PART II

Chapter 11

Capital Formation in Health Systems

Introduction

Knowing how much a health system is investing in infrastructure, machinery and equipment is very relevant for policy making and analysis. Although health systems remain a highly labour-intensive sector, capital has been increasingly important as a factor of production of health services over recent decades. Consider, for example, the growing importance of diagnostic and therapeutic equipment or the expansion of information, computer and telecommunications technology in health care over the last few years. The availability of statistics on capital are essential to the analysis of the health system's production capacity (that is, whether capacity is appropriate, deficient or excessive), which is needed in turn to inform policy implementation (for example, if excess capacity exists, the marginal cost of expanding coverage will be lower than if the health care system is already straining to fill current demand). Information on capital could also assist with the estimation of productivity, capital intensity and rates of return.

The remainder of this chapter presents the definition of the capital aggregates in health systems, the identification of their boundaries and the criteria for valuation, with a short section illustrating some guidelines for the estimation of capital formation. The chapter provides an example of a capital account for SHA. Research and development in health and the Education and training of health personnel are included as memorandum items to the capital account.

Definition of gross capital formation in SHA

The aggregate "Gross[1] capital formation" is measured by the sum of three components:

- Gross fixed capital formation (*e.g.* hospital buildings or ambulances);
- Changes in inventories (*e.g.* vaccinations kept in stock); and
- Acquisitions less disposals of valuables (*e.g.* artworks).

Gross fixed capital formation is generally the most relevant component. It is defined as follows:

Gross fixed capital formation

Gross fixed capital formation in the health care system is measured by the total value of the fixed *assets* that health providers have *acquired* during the accounting period (less the value of the disposals of assets) and that are used repeatedly or continuously for more than one year in the production of health services.

Assets are defined as "a store of value", or a means of carrying forward value from one period to another. By holding or using the assets, the owner can accrue benefits. Fixed assets have come into existence as outputs from a production process. Assets qualify as "fixed" only if they can be used repeatedly or continuously in production for more than one year. Goods that can be used once only (*e.g.* coal), even if physically highly durable, are not

considered as fixed assets. Examples of fixed assets in the health sector include, among other things, hospital buildings, ambulances and medical imaging machines.

Health care providers, as defined in Chapter 6, can acquire fixed assets by purchase or barter or as transfers in kind. Symmetrically, health providers can dispose of the assets by selling them, surrendering them in barter or as transfers in kind.

Note that it is possible for gross fixed capital formation to be negative. This would occur if the value of the disposed assets exceeds the value of those acquired.

Boundaries

Ownership

The guiding principle for the recording of gross capital formation in health accounts is the legal ownership of the assets by health care providers. Only assets legally owned by the health care providers are included under capital formation.[2]

SHA records the value of assets acquired, and disposed of, by all health care providers except health care providers classified under the rest of the world. The exclusion of the rest of the world avoids recording the same assets in two countries.[3,4] Particular attention should be paid to the assets acquired by those health care providers whose principal activity is not the provision of health services. Assets used repeatedly or continuously for the provision of health services should be included regardless of the fact that the provision of health services is the principal activity of the owner. For example, road ambulances used repeatedly or continuously for the transportation of patients should be included regardless of the fact that the principal activity of the owner of the ambulance is to operate taxis. However, a taxi used occasionally, but not repeatedly or continuously, by the same owner for the transportation of patients should be excluded. Similarly, air-ambulances should be included even if the owner is primarily engaged in the air transportation of passengers. The net acquisition of capital assets made by retail sellers of medical goods are also included, since retail sellers are considered as health care providers in a number of countries. For example, in Switzerland, pharmacists can recommend and even prescribe medicines. In other countries, pharmacists also offer advice on common complaints such as coughs, colds, aches and pains and other health issues, such as healthy eating and giving up smoking. Health capital goods acquired by households are included only if their costs are reimbursed. For example, financing schemes can reimburse households that purchase a hospital-type bed or can cover completely or partially the cost of adapting vehicle access for people with reduced mobility. Some difficulties might arise in recording the value of the assets owned by "Providers of health care system administration and financing" (HP.7) and "Other health care providers" (HP.8) that can also be used for the production of services other than health. For example, buildings owned by insurance companies might well be used indistinctively for the production of both health and non-health insurance services. In such cases, only a part of the value of the assets should be recorded. To do that, it would be advisable to use a pragmatic approach in which only the proportion of the value of the assets that can be identified through a relatively inexpensive effort should be recorded.

