	33,560	H
Orillia Community Health Link	36,870	H
STRATFORD GENERAL HOSPITAL	38,916	H
Huron-Perth County Health Link**	38,980	H
GEORGIAN BAY	40,498	H
GREY BRUCE HEALTH SERVICES-OWEN SOUND	44,052	H
THUNDER BAY SATELLITE NETWORK-NW	44,654	H
PEMBROKE REGIONAL HOSPITAL INC	54,677	* H
Cochrane South/Timmins Health Link**	55,546	* H
THUNDER BAY SATELLITE NETWORK-SOUTH	57,575	* H
South Renfrew Health Link	60,804	* H
SUDBURY SATELLITE NETWORK	71,168	* H
OWEN SOUND SATELLITE NETWORK-SOUTH	78,240	* H
THUNDER BAY SATELLITE NETWORK-EAST	86,946	* H
TIMMINS SATELLITE NETWORK	97,511	* H
Cochrane North Health Link	119,934	* H

Table 11 Urban HLs and PNs ranked by PC rostering: Full cohort

Health Link / PHYSICIAN NETWORK	Std Proportion Rostered to PC Physician		
All Ontario cohort	70.0		
KINGSTON GENERAL HOSPITAL	84.7	*	H
JOSEPH BRANT MEMORIAL HOSPITAL	84.7	*	H
CAMBRIDGE MEMORIAL HOSPITAL	84.2	*	H
HOPITAL MONTFORT	82.6		H
HALTON HEALTHCARE SERVICES CORP-OAKVILLE	82.1		H
BRANT COMMUNITY HEALTHCARE SYS-BRANTFORD	81.6		H
Burlington Health Link	80.7		H
Hamilton West Health Link	80.4		H
LAKERIDGE HEALTH CORPORATION-OSHAWA SITE	80.2		H
HAMILTON HEALTH SCIENCES CORP-MCMASTER	79.5		H
ROUGE VALLEY HEALTH SYSTEM-AJAX SITE	79.5		H
NIAGARA HEALTH SYSTEM-ST CATHARINES GEN	79.2		H
QUEENSWAY-CARLETON HOSPITAL	79.1		H
GUELPH GENERAL HOSPITAL	78.9		H
NIAGARA HEALTH SYSTEM-GREATER NIAGARA	78.8		H
ST JOSEPH'S HEALTH CARE SYSTEM-HAMILTON	78.3		H
ROYAL VICTORIA HOSPITAL OF BARRIE (THE)	77.4		H
SCARBOROUGH HOSPITAL (THE)-GRACE SITE	77.4		H
MARKHAM STOUFFVILLE HOSPITAL	76.5		H
WILLIAM OSLER HEALTH CENTRE-BRAMPTON	76.1		H
GRAND RIVER HOSPITAL CORP-WATERLOO SITE	76.0		H
CREDIT VALLEY HOSPITAL (THE)	76.0		H
ROUGE VALLEY HEALTH SYSTEM-CENTENARY	75.9		H
LONDON HLTH SCIENCES CTR-UNIVERSITY HOSP	75.6		H
OTTAWA HOSPITAL (THE)-GENERAL SITE	75.6		H
Hamilton East Health Link	75.3		H
HOTEL-DIEU GRACE HOSPITAL-ST JOSEPH'S	75.1		H
Bolton Health Link	74.9		H
HUMBER RIVER REGIONAL HOSP-HUMBER MEM	74.2		H
Brampton Health Link	73.6		H
SUNNYBROOK HEALTH SCIENCES CENTRE	73.5		H
Arnprior Region and Ottawa West Health Link	73.5		H
NORTH YORK GENERAL HOSPITAL	73.1		H
UNIVERSITY HEALTH NETWORK	72.9		H
THUNDER BAY REGIONAL HLTH SCIENCES CTR	72.2		H
Hamilton Central Health Link**	72.2		H
TRILLIUM HEALTH CENTRE-MISSISSAUGA	71.6		H
HOPITAL REGIONAL DE SUDBURY-LAURENTIAN	71.2		H
YORK CENTRAL HOSPITAL	71.1		H
Don Valley/Greenwood Health Link**	70.7		H
WILLIAM OSLER HEALTH SYSTEM-ETOBICOKE	70.6		H
TORONTO EAST GENERAL HOSPITAL	70.0		
SCARBOROUGH HOSPITAL (THE)-SCAR.GEN.SITE	70.0		
HUMBER RIVER REGIONAL HOSP-YORK-FINCH	69.9		
Bramalea Health Link	68.9		L
City of Thunder Bay Health Link	68.7		L
North York Central Health Link **	68.4		L
ST MICHAEL'S HOSPITAL	67.7		L
East Mississauga Health Link**	67.6		L
WINDSOR REGIONAL HOSPITAL-METROPOLITAN	67.3		L
North Etobicoke-Malton-West Woodbridge Health Link**	66.2		L
OTTAWA HOSPITAL (THE)-CIVIC SITE	65.4		L
East Toronto Health Link**	63.7		L
MOUNT SINAI HOSPITAL	62.7		L
Mid-West Toronto Health Link**	61.9		L
North Toronto East Health Link	60.7	*	L
ST JOSEPH'S HEALTH CENTRE	59.8	*	L
South Toronto Health Link	55.0	*	L
Mid East Toronto Health Link**	54.5	*	L
CHILDREN'S HOSPITAL OF EASTERN ONTARIO	49.1	*	L
CENTRE FOR ADDICTION & MENTAL HEALTH-ARF	31.4	*	L
HOSPITAL FOR SICK CHILDREN (THE)	30.6	*	L

