Measuring health system efficiency in Canada

Canadian Institute for Health Information
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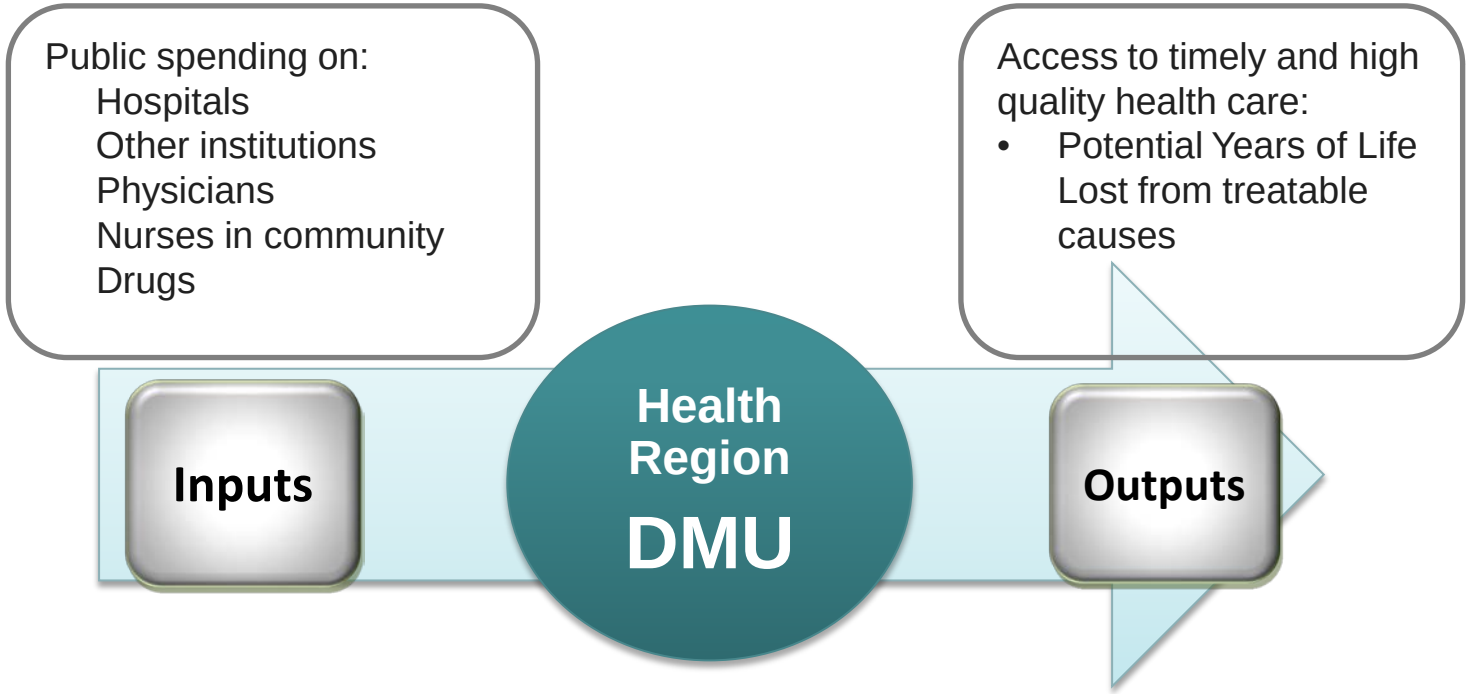
Presentation outline

- Project background
- Methods
- Data
- Preliminary results
- Any questions or comments

The objective of this study is to measure health system efficiency

- Technical efficiency: the ratio of the quantity of output achieved to the *maximum attainable* output given the quantity of inputs (resources) available.
- Allows us to address the following questions:
  - Step 1: How much more could we get from what we spend?
  - Step 2: What policy levers could be used to improve the outcomes attained with a given set of inputs?
- This work will help to uncover, and fill, important data gaps

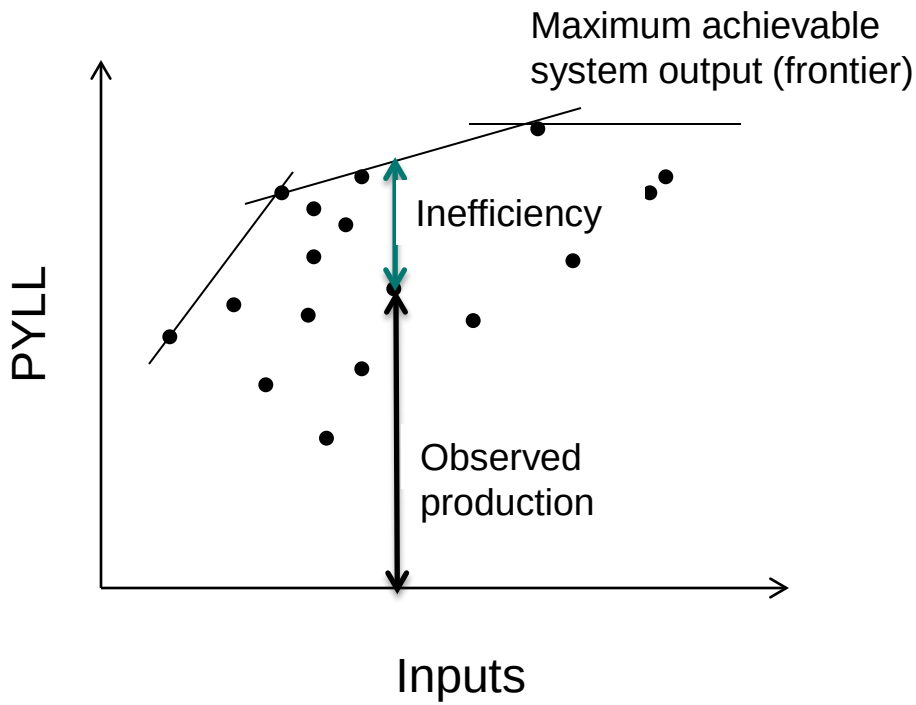
The proposed conceptual model to measure efficiency



