Working Party on National Accounts

NOTE ON PRICE AND VOLUME MEASURES FOR HEALTH CARE

To be held on 29-30 October 2015
OECD Conference Centre
Beginning at 11:30 am on the first day

This document has been prepared by Luca Lorenzoni - OECD Secretariat (ELS Department) and will be presented under item 19 of the draft agenda

JT03384611

Complete document available on OLIS in its original format
This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.
NOTE ON PRICE AND VOLUME MEASURES FOR HEALTH CARE

1. Price and volume measures: the theory

1. The overall change in the value of goods and services produced and made available within an economy over time is referred to as “growth”. The prime task of National accounts is to separate out, within the change in observed monetary aggregate, the part of growth that stems from a change in quantity from the part that is due to a change in price (Lequiller and Blades 2014).

2. In a time series, price and volume measurements of goods and services in the economy relate to the decomposition of transaction values in current prices into their price and volume components (temporal volume/price breakdown).

3. Besides, the principles of trend analysis can also be used to measure output across countries while holding time constant, that is carry out cross-country comparisons. Measurement of changes in price and volume can be analysed from a perspective of change in purchasing power across countries over some basket of final consumption goods and services (spatial volume/price breakdown) (OECD, Eurostat, WHO 2011).

4. It is important to clarify that a time series of volumes and volumes derived using PPP estimates as deflators are two different measures. In a time series of volumes, the effects of price changes from one period to another are removed to produce volume measures from which rates of economic growth are calculated. In the case of an inter-country comparison, the effects of differences due to exchange rates and those due to different price levels within each country are removed from the expenditure values to provide a comparison between the volumes in the country concerned (System of National Accounts 2008, paragraph 15.228).

5. The compilation of consistent measures of output, whether these services are provided by market or by non-market producers\(^1\), should be encouraged. Hill (1975) formulated this idea as follows:

“It is proposed as a matter of principle that the basic methodology used to measure changes in the volume of real output should always be the same irrespective of whether a service is provided on a market or on a non-market basis. This is not to say that the actual numerical measures would not be affected by whether the service is market or non-market, because different weighting systems would be involved, but at least the methods of measurement should be conceptually similar (page 19).”

---

\(^1\) Market output is output that is sold at prices that are economically significant. Thus, for market services of health, the value of output in current prices can be measured by the value of sales of these services. However, health is one of the most common examples of services provided by government free of charge or at prices which are not economically significant and thus constitute non-market output. A price which is not economically significant is deliberately fixed well below the equilibrium price that would clear the market. It is defined as a price which has little or no influence over how much the producer is willing to supply and which has only a marginal influence on the quantities demanded.
6. The definition and measurement of output is particularly challenging in the health sector. For practical reasons, estimates of health care output are restricted to complete treatments delivered by a single provider. Therefore, output is measured by statistics such as the number of hospitalisation by Diagnosis Related Groups, the number of bed days or the number of consultation or visits.

1.1 Inter-temporal indexes of price and volume

7. For the time series type of analysis, there is a duality in the measurement of prices and volumes. One can either deflate a current year value with a price index, or alternatively extrapolate a base year value with a volume index to arrive at an estimate in prices of the base year.

8. In the literature, deflation procedures are often exclusively associated with market producers. This reflects the idea that constructing a price index requires the presence of market prices observed from transactions in open and competitive markets. Primarily this means that prices should correspond to the value that informed consumers, making choices in open and competitive markets, attach to different commodities.

9. While this argument is correct, things are less clear-cut if one allows for a more comprehensive meaning of "deflation". In particular, deflation can be understood as applying a true market price index but it can also be understood as applying a cost index when market price observations are not readily available and non-market producers are often present. In such cases, measurement can be based on the cost per unit of output or quasi-price (Diewert 2011 and 2012; Schreyer 2012). Those values are imputed to approximate what a market price might have been, if there were a market.

10. A cost index is a weighted average of cost per unit of output, where the cost share of each type of treatment/output constitutes the weight. Such an index mimics a price index and can be used for deflation when production is on a non-market basis.

11. Independently of the market or non-market situation, deflation could use also an input-based index. Table 1 shows examples of indices used by national accountants to deflate a current year health expenditure value.

---

2 In reality, treatments are often delivered by a combination of providers, e.g., a general practitioner, a medical specialist, a hospital, etc.

3 Diagnosis-Related Groups (DRGs) are a way of describing hospital inpatient activity. The DRG is a statistical measure used to classify hospital cases into one of a number of pre-defined groups according to categories of diagnosis and treatment. DRGs classify patients into groups that are both clinically meaningful and homogeneous in terms of resource utilisation (or cost). Relevant diagnoses and procedures are coded for each admitted patient episode and the combination of codes for each episode guide its assignment to a DRG through the use of DRG ‘grouper’ software. Most DRG classifications use the International Classification of Diseases for diagnoses and country-specific classifications for procedures.