Table 12 Suburban HLs and PNs ranked by PC rostering: Full cohort

Health Link / PHYSICIAN NETWORK	Std Proportion Rostered to PC Physician		
All Ontario cohort	70.0		
NORFOLK GENERAL HOSPITAL	88.4	*	H
WOODSTOCK GENERAL HOSPITAL	87.8	*	H
OTTAWA SATELLITE NETWORK	86.8	*	H
COLLINGWOOD GENERAL AND MARINE HOSPITAL	86.5	*	H
NORTHUMBERLAND HILLS HOSPITAL	85.3	*	H
Niagara North West Health Link	84.5	*	H
Norfolk Health Link	84.0	*	H
Rural Wellington Health Link	83.2		H
ST THOMAS-ELGIN GENERAL HOSPITAL	82.5		H
QUINTE HEALTHCARE CORPORATION-BELLEVILLE	82.0		H
Haldimand Health Link	81.9		H
LEAMINGTON DISTRICT MEMORIAL HOSPITAL	81.8		H
SOUTHLAKE REGIONAL HEALTH CENTRE	81.7		H
HEADWATERS HEALTH CARE CENTRE-DUFFERIN	81.6		H
Cambridge Health Link	81.4		H
Kingston Health Link**	81.2		H
PETERBOROUGH REGIONAL HEALTH CENTRE	80.9		H
Dufferin Health Link**	80.8		H
Quinte Health Link**	80.7		H
PUBLIC GENERAL HOSP SOCIETY OF CHATHAM	80.4		H
Upper Canada Health Link	80.4		H
ORILLIA SOLDIERS' MEMORIAL HOSPITAL	80.3		H
Chatham City Centre Health Link	80.3		H
BROCKVILLE GENERAL HOSPITAL	79.3		H
South Simcoe and Northern York Health Link**	79.1		H
Thousand Islands Health Link**	78.2		H
North Simcoe Collaborative Heath Link	78.1		H
Brantford, Brant & Six Nations Health Link	78.0		H
BLUEWATER HEALTH-SARNIA GENERAL SITE	77.5		H
SAULT AREA HOSPITAL-SAULT STE MARIE	76.5		H
ROSS MEMORIAL HOSPITAL	74.3		H
Barrie Community Health Link**	73.9		H
TIMMINS & DISTRICT GENERAL HOSPITAL	72.8		H
Guelph Health Link**	72.3		H
Niagara North East Health Link	72.2		H
NORTH BAY GENERAL HOSP-CIVIC/ST JOSEPH'S	72.2		H
Kitchener-Waterloo Health Link	71.9		H
London-Middlesex County Health Link	71.8		H
Niagara South East Health Link	71.7		H
Salmon River Health Link	70.0		
NIAGARA HEALTH SYSTEM-WELLAND COUNTY	68.6		L
South West York Region Health Link	66.6		L
Rideau Tay Health Link	65.0		L
PERTH & SMITHS FALLS DISTRICT HOSPITAL	64.1		L
Niagara South West Health Link	61.6		L
Temiskaming Health Link**	55.2	*	L
CORNWALL COMMUNITY HOSPITAL	53.4	*	L
WEENEEBAYKO GENERAL HOSPITAL	5.8	*	L

Table 13 Rural HLs and PNs ranked by PC rostering: Full cohort

Health Link / PHYSICIAN NETWORK	Std Proportion Rostered to PC Physician		
All Ontario cohort	70.0		
OWEN SOUND SATELLITE NETWORK-SOUTH	87.0	*	H
STRATFORD GENERAL HOSPITAL	86.2	*	H
GEORGIAN BAY	83.6	*	H
GREY BRUCE HEALTH SERVICES-OWEN SOUND	83.4		H
Huron-Perth County Health Link**	83.0		H
South Georgian Bay Community Health Link**	82.9		H
Rural Kingston Health Link**	81.9		H
Prescott-Russell Regional Health Link	78.7		H
MUSKOKA ALGONQUIN HEALTHCARE-HUNTSVILLE	78.6		H
Orillia Community Health Link	77.3		H
SUDBURY SATELLITE NETWORK	76.8		H
Peterborough Health Link**	76.6		H
Muskoka Community Health Link	75.2		H
Rural Hastings Health Link**	72.2		H
THUNDER BAY SATELLITE NETWORK-SOUTH	71.8		H
Cochrane South/Timmins Health Link**	68.0		L
South Renfrew Health Link	64.7		L
THUNDER BAY SATELLITE NETWORK-EAST	63.7		L
PEMBROKE REGIONAL HOSPITAL INC	61.9		L
Cochrane North Health Link	61.2	*	L
TIMMINS SATELLITE NETWORK	56.9	*	L
THUNDER BAY SATELLITE NETWORK-NW	56.4	*	L

