Composite Indicators of System Performance

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Composite indicators: the rationale

- performance is multidimensional;
- need a rounded assessment of performance;
  - assessing managerial competence;
  - assessing efficiency;
  - accountability and public assurance;
- need to make comparisons systematic.
Structure of talk

- introduction to the concept;
- four examples from health;
- some theory;
- practical issues in developing composites;
- concluding comments.
# Health System Performance in OECD

(source: OECD Health Data 2000)

<table>
<thead>
<tr>
<th></th>
<th>Life expectancy 1995: Females at age 65</th>
<th>Infant mortality 1996: Deaths per 1,000 live births</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Years</td>
<td>Rank</td>
</tr>
<tr>
<td>Australia</td>
<td>19.5</td>
<td>8</td>
</tr>
<tr>
<td>Austria</td>
<td>18.7</td>
<td>15</td>
</tr>
<tr>
<td>Belgium</td>
<td>19.6</td>
<td>7</td>
</tr>
<tr>
<td>Canada</td>
<td>20.1</td>
<td>4</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>16.1</td>
<td>27</td>
</tr>
<tr>
<td>Denmark</td>
<td>17.6</td>
<td>23</td>
</tr>
<tr>
<td>Finland</td>
<td>18.6</td>
<td>17</td>
</tr>
<tr>
<td>France</td>
<td>20.6</td>
<td>2</td>
</tr>
<tr>
<td>Germany</td>
<td>18.5</td>
<td>18</td>
</tr>
<tr>
<td>Greece</td>
<td>18.4</td>
<td>19</td>
</tr>
<tr>
<td>Hungary</td>
<td>15.8</td>
<td>28</td>
</tr>
<tr>
<td>Iceland</td>
<td>19.4</td>
<td>9</td>
</tr>
<tr>
<td>Ireland</td>
<td>17.4</td>
<td>24</td>
</tr>
<tr>
<td>Italy</td>
<td>19.4</td>
<td>9</td>
</tr>
<tr>
<td>Japan</td>
<td>20.9</td>
<td>1</td>
</tr>
<tr>
<td>Korea</td>
<td>17.0</td>
<td>25</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>18.2</td>
<td>11</td>
</tr>
</tbody>
</table>
Two performance indicators in OECD countries

Life expectancy, females aged 65

Infant mortality per 1,000
What is a composite indicator?

- A linear example:

\[ C = \alpha_1 P_1 + \alpha_2 P_2 + \ldots + \alpha_n P_n \]

- where \( \alpha_1 \) indicates “value” attached to an extra unit of indicator 1.
Towards a measure of efficiency

Divide the composite performance score by expenditure:

\[ E = \frac{\alpha_1 P_1 + \alpha_2 P_2 + \ldots + \alpha_n P_n}{\text{EXP}} \]

…. but what about environmental influences on performance?
Some examples from health

• US Medicare;
  – ranking states.

• Canadian health regions;
  – more sensitive measurement.

• British health authorities;
  – more attention to weights.

• WHO national health systems;
  – towards a measure of efficiency.
Issues in health system efficiency measurement

• what are the health system boundaries?
• measuring outcomes vs processes;
• external influences on performance;
  – other agencies
  – social and other external factors
• measuring expenditure;
• complexity.
US Medicare  
*Jencks et al (2000)*

- Objective is “to provide a performance monitoring system to support continuous quality improvement”;
- Fifty US states plus DC and Puerto Rico;
- Twenty-two process indicators of performance;
- Each state ranked 1-52 on each indicator;
- Ranks summed across 22 indicators.
US Medicare - Criteria for Inclusion

• The disease is a major source of morbidity or mortality;
• Certain processes of care are known to improve outcomes;
• Measurement of these processes is feasible;
• There is substantial scope for improvement in performance;
• Managerial intervention can potentially improve performance.
US Medicare -
the chosen indicators

- acute myocardial infarction (6 indicators),
- heart failure (2),
- stroke (3),
- pneumonia (7),
- breast cancer (1),
- diabetes (3).
Medicare
the pneumonia indicators

**Inpatient setting**
- Antibiotic within 8 hr of arrival at hospital
- Antibiotic consistent with current recommendations
- Blood culture drawn (if done) before antibiotic given
- Patient screened for or given influenza vaccine
- Patient screened for or given pneumococcal vaccine

**Any setting**
- Influenza immunization every year
- Pneumococcal immunization at least once ever
Canadian Regions
the Macleans report

- Objective is to present information on health care that “truly matters to Canadians”;
- 54 largest Canadian health regions;
- 15 indicators of performance organized in six categories;
- indicators combined using weights based on “expert judgement”.
Canadian Regions
the categories of performance

• outcomes (0.2);
• prenatal care (0.2);
• community health (0.2);
• elderly services (0.1);
• efficiencies (0.2);
• resources (0.1).
Canadian Regions “efficiencies”

