

Revision of the

# System of Health Accounts

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Unit 3

## Key concepts and definitions in Health Accounts (Unit 3)

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## INTRODUCTION

1. This unit outlines the main principles, concepts and definitions used in the core framework and extensions of the System of Health Accounts. It sets out the analytic framework of SHA 2.0 building on SHA 1.0 and the Producer Guide and enhances them with the use of new accounting tools. It establishes a firm link to the System of National Accounts (SNA), and takes into consideration other systems such as Government Finance Statistics, where appropriate.

2. The unit discusses the following: current expenditure on health; gross capital formation; the relationship between supply of and demand for healthcare including trade; estimation of health care volume output; market and non-market production of health care; prices for health care products; and health-specific Purchasing Power Parities (PPPs). This unit introduces also some specific accounting rules which will be described in detail in Unit 16, and establishes guidelines for the health care products classification which will be used in Unit 13.

3. The proposed accounting rules follow the SNA guidelines and are thus compatible with the common internationally recognised accounting rules for defining national economic aggregates. Unit 5: Types of Health Accounts further extends this discussion and explores the links between the two systems with the aim of providing better information on the role of the health sector within the national economy.

4. Consistently measured health expenditure estimates are important for undertaking comparative analysis. Health expenditures may be compared in current prices, in constant prices over time (volumes) and in constant prices between countries (deflated using PPPs). In order to be more useful for analysing growth rates, and inflation, health expenditures estimates and components need to be disaggregated in terms of prices and volumes.

## MAIN AGGREGATES OF HEALTH AND HEALTH-RELATED EXPENDITURES

5. As discussed in Unit 2: Global Boundaries of Health Care, health care is defined by the types of activities or purposes according to the classification of health care functions (ICHA-HC). In measuring expenditure on these activities, two main aggregates are distinguished: i) *current expenditure on health* and ii) *gross capital formation*.

*Current expenditure on health:* final consumption expenditure of resident units on health care goods and services.

6. In other words, current expenditure on health quantifies the economic resources spent on the health care functions as defined in the core health accounting framework in Unit 2. That is, expenditure of resident units in the domestic territory plus their expenditures in the rest of the world.

7. We can go beyond this measure of current expenditure on the health care function categories of the core framework by measuring the aggregate *capital expenditure* in those health care provider industries primarily involved in health care delivery. This can cover expenditure on hospital buildings, capital items of health-care machinery, computer software and R&D in health care commissioned by these health providers<sup>1</sup>.

*Gross capital formation in health care industries:* sum of gross capital formation in the units listed under the ICHA-HP classification (excluding “retailers of medical goods”), where health care is the predominant activity.

8. As discussed in Unit 2, the primary focus of the SHA is on the consumption of health care goods and services by the residents of a country, such that expenditure on these core functions is included as long as it is borne for *final use* of resident units. An important distinction to bear in mind, therefore, is between final and intermediate consumption. Intermediate consumption consists of the value of goods and services (except capital) that are consumed as inputs by a further process of production, for example, the provision of diagnostic services from one health care provider to another as an input to a final service to a patient.

9. Another key concept in this definition is the *final expenditure by resident units*. This highlights some differences between the SHA and SNA approaches. Whereas the SNA estimates, in the first instance, domestic *production*, the SHA concerns itself primarily with the health goods and services *consumed* by resident units, irrespective of where the consumption takes place. Therefore, exports of health care goods and services i.e. provided to non-resident units, are excluded, whereas imports of health care goods and services for final use i.e. provided to residents, are included. The concepts and definitions related to residence and imports and exports are discussed later in the unit.

## **THE RELATIONSHIP BETWEEN THE SUPPLY OF AND DEMAND FOR HEALTH CARE GOODS AND SERVICES**

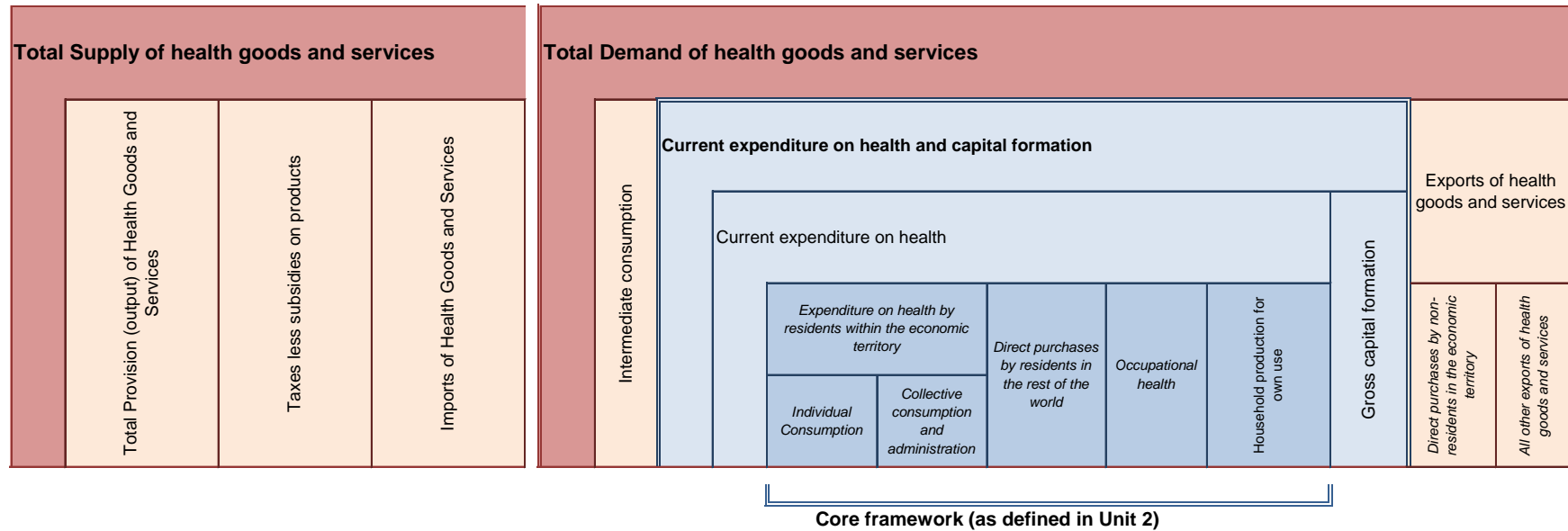
10. The relationship between the supply and demand of health care goods and services and the main aggregates of health expenditure are shown in Figure 1. To attain a measure of the total demand of health care goods and services it is necessary to add those health care goods and services consumed by other health care providers (intermediate consumption) as well as the external demand for these goods and services (exports) to current expenditure on health and capital formation. This total demand then balances with the total supply of such goods and services, either provided by resident units or from non-residents, in the form of imports. For more explanation on imports and exports, see Appendix 3.2 on International trade in health from the expenditure, economic and trade policy perspectives.

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<sup>1</sup> For a more detailed definition and further explanation of Capital Formation, see Appendix 3.1.

11. In Figure 1, the term “individual consumption” equals the sum of final consumption expenditure of households, social transfers in kind from the government, and social transfers in kind from the NPISH sector. The concept of household actual individual consumption has been introduced in the SNA93 with the aim of better comparing final consumption of households across space and time in a country or internationally.

**Figure 1 The balance between the provision and consumption of health goods and services and the main aggregates of SHA**



Note. Final consumption on health in SHA differs from SNA conventions with respect to treatment of Occupational Health Care and Household production of health care for own use.

[Further discussion on pharmaceutical goods and capital expenditures representation in the product balance figure above is needed]

## BASIC ACCOUNTING CONCEPTS IN SHA

### Valuation of health goods and services

12. To complete the balance between the provision and consumption of health goods and services, one needs to consider the different price valuations in use. Usually, the producer and the user of a given product perceive its value differently owing to the existence of taxes and subsidies on products, the transport costs to be paid and the occurrence of trade margins. In order to keep as close as possible to the views of the economic transactors themselves, the SNA records all uses at purchasers' prices which includes these elements, but then excludes them from the value of output of the product.

13. Output of products is recorded at basic prices. The basic price is defined as the amount receivable by the producer from the purchaser for a unit of good or service produced as output minus any tax payable and plus any subsidy receivable on the product as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer. If it proves impossible to obtain the required information at basic prices, output may be valued at producers' prices. The producer's price is defined as the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any value added tax (VAT), or similar deductible tax, invoiced to the purchaser. It also excludes any transport charges invoiced separately by the producer.

14. The purchaser's price is defined as the amount payable by the purchaser, including any taxes less subsidies on the products (but excluding deductible taxes such as VAT), in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place.

15. The difference in value recorded for a product between when it is produced and the moment it is used for, say, final consumption expenditure can be considerable. Components of this difference may be:

- i. Taxes less subsidies on products payable by the producer;
- ii. Trade and transport margins, including taxes less subsidies on products payable by wholesale and retail traders;
- iii. Transport, including taxes less subsidies on products, paid separately by the consumer;
- iv. Predictable quality increases producing additional output volume less current losses during storage;
- v. Holding gains while the product is with the producer and with wholesale and retail traders.

16. As one can see from the above, the difference between the original basic price and ultimate purchaser's price of a particular good encompasses both pure price and volume elements. In practice, of course, the estimates do not keep track of individual products but are made at a more global level for groups of products.