Factors to explain inefficiency:

- Environmental factors (e.g. socioeconomic, demographic indicators)
- Health system factors (e.g. indicators of hospital performance, continuity of care, private revenues)

Data envelopment analysis: calculate point estimates of efficiency



Three main steps:

1) Calculate point estimates of efficiency using DEA
2) Apply statistical outlier detection methodology (Wilson 1993)
3) Bootstrap point estimates to generate "bias-corrected" efficiency scores (Simar & Wilson 1998)

Data: overview of output data source

Potential years of life lost from treatable causes
Statistics Canada vital statistics (2007-2009)

Reminder: The objective that we are measuring efficiency against is to ensure Canadians have access to timely and effective health care when they are sick.

Data: overview of input data sources

Sector	Hospitals	Other institutions	Physicians	Nurses in community	Prescription drugs (outside hospital)
Current data source	CIHI's Canadian MIS Database (CMDB): Revenue to hospitals from provinces	Residential Care Facility (RCF) survey	Billings data (CIHI's National Physicians Database) and Scott's Medical Database	Census data	IMS Brogan
Possible alternative data source	RHA public accounts	CMDB: Revenue to all facilities from provinces	Census; NHEX estimates	CIHI's Nursing database	CIHI's National Prescription Drug Utilization Information System (NPDUIS) Database (Public plans)

Adjustments to the input data

- Random fluctuations over time
  - All inputs are averaged over 3-year period (where possible)
- Population size
  - All inputs are estimated per capita
- Patient flow:
  - Adjust hospital and specialist spending estimates by currently available measures of inpatient patient flow (based on acute care cases)
  - In progress: adjusting measure of patient flow by resource intensity
- Spending on capital:
  - Adjust hospital revenue data by capital spending, assuming the distribution of capital spending is equivalent to the distribution of total spending by revenue category

Summary of input and output data in the sample of 71 regions

	Mean	SD	Range	
Inputs ($ per capita)			min	max
Hospital	1500.05	483.78	630.81	3369.82
Physicians: GP	251.85	57.95	129.81	464.96
Physician: Specialist	304.54	62.23	197.66	460.72
Prescription drugs	512.95	111.58	288.53	790.85
Other institutions	304.73	199.22	0.00	1037.58
Community nurses	55.65	21.47	19.59	119.48
Output				
PYLL from treatable causes	1331.56	318.31	704.30	2271.20

Preliminary results: summary of efficiency scores

- Efficiency estimates varied across regions; 21 regions were on the “frontier”
- On average, regions could potentially reduce PYLL by 35%.

	Mean	First quartile	Median	Third quartile	Fourth quartile
Efficiency point estimate	0.8	0.64	0.8	1	1
Robust (“bias-corrected”) efficiency point estimates	0.65	0.57	0.66	0.73	0.93

Preliminary results of factors related to efficiency: some findings are intuitive…

	Lowest quartile of efficiency scores	Second quartile	Third quartile	Highest quartile of efficiency scores
Other public hospital revenue ($ per capita)	69.67	50.69	105.14	73.58
Private hospital revenue ($ per capita)	37.59	33.88	38.00	49.97
% GP (of total physicians)	**58.74**	**58.13**	**70.91**	**72.96**
% full time nurses	**62.83**	**64.81**	**68.34**	**71.73**

Preliminary results of factors related to efficiency: some findings are less intuitive…

	Lowest quartile of efficiency scores	Second quartile	Third quartile	Highest quartile of efficiency scores
Population density	**588.8**	**180.10**	**93.10**	**72.46**
Average income	33,142	34,129	32,022	30,031
% Overweight	34.22	34.98	36.51	37.32
% Obese	19.04	18.64	20.17	24.87

Average efficiency scores by quartile of a selection of explanatory variables

	Q1	Q2	Q3	Q4
% GPs	0.6361	0.6205	**0.6354**	**0.7220**
% Full time nurses	0.6234	0.6428	**0.6484**	**0.6980**
ACSC admissions	0.6335	0.5902	0.7025	0.6857
Population density	0.6922	0.6893	0.5965	0.6309

Next steps:

- Apply revised measure of patient flow to hospital and specialist spending estimates
- Adjust PYLL with a measure of morbidity, based on health utilities index
- Fill some data gaps (e.g. spending on community care and public health)
- Develop a method for assessing multivariate relationships of factors related to efficiency, e.g. with factor analysis

Thank you!

Any questions?

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