Table 14 Urban HLs and PNs ranked by low acuity ED visit rate: Top 5%

Health Link / PHYSICIAN NETWORK	Std Rate ED Visit: Low Acuity (/100,000)		
Top 5% Cohort Average	39,256		
HOSPITAL FOR SICK CHILDREN (THE)	13,827	*	L
Bramalea Health Link	15,791	*	L
SCARBOROUGH HOSPITAL (THE)-GRACE SITE	17,628	*	L
HUMBER RIVER REGIONAL HOSP-YORK-FINCH	17,842	*	L
North Etobicoke-Malton-West Woodbridge Health Link**	17,893	*	L
WILLIAM OSLER HEALTH CENTRE-BRAMPTON	18,112	*	L
North Toronto East Health Link	18,231	*	L
Brampton Health Link	18,350	*	L
North York Central Health Link **	18,659	*	L
NORTH YORK GENERAL HOSPITAL	19,346	*	L
CREDIT VALLEY HOSPITAL (THE)	19,362	*	L
WILLIAM OSLER HEALTH SYSTEM-ETOBICOKE	19,580	*	L
CHILDREN'S HOSPITAL OF EASTERN ONTARIO	20,011	*	L
East Mississauga Health Link**	20,514		L
SUNNYBROOK HEALTH SCIENCES CENTRE	21,047		L
UNIVERSITY HEALTH NETWORK	21,444		L
YORK CENTRAL HOSPITAL	21,458		L
HUMBER RIVER REGIONAL HOSP-HUMBER MEM	21,610		L
Mid-West Toronto Health Link**	22,301		L
TRILLIUM HEALTH CENTRE-MISSISSAUGA	22,466		L
MARKHAM STOUFFVILLE HOSPITAL	22,716		L
SCARBOROUGH HOSPITAL (THE)-SCAR.GEN.SITE	22,884		L
OTTAWA HOSPITAL (THE)-GENERAL SITE	22,891		L
ROUGE VALLEY HEALTH SYSTEM-CENTENARY	22,926		L
Bolton Health Link	22,959		L
OTTAWA HOSPITAL (THE)-CIVIC SITE	24,420		L
HALTON HEALTHCARE SERVICES CORP-OAKVILLE	24,430		L
MOUNT SINAI HOSPITAL	24,740		L
Burlington Health Link	24,742		L
East Toronto Health Link**	24,855		L
Hamilton East Health Link	25,791		L
GRAND RIVER HOSPITAL CORP-WATERLOO SITE	26,070		L
ST JOSEPH'S HEALTH CENTRE	26,448		L
TORONTO EAST GENERAL HOSPITAL	26,540		L
QUEENSWAY-CARLETON HOSPITAL	26,635		L
JOSEPH BRANT MEMORIAL HOSPITAL	27,163		L
CAMBRIDGE MEMORIAL HOSPITAL	27,398		L
ST MICHAEL'S HOSPITAL	28,135		L
Don Valley/Greenwood Health Link**	28,332		L
Mid East Toronto Health Link**	29,990		L
BRANT COMMUNITY HEALTHCARE SYS-BRANTFORD	29,991		L
HAMILTON HEALTH SCIENCES CORP-MCMASTER	30,638		L
WINDSOR REGIONAL HOSPITAL-METROPOLITAN	30,895		L
South Toronto Health Link	31,347		L
Hamilton West Health Link	31,422		L
Arnprior Region and Ottawa West Health Link	32,741		L
NIAGARA HEALTH SYSTEM-GREATER NIAGARA	32,990		L
ROUGE VALLEY HEALTH SYSTEM-AJAX SITE	33,041		L
HOPITAL MONTFORT	34,342		L
Hamilton Central Health Link**	35,226		L
ST JOSEPH'S HEALTH CARE SYSTEM-HAMILTON	35,375		L
HOPITAL REGIONAL DE SUDBURY-LAURENTIAN	36,265		L
ROYAL VICTORIA HOSPITAL OF BARRIE (THE)	36,794		
NIAGARA HEALTH SYSTEM-ST CATHARINES GEN	39,175		
LAKERIDGE HEALTH CORPORATION-OSHAWA SITE	41,274		
GUELPH GENERAL HOSPITAL	42,965		H
HOTEL-DIEU GRACE HOSPITAL-ST JOSEPH'S	43,819		H
LONDON HLTH SCIENCES CTR-UNIVERSITY HOSP	44,334		H
CENTRE FOR ADDICTION & MENTAL HEALTH-ARF	55,855		H
City of Thunder Bay Health Link	56,065		H
THUNDER BAY REGIONAL HLTH SCIENCES CTR	57,861		H
KINGSTON GENERAL HOSPITAL	66,208		H