17. In keeping with the SNA, the final use of health care goods and services consumed at economically significant prices are valued at purchasers' prices. Often, health care services do not

include VAT because of tax exemption, but pharmaceuticals and medical devices typically do although some countries have reduced rates or no VAT. When such prices are not available, i.e. in the case of non-market providers, then it is convention to value the output to be equal to the sum of the costs of provision: that is, as the sum of selected inputs.

18. Finally, in determining the price for health care services e.g. a GP consultation, any informal or so-called ‘under the table’ payments should also be included. These payments are part of the non-observed economy which is not captured in regular statistical enquiries.

19. In the case of transactions between residents and non-residents, the values of exports and imports denominated in foreign currencies should be converted into national currency using market rates of exchange.

### **Time of recording**

20. The timing of recording of the final consumption expenditures within SHA has two elements:

- i. calendar year versus fiscal year
- ii. accrual versus cash accounting

21. First, a particular period must be chosen within which the activities took place. Most often this is a fiscal year or a calendar year. This choice may seem trivial, but in practice it can pose problems. For example, government entities may report spending on the basis of a fiscal year while private entities report on the basis of a calendar year. In such a case, the health accountant must adjust the figures reported so that only one time period is used.

22. The second element of the time boundary is the distinction between when the activity took place and when the transaction that paid for the activity took place. In practice, this involves a choice between accrual accounting and cash accounting. Health accounts should use the accrual method, in which expenditures are attributed to the time period during which the economic value was created, rather than the cash method, in which expenditures are registered when the actual cash disbursements took place.

23. Similarly, in the case of exports and imports, these are recorded at the time when a service is delivered or, in the case of goods, when the change in ownership of real assets occurs.

### **Institutional units and establishments in SNA and SHA**

24. An Institutional Unit is defined in SNA as: “an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities”.

25. The main attributes of institutional units may be described as follows:

- i. an institutional unit is entitled to own goods or assets in its own right; it is therefore able to exchange the ownership of goods or assets in transactions with other institutional units;
- ii. it is able to take economic decisions and engage in economic activities for which it is itself held to be directly responsible and accountable at law;
- iii. it is able to incur liabilities on its own behalf, to take on other obligations or future commitments and to enter into contracts;
- iv. either a complete set of accounts, including a balance sheet of assets and liabilities, exists for the unit, or it would be possible and meaningful, from an economic viewpoint, to compile a complete set of accounts if they were to be required.

26. Another kind of unit with more homogeneous activities is the *Establishment*. The establishment combines both the kind-of-activity dimension and the locality dimension. It is defined in SNA as “an enterprise, or part of an enterprise, that is situated in a single location and in which only a single productive activity is carried out or in which the principal productive activity accounts for most of the value added”. 27. Establishments are sometimes referred to as local kind-of activity units (local KAUs). Although the definition of an establishment allows for the possibility that there may be one or more secondary activities carried out, they should be on a small scale compared with the principal activity. If a secondary activity within an enterprise is as important, or nearly as important, as the principal activity, then that activity should be treated as taking place within a separate establishment from that in which the principal activity takes place.

28. In practice, an establishment may usually be identified with an individual workplace in which a particular kind of productive activity is carried out: an individual farm, mine, quarry, factory, plant, shop, store, construction site, transport depot, airport, garage, bank, office, or clinic. It may be that a unit in SHA is a part of a hospital, or an occupational health unit in a manufacturing plant.

## **Residence**

29. The concept of residence used in SHA is the same as that used in SNA and in the *Balance of Payments and International Investment Position Manual* of the International Monetary Fund (IMF), known as *BPM6*. An institutional unit is said to be resident within the economic territory of a country when it maintains a centre of predominant economic interest in that territory, that is, when it engages, or intends to engage, in economic activities or transactions on a significant scale either indefinitely or over a long period of time, usually interpreted as one year. Thus the concept of residence in the SNA is not based on nationality or legal criteria. Resident units engage in transactions with non-resident units (that is, units that are residents of other economies). These transactions are the external transactions of the economy and are grouped in the account of the rest of the world. Strictly speaking, the rest of the world is the account of transactions occurring between resident and non-resident units, but it may also be seen as the whole group of non-resident units that enter into transactions with resident units. In the SNA’s accounting structure, the rest of the world plays a role similar to that of an institutional sector, although non-resident units are included only in so far as they are engaged in transactions with resident institutional units.

## **Transactions**

30. As in the national accounts, each transaction in the core SHA framework consists of two related transactions - a non-financial transaction between the provider unit and the beneficiary and a counterpart financial transaction between the financing agent and the provider unit. The functional classification is in effect a classification of health care transactions according to their purpose. It distinguishes transactions for individual health care services and goods and transactions for collective health care services. According to SNA terminology these transactions are transactions on goods and services (products) and are linked to a counterpart financial transaction. A full and concise classification of both sets of transactions is essential in SHA, requiring more detail than the SNA can offer, and relating to different types of payments as e.g. reimbursement by government or social security funds or out-of pocket payments or a combination of different payments (i.e. cost-sharing). Within the core framework, these transactions are concerned only with the final delivery of health goods and services, such that activities comprising intermediate consumption, other transactions related to the allocation of inputs in the provision of health care, capital formation and financial pooling are not considered. These ‘supporting activities’ are, however, included in the extended framework.

## Relationship between SHA current expenditure on health and SNA aggregates.

31. Figure 2 below, taken from SHA 1.0 manual<sup>2</sup>, shows the link between current expenditure on health as defined in SHA and the main components of consumption as defined in SNA93 (codes will be changed as soon as the new SNA08 codes become available). Although the concept of current expenditure on health mainly overlaps with the SNA aggregate “actual final consumption” (which is much wider as it covers all goods and services consumed in the economy), it also includes some components which are not considered as consumption in SNA. These include “Government subsidies to health care providers (net) in order to lower the price of output”, Occupational health care and “Remunerated unpaid household production in the form of transfer payments”.

**Figure 2 Relationship between SHA current expenditure on health and SNA aggregates.**

<i>SNA 93 code</i>	<i>Description</i>
P.41	Actual final consumption expenditure on health by households and NPISHs
P.42	Actual final consumption expenditure on health by general government
P.4	Actual final consumption expenditure on health (= P.41 + P.42)
D.31	Government subsidies to health care providers (net) in order to lower the price of output
P.41*	Occupational health care (intermediate consumption within establishments) minus an estimated share of occupational health in health providers' and other medical industries' net administration (= occupational health care)
P.41*	“Remunerated” unpaid household production in the form of transfer payments (social benefits in cash) for home care of sick, disabled and elderly persons provided by family members
P.4*	<b>Adjusted total actual final consumption expenditure on health</b> (= P.4 + D.31 + P.41*)

(\*): The production boundaries used in the SHA for the estimation of this item differ from SNA rules.

## PRICE AND VOLUME MEASUREMENT OF HEALTH CARE

32. This section discusses the measurement of health volume output for both market and non-market production. Guidance for measurement is based on a number of publications including the Eurostat Handbook on Price and Volume Measures in National Accounts (2001), the OECD Handbook Towards Measuring Education and Health Volume Output<sup>3</sup> (forthcoming) and Eurostat-OECD Methodological Manual on Purchasing Power Parities (2006).

<sup>2</sup> See SHA 1.0 page 65

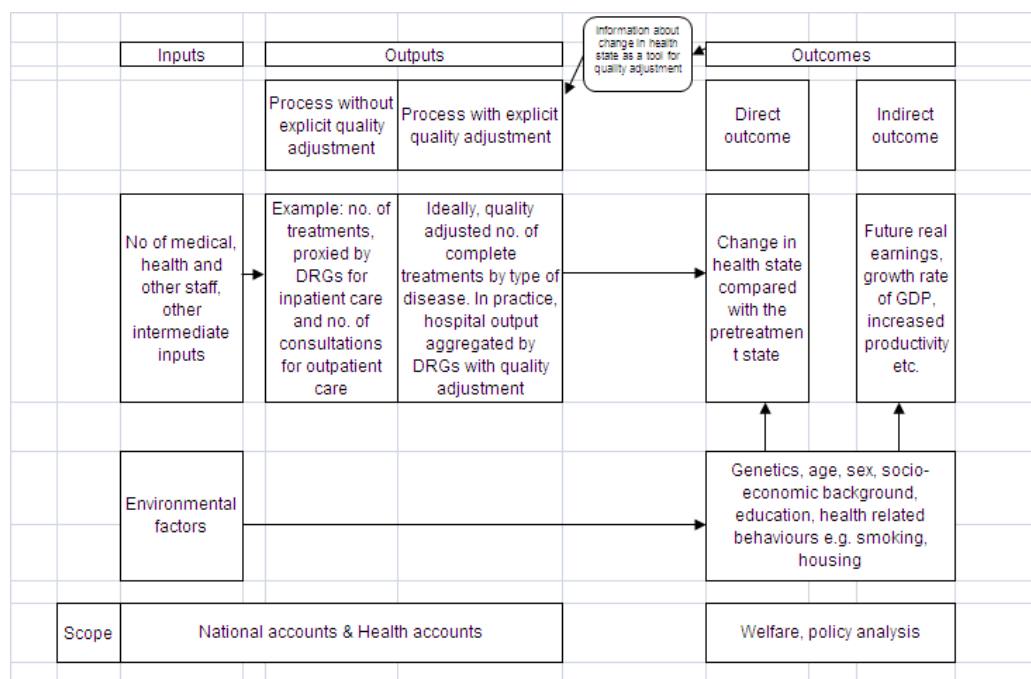
<sup>3</sup> This section draws on this Handbook.