Assets owned by non-health care providers are not accounted for in SHA. Therefore, assets owned by banks and leased (operational leasing) to health care providers are not recorded in SHA. For example, an MRI machine bought by a bank (which is the legal owner)

and leased to a hospital with no intention of transferring the ownership will not be recorded in SHA, as the bank is not a health care provider.[5]

Time of recording

Acquisitions and disposals of fixed assets are recorded when the ownership is transferred to the health care provider that intends to use them in production (in the case of acquisitions) or from the health care provider who has previously used them in production (in the case of disposals). In general, this is not the same as the time at which the fixed assets are produced. Nor is it necessarily the time at which the assets are put into use in the production of health care goods or services.

Exceptions

Exceptions to the ownership and change of legal ownership principles are possible in the case of financial leasing or when the construction of the fixed assets spans a long period of time, as is often the case for hospital buildings (typically several years).

Financial leasing is a form of contract that allows one party (the lessee) to use the asset in exchange for rental payments. During the leasing period, it is the responsibility of the lessee to repair and maintain the asset. At the end of the leasing period the lessee can buy the asset. In this case, the asset is recorded as gross fixed capital formation of the lessee at the beginning of the leasing period and not at the end of the leasing period when the legal ownership is acquired (see Box 11.3 for the distinction between financial and operating leasing).

An exception is made when the construction of the fixed assets spans a long period of time, and the two following conditions are met: the future owner is known and stage payments are made during the construction period. The future owner can be identified before the construction is finished if the asset is produced under a contract of sale agreed in advance between the producer and the future owner. The contract of sale can foresee stage payments to be made on a regular basis during the construction period. In these circumstances, the stage payments can be regarded as the purchase of a part of the fixed asset and recorded as gross capital formation of the future owner. This can also be done in the case when the value of the stage payment exceeds the value of the incomplete asset put in place. In that case, the excess part of the stage payment can be seen as a trade advance.

Valuation

The value of the various components of gross capital formation is given by the sum of acquisitions less disposals. Acquisitions include the whole value of fixed assets purchased, acquired through barter or received as capital transfers in kind plus the value of fixed assets produced by health care providers and retained for their own use (such as software). Disposals include the value of existing fixed assets sold or surrendered in barter and capital transfers in kind. The value of fixed assets purchased or produced by health care providers and retained for their own use include new assets, existing assets, the value of improvements to assets and the cost of ownership transfers in respect of these assets. Disposals include assets that may cease to be used as fixed assets by their new owners (for example, a hospital sold by local government to central government[6]), assets that are scrapped or demolished by their new owners (*e.g.* obsolete ambulances) and assets that are exported.

Box 11.1. **Terminology**

Difference between gross capital formation (GCF) and gross fixed capital formation (GFCF)

Gross capital formation is the sum of the value of the following three components:

1. Gross fixed capital formation;
2. Changes in inventories; and
3. Acquisitions less disposals of valuables.

Therefore gross fixed capital formation is one of the three elements included in the wider aggregate called gross capital formation.

Consumption of fixed capital (CFC)

As time goes by, capital goods progressively lose their value. This could be due either to physical use or obsolescence. Consider for example a personal computer bought at a certain point in time for EUR 1 000: after three years its market value would be greatly reduced, and after five years it would be almost negligible. The loss of the value of the capital goods due to their normal wear and tear or obsolescence is called *Consumption of fixed capital* or *capital consumption*. Capital consumption is an *imputed*, not an actual cost. In other words it is a non-cash expense. Capital consumption is added to all other production costs to indirectly estimate the value of the non-market production. The indirect measure is an approximation required to overcome the lack of economically significant prices for the non-market sector.