4 To avoid possible ambiguities, it should be noted that the cost index measures the average change in cost per unit of output. It does not measure the average changes in the prices of material or other inputs, although these will be among the factors contributing to changes in cost per unit of output (Hill, 1975).

5 As noted by Schreyer (2010), unlike market prices that combine consumer and producer valuations of products, unit costs and cost weights reflect in the first instance the producer or supply side (or government’s willingness to pay). This implies that it is the production value and not necessarily the societal value that is attributed to health care. However, the purpose of output measurement is not to provide estimates of the societal value, so the use of unit costs cost weights does not constitute a major drawback in the context of the national accounts.
Table 1. Examples of indices used for deflation

<table>
<thead>
<tr>
<th></th>
<th>Input-based</th>
<th>Output-based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
<td>Index based on wages/salaries</td>
<td>Consumer price index relevant component</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Producer price index relevant component</td>
</tr>
<tr>
<td>Non-Market</td>
<td>Index based on wages/salaries</td>
<td>DRG-based cost index</td>
</tr>
</tbody>
</table>

12. To calculate volumes directly, national accountants rely on the summation of output weighted by the price (market sector) or the cost (non-market sector) of these units. A volume index could be compiled by comparing the sum of the outputs in the first period, weighted by a given price/cost structure, with the sum of outputs in the second period, weighted by the same price/cost structure (Lequiller and Blades, 2014).

1.2 Inter-country indexes of price and volume

13. Purchasing Power Parities (PPPs) are used to compare levels of price and volume between different regions or countries in the same period of time. These allow for a spatial price/volume breakdown, that is a price/volume breakdown among countries for a given point in time.

14. Conceptually, PPPs are very similar to price indexes. PPPs are measures of price level differences across space or, in their most popular form, across countries. Because the prices of goods and services in different countries are expressed in national currencies, the purchasing power parity between currencies of the two countries, say A and B, is the number of units of currency of country B (or A) that has the same purchasing power as one unit of currency of country A (or B). Though the PPPs are similar to price index numbers in spatial comparisons, they assume special significance because the PPPs can be used as a conversion factor, in place of exchange rates, in converting various economic aggregates from different countries into a common currency unit (a statistical construct).

15. A joint effort between OECD National Accounts and Health divisions and Eurostat has developed output-based PPPs for health goods and services (Koechlin et al. 2014). The main novel feature is the collection of comparable prices for hospital services that can then be applied to matching national accounts expenditure data so as to derive consistent price and volume comparisons of hospitals and health products. The new output-based hospital-specific methodology was implemented by Eurostat and OECD for the official calculation of PPPs at the end of 2013.

2. Price and volume measures: country practices

16. In 2015, Eurostat and OECD carried out a survey to review country practices in national accounts for price and volume measures of health services. Countries were asked to fill in a questionnaire to review the approach used for temporal price and volume measures for hospital services, residential health-care services, medical and dental services, and other human health services. This updated the information compiled by countries in 2009 (Schreyer 2010) to see which developments have taken place since then and whether national accounts practices have further converged or not.

17. Table 2 shows the reporting countries by approach for hospital services in 2015. A slight increase from 2009 to 2015 in the percentage of countries using the direct volume approach for general hospitals
was observed, while for specialised hospitals the increase is higher than five percentage points. Countries that use the direct volume method report to mainly utilise DRGs-based activity and cost data to measure volumes.

18. As to the other types of services, estimates of health services provided by market providers are usually derived by deflating the nominal measures using the relevant Producer Price Index (PPI) or Consumer Price Index (CPI) component, while measures of health services provided by non-market providers and by government are derived as the sum of production costs based on expense data or by using the number of consultations/treatments weighted by revenues/costs to compute price indices for deflation of nominal measures.

19. A complete description of results by type of service in reported in the Annex.

Table 2. List of countries by approach used, hospital services, 2015 survey

<table>
<thead>
<tr>
<th>Type of service</th>
<th>Direct volume</th>
<th>Deflation</th>
<th>Deflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>General hospitals</td>
<td>Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France (non-market output), Greece (<em>), Hungary, Ireland, Israel, Italy, Lithuania, the Netherlands, New Zealand (</em>), Norway, Slovenia, Sweden and United Kingdom.</td>
<td>Bulgaria (market output), Chile, France (market output), Germany, Iceland, Japan, Korea, Latvia (market output), Luxembourg (*), Poland (market output), Portugal, Slovakia, Switzerland and United States (market output).</td>
<td>Bulgaria (non-market output), Canada, Estonia, Latvia (non-market output), Poland (non-market output) and United States (non-market output).</td>
</tr>
<tr>
<td>Specialised hospitals</td>
<td>Australia, Austria, Belgium, Denmark, Finland, France (non-market output), Greece (<em>), Ireland, Israel, Italy, Lithuania, the Netherlands, New Zealand (</em>), Norway (non-market output), Slovenia, Sweden and United Kingdom.</td>
<td>Bulgaria (market output), Chile, Czech Republic, France (market output), Germany, Iceland, Japan, Korea, Latvia (market output), Luxembourg (*), Norway (market output), Poland (market output), Portugal, Switzerland and Slovakia.</td>
<td>Bulgaria (non-market output), Latvia (non-market output), Poland (non-market output).</td>
</tr>
</tbody>
</table>