33. The challenges of measuring the output of the health sector arise from two key elements of the nature of health care (Office of Health Economics, 2008). First, it is largely a customised rather than a standardised product, with a complex production process. Second, for the majority of countries, there is an absence of market or economically significant prices for many services and goods – they are frequently provided by non-market producers.

34. The latter makes impossible any estimation of the output by multiplying quantities by prices. As a consequence, the standard method of measuring the value of non-market output has been by summing production costs, and changes in the volume (or price) of health services have typically been captured by measuring the changes in the volume (or price) of inputs. However, the “input equals output” convention does not capture the value added resulting from non-market spending. Moreover, this convention means that measured output could only ever grow at the same rate as input. Finally, the measures of real output in an economy are incomplete, as are measures of consumption and real income.

35. Before further discussion of the measurement aspects of this definition of health care output, it is useful to put it in relation to the notions of inputs, processes and outcomes (Figure 3).

**Figure 3 Inputs, output and outcomes**



36. Activities – or more precisely production processes - in health care arise from the use of resources and are intended to benefit the individual patient. They can be thought of as components of treatments of a particular disease resulting in the provision of health care, which in turn constitutes the *output* of health care providers. In health services, processes include operative procedures, diagnostic tests, outpatient visits, and medical consultations, individual prevention and counselling. Sometimes, a particular process may coincide with a treatment but this is not generally the case. Nor is the count of processes in itself necessarily a sufficient measure of the output of health care services. This is in particular the case, when processes reflect only part of a treatment, and when processes undergo quality change.

37. *Outcome* is the term used to describe a state that consumers value and to which provision of goods and services aim to influence, for example a person’s state of health. Changes in health state not only result from medical intervention but are influenced by many other factors such as patient characteristics, environment, and lifestyle. The provision of medical services and its effects on

outcome do not necessarily coincide – there may be lags of different length and other factors interacting with medical services. Note also that in the health care literature outcome is typically defined more narrowly covering only changes in the health status that are attributable to health services.

38. In addition to the health industry contribution, health outcomes are also influenced by the following factors:

- i. socioeconomic factors such as income, income distribution, employment, education
- ii. behavioral factors such as tobacco, diet, exercise, hygiene
- iii. environmental factors such as housing, water, pollution
- iv. personal factors such as genetics, age and gender

39. In addition, co-production in health occurs, as the health industry itself does not produce health outcomes but can only support people in realizing their potential health. Thus outcomes are also dependent on the individual efforts of patients.

40. The measurement of the impact of medical intervention on health status or outcome is beyond the scope of the SHA manual, as the purpose is to measure values of economic transactions, not the effects or outcomes from consumption and production. However, the point will be made that while outcome as such is not the measurement target of SHA, output and outcome are not independent of each other. In particular, statements about quality improvement or deterioration of a medical service cannot be made without some reference to the effects of a medical service on outcome, i.e., to the improvement or deterioration of the state of health of the patient.

41. Even if not always relevant for the (core) part of the SHA, a significant literature is developing in conjunction with measuring the outcome of health care activity. For example, the US Bureau of Economic Analysis is, at the time of writing, developing a Health Care Satellite Account which moves beyond looking at health outputs to consider the impact of health spending and medical intervention on improvements in health generally (Aizcorbe et al, 2008). In this framework, health is considered to be a type of human capital which like other capital goods depreciates over time and requires investment. Hence accounting for the health investment requires inclusion of the value of time that members of households invest in their health (e.g. exercise, sleep, waiting for medical services) and in the health of others (e.g. home nursing). Other research has also relied on outcomes.

### **Market and non-market producers**

42. The distinction between market and non-market producers is far from clear-cut. The SNA specifies no particular rule as to what constitutes a non-market producer, and even where such rules exist as in the European Union<sup>4</sup>, their applicability is not straight forward. In OECD countries, there are many shadings of market-based and non-market based health systems and institutions and allocation of institutional units to the group of market or non-market producers brings with it a certain element of arbitrariness.

43. A particular difficulty with health goods and services is that the sector, private or public, is not usually very competitive. Sources of market failure including externalities, moral hazard and

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<sup>4</sup> Non-market producers are those that provide services, and in some cases goods, either free of charge or at prices that are not economically significant, meaning in practice prices that cover less than half the cost of production (Eurostat 1995). General government bodies constitute the bulk of the non-market producers, but there are others, like the non-profit institutions. Most of the services provided by general government are provided to the general public without charge. These services are obviously financed through taxation and social contributions, but there is no direct link between the payment of the tax and the level of services received.

imperfect information render the health care market different from markets for other goods and services. Consumers tend to be well-insured, and this places doubt on the extent to which the price they pay reflects their marginal valuation. The nature of health care as a commodity often means it is considered inappropriate to allocate it on the basis of willingness to pay. Hence, decisions about methods for the measurement of volume outputs should be made pragmatically and on the basis of available information rather than on the sometimes tenuous distinction between market and non-market production. What counts for the present purpose is that output measures aim at tracking outputs and not inputs into medical care production.

### **Direct volume measures, deflation, and indices**

44. The changes in the values of flows of goods and services can be directly factored into two components, one reflecting changes in the prices of the goods and services concerned and the other the changes in their volumes. One major advantage of compiling price and volume measures within an accounting framework is that a check is provided on the numerical consistency and reliability of the set of measures as a whole. Another advantage of compiling price and volume measures within an accounting framework is that price or volume measures can be derived for certain important balancing items. In particular, gross value added can be measured in volume terms by subtracting intermediate consumption in volume terms from gross output in volume terms, the so-called “double deflation” method. Double deflation may be used at the level of an individual enterprise, industry or sector. 45.

For each individual type of good or service it is necessary to specify an appropriate quantity unit in which that good or service can be measured. Goods or services may be supplied in units that are either discrete or continuously variable. Automobiles, aircraft, microcomputers, haircuts and appendectomies are examples of goods or services provided in discrete or integral units. The quantities of such goods and services are obtained simply by counting the number of units. Oil, electricity, sugar and transportation are examples of goods or services provided in units that vary continuously in respect of characteristics such as weight, volume, power, duration and distance. The choice of physical unit, and its price in relation to the unit selected, is therefore a matter of convenience. For example, the price is quoted per tonne is one thousand times greater than one quoted per kilo. As long as the price is expressed in a manner consistent with the unit of volume, the value ( $v$ ) at the level of a single, homogeneous good or service is equal to the price per unit of quantity ( $p$ ) multiplied by the number of quantity units ( $q$ ), that is:  $v = p \times q$ .

46. Certain important properties in relation to the additivity of quantities, prices and values may be briefly noted:

- i. Quantities are additive only for a single homogeneous product. For example, it is not economically meaningful to add 10 tonnes of coal to 20 tonnes of sugar. Less obviously, the addition of 10 automobiles of one type to 20 automobiles of another type would not be economically meaningful either if they differ in quality.
- ii. The price of a good or service is defined as the value of one unit of that good or service. It varies directly with the size of the unit of quantity selected and in many cases can be made to vary arbitrarily by changing the unit of quantity, for example, by choosing to measure in tonnes instead of in kilograms. Prices, like quantities, are not additive across different goods or services. An average of the prices of different goods or services has no economic significance and cannot be used to measure price changes over time.
- iii. Values are expressed in terms of a common unit of currency and are additive across different products. Values are invariant to the choice of quantity unit.

47. Several ways exist to split current-price values of medical services into a price and a volume component, and partly, the way chosen depends on whether services are provided by market or by non-market units. The value of output of institutional units in the health care industry is measured by the observed money value of output in the case of market producers. In a market system, the relative prices of different goods and services should reflect both their relative costs of production and their relative utilities to purchasers, whether the latter intend to use them for production or consumption.

Relative costs and relative utilities influence the rates at which sellers and buyers are prepared to exchange goods and services on markets. An aggregation of the values of different goods and services necessarily reflects the choices of which goods and services have been produced and consumed at the currently prevailing prices.

48. In the case of non-market producers, the output provided without charges to households is estimated as the sum of intermediate consumption, compensation of employees, consumption of fixed capital, and other taxes (less subsidies) on production (SNA, 2008).

49. When it comes to measuring volume (indices), there are two basic options: deflation of values by a price (or quasi price) index; construction of a direct volume index.

50. In a market-based health system where there is information on market prices or where prices are significant, expenditure on the treatment of a disease can be deflated by a disease-specific price index to arrive at a volume output measure of the disease. For example, Berndt et al (2001) have estimated a price index for heart attacks and this index can be used to deflate disease-specific expenditures. This is similar to what happens in other market sectors in the economy where volume output measurement is accomplished by dividing data on revenues or sales by a price index. Under ideal conditions, the prices for privately provided health goods and services would reflect the marginal costs of production and the marginal utility to consumers.

51. In the debate, deflation procedures are often exclusively associated with market producers. This reflects the idea that constructing a price index requires the presence of market prices and the latter are directly associated with market production. 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 unit cost or 'quasi price index' (Schreyer 2008).

52. In some countries, hospitals and other providers of medical services are considered market producers because they receive economically significant revenues from reimbursement schemes that, on average, cover their costs. In such cases, a quasi price index consists of average revenues per treatment. One notes, however, that reimbursement schemes are themselves based on cost so that the differentiation between costs and revenues is blurred. Also, the fact that there are revenues does not imply that there is a competitive market where prices necessarily carry signals about consumer preferences.