Difference between capital formation and consumption of fixed capital (CFC)

Capital formation identifies the value of the assets acquired in the accounting period (*e.g.* new ambulances purchased or new hospitals built in that period), while the consumption of fixed capital refers to the loss in value (due to normal wear-and-tear or obsolescence) of the whole existing stock of capital (which includes not only the assets newly acquired, but all those still available regardless of the moment they were initially acquired).

Difference between gross and net capital formation

A refined measure of how much value has been added to the existing capital stock in the accounting period should take into account the loss of value of the existing capital goods that has been lost due to use or obsolescence. Such a refined measure, called net capital formation, is obtained by subtracting the value of capital consumption from gross capital formation.

Investment

While gross capital formation is an investment, not all investments can be classified as gross capital formation. For example, the purchase of a financial product is an investment, although it is not included in gross capital formation.

Assets acquired (or improvements carried out) are valued at purchasers' prices, which include all transport and installation charges as well as all costs of the transfer of ownership.

Type of asset

A fundamental question for national compilers is, "what assets are to be included in health accounts?" For example, are road ambulances included or not? And buildings? And

what about computers? A clear identification of the assets might help national compilers, and also enhance the international comparability of the data. To address this issue, a list of categories of assets whose value should be included in the aggregate gross fixed capital formation is given in Table 11.1. The classification of type of assets is meant to be used primarily for the identification of the capital goods and services to be reported.

The classification of health capital goods by type of asset provides policy makers with relevant information on the nature of equipment, machinery, buildings and so on. One reason this is useful to know is that the technology embedded in the assets will affect their expected service life. For example, investments in hospital buildings are likely to last longer than investments in transport equipment, and transport equipment are expected to serve longer than ICT devices. A classification by assets could also serve policy analysts by enhancing the international comparability, and also by facilitating the linkage to non-expenditure statistics (*e.g.* number of beds, number of scans). Indeed, as with current health expenditure, for which the functional classification allows the identification of comparable aggregates, the classification by assets of gross fixed capital formation would allow categories to be set that are more directly comparable. For example, the amount spent on medical equipment is more comparable than how much was spent on investment by hospitals.

Table 11.1. **Classification of gross fixed capital formation in health systems by type of asset**

HK.1.1.1 Infrastructure
HK.1.1.1.1 Residential and non-residential buildings
HK.1.1.1.2 Other structures
HK.1.1.2 Machinery and equipment
HK.1.1.2.1 Medical equipment
HK.1.1.2.2 Transport equipment
HK.1.1.2.3 ICT equipment
HK.1.1.2.4 Machinery and equipment *n.e.c.*
HK.1.1.3 Intellectual property products
HK.1.1.3.1 Computer software and databases
HK.1.1.3.2 Intellectual property products *n.e.c.*

Source: IHAT for SHA 2011.

HK.1.1.1 Infrastructure

Infrastructure in the health care system includes two components: "Residential and non-residential buildings" and "Other structures".

HK.1.1.1.1 Residential and non-residential buildings. Residential and non-residential buildings acquired (less those disposed) by the health care providers are included in this category. Examples include nursing and residential care facilities, hospital settings, ambulatory facilities and so on. Health providers' residential and non-residential buildings are included in the subclasses Multi-dwelling residential buildings (53112 in CPC ver.2.), Commercial buildings (53122) and Other non-residential buildings (53129).

HK.1.1.1.2 Other structures. Other structures include structures other than buildings acquired (less those disposed) by the health care providers, for example, emergency helicopter landing facilities (Airfield runways 53213 in CPC ver.2.), aircraft hangars and so on, whenever they are not incorporated in the building.

HK.1.1.2 Machinery and equipment

Machinery and equipment covers medical equipment, transport equipment, information, communication and telecommunications (ICT) equipment, and other machinery and equipment not elsewhere classified. As explained above, leased machinery and equipment is recorded under capital formation of the health providers in the case of financial leases only (that is, the provider will eventually become the owner of the assets). On the contrary, assets used by health care providers under operational lease are not recorded as capital formation of the user, as the ownership of the assets is the guiding principle for inclusion or exclusion of the assets. Tools that are relatively inexpensive and purchased at a relatively steady rate, such as hand tools, are considered as intermediate consumption and are therefore excluded from capital formation. Also excluded are machinery and equipment integral to a building.