Table 15 Suburban HLs and PNs ranked by low acuity ED visit rate: Top 5%

Health Link / PHYSICIAN NETWORK	Std Rate ED Visit: Low Acuity (/100,000)		
Top 5% Cohort Average	39,256		
South West York Region Health Link	23,677		L
Kitchener-Waterloo Health Link	24,684		L
Cambridge Health Link	26,961		L
Guelph Health Link**	31,340		L
Brantford, Brant & Six Nations Health Link	32,145		L
Upper Canada Health Link	32,852		L
Niagara South East Health Link	33,316		L
Barrie Community Health Link**	35,110		L
SOUTHLAKE REGIONAL HEALTH CENTRE	35,400		L
HEADWATERS HEALTH CARE CENTRE-DUFFERIN	36,323		
Niagara North West Health Link	36,355		
South Simcoe and Northern York Health Link**	36,540		L
NORTHUMBERLAND HILLS HOSPITAL	37,057		
Dufferin Health Link**	37,240		
Niagara North East Health Link	39,469		
Niagara South West Health Link	41,479		
COLLINGWOOD GENERAL AND MARINE HOSPITAL	41,969		
London-Middlesex County Health Link	45,519		H
ST THOMAS-ELGIN GENERAL HOSPITAL	50,673		H
Quinte Health Link**	51,923		H
PETERBOROUGH REGIONAL HEALTH CENTRE	51,932		H
LEAMINGTON DISTRICT MEMORIAL HOSPITAL	52,101		H
Norfolk Health Link	52,217		H
NORFOLK GENERAL HOSPITAL	53,387		H
PUBLIC GENERAL HOSP SOCIETY OF CHATHAM	55,331		H
QUINTE HEALTHCARE CORPORATION-BELLEVILLE	56,177		H
NIAGARA HEALTH SYSTEM-WELLAND COUNTY	56,696		H
Chatham City Centre Health Link	57,515		H
CORNWALL COMMUNITY HOSPITAL	59,569		H
WOODSTOCK GENERAL HOSPITAL	61,401		H
Thousand Islands Health Link**	62,885		H
BROCKVILLE GENERAL HOSPITAL	63,440		H
SAULT AREA HOSPITAL-SAULT STE MARIE	64,146		H
OTTAWA SATELLITE NETWORK	66,343		H
ROSS MEMORIAL HOSPITAL	66,896		H
Haldimand Health Link	67,055		H
Kingston Health Link**	68,139		H
Rural Wellington Health Link	72,310		H
North Simcoe Collaborative Heath Link	73,686		H
BLUEWATER HEALTH-SARNIA GENERAL SITE	86,440		H
ORILLIA SOLDIERS' MEMORIAL HOSPITAL	90,157		H
Salmon River Health Link	92,621		H
NORTH BAY GENERAL HOSP-CIVIC/ST JOSEPH'S	102,098		H
TIMMINS & DISTRICT GENERAL HOSPITAL	106,046		H
PERTH & SMITHS FALLS DISTRICT HOSPITAL	107,518		H
Rideau Tay Health Link	109,482	*	H
Temiskaming Health Link**	160,097	*	H
WEENEEBAYKO GENERAL HOSPITAL	163,462	*	H

Table 16 Rural HLs and PNs ranked by low acuity ED visit rate: Top 5%

Health Link / PHYSICIAN NETWORK	Std Rate ED Visit: Low Acuity (/100,000)		
Top 5% Cohort Average	39,256		
South Georgian Bay Community Health Link**	40,346		
Peterborough Health Link**	44,854		H
Prescott-Russell Regional Health Link	61,070		H
Rural Hastings Health Link**	62,029		H
MUSKOKA ALGONQUIN HEALTHCARE-HUNTSVILLE	63,410		H
Muskoka Community Health Link	70,276		H
GEORGIAN BAY	71,462		H
GREY BRUCE HEALTH SERVICES-OWEN SOUND	73,419		H
Huron-Perth County Health Link**	80,191		H
STRATFORD GENERAL HOSPITAL	80,818		H
Rural Kingston Health Link**	82,219		H
Orillia Community Health Link	87,272		H
PEMBROKE REGIONAL HOSPITAL INC	108,678	*	H
THUNDER BAY SATELLITE NETWORK-NW	110,944	*	H
South Renfrew Health Link	126,513	*	H
Cochrane South/Timmins Health Link**	127,562	*	H
SUDBURY SATELLITE NETWORK	140,802	*	H
THUNDER BAY SATELLITE NETWORK-SOUTH	149,471	*	H
OWEN SOUND SATELLITE NETWORK-SOUTH	154,274	*	H
TIMMINS SATELLITE NETWORK	218,091	*	H
THUNDER BAY SATELLITE NETWORK-EAST	241,029	*	H
Cochrane North Health Link	268,008	*	H