53. In some instances, it may also be possible to draw on market price information for purposes of deflating values of non-market production. A potential candidate is the medical services part of the Consumer Price Index (CPI). However, care has to be exerted to make sure that the CPI is representative for the deflation of the non-market production. In particular,

- i. the services supplied by the market provider have to be sufficiently similar to those supplied by the non-market provider – this is true for each type of service and for the mix between different services
- ii. the scope of the CPI has to match the scope of non-market production. This may not be the case when the CPI is designed to reflect prices for out-of-pocket expenditures and when consumers only pay part of the full price for the medical good or service. In this case, the CPI is not an appropriate tool for deflation of non-market production which relies on a concept of measuring production at its full cost

54. Alternatively, direct volume indices can be constructed. A direct volume index is an average of the proportionate changes in the quantities of a specified set of goods or services between two periods of time. The quantities compared over time must be those for homogeneous items and the resulting quantity changes for different goods and services must be weighted by their economic importance, as measured by their relative values in one or other, or both, periods. For this reason

volume is a more correct and appropriate term than quantity in order to emphasize that quantities must be adjusted to reflect changes in quality.

55. Berndt et al. (p.173) suggest that “real output of medical care could be formed from cost of disease accounts by counting quantities of medical procedures (the number of heart bypass operations, say, or of appendectomies, or of influenza shots), and weighing each procedure by its cost”. It should be noted that such a unit cost index could also mimic a price index and can be used for deflation when production is on a non-market basis.

56. Although there are some differences between a direct volume index and a volume index derived at by deflation (such as index number formulae, timeliness of data), the basic idea remains the same – volume measures of outputs are sought, as opposed to volume measures of inputs.

### **Healthcare output definition**

57. The target definition of health care output is the number of complete treatments with specified bundles of characteristics so as to capture quality change and new products. A complete treatment refers to the pathway that an individual takes through heterogeneous institutions in the health industry in order to receive full and final treatment for a disease or condition. This definition of the ideal measure is similar to that used in the Eurostat Handbook (2001), Berndt et al (2001) and Aizcorbe et al (2008).

58. We can qualify this ideal definition in several respects, mainly imposed by data constraints. A first limitation arises with regards to measuring complete treatments. In concept, ‘complete’ is understood as a complete treatment pathway across the health care system. An example of a complete treatment pathway is a hip replacement operation. In this case, the pathway approach would imply aggregating all services or procedures associated with the intervention for the condition whether it is received from primary care services such as a general practitioner, specialists, at hospitals, or at a rehabilitation service. Thus, using the pathway complete would entail collecting data on outputs from a number of health care providers and aggregating them in a meaningful way. Assembling the data required for aggregating health volume output by disease approach is very challenging. This is particularly so in the absence of market prices.

59. There are additional reasons why the principle of complete treatment is difficult to implement:

- i. total output of an industry is based on summing up outputs of various service providers (establishments), and therefore the principle of a complete treatment is directly applicable only if the service provider is the same during the whole treatment. Even if it were possible to observe complete treatments if there are several service providers involved (e.g. hospitals and outpatient services), there would be no simple way to allocate the overall service to the different participating units and yet this is a requirement for health accounts purposes
- ii. most data retrieval systems do not have the capacity to link the treatment of an individual across institutions to enable measurement of the complete treatment. Data on both expenditures (value of inputs) and services received would be required. Thus a health care pathway approach has demanding data requirements as patient records have to be linked across activities and institutions. Even within institutional settings, data may not be appropriately linked
- iii. the beginning and end point of a treatment pathway is observable in the case of acute health conditions but unclear for chronic health problems or for medical conditions that give rise to long-term care and services provided in nursing homes. Many of the diseases associated with ageing and most psychiatric conditions are chronic, long-term

conditions, and the patient may be treated for more than one illness or problem within a period. Thus the boundaries of the complete treatment would be unclear

60. Given the difficulty with compiling complete treatments, estimates of health care output usually are made at the institutional level. Thus a narrower view of a treatment is that defined by the type of health service. This measure captures the full treatment only within an institution and generally by function or type of service. As an example, Dawson et al. (2005) compile an output index with 1700 categories of UK National Health Service activity including primary care. This aligns with standard practice in national accounting, where the number of treatment categories used for measuring healthcare output increased to 2515, including hospital inpatient, day case and outpatient episodes, general practitioners and practice nurses consultations and prescriptions, dental treatments, sight tests and ambulance journeys (Pont 2008).

61. Thus, rather than reasoning in terms of complete pathways of treatment across the health system, the output measures proposed are best thought of episodes of treatment of particular diseases as provided by a given institutional unit. Furthermore, this measurement objective will mainly be applicable for curative care whereas other measures will have to be targeted for long-term care and other specialised services where it is difficult to establish when an episode of treatment is complete. For example, inpatients in nursing homes do not generally receive treatment for a specific illness or illnesses where there is an obvious start and end point. For such institutions, a strong case can be made that the output is defined by the activities of the institution of care, not a treatment. The same applies to chronic and progressive health conditions where the patient faces a slow, variable and unpredictable progression of a disease.

62. The present considerations suggest that it is best to treat the measurement of output of medical services by type of health care provider. One specific consequence of the working definition of output above is that it does not permit tracking treatments across institutional units or capturing the effects of shifts between inpatient and outpatient treatments. Outpatient care refers to all medical and health care delivered to individuals when they are not classified as an admitted hospital inpatient. Thus the care may be received in an outpatient facility of a hospital or in a facility not attached to a hospital such as a doctor's consultation rooms. It is feasible to measure output defined as the number of complete treatments differentiated by type of disease in the acute hospital setting as there are well-developed classification systems. But once treatment moves outside the hospital, the paucity of case-mix classification systems means that measurement often reverts to summing up numbers of processes or numbers of patients. And there is evidence of an ongoing shift between inpatient and outpatient treatment of diseases.

63. Furthermore, between inpatient care and outpatient care there is an area which includes services known variously as day care, day treatment, or day surgery. These services are provided either at freestanding facilities or in dedicated units within hospitals. They relate to different types of activities/treatments, spanning from rehabilitation therapy to surgery. To measure these elective/planned services, several countries use the same tools that are available for inpatient care. For example, in England, day surgery cases are categorised under the same Healthcare Resource Groups<sup>5</sup> classification system used for inpatient; moreover, an equivalent tariff/price is posted for the same case type treated as inpatient and day case.

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<sup>5</sup> Healthcare Resource Groups (HRGs) are standard groups of clinically similar treatments which use common levels of healthcare resource. HRGs offer organisations the ability to understand their activity in terms of the types of patients they care for and the treatments they undertake. They enable the comparison of activity within and between different organisations and provide an opportunity to benchmark treatments and services to support trend analysis over time (The Information Centre 2008).

## Quality adjustments

64. Price and volume measures of output should reflect quality changes in the health services provided. In other words, only prices, unit values or quantities of the same quality, i.e., with the same characteristics should be compared over time.

65. A first and important step towards capturing quality change is the correct stratification, i.e., a comparison of products with the same or at least similar characteristics. In this way, stratification keeps quality constant if the products included in a particular stratum are relatively homogenous. And a quality change is then captured by changes in the proportions of total services in each category.

66. An example in health services would be the matching of hospital services. Public and private services may provide the same treatments and yield the same health outcomes but if the amenities provided are valued differently by consumers, the services should not be matched. In addition in some countries, consumers use private hospitals because there may be a waiting time for a public hospital procedure but no waiting for the same procedure in a private hospital. Thus under these circumstances, private hospital services may not be considered as a substitute for public hospital services and services provided in the two types of units should be considered different products.

67. Matching of services has its limits when comparable products do not exist in comparison periods or when new services only gradually diffuse in practice. This is the case even when using relatively sophisticated output measures such as Diagnosis Related Groups<sup>6</sup>. A possible solution to deal with the problem of categorization changes in the output indices involves imputing values – by deflation or inflation – where cost data are missing for any particular period of time (Castelli at al 2008).

68. A second way of incorporating the quality of services into output indices would require an adjustment factor reflecting the compliance rate with established procedures by country and disease group. Changes in the proportion, either positive or negative, would indicate where medical practice and procedures have changed to reflect the introduction of new treatments and improvements in the existing practices. There is a limited literature reporting such proportions. For example, Schuster et al. (2005) find that by averaging the findings from US preventive care studies that 50% of people received recommended care, and for acute care studies found that 70% of patients received recommended care and 30% of patients received contraindicated acute care. It is important to note that achievement of full compliance to guidelines, that is a rate of 100%, is not necessarily a public health goal. In industrial production processes, uniformity ensures highest quality of outcomes. The same does not hold in health care as individual differences and preferences need to be accommodated.

69. There is a wealth of information on clinical practice guidelines by country but insufficient summary information at this stage on the rate of compliance to best practice. In the USA, the National Guideline Clearinghouse maintains a catalogue of high quality guidelines published by various organisations (mostly professional physician organisations). In the United Kingdom, clinical practice guidelines are published primarily by the National Institute for Health and Clinical Excellence (NICE). In The Netherlands, the Dutch Institute for Healthcare Improvement (CBO) and the Dutch College of General Practitioners (NHG) have guideline development programs that use an evidence-based approach. In Germany, the Agency for Quality in Medicine coordinates a national program for disease management guidelines. All these organisations are members of the Guidelines International Network, an international not-for-profit association of organisations and individuals involved in clinical practice guidelines.