(*): 2009 survey

3. Price and volume measures for health care: next steps

20. Countries that reported the use of PPI or CPI to deflate hospital spending at current prices were classified under “output-based, deflation” in the table above. We need confirmation from those countries that this clustering is correct. Furthermore, several countries reported the use of “days of hospital care” as the method to construct a direct volume index. Should this approach be classified as an input- or output-based method?
21. On the basis of the findings of the survey to review country practices, a second work stream would be designed to use the new and recurring price collection for health PPPs and construct temporal price indices essentially with the same information. This will not only permit developing a (fairly) consistent set of inter-temporal and inter-spatial price indices for health services, it will also allow entering into a dialogue with national accountants to compare current national accounts methods and the new PPPs approach. The new series are also essential for measuring health care productivity.

22. Suggested next steps of this work stream include:

- Select 3-5 countries that in 2015 reported the use of an output-based method, in particular for hospitals. Candidates include Australia, France, Italy and Norway.
- Review methods and gather results on hospital inter-temporal price and volume measures derived using an output-based approach from selected countries.
- Contrast the hospital price and volume measures based on hospital PPPs data collection to the country-specific measures based on national accounts to assess if those measures are reasonably consistent. In particular:
  - Compare items priced in the domestic time series against items priced for PPPs.
  - Compare the price methodology used in the domestic time series against the methodology used for PPPs, with a focus on the use of quality adjustments.
On the estimation of output-based measures of health services in national accounts: survey results

A.1.1 General hospitals

23. Thirty-one countries responded to the 2015 survey. Seventeen countries reported to use a direct volume approach. Fourteen countries use DRGs and DRGs cost weights to measure volumes – Australia, Austria, Belgium, Denmark, Finland, France (non-market output), Hungary, Ireland, Italy, the Netherlands, Norway, Slovenia, Sweden and United Kingdom. Israel and Lithuania use the number of days, and the Czech Republic uses revenue per day as weight. France reported the use of an output-based deflation method for market output. Norway said that an output-based deflation approach is used for out-of-pocket payments of hospital-based outpatient services.

24. Eight countries reported to use of an output-based deflation approach – Chile, Germany, Iceland, Japan, Korea, Portugal, Switzerland and Slovakia. Bulgaria, Latvia, Poland and the United States reported the use of an output-based deflation approach for market output and of an input-based deflation approach for non-market output. Canada and Estonia reported the use of an input-based deflation method.

25. If the 2015 survey results are compared to the 2009 ones, three countries shifted from a deflation method to a direct volume approach: Austria (output-based deflation in 2009), Ireland (input-based) and Slovenia (input-based). Those countries use DRGs and DRGs cost weights to directly measure volumes. Portugal shifted from direct volume to an output-based deflation.

26. Three countries that provided information in 2009 did not report in 2015 – Greece, Luxembourg and New Zealand. In 2009, Luxembourg reported the use of an output-based deflation approach, while Greece used a direct volume method based on the number of hospital days. New Zealand reported the use of a direct volume approach based on DRGs for non-market output, while the use of an output-based deflation method was reported for market output. Turkey did not report both in 2009 and 2015.

A.1.2 Mental health and substance abuse hospitals. Specialised hospitals

27. Twenty-seven countries responded to the 2015 survey. Fifteen countries reported the use of a direct volume approach. Eight countries use DRGs and DRGs cost weights to measure volumes – Australia, Austria, Denmark, Finland, Ireland, Italy, the Netherlands and United Kingdom. Belgium, France (non-market output), Israel, Norway (non-market output), Lithuania, Slovenia and Sweden use the number of days, the number of consultations or the number of admission weighted by costs to measure volumes. France and Norway reported the use of an output-based deflation method for market output.

28. Nine countries reported to use of an output-based deflation approach – Chile, Czech Republic, Germany, Iceland, Japan, Korea, Portugal, Slovakia and Switzerland. Bulgaria, Latvia and Poland reported the use of an output-based deflation approach for market output and an input-based deflation approach for non-market output.