Table 17 Urban HLs and PNs ranked by PC rostering: Top 5%

Health Link / PHYSICIAN NETWORK	Std Proportion Rostered to PC Physician		
Top 5% Cohort Average	71.9		
JOSEPH BRANT MEMORIAL HOSPITAL	84.5	*	H
Burlington Health Link	83.3		H
HOPITAL MONTFORT	82.2		H
HALTON HEALTHCARE SERVICES CORP-OAKVILLE	80.9		H
KINGSTON GENERAL HOSPITAL	80.8		H
Bolton Health Link	79.7		H
ROUGE VALLEY HEALTH SYSTEM-AJAX SITE	79.6		H
LAKERIDGE HEALTH CORPORATION-OSHAWA SITE	79.4		H
WILLIAM OSLER HEALTH CENTRE-BRAMPTON	78.8		H
HUMBER RIVER REGIONAL HOSP-HUMBER MEM	78.4		H
Brampton Health Link	78.0		H
QUEENSWAY-CARLETON HOSPITAL	77.7		H
NIAGARA HEALTH SYSTEM-GREATER NIAGARA	77.6		H
Hamilton West Health Link	77.4		H
BRANT COMMUNITY HEALTHCARE SYS-BRANTFORD	77.4		H
NIAGARA HEALTH SYSTEM-ST CATHARINES GEN	76.9		H
Bramalea Health Link	76.7		H
CAMBRIDGE MEMORIAL HOSPITAL	76.7		H
Hamilton East Health Link	76.5		H
ST JOSEPH'S HEALTH CARE SYSTEM-HAMILTON	76.3		H
ROUGE VALLEY HEALTH SYSTEM-CENTENARY	75.8		H
HAMILTON HEALTH SCIENCES CORP-MCMASTER	75.2		H
Arnprior Region and Ottawa West Health Link	75.1		
MARKHAM STOUFFVILLE HOSPITAL	75.0		
CREDIT VALLEY HOSPITAL (THE)	74.8		
SCARBOROUGH HOSPITAL (THE)-GRACE SITE	74.6		
OTTAWA HOSPITAL (THE)-GENERAL SITE	73.7		
UNIVERSITY HEALTH NETWORK	73.3		
SUNNYBROOK HEALTH SCIENCES CENTRE	73.2		
GUELPH GENERAL HOSPITAL	73.1		
HOTEL-DIEU GRACE HOSPITAL-ST JOSEPH'S	72.7		
WILLIAM OSLER HEALTH SYSTEM-ETOBICOKE	72.3		
ST MICHAEL'S HOSPITAL	72.0		
TRILLIUM HEALTH CENTRE-MISSISSAUGA	71.6		
GRAND RIVER HOSPITAL CORP-WATERLOO SITE	71.5		
YORK CENTRAL HOSPITAL	71.4		
NORTH YORK GENERAL HOSPITAL	71.3		
North Etobicoke-Malton-West Woodbridge Health Link**	71.0		
ROYAL VICTORIA HOSPITAL OF BARRIE (THE)	71.0		
SCARBOROUGH HOSPITAL (THE)-SCAR.GEN.SITE	70.7		
East Mississauga Health Link**	70.5		
North York Central Health Link **	70.3		
Hamilton Central Health Link**	69.9		
TORONTO EAST GENERAL HOSPITAL	69.8		
HUMBER RIVER REGIONAL HOSP-YORK-FINCH	69.7		
East Toronto Health Link**	69.1		
LONDON HLTH SCIENCES CTR-UNIVERSITY HOSP	69.1		L
Don Valley/Greenwood Health Link**	68.8		
HOPITAL REGIONAL DE SUDBURY-LAURENTIAN	67.3		L
WINDSOR REGIONAL HOSPITAL-METROPOLITAN	66.1		L
MOUNT SINAI HOSPITAL	65.0		
City of Thunder Bay Health Link	63.8		L
THUNDER BAY REGIONAL HLTH SCIENCES CTR	63.7		L
Mid East Toronto Health Link**	63.1		L
North Toronto East Health Link	61.5	*	L
OTTAWA HOSPITAL (THE)-CIVIC SITE	61.4	*	L
ST JOSEPH'S HEALTH CENTRE	60.9	*	L
South Toronto Health Link	59.8	*	L
Mid-West Toronto Health Link**	58.0	*	L
CHILDREN'S HOSPITAL OF EASTERN ONTARIO	52.1	*	L
HOSPITAL FOR SICK CHILDREN (THE)	37.1	*	L
CENTRE FOR ADDICTION & MENTAL HEALTH-ARF	20.3	*	L