70. A third aspect of quality relates to the impact/contribution of health services on health outcomes. Obviously there is a strong connection between process and output, as treatment guidelines

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<sup>6</sup> Diagnosis related groups (DRGs) were developed with the explicit objective of creating relatively cost homogeneous groups in order to compare hospital performance (Fetter 1991).

are based on medical evidence which is efficacious. Health services researchers recommend using both process and outcome indicators for two reasons. First, there is a difference between evidence in research (efficacy) and the outcomes in real life (effectiveness). Second, there is frequently a considerable time period between the process and its impact on the outcome. For example, studies have examined family doctors' compliance with guidelines for hypertension treatment. The outcome associated with this practice, is reductions in AMIs (heart attacks) and stroke (as an intermediate outcome) and mortality related to cardiovascular diseases (as an ultimate outcome). Reductions in the incidence of these diseases occur over a very long time period and hypertension treatment is only one factor involved in the ultimate outcome. Aside from other things patients with hypertension have to comply themselves with a lifestyle involving healthy nutrition and adequate exercise.

71. This discussion emphasises the use of quality adjustment using process and outcome indicators. It is also noted that there is an 'industry of quality measures' but at this stage none appear appropriate for quality adjustment of health volume output. The main reasons for that lack of applicability is that many of the available process and outcome indicators are country or even institution specific.

72. Since quality is multidimensional, it would be ideal to be able to subsume several characteristics of quality into a single indicator that reflects the contribution of the product to outcome. Alternative means have been suggested to derive a single indicator. The first is to choose the most important dimension only, e.g. 30 day survival rate. The second is to use indicators from more than one quality dimension and weigh them as equally important. Third, indicators from a number of quality dimensions can be used but expert opinion should be sought on the appropriate weights (UKCeMGA, 2008). Finally, measures such as quality-adjusted life years (QALYs) can be used that reduce modifications in health outcomes due to medical care to one dimension, the quality-adjusted gain in time. However, many of these empirical methods are still in a research stage and not normally robust enough to be applied in the system of health accounts.

73. There are a number of desirable characteristics of indicators which could be used for quality adjustment for volume output for determining the marginal contribution of the health industry to outcome. These are outlined below.

- i. the quality measure should be aligned with the processes sought by consumers, which would generally be a complete treatment by disease
- ii. the adjustment in output should reflect the marginal contribution of the health industry to an outcome. It should not be affected by any other factors that influence health outcomes such as genetic background, income or lifestyle
- iii. consumers are ultimately concerned to achieve an improvement in their health outcome. Waiting times and comfort are secondary to improvements in health status. This points to a conclusion that different dimensions of quality should not be given the same weight
- iv. in many health treatments or processes, there is a time lag before the improvements in health status. Quality adjustment needs to address in a realistic manner the impact of lifetime effects of health expenditures
- v. the quality measure should reflect as closely as possible the normal, average or expected effect of the activity on the state of health. Individual capacities to benefit from treatment, or what is known as co-production, should not be counted in the measure of quality adjusted health volume output.
- vi. international comparison is important, and the indicators and methods of output adjustment should be standardised across countries to facilitate comparisons (Smith and Street, 2007)

74. To sum up, methods for quality adjustment of output are still under development. Some headway towards capturing quality can be made by using detailed product specifications and follow the associated costs and treatments over time. The importance of explicit quality adjustment is

undeniable but until there is a consensus on techniques for adjustment, it will be difficult to put forward a recommendation for an explicit quality adjustment of health volume output in the system of health accounts. A similar conclusion has been reached by the United States Bureau of Economic Analysis (BEA) who note that the “BEA will not attempt to account for potential changes in the quality of treatments, a problem where no clear consensus exists on a solution” (Aizcorbe et al, 2008, p. 25).

### **Comparing health goods and services volumes across countries**

75. This section deals with the comparison of the volume of health services across countries. The quantity and quality indicators that are recommended for use in cross-country comparisons will be, at least conceptually, the same as the quantity and quality indicators to be used in a time series analysis. For example, if it is proposed to use case products (or similar treatments) to measure the growth of the volume of hospital services *over time* for a given country and, symmetrically, the discussion of volume comparisons of output of hospital services *of two countries* at a given point in time will also recommend using an aggregate based on comparable treatments in the two countries.

76. Purchasing Power Parities (PPPs) are meant to eliminate the effects of the differences in price levels between countries, thus allowing volume comparisons of Gross Domestic Product (GDP) components and comparisons of price levels. The PPPs are calculated as quasi-weighted geometric averages of relative prices (parities) between pairs of countries for the basket of products which are representative in both countries.

77. Why do we need health specific PPPs? Health expenditures are probably the most commonly used single indicator of comparative policy analysis in the health sector. They are also of importance in fiscal policy as health expenditure in most countries is publicly funded and represents a large and growing share of governments’ budgets. Those seeking to assess health expenditures most commonly benchmark their country’s expenditure against international rankings of health expenditure using measures such as health expenditure per capita or health expenditure as a percentage of GDP. While useful indicators for the amount of resources committed, nominal expenditure indicators are sometimes also used to draw direct conclusions about the amount of health care provided. Simple expenditure comparisons, however, cannot take into consideration price and wage differences between countries or differences in productivity between health sectors.

78. Health-specific PPPs are meant to address these issues. Health-specific PPPs are ratios of prices (or quasi prices<sup>7</sup>) for health goods and services in different countries. Applied to money values of production or consumption expenditure on health for a given year, they yield a volume comparison of health services between the countries under consideration. In principle, PPPs are derived from price ratios of the same products in different countries. In practice, prices are not always meaningful in the health industry and other methods have to be employed to develop PPPs, the spatial deflators. In particular, in calculations of health PPPs, prices are often replaced by unit costs, i.e., by the total costs per unit of medical products.

### **The PPPs methodology**

79. PPPs are calculated for OECD countries every three years within the joint Eurostat-OECD PPP programme established in the early 1980’s. The current round is 2008 and covers 55 countries and foresees the calculation of PPPs in three stages. The first is at the product level, where price relatives are calculated for individual goods and services. The second is at the product group level (i.e. basic heading), where the price relatives calculated for the products in the group are averaged to obtain unweighted PPPs for the group. And the third is at the aggregation levels, where the PPPs for

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<sup>7</sup> As stated above, the term “quasi prices” is used to refer to those (unobserved) prices that emulate a competitive situation where prices equal average costs per products. Thus unit costs can be treated as if they were prices (Schreyer, 2008).

the product groups covered by the aggregation level are weighted and averaged to obtain weighted PPPs for the aggregation level. The weights used to aggregate the PPPs in the third stage are the expenditures on the product groups<sup>8</sup>.

80. In the present Eurostat-OECD PPP comparison programme, expenditure on health appears in three parts in GDP expenditure: household consumption expenditure, expenditure of non-profit institutions serving households (NPISHs) and government expenditure on health. Table 1 describes health expenditure items by main aggregate in the present classification.

81. PPPs for health goods (pharmaceutical products, other medical products, therapeutic appliances and equipment) and outpatient health services (medical services, dental services, paramedical services) under household consumption expenditure and social benefits in kind are based on a “normal” price collection. This means that the estimation of PPPs starts by selecting a sample of products in each expenditure category to compare their prices in different countries. Prices to be collected should be full market<sup>9</sup> average prices for the whole country.

**Table 1 Health expenditure items by main aggregate in the present Eurostat-OECD PPP classification**

	<i>Individual consumption expenditures by household</i>
11.06.11.1	Pharmaceutical products
11.06.12.1	Other medical products
11.06.13.1	Therapeutic appliances and equipment
11.06.21.1	Medical services
11.06.22.1	Dental services
11.06.23.1	Paramedical services
11.06.31.1	Hospital services
	<i>Individual consumption expenditure by non-profit institutions serving households</i>
12.01.11.1	Health
	<i>Individual consumption expenditure by government – Health</i>
	<i>Health benefits and reimbursement</i>
13.02.11.1	Pharmaceutical products
13.02.11.2	Other medical products
13.02.11.3	Therapeutic appliances and equipment
13.02.12.1	Out-patient medical services
13.02.12.2	Out-patient dental services
13.02.12.3	Out-patient paramedical services
13.02.12.4	Hospital services
	<i>Production of health services</i>
13.02.21.1	Compensation of employees: physicians
13.02.21.2	Compensation of employees: nurses and other medical staff
13.02.21.3	Compensation of employees: non-medical staff
13.02.22.1	Intermediate consumption: pharmaceutical products and other
13.02.22.2	Intermediate consumption: therapeutical appliances and
13.02.22.3	Intermediate consumption not elsewhere classified
13.02.23.1	Gross operating surplus
13.02.24.1	Net taxes on production
13.02.25.1	Less receipts from sales

82. For inpatient services, an input method is applied for public but also for private hospitals. As stated above, this follows national accounts conventions that recommend that the value of output of institutional units in health industry is measured by the sum of costs of production in the case of non-

<sup>8</sup> This methodological description is strongly simplified. Further information can be found in the [Eurostat-OECD Methodological Manual on Purchasing Power Parities](#).

<sup>9</sup> The full market price is the total amount that the private service provider receives for supplying the health service specified.

market products. In the input method, PPPs for compensation of employees are based on a wage comparison of employees, that is, wages are used in the PPP estimation in the same way as normal product prices. PPPs for other inputs are based on proxy PPPs extracted from other parts of the comparison<sup>10</sup>.