---

6 Estonia suspended the planned methodological developments towards a direct volume approach due to lack of resources.

7 Note that in the Unites States mental hospitals are not separated from general hospitals. So there was no response to this section questions from the country.
29. If the 2015 survey results are compared to the 2009 ones, three countries shifted from a deflation method to a direct volume approach: Austria (output-based deflation in 2009), Ireland (input-based) and Slovenia (input-based). Austria and Ireland use DRGs and DRGs cost weights to directly measure volumes, while Slovenia uses the number of days by level of care weighted by costs. Portugal shifted from direct volume to output-based deflation.

30. Three countries that provided information in 2009 did not report in 2015 – Greece, Luxembourg and New Zealand. In 2009, Luxembourg reported the use of an output-based deflation approach, while Greece used a direct volume method based on the number of hospital days. New Zealand reported the use of a direct volume approach based on DRGs for non-market output, while the use of an output-based deflation method was reported for market output.

A.1.3 Residential health care services

31. Twenty-seven countries responded to the 2015 survey. Twelve countries use a direct volume approach. Seven countries use the number of days as a basis to measure volumes – Belgium, Finland, Hungary, Israel, Lithuania, Slovenia and the United Kingdom. Denmark, France and Sweden use the number of residents, the Netherlands the type of care provided and Norway the number of beds.

32. Twelve countries reported to use an output-based deflation approach – Australia, Austria, Canada, Czech Republic, Estonia, Germany, Iceland, Italy, Japan, Korea, Slovakia and Switzerland. Bulgaria, Poland and the United States reported the use of an output-based deflation method for market output and an input-based deflation approach for non-market output.

33. Three countries – Greece, Luxembourg and New Zealand - provided information in 2009 and did not respond in 2015. In 2009, Luxembourg and New Zealand reported the use of an output-based deflation method, while Greece used a direct volume approach based on number of days and DRGs cost weights.

A.1.4 Medical and dental services

34. Twenty-seven countries responded to the 2015 survey. Eleven countries use a direct volume approach – Austria, Belgium, Denmark, Finland, Hungary, Ireland, Israel, Norway (non-market services), Sweden and the United Kingdom. Austria and Hungary use the number of treatments as output measure, while the remaining countries use the number of visits/consultations. Norway reported also the use of an output-based deflation method for market services.

35. Twelve countries reported to use of an output-based deflation method – Canada, Chile, Estonia, France, Germany, Iceland, Italy, Japan, Korea, the Netherlands, Slovakia and Switzerland. Bulgaria, Latvia, Poland and the United States reported the use of an output-based deflation approach for market output and an input-based deflation approach for non-market output.

36. Three countries – Greece, Luxembourg and New Zealand - provided information in 2009 and did not respond in 2015. In 2009, those countries reported the use of an output-based deflation method.

---

8 Only for residential care facilities for the elderly. For other residential care facilities, an input-based (based on wages) deflation approach is used.

9 The services provided by NPISHs are deflated using an input-based method.

10 An input-based deflation method is used for services provided directly by government providers.

11 See footnote 6 above.
A.1.5 Other human health services

37. Twenty-three countries responded to the 2015 survey. Five countries use a direct volume approach. Belgium, Denmark and Sweden use the number of consultations as an output measure, the United Kingdom uses different measures depending on the type of service and Lithuania uses the total number of employees.

38. Fourteen countries reported to use an output-based deflation method - Austria, Canada, Chile, Estonia, France, Germany, Iceland, Italy\textsuperscript{12}, Japan, Korea, the Netherlands, Norway (market services), Slovakia and Switzerland. Bulgaria, Latvia, Poland and the United States reported the use of an output-based deflation approach for market output and an input-based deflation approach for non-market output. Norway reported also the use of a direct volume method for non-market output.

39. Three countries that provided information in 2009 did not report in 2015 – Greece, Luxembourg and New Zealand. In 2009, Greece and New Zealand reported the use of an output-based deflation method, while Luxembourg used a direct volume measures based on number of consultation/treatments (non-market services) and output-based deflation (market services).

A.2 Quality adjustment

40. Taking quality changes into account for adjusting output indicators is a challenging undertaking. Quality changes may be captured by only comparing outputs with the same or very similar characteristics. In this way, stratification keeps quality constant if the output stays relatively homogeneous (Atkinson, 2005).

41. Future methodological advancement could occur by augmenting the analysis with an explicit quality adjustment based – as an example - on post-treatment survival, life expectancy and waiting times (Castelli \textit{et al.}, 2007; Deveci, 2011) and patient-reported outcome measures (NHS Information Centre, 2011; Gutacker \textit{et al.}, 2011).

42. As part of the 2015 survey, we asked countries whether quality adjustments were in place and which tools/metrics were used. Only three countries reported that a quality adjustment is in place for general hospitals. Hungary uses survival indices, Norway readmissions and the United Kingdom (for productivity analyses only) patient experience and quality adjusted life years.

\textsuperscript{12} See footnote 6 above.
REFERENCES