Table 18 Suburban HLs and PNs ranked by PC rostering: Top 5%

Health Link / PHYSICIAN NETWORK	Std Proportion Rostered to PC Physician		
Top 5% Cohort Average	71.9		
NORFOLK GENERAL HOSPITAL	91.1	*	H
Norfolk Health Link	90.6	*	H
LEAMINGTON DISTRICT MEMORIAL HOSPITAL	88.2	*	H
Haldimand Health Link	88.1	*	H
OTTAWA SATELLITE NETWORK	86.1	*	H
Dufferin Health Link**	85.2	*	H
Niagara North West Health Link	84.9	*	H
COLLINGWOOD GENERAL AND MARINE HOSPITAL	84.3		H
South Simcoe and Northern York Health Link**	84.2		H
HEADWATERS HEALTH CARE CENTRE-DUFFERIN	83.6		H
SOUTHLAKE REGIONAL HEALTH CENTRE	83.2		H
WOODSTOCK GENERAL HOSPITAL	83.0		H
Rural Wellington Health Link	82.8		H
Quinte Health Link**	82.1		H
NORTHUMBERLAND HILLS HOSPITAL	81.7		H
Upper Canada Health Link	80.6		H
QUINTE HEALTHCARE CORPORATION-BELLEVILLE	80.2		H
Chatham City Centre Health Link	80.0		H
Kingston Health Link**	80.0		H
PUBLIC GENERAL HOSP SOCIETY OF CHATHAM	79.8		H
Cambridge Health Link	78.5		H
ORILLIA SOLDIERS' MEMORIAL HOSPITAL	77.0		
Brantford, Brant & Six Nations Health Link	76.3		H
ST THOMAS-ELGIN GENERAL HOSPITAL	76.2		
North Simcoe Collaborative Heath Link	76.2		
Thousand Islands Health Link**	75.9		
BROCKVILLE GENERAL HOSPITAL	74.9		
Niagara South East Health Link	73.6		
BLUEWATER HEALTH-SARNIA GENERAL SITE	73.3		
Niagara North East Health Link	73.3		
SAULT AREA HOSPITAL-SAULT STE MARIE	73.0		
Barrie Community Health Link**	71.7		
PETERBOROUGH REGIONAL HEALTH CENTRE	71.4		
Rideau Tay Health Link	70.9		
NORTH BAY GENERAL HOSP-CIVIC/ST JOSEPH'S	70.4		
TIMMINS & DISTRICT GENERAL HOSPITAL	70.4		
Salmon River Health Link	69.7		
ROSS MEMORIAL HOSPITAL	69.4		
Kitchener-Waterloo Health Link	69.3		
NIAGARA HEALTH SYSTEM-WELLAND COUNTY	69.1		
Guelph Health Link**	67.6		L
London-Middlesex County Health Link	66.8		L
South West York Region Health Link	66.4		L
PERTH & SMITHS FALLS DISTRICT HOSPITAL	66.1		
Niagara South West Health Link	64.0		L
Temiskaming Health Link**	59.8	*	L
CORNWALL COMMUNITY HOSPITAL	54.1	*	L
WEENEEBAYKO GENERAL HOSPITAL	4.3	*	L

Table 19 Rural HLs and PNs ranked by PC rostering: Top 5%

Health Link / PHYSICIAN NETWORK	Std Proportion Rostered to PC Physician		
Top 5% Cohort Average	71.9		
Huron-Perth County Health Link**	86.4	*	H
South Georgian Bay Community Health Link**	86.1	*	H
OWEN SOUND SATELLITE NETWORK-SOUTH	85.9	*	H
STRATFORD GENERAL HOSPITAL	85.1	*	H
GREY BRUCE HEALTH SERVICES-OWEN SOUND	84.8	*	H
GEORGIAN BAY	82.4		H
Rural Kingston Health Link**	82.3		
Prescott-Russell Regional Health Link	79.6		H
Orillia Community Health Link	77.6		H
MUSKOKA ALGONQUIN HEALTHCARE-HUNTSVILLE	77.3		
Muskoka Community Health Link	77.3		
SUDBURY SATELLITE NETWORK	77.0		
THUNDER BAY SATELLITE NETWORK-SOUTH	76.9		
Rural Hastings Health Link**	75.9		
South Renfrew Health Link	71.6		
Cochrane South/Timmins Health Link**	70.0		
Peterborough Health Link**	68.6		
Cochrane North Health Link	65.6		
THUNDER BAY SATELLITE NETWORK-EAST	64.0		
PEMBROKE REGIONAL HOSPITAL INC	62.6		L
TIMMINS SATELLITE NETWORK	58.6	*	L
THUNDER BAY SATELLITE NETWORK-NW	49.4	*	L

Comparison of Overlapping Health Links and Physician Networks

The league tables do not take into account whether a HL or PN located close to each other in the league table are also located in close proximity within the province of Ontario. We sought to examine the extent of overlap between HLs and PNs in terms of the defined patient population. Initial exploration revealed that it is possible for a HL to overlap with all 78 PNs due to the way PNs were created (based on physician referral patterns, not geographical boundaries). We adjusted the overlap criterion to require that at least 5% of the HL's population overlapped with a PN. This reduced the number of overlapping PNs to between one and six per HL. Information on the PN and HL overlap, including the number of HL individuals overlapping with PNs, can be found in Appendix 8.