### **A proposal for the calculation of output-based health-specific PPPs**

83. The efforts to derive measures of output that are separate from measures of inputs stems from the fact that the equality of inputs and outputs in value does not imply equality of inputs and outputs in volume or quantity. The main difference between cost-based prices of outputs and prices of inputs is that the former corresponds to cost per unit of output whereas the latter corresponds to the cost per unit of input. And in the input method productivity differences that could exist between non-market producers of the countries are not taken into account<sup>11</sup>.

84. The proposal of comparing measures of output across countries is consistent with the “output volume method” recommended by national accounts for compiling indicators of volume changes in non-market services. This method is based on quantity indicators, adequately quality-adjusted, weighted together using average cost weights (SNA, 2008).

85. As in volume comparisons over time within a country, volume comparisons at a point in time between countries can be achieved either by directly comparing volumes of health services or by deflating current values with health-specific PPPs. Both approaches require the same steps in measurement in the two dimensions. And they might also use the same sources of information. In this sense, comparisons within a country over time and comparisons between countries at a particular point in time are consistent.

86. The main differences between the two dimensions relate to the way products are identified and to the estimation of prices/quasi prices, or unit cost as would typically be the case for health products. Comparisons of volume over time for a given country require within-country consistency of the choice of health products. This means that the product taxonomy has to be stable but it can be country specific. Each country can use its own tools to identify and measure products. Because countries are different, the bundle of products whose quantities or prices are followed will be different for every country. For comparisons across countries, we need consistency in health product definitions among countries. This means that – in most cases – we cannot use the country-specific measurement tools as they are, but it is necessary to define a common sample of health products.

87. In time series comparisons, within country consistency of measurement is necessary. Thus country specific taxonomies, such as DRGs systems, may be used. In cross country comparisons, however the product descriptions must be as consistent as possible. As most DRG systems tend to have country specific modifications, using DRGs for comparison purposes is problematic. In the PPP framework, the items for which costs are collected and reported should be comparable and representative within a basic heading (Eurostat-OECD, 2006). It is clear that such a list of items will not be exhaustive in that it covers all the activities within a type (as an example, inpatient hospital care). However, exhaustiveness is not necessarily required if the selected case types are considered representative for a broad set of activities.

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<sup>10</sup> As an example, PPPs for pharmaceutical products are used as proxy PPPs for intermediate consumption, although the relative difference between prices paid by hospitals and pharmacy prices is not necessarily the same in all countries.

<sup>11</sup> A discussion on productivity adjustment methods can be found on page 105-107 in the [Eurostat-OECD Methodological Manual on Purchasing Power Parities](#) and on page 312 of the SNA 2008 (paragraphs 15.112).

### APPENDIX 3.1: CAPITAL FORMATION

88. The distinction between current expenditure on health care goods and services and capital expenditure in health care industries is important. Capital goods are an essential component of demand and play a crucial role in the provision of health care services and goods allowing for the expansion of production, the more capital there is, the greater the capacity for growth.

89. Gross capital formation is defined in the SNA as the net acquisition of produced fixed assets i.e. assets intended for use in the production of other goods and services for a period of more than one year. Net acquisition refers to the fact that in calculating capital formation, any sales of existing assets should be deducted from any new purchases of capital goods. Such capital goods may be tangible assets, for example, hospital buildings, ambulances or MRI machines, or intangible assets, such as investment in software and expenditure on Research and Development (see below). Gross capital formation can be further broken down according to the health care provider industry. It is clear that for the most part the tangible capital goods are produced by branches or industries outside the realm of health care providers.

90. For the recording of gross capital formation, the SHA recommends that it concerns only those providers where health care is the predominant activity. The retail sale of medical goods is regarded as a supporting activity to health care and therefore any capital formation in retailers of goods is not counted under total capital formation of health care providers. Where administration activities of public health and health care financing or insurance are embedded into larger units, any relevant capital formation may be impossible to distinguish. In summary, the fundamental definition is:

*Gross capital formation in health care industries = sum of gross capital formation in the units listed under the ICHA-HP classification (excluding HP.4), where health care is the predominant activity.*

#### Research and development

91. In the 2008 SNA, research and development is to be considered as an intellectual property product and as such included as a part of capital formation. “Research and [experimental] development consists of the value of expenditures on creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and use of this stock of knowledge to devise new applications. This does not extend to including human capital as assets within the SNA. The value of research and development (R&D) should be determined in terms of the economic benefits it is expected to provide in the future. This includes the provision of public services in the case of R&D acquired by government. In principle, R&D that does not provide an economic benefit to its owner does not constitute a fixed asset and should be treated as intermediate consumption. Unless the market value of the R&D is observed directly, it may, by convention, be valued at the sum of costs, including the cost of unsuccessful R&D....” (SNA 2008, 10.103).

92. Therefore, R&D in health care providers should be recognised as part of capital formation. In order to achieve this, several issues have to be addressed. These include deriving measures of research and development, price indices and service lives. Specific guidelines, together with handbooks on methodology and practice, will provide a useful way of working towards solutions that give the appropriate level of confidence in the resulting measures.

93. The Frascati Manual provides detailed guidelines for the estimation of expenditure on research and development for R&D in health according to the functional boundaries (OECD, 2002, Annex 4). Further information on international comparisons and examples of national efforts can be found in Measuring expenditure on Health-related R&D (OECD, 2001). The separate recording of expenditure on R&D as a component of capital formation is suggested.

### **On discontinuing the use of the aggregate “total health expenditure”**

94. This section aims at shedding some light on the issue of adding the aggregate “current expenditure on health” to the aggregate “gross capital formation in health care industries”. Following the SHA1 proposed approach, the sum of these two aggregates equals “total health expenditures”. We propose to discontinue the use of the “total health expenditures” aggregate since the sum of the current health expenditure and gross capital formation does not equal the value of production of health care providers.

95. To illustrate this proposal, the Leontief-type input-output approach is used. Table 2 represents a very simplified version of a symmetric input output table for the whole economy. For simplicity, a closed economy is considered which includes only three sectors of economic activities:

- i. Providers of health care services and goods
- ii. Producer of Capital goods
- iii. Rest of the economy

96. Rows in Table 2 represent the value of sectors' outputs: Providers of health care services and goods produce health products for final use only (consumption= 50)<sup>12</sup>. Producer of Capital goods produce assets for final use only (Gross fixed capital formation = 5). The output of the Rest of the economy (45) is used as intermediate consumption only: 35 is purchased by the Providers of health care services and goods; 3 by the Producer of Capital goods, and 7 by the Rest of the economy. Therefore, total supply accounts for 100 (50+5+45) which equals the total demand. A part of the total demand is used for final uses (55) broken down between Consumption (50) and Gross fixed capital formation (5).

97. Columns in Table 2 represent the inputs: Providers of health care services and goods purchase 35 from the rest of the economy as input. Hence, their gross value added is 15. A part of the value added (10) is used to remunerate the employees, while the rest (5) is saved. Saving is in turn, used to purchase capital goods, which is the output of the sector producing capital goods. The other columns can be read similarly. For simplicity the other sectors do not purchase capital goods.

98. Considering now the equations:

$$Y=C+I \Rightarrow 55=50+5 \quad \text{Eq. 1}$$

$$Y=C+S \Rightarrow 55=50+5 \quad \text{Eq. 2}$$

where Y is the income<sup>13</sup>, C the consumption, I the Gross fixed capital formation, and S the saving. Solving the system of equations gives

$$S=I=5. \quad \text{Eq. 3}$$

99. The two aggregates represent two components of final uses and as such do not overlap, since each product produced in the economy is included either in the consumption or in the gross capital

<sup>12</sup> We are also assuming that health good and services are the only products available in the economy for final consumption, and that the production of capital goods by health care providers (e.g. software) is zero.

<sup>13</sup> In this example, as there are no transfers from either the rest of the economy nor from the rest of the world, income coincides with value added.

formation. The same conclusion can be reached using the second equation above where the income is split between consumption and saving: the two aggregates complement each other with no overlap.

100. The information included in Table 2 can be reported in a typical SHA HCxHP table. In Table 3 Current expenditure is the value of consumption taken from Table A.1 and broken-down by providers and function, while HC.R.1 represents the value of Gross fixed capital formation also taken from Table 2 and broken-down by providers.

101. The whole economy disposes of an income of 55. Of this 5 are used to purchase capital goods, the remaining 50 are distributed to the consumers in the form of remuneration of employees. Consumers spend all the 50 to purchase the products of the providers of health care services and goods. If we focus on the health sector, the sum of the current health expenditure and gross capital formation (55 units) does not equal the value of production of the health care providers (50 units). This is the reason why we suggest to keep the two aggregates separated in revised manual and to discontinue the use of the aggregate “total health expenditures”.

102. There exist a number of issues strictly linked to the one analysed here. Among those, it is worth mentioning the estimation techniques to be employed to breakdown the total expenditure on capital goods by providers, and the techniques to estimate consumption of fixed capital (i.e. the perpetual inventory method). Each of these items is addressed in other units of this Manual and – therefore - is outside the scope of this unit.