- *Possible outpatients*: percentage of acute care hospitalizations for conditions not requiring admission.
- *Early discharge*: variation from the expected length of stay, standardized for age and diagnosis.
- *Preventable admissions*: age standardized hospital admissions per 100,000 people for conditions (such as diabetes or asthma) where appropriate ambulatory care reduces the need for hospitalization.
The Sick List: The NHS from best to worst
Objective is to “measures the standard of healthcare against public expectations”;
• 120 British health authorities (populations about 500,000);
• Six indicators of performance;
• Weights based on public preferences;
• Some attempt made to adjust for environmental factors.
British Health Care - the chosen indicators

- Deaths from cancer (per 100,000 people)
- Deaths from heart disease (per 100,000)
- Total number of people on hospital waiting lists (per 1,000)
- Percentage of people on waiting lists who had been waiting over 12 months
- Number of hip operations (per 100,000)
- Deaths from “avoidable” diseases (per 100,000)
UK health care: 
Average allocation of 60 chips between six performance indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Chips</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reducing deaths from cancer</td>
<td>16</td>
<td>1.00</td>
</tr>
<tr>
<td>2. Reducing deaths from heart disease</td>
<td>12</td>
<td>0.75</td>
</tr>
<tr>
<td>3. Reducing total number of people on hospital waiting lists</td>
<td>10</td>
<td>0.63</td>
</tr>
<tr>
<td>4. Reducing number of people waiting over 12 months</td>
<td>9</td>
<td>0.56</td>
</tr>
<tr>
<td>5. Increasing number of hip operations</td>
<td>5</td>
<td>-0.31</td>
</tr>
<tr>
<td>6. Reducing deaths from 'avoidable' diseases</td>
<td>8</td>
<td>0.50</td>
</tr>
</tbody>
</table>
National health systems:
the WHO World Health Report 2000

- Objective is to examine “whether a health system is performing as well as it could”;
- 191 countries;
- Five indicators of system performance;
- Missing data inferred statistically;
- Weights based on survey of informants;
- Measure of efficiency estimated after some adjustment for environment.
WHR 2000 Indicators

• Overall health outcomes (measured by disability-adjusted life expectancy)
• Inequality in health (measured by an index based on child mortality)
• Overall health system responsiveness, reflecting respect for persons and client orientation (as assessed by a panel of key informants)
• Inequality in health system responsiveness (as assessed by the key informants)
• Fairness of financing (measured by an index based on the proportion of non-food expenditure spent on health care).
## World Health Report 2000: Weights and transformations used for five objectives

<table>
<thead>
<tr>
<th>Objective</th>
<th>Weight</th>
<th>Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>H: Overall health outcome</td>
<td>0.250</td>
<td>((H-20)/(80-20))*100</td>
</tr>
<tr>
<td>HI: Distribution of health</td>
<td>0.250</td>
<td>((1-HI))*100</td>
</tr>
<tr>
<td>R: Overall responsiveness</td>
<td>0.125</td>
<td>((R/10))*100</td>
</tr>
<tr>
<td>RI: Distribution of</td>
<td>0.125</td>
<td>((1-RI))*100</td>
</tr>
<tr>
<td>responsiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF: Fairness of financing</td>
<td>0.250</td>
<td>FF*100</td>
</tr>
</tbody>
</table>
Building up the “production possibility frontier”
Preferences affect the preferred production point on the frontier.
The composite score increases as the parallel lines move to the right.
Some technical issues

- Choosing what should be measured.
- Collinearity of components.
- Identifying the composite weights.
- Transforming the constituent indicators
- Analytic approaches to inferring efficiency
- External influences on measured performance
Potential influences on measures of health system performance

- differences in health status of citizens being served;
- external environment – for example, geography, climate, other agencies, culture;
- quality of resources being used;
- different accounting treatments;
- data errors;
- random fluctuation;
- different priorities;
- differences in effectiveness.
For composite indicators ...

- Place system performance at the centre of the policy arena;
- Offer a rounded assessment of system performance;
- Enable judgements to be made on system efficiency;
- Facilitate communication and promote accountability;
- Indicate which systems represent the beacons of best performance;
- Indicate which systems represent the priority for improvement efforts;
- Stimulate the search for better data and better analytic efforts across all of health care;
- Offer local policy makers the freedom to set their own priorities.
Against composite indicators ...

- May disguise serious failings in parts of some systems;
- Difficult to know what remedial action to take;
- Individual elements of composite indicator often contentious;
- May have to rely on very feeble or opaque data in some dimensions of performance;
- A composite that ignores dimensions of performance that are difficult to measure may distort behaviour;
- Methodology for calculating weights seriously inadequate;
- The weights used in composite indicators reflect a single set of preferences.
The last word: Oscar Wilde

“What is a cynic? A man who knows the price of everything and the value of nothing.

“And a sentimentalist is a man who sees an absurd value in everything, and doesn’t know the market price of any single thing.”

Lady Windermere’s Fan

The challenge:

to find a way between the cynics and the sentimentalists.