We examined two measures of overlap between Health Links and Physician Networks. The first examined the proportion of patients in a defined Health Link that were drawn from the PN with the largest overlap of patients. We found that just under 70% of Health Links patients, on average, were drawn from the PN with the highest degree of overlap. We also examined a more general measure of overlap by considering both the HL and the PN population to determine what proportion of the HL and PN patient population were shared by both the HL and PN, essentially changing the denominator to include both HL and PN populations for the same dyad. In this measure we found an overage of only 46% of patients were common to the HL and PN with the highest degree of overlap. This means that by practice patterns, primary care physicians have many patients who are being treated in hospitals that are not part of the geographically defined health link that they are practicing within. It also means that hospitals are treating many patients whose primary care physician practices outside of the geographic boundary of the health link.

Conclusions

This baseline assessment of the performance of Health Links revealed that HLs are starting their integration and coordination efforts at different levels of performance. Some HLs are beginning their process as high performers compared to the provincial average for numerous performance indicators. Other HLs appear to be starting their initiatives with more opportunities for improvement when their baseline performance is compared to the provincial average. These latter HLs are generally those in more rural areas and face challenges resulting from marginalization. Analysis revealed that while urban HLs tended to perform at a higher level when compared to the provincial average, there are urban areas with significantly lower performance levels. This highlights the importance of allowing HLs the flexibility to organize and function in a manner that takes the needs of their population, and available resources, into consideration.

Future evaluations can use the results included in this report as a benchmark to compare individual HLs over time and identify when improvements are occurring as a result of HL best practices. Differences in performance based on rurality and marginalization were not surprising, but highlight important contextual factors for HL leaders and decision makers to consider when deciding how to group HLs with appropriate peer-comparators when attempting to compare performance across HLs. Identifying the specific effect of HL on patient care and outcomes requires being able to identify which individuals are enrolled in HL programs. This was not possible at the time of this report. A registry of patients enrolled in Health Links would enable a direct evaluation of the impact of HL activities on the patients that they have enrolled. A registry that allows for linkage with health administrative data would further enable comparisons of enrolled and similar patients who are not yet enrolled in HLs as this initiative is implemented across the province. The present report describes the general population trends of patients in Health Link geographies but does not evaluate the performance of Health Links specifically in regard to the patients who are enrolled in HL programs.

The variation in performance across Health Links suggests considerable potential for improvement by focusing on coordinating and integrating care for individuals in areas of the province with lower levels of performance. While this information is not a surprise, it emphasizes the fact that there are substantial differences in performance between local HLs across and within LHINs.

The results of this report indicate that there are considerable opportunities to improve enrolment with a primary care provider, including among individuals in the top 5% high cost population. The current average proportion of high cost individuals in Ontario who are rostered is 71.9 percent, but this is only 1.9 percent higher than the provincial average for the full population of Ontario. This emphasizes the importance of increasing access to primary care, especially for individuals with complex conditions and who are often frequent users of the health care system. These individuals will benefit from having regular and timely access to a primary care provider.

The finding that rural and suburban HLs had better performance in their top 5% high cost individuals compared to their total population indicates that some HLs may be better at addressing the needs of these individuals. An alternative explanation is that more high cost individuals with more complex health care needs live in urban areas. There were relatively few risk-adjustment factors

included in the indicator standards from the Resource for Indicator Standards (RIS) that we adopted for this report.

Differences in indicator results found when comparing the high cost cohort to the full cohort of Ontarians suggests that demographics beyond age and sex may play a role. As demographics change within a region, so may performance. This means that HLs currently performing well with their current demographic structure need to plan ahead for what care will be needed in the future and/or how care is coordinated. As well, what is currently working well in one HL may not be a model that works for all HLs, unless population and other characteristics are comparable. Even so, the increased focused on integrating and coordinating care for targeted populations in Ontario may lead to further improvements (even spill over effects) for both the cohort of high cost individuals as well as Ontario's full population.

Measures of marginalization further emphasize the need to address issues such as lack of housing, low levels of education, unemployment (or under employment), and the importance of social supports. Health Link leaders recognize this and know that the health care system cannot solve all problems that lead to poor health outcomes and high usage of health care services. Some HLs have begun to include organizations that provide social assistance in their discussions on how to integrate and coordinate care, and other services, for their targeted population. This early work can lead to structures that may be useful at the broader population level to address poor health outcomes and other issues that increase marginalization scores.

The higher proportion of HLs that are suburban and rural compared to the higher proportion of urban PNs indicates that voluntary HLs have formed more rapidly in suburban and rural areas compared to urban areas. This may be partially due to the ease of identifying the appropriate network of providers and that stronger existing relationships exist among different kinds of providers in suburban and rural areas. It may be more difficult to foster relationships within urban areas, particularly where existing practice and referral patterns (in PNs) are less clearly defined. This is also highlighted in Appendix 8 where the degree of overlap between HLs and PNs is much higher in suburban and rural areas compared to urban areas.