**Table 2 Input-output symmetric table**

	Supply				Demand				
	Intermediate consumption			Total	Total Intermediate consumption	Final Uses			Total
	Providers of health care services and goods	Producers of Capital goods	Rest of the economy			Consumption	Gross fixed capital formation	Total Final uses	
Providers of health care services and goods				50		50			50
Producer of Capital goods				5			5		5
Rest of the economy	35	3	7	45	45			0	45
<b>Total uses</b>	<b>35</b>	<b>3</b>	<b>7</b>	<b>100</b>	<b>45</b>	<b>50</b>	<b>5</b>	<b>55</b>	<b>100</b>
Total gross value added/GDP	15	2	38	55					
Compensation of employees	10	2	38	50					
Gross Saving	5	0	0	5					
Gross fixed capital formation	5	0	0	5					
Consumption of fixed capital	1	0	0	1					
Net capital formation	4	0	0	4					

**Table 3 SHA HCxHP table**

Providers		HP.1	HP.2	HP.3	HP.4	HP.5	HP.6	HP.7	HP.9	HP.0	
Million of national currency		Hospitals	Nursing and residential care facilities	Providers of ambulatory health care	Retail sale and other providers of medical goods	Provision and administration of public health programs	General health administration and insurance	Other industries (rest of the economy)	Rest of the world	n.e.c.	Current expenditure HP.1-HP.9
Functions											
<b>HC.1; HC.2</b>	Services of curative and rehabilitative care	12		11							23
<b>HC.3</b>	Services of long-term nursing care	1	6	1							8
<b>HC.4</b>	Ancillary services to health care	3		1							4
<b>HC.5</b>	Medical goods dispensed to out-patients				10						10
<b>HC.6</b>	Prevention and public health services					3					3
<b>HC.7</b>	Health administration and health insurance						2				2
<b>HC.9</b>	Not specified by kind										0
	<b>Current expenditure</b>	16	6	13	10	3	2				50
<b>HC.R.1</b>	Capital formation of health care provider institutions	3	1	1							5
	<b>Total expenditure HC.1-HC.9; HC.R.1</b>	19	7	14	10	3	2				55

### APPENDIX 3.2: INTERNATIONAL TRADE IN HEALTH FROM THE EXPENDITURE, ECONOMIC AND TRADE POLICY PERSPECTIVES

103. This section distinguishes between i) imports of health care goods and services for final use and ii) international trade in health care products as defined in Unit 13.

104. As discussed above, health expenditure relates to the resident population, such that it should *exclude* any consumption of health care goods and services by non-residents (exports) but should *include* any final consumption by residents outside of the territory (imports).

105. In this respect it is important to clarify the concepts of residence and what is to be included under imports and exports.

106. Residents include any individual, enterprise or other organisation ordinarily domiciled domestically. The SHA takes its lead from the definitions contained in the Balance of Payments Manual (BPM6) “The residence of each institutional unit is the economic territory with which it has the strongest connection, expressed as its centre of predominant economic interest. Each institutional unit is a resident of one and only one economic territory determined by its centre of predominant economic interest.

107. An institutional unit is resident in an economic territory where there exists, within the economic territory, some location, dwelling, place of production, or other premises on which or from which the unit engages and intends to continue engaging, either indefinitely or over a finite but long period of time, in economic activities and transactions on a significant scale. The location need not be fixed so long as it remains within the economic territory. Actual or intended location for one year or more is used as an operational definition; while the choice of one year as a specific period is somewhat arbitrary, it is adopted to avoid uncertainty and facilitate international consistency.

108. More detail is provided by the Balance of Payments Manual (BPM6 Chapter 4). Resident units engage in transactions with non-resident units (that is, units which are residents in other economies). These transactions are the external transactions of the economy and are grouped in the rest of the world account. So, in the SNA’s accounting structure, the Rest of the world plays a role similar to that of an institutional sector, although non-resident units are included only in so far as they are engaged in transactions with resident institutional units. Consequently, as far as coding of classifications is concerned, a specific item for the rest of the world is included at the end of the classification of sectors within the SNA.

109. In the System of Health Accounts, a category related to non-resident units exists in both the provider and financing schemes classifications. In both classifications they refer to “rest of the world”. However, with respect to imports and exports of health goods and services, it is important to clarify that it is the provision rather than the financing by non-resident units that is of interest here. For example, if a foreign government or NGO pays for services for residents then these services are financed by the Rest of the World but may be provided by domestic provider and therefore not an import. If, however, a service is provided and paid for by a foreign government to a resident, then this is indeed accounted for as an import.

110. In the SHA tables therefore, imports of goods and services from non-resident units are to be recorded under the provider category ‘Rest of the world’ and broken down by the various functions under

the core framework. Within the consumption boundary, exports are not included since they refer to consumption by non-residents. However, in practice from the provision perspective the direct purchase of health care goods and services by non-residents will need to be explicitly excluded from domestic provider revenues. For transparency, however and to allow for reconciliation with the production account, exports should also be reported as a memorandum item.

111. Imports and exports of goods and services are defined by the existence of a transaction (sale, barter, gift, grant, etc) in goods and services to/from residents from/to non-residents, but not necessarily involving the movement of the good or service across a border. Given the increasing importance of trade in health goods and services, (e.g. patient mobility, e-health, tele-diagnosis, the purchase of medical goods via the internet, etc) a consistent and comparable aggregate of health care expenditure which takes accounts of this trade is deemed necessary.

112. A further item relevant for reporting under an extended framework of the SHA is also foreign trade in capital formation in health care industries and health insurance.

113. Faced with the requirements for relevant, comparable and reliable statistics on trade in all services, not only in health, the international agencies have been active in developing the concepts and data reporting requirements.

114. A distinction is made between information on imports and exports under the core framework of the SHA and trade in health care products in a wider economic sense.

#### **Statistics of International Trade in Services**

115. This work on international trade in services has taken on importance since the WTO General Agreement on Trade in Services (GATS) in 1995, which defined four modes of supply of services (Table 4).

116. The Manual on Statistics of International Trade in Services (MSITS), incorporating the key concepts from System of National Accounts (SNA 2008) and the Balance of Payments manual (BPM6), provides recommendations for the measurement of international trade in services. It sets out the Extended Balance of Payments Services Classification (EBOPS) which provides a greater level of detail to the BPM6 classification of services and has correspondence tables with standard product and industry classifications. Within the EBOPS (Table 5), health services are split between two classes of the classification; Health-related travel (corresponding to mode 2 of GATS) and Health services (either cross-border (mode 1) or delivered on the territory by temporary movement of providers (part of mode 4). An alternative grouping, which may better approach the SHA boundaries of health care goods and services, combines these two categories. It is important to achieve proper linkages and synergies between SHA and international trade reporting by ensuring consistent boundaries and definitions of trade in ‘health care’.

117. In developing and sourcing statistics in international trade, it needs to be reiterated that for estimating total health expenditure, we are concerned primarily with those goods and services destined for final use. For example, tele-diagnosis services from abroad may be purchased by a domestic hospital. In this case, the in-patient care provided by this hospital constitutes the service consumed, and the tele-diagnosis is an import by the hospital sector rather than a direct import of health services by the patient. Such imports of goods and services for intermediate consumption should be recorded separately.

**Table 4 Four modes of supply of services in trade defined by the General Agreement on Trade in Services (GATS)**

<b>Mode</b>	<b>of</b>	<b>Territorial</b>	<b>Health related example</b>	<b>Major</b>
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supply	presence of transactors		statistical areas
<b>Mode 1.</b> Cross-border supply	Service only crosses the border. Consumer in his/her territory of residence: Supplier outside the territory of the consumer	Includes shipment of laboratory samples, diagnosis, and clinical consultation via traditional mail channels, as well as electronic delivery of health services, such as diagnosis, second opinions, and consultations. Variety of telemedicine, tele-health (or e-medicine/e-health) services includes tele-health services, including tele-diagnosis, tele-pathology, tele-radiology and tele-psychiatry.	BPM6
<b>Mode 2.</b> Consumption abroad	Consumer outside territory of residence	Medical treatment of non-resident persons i.e. person travelling abroad to the home country of the provider for:  i) specialised or advanced treatment not available in the home country, generally sought by affluent patients from developing countries travelling to hospitals in industrialised countries or in neighbouring developing countries with superior health care standards.  ii) or a price or quality advantage over the home country, generally sought by patients from industrialised countries who purchase affordable, high-quality treatment or alternative medicines and treatments in developing countries.	BPM6
<b>Mode 3.</b> Commercial presence	Supplier in the territory of the consumer: through commercial presence	Health care companies in industrialised and some developing countries are increasingly engaging in joint ventures and alliances, resulting in several regional health care networks and chains. Medical treatment in a foreign-owned clinic resident in the reporting economy.	FATS and Activities of Multinational Enterprises
<b>Mode 4.</b> Presence of natural persons either self employed or employees	Supplier in the territory of the consumer: Through the presence of natural persons	Movement of health personnel, including physicians, specialists, nurses, paramedics, midwives and other professionals. Short-term flows have mainly been driven by conscious strategies to promote health services exports, in order to earn foreign exchange and foster cooperation between governments.	BPM6 & other <sup>1</sup>

1. The “other” statistical areas include migration and employment statistics. BPM6 is the fifth edition of the IMF Balance of Payments Manual. FATS refers to the “Foreign affiliates statistics”, definitions for which are mostly derived from 2008 SNA.

**Table 5 Health services under the proposed EBOPS 2010 classification**

4	Travel
4.1	Business
	Acquisition of goods and services by border and seasonal workers
	Other
4.2	Personal
	<b>Health-related</b>
	Education-related
	Other
	<i>Alternative presentation for Travel</i>
	<i>For both business and personal travel</i>
4a.1	<i>Goods</i>
4a.2	<i>Local transport services</i>
4a.3	<i>Accommodation services</i>
4a.4	<i>Food-serving services</i>
4a.5	<i>Other services</i>
	<i>Of which:</i>
	<b>Health services</b>
	<i>Education services</i>
11	<i>Personal, cultural, and recreational services</i>
11.1	<i>Audiovisual and related services</i>
11.2	<i>Other personal, cultural, and recreational services</i>
11.2.1	<i>Health services</i>
11.2.2	<i>Education services</i>
11.2.3	<i>Other</i>
	<i>Alternative EBOPS groupings</i>
	<b>7 Health services = health services in travel + health services in personal cultural and recreational services</b>

## REFERENCES

Abraham, K.G. and Mackie, C. (eds.) (2005) *Beyond the Market: Designing Nonmarket accounts for the United States*, Committee on National Statistics Division of Behavioral and Social Sciences Education, National Academies Press, Washington DC.

Aizcorbe, A. M., Retus, B.A. and Smith, S. (2008) *Toward a Health Care Satellite Account*, BEA Briefing, May.

Atkinson Review (2005) *Measurement of Government Output and Productivity for the National Accounts*. Final Report, Palgrave Macmillan.

Berndt, E.R., Cutler, D.M et al. (2000) *Medical care price and output*. In Culyer, A.J. and Newhouse, J.P. (Eds.) *Handbook in Health Economics* vol 1a., Elsevier.

Berndt, E.R., Cutler, D.M. et al. (2001) *Price Indexes for Medical Goods and Services: An Overview of Measurement Issues*. In Cutler, D.M. and Berndt, E.R. (Eds) *Medical Care Output and Productivity* Chicago: University of Chicago Press.

Berndt, E.R., and Cutler, D.M. (Eds.) (2001) *Medical Care Output and Productivity*; Vol. 62, NBER Studies in Income and Wealth, University of Chicago Press.

Brahaug, A-L. (2006) *Measurement of Health Output – experiences from the Norwegian National Accounts*. Paper prepared for the joint OECD/ONS/Government of Norway Workshop *Measurement of non-market output in education and health* London, 3<sup>rd</sup> -5<sup>th</sup> October.

Brazier, J., Deverill, M., Green, C., Harper, R., Booth, A. (1999) *A review of the use of health status measures in economic evaluation*. Health Technology Assessment 3(9). (Available at: <http://www.hta.nhsweb.nhs.uk/execsumm/summ309.htm>).

Cardenas, E.M. (1996) *Revision of the CPI hospital service component*, Monthly Labor Review, December: 40 – 48.

Castelli, A., Laudicella, M., and Street, A. (2008) *Measuring NHS Output Growth*. Centre for Health Economics Research Paper 43 (available at: [www.york.ac.uk/inst/che/pubs](http://www.york.ac.uk/inst/che/pubs)).

Castelli, A., Dawson, D., Gravelle, H., and Street, A. (2007) *Improving the Measurement of Health System Output Growth*. Health Economics 16(10), 1091-107.

Chessa, A.G., and Kleima, F.J. (2006) *The Dutch Experience in Measuring Health Output and Labour Productivity*. Paper prepared for the joint OECD/ONS/Government of Norway workshop “*Measurement of non-market output in education and health*” London, Brunei Gallery, October 3 – 5.

Christian, M. S. (2007) *Measuring the Output of Health Care in the United States*. Survey of Current Business, BEA June, 78-83.

Cutler, D.M., McClellan, M., Newhouse, J.P., and Remler, D. (1998) *Are Medical Prices Declining? Evidence from Heart Attack Treatment*. Quarterly Journal of Economics, Vol. CXII, November, pp. 991-1023.

Dawson, D., Gravelle, H., et al. (2005) *Developing new approaches to measuring NHS outputs and productivity. Final Report*. Centre for Health Economics, University of York, Research Paper 6.

Deveci, N., Heurlén, K., and Sorensen, H.S. (2008) *Non-Market Health Care Service in Denmark – Empirical Studies of A, B and C Methods*. Paper presented at the 30th meeting of the *International Association for Research in Income and Wealth*; Portoroz, Slovenia (available at: [www.iariw.org](http://www.iariw.org)).

Diewert, E.W. (2008) *The Measurement of Nonmarket Sector Outputs and Inputs Using Cost Weights*. University of British Columbia, Department of Economics Discussion Papers 08-03 (available at: [www.econ.ubc.ca/diewert/dp0803.pdf](http://www.econ.ubc.ca/diewert/dp0803.pdf)).

Dolan, P. (2000) *The Measurement of Health-related Quality of Life*. In Culyer, A.J. and Newhouse, J.P. (eds.) *Handbook of Health Economics* Volume 1b, chapter 32, Elsevier: Amsterdam.

Ebdon, J. and Okiti, O. (2006) *A Framework for Quality Adjustment across the UK Public Services*. Paper prepared for the 29th General Conference of the International Association for Research in Income and Wealth, Joensuu, Finland, August 20-26.

Eurostat (1995) *European System of Accounts*. European Commission.

Eurostat (2001) *Handbook on Price and Volume Measures in National Accounts*. European Commission.

Eurostat-OECD (2006) *Methodological manual on Purchasing Power Parities*, OECD, Paris.

Fetter, R.B. (Edt) (1991) *DRGs. Their Design and Development*. Health Administration Press, Ann Arbor Michigan.

Gerard, K., and Mooney, G. (1993) *QALY League Tables: Handle with Care*. Health Economics, 2: 59- 64.

Häkkinen, U. and Joumard, I. (2007) *Cross Country Analysis in OECD Health Care Sectors: Options for Research*. Economics Department Working Paper no. 554. OECD.

Huber, M. (2007) *International comparison of prices and volumes in health care among OECD countries*. Paper presented at the 1<sup>st</sup> meeting of the Task Force for the Development of Health-specific Purchasing Power Parities, Paris, 8 June.

International Monetary Fund (2008) *Balance of Payments and International Investment Position Manual* (available at: [www.imf.org](http://www.imf.org)).

Jacobs, R., Smith, P.C., and Street, A. (2006) *Measuring Efficiency in Health Care*, Cambridge University Press.

Magee, H.F. (2003) *The Hospital Data Project. Comparing hospital activity within Europe*. European Journal of Public Health; Vol. 13 (3): 73 - 79

Mattke, S., Kelley E., Scherer, P., and Gil Lapetra, M.L. (2006) *Health Care Quality Indicators Project Initial indicators Report*. Organisation for Economic Co-operation and Development Health Working Papers no. 22.

Office of Health Economics (2008) *NHS Outcomes, Performance and Productivity* (available at: [www.ohe.org](http://www.ohe.org)).

OECD (2000) *A System of Health Accounts*, Organisation for Economic Co-operation and Development, Paris.

OECD (2001) *Measuring Expenditure on Health-related R&D*. Organisation for Economic Co-operation and Development, Paris.

OECD (2002) *Frascati Manual. Proposed standard practice for surveys on research and experimental development. Sixth Edition*. Organisation for Economic Co-operation and Development, Paris.

OECD (forthcoming) *Towards measuring education and health volume output*. Organisation for Economic Co-operation and Development, Paris (draft available at: [www.oecd.org](http://www.oecd.org)).

Pont, M. (2008) *Improvements to the measurement of government output in the National Accounts*. Economic & Labour Market Review 2 (2): 17-22.

Schreyer, P. (2008) *Output and Outcome – Measuring the Production of Non-market Services*. Paper presented at the 30th meeting of the International Association for Research in Income and Wealth; Portoroz, Slovenia (available at: [www.iariw.org](http://www.iariw.org)).

Schultze, C.L., and Mackie, C. (Eds.) (2002), *At What Price? Conceptualizing and Measuring Cost-of-Living and Price Indexes*, National Academy Press, Washington.

Schuster, M.A., McGlynn, E.A., and Brook, R.H. (2005) *How Good is the Quality of Care in the United States*. The Milbank Quarterly, 83: 843-95.

Smedby, B. (2007) *A selected list of hospital procedures for international comparison*. Report on the work of the expert group on procedures under the HDP2 project”, presentation at the OECD Health Data National Correspondents meeting, Paris, 9-10 October.

Smith, P.C., and Street, A. (2007) *Measurement of Non-Market Output in Education and Health*. Centre for Health Economics, University of York, CHE Research Paper 23.

The Information Centre. National Health Service (2008) *Healthcare Resource Groups v4* (available at: [www.ic.nhs.uk/services/casemix/healthcare-resource-groups](http://www.ic.nhs.uk/services/casemix/healthcare-resource-groups)).

Triplett, J. E. (2003) *Integrating Cost-of-disease Studies into Purchasing Power Parities. A Disease-Based Comparison of Health Systems*. Organisation for Economic Co-operation and Development, Paris.

Triplett, J. E. (1998) *Accounting for Health Care: Integrating Price Index and Cost-Effectiveness Research*. Brookings Institution.

System of National Accounts (2008) *Pre-edited version of Volume 1*. Approved by the Bureau of the UN Statistical Commission (available at: [www.unstats.un.org](http://www.unstats.un.org)).

UKCeMGA (2008) *Public Service Productivity: Health Care* (available at: [ww.statistics.gov.uk](http://ww.statistics.gov.uk)).

Willmer, R., and Little, C. (2007) *Review of data sources and methodology for the calculation of hospital output in the NHS* (available at: [www.dh.gov.uk/publications](http://www.dh.gov.uk/publications)).