The HLs initiative is focused not only on controlling health care costs, but also on improving health care provided at the individual level. These are two important and related areas that can improve as HLs continue working on increasing the integration and coordination of health care services, and even other social services. As HLs continue to spread across Ontario they should keep in mind that population level improvements can also lead to improvements in costs and care provision. There are currently no indicators being used to track the performance or success of HLs on population level measures. This highlights the usefulness of the Triple Aim framework as a means to guide quality improvement efforts. Future research and assessments should take other population level health care indicators (e.g., cancer screening, diabetes care) and even population health indicators (e.g. physical activity) into account. This will help decision makers determine priority areas for networks to improve care and the extent to which HLs need to expand their focus to include targeting more upstream interventions. Population level or 'upstream health care' interventions can have significant effects, but may be more challenging to tie to a

specific HL initiative because positive effects can take many years before they are measurable and may be influenced by other policies.

Achieving effective inter-organizational integration across the care continuum is a challenging but important goal for Ontario's health care system. The example of Accountable Care Organizations in the US indicates that it will take time for success to be achieved. HLs have sought to build productive relationships among health care provider partners, and increasing integrated care in a way that focuses on the needs of individuals receiving health care services (see the second report in this series). As HLs continue to develop, increase coordination of care, share best practices, and focus on the needs of their respective populations it is expected that their performance on the indicators used to measure their success will show improvements over time. Knowing which providers to engage and better approaches to identifying which patients to target for HL interventions will be a key factor in the success of HLs.

The model of Accountable Care Organizations described in the first report of this series could be pursued in Ontario based either on geographic boundaries, or enrolment models following existing practice patterns; it will be highly challenging to enable accountability and provide equitable funding with a hybrid approach. Differences in existing patterns of care for patients among providers (Physician Networks) compared to the geographic approach employed by Health Links definitions will have to be resolved in order for HLs to effectively manage care for complex patients. Full population-based accountability will require either that patients be willing to change primary care providers or that Health Links be reorganized to engage with providers in their referral network regardless of geography.

References

Baker, GR., et al. (2011) "Enhancing the Continuum of Care: Report of the Avoidable Hospitalization Advisory Panel." Submitted to the Ministry of Health and Long-Term Care. Available from: http://www.health.gov.on.ca/en/common/ministry/publications/reports/baker_2011/baker_2011.pdf

Bains, N. (2009) "Standardization of Rates." Core Indicators Work Group, Core Indicators for Public Health in Ontario Project. Association of Public Health Epidemiologists in Ontario (APHEO). Available from: http://www.apheo.ca/resources/indicators/Standardization%20report_NamBains_FINALMarch16.pdf. Accessed on July 20, 2014.

Institute for Health Care Improvement (2014). Website. Available from: http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

Kralj, B. (2009) Measuring Rurality – RIO 2008_BASIC: Methodology and Results. RIO Review Working Group. OMA Economics Department. Available from: https://www.oma.org/Resources/Documents/2008RIO-FullTechnicalPaper.pdf. Accessed on June 20, 2014.

Matheson, FI; Dunn, JR; Smith, KLW; Moineddin, R; and Glazier, RH. (2012) ON-Marg Ontario Marginalization Index, User Guide version 1.0. Centre for Research on Inner City Health. Available from: http://www.torontohealthprofiles.ca/onmarg/userguide_data/ON-Marg_user_guide_1.0_FINAL_MAY2012.pdf. Accessed on January 2, 2015.

Mery G, Wodchis WP. Assessing Value in Ontario Health Links. Part 1: Lessons from US Accountable Care Organizations. Applied Health Research Question Series. Vol 4. Toronto: Health System Performance Research Network; 2014;

Mery G, Kromm S, and Wodchis WP. Assessing Value in Ontario Health Links. Part 2: A Perspective from Early Adopter Health Links. Applied Health Research Question Series. Vol 4. Toronto: Health System Performance Research Network; 2015;

Ministry of Health and Long-Term Care (2014) Resource for Indicator Standards. Available from: http://www.health.gov.on.ca/en/pro/programs/ris/alpha_indicators.aspx. Accessed on July 15, 2014.

Stukel, TA; Glazier, RH, Schultz, SE; Guan, J; Zagorski, BM; Gozdyra, P; and Henry, DA (2013) Multispecialty physician networks in Ontario. *Open Medicine*, 7(2): e40.

Wodchis, WP; Hirdes, JP; Feeny, DH. (2003) Health-Related Quality of Life Measure Based on the Minimum Data Set. *International Journal of Technology Assessment in Health Care*, 19(3): 490-506.

Appendices

Appendix 1 – HSPRN Indicators used for assessing HLs

Appendix 2 – Baseline demographic information for LHINs and HLs

Appendix 3 –Baseline HL performance of early and later adopters, both cohorts: 22 indicators

Appendix 4 –Baseline HL performance by rurality, both cohorts: 22 indicators

Appendix 5 – Total Zscore comparison of HL performance in both cohorts by rurality: 22 indicators

Appendix 6 –Baseline HL performance by marginalization quintile, both cohorts: 22 indicators

Appendix 7 – League tables for HL and PN for 6 selected indicators by rurality: Both cohorts

Appendix 8 – Overlap of individual Ontarians between HLs and PNs