HK.1.1.2.1 Medical equipment. Medical equipment consists of assets employed for the diagnosis, monitoring or treatment of medical conditions. Examples include: diagnostic equipment (*e.g.* ultrasound and MRI machines, PET and CT scanners, and X-ray machines), therapeutic equipment (*e.g.* infusion pumps, medical lasers and LASIK surgical machines), life support equipment (*e.g.* medical ventilators, heart-lung machines, ECMO and dialysis machines), medical monitors (for example, ECG, EEG, blood pressure) or miniature robots employed to perform complex surgery; laboratory equipment (blood test devices) and hospital-type beds can also be included in this category.

HK.1.1.2.2 Transport equipment. Transport equipment consists of equipment for moving patients, organs and health personnel. Examples include road vehicles (road ambulances, patient transport vehicles, patient transport cars, rapid response cars and cars used by health personnel in the framework of vaccination provision programmes) and air ambulances (either fixed or rotary wing). In a few specific cases this could also include water ambulances (boat) or special rapid-response motorbikes and bicycles in urban areas. Mobile health clinics are also included in this item. In CPC ver.2, the health providers' transport equipment would be classified under the subclasses Motor cars and other motor vehicles principally designed for the transport of persons (49113), Special-purpose motor vehicles *n.e.c.* (49119), Aeroplanes and helicopters (4962) and Other floating structures (49390).

HK.1.1.2.3 ICT equipment. Information, computer and telecommunications (ICT) equipment consists of devices using electronic controls as well as the electronic components incorporated in these devices. In the health system, ICT devices can be used to deliver health care services where distance is a critical factor, such as when health care professionals exchange information for the diagnosis, treatment and prevention of diseases and injuries, for research and evaluation, and for the continuing education of health care providers. In addition, ICT devices can be employed in the administration of health providers. Relevant subclasses of the CPC ver.2 for ICT equipment are: from 4522 to 4525, from 45261 to 45269, 4527, 45281 and 45289.

HK.1.1.2.4 Machinery and equipment not elsewhere classified. Other machinery and equipment not elsewhere classified includes, for example, kitchen equipment used in hospital for the preparation of meals for patients and personnel or closed-circuit television (CCT) used for the security of health care facilities.

Box 11.2. **Difference between gross capital formation (GCF) and intermediate consumption**

Health care providers require an array of goods and services that are used as inputs for the provision of health care services. Some goods and services are entirely used up (*e.g.* electricity, water, fuel, surgical masks, protective wear). Other goods are transformed or incorporated into the final service provided to the users (*e.g.* bandages). Those categories of goods and services whose economic life ends within the accounting period are classified as intermediate consumption. As such they are recorded in the factors of provision (see Chapter 9).

Those goods and services differ significantly from other inputs that are used repeatedly or continuously for more than one year in the production of health services, for example, hospital infrastructure, road ambulances or MRI machines. Only this category is classified as capital formation.

HK.1.1.3 Intellectual property products

Intellectual property products are the result of research, development, investigation or innovation leading to knowledge that the developers can market or use to their own benefit in production, because use of the knowledge is restricted by means of legal or other protection.

Intellectual property products could be produced by health care providers on their own account. Examples of intellectual property products are computer software and databases, and the results of research and development.

HK.1.1.3.1 Computer software and databases. Computer software consists of computer programmes, programme descriptions and supporting materials for both systems and applications software. Databases consist of data files organised in such a way as to permit resource-effective access to and use of the data.

Due to the specific nature of research and development and to the methodological difficulties related to the estimation of this specific item, SHA 2011 does not consider expenditure on R&D as an investment, and it is therefore not included in health capital formation. Health R&D is to be reported separately as a memorandum item. This represents a departure from SNA 2008.

Treatment of specific cases

In general, the bulk of capital goods acquired by health care providers are produced outside the health care sector (either by other sectors of the national economy or abroad). The main exception is the production of specific software. In this case, if the software produced by the health provider is acquired by units that cannot be classified as health care providers, then that production should be seen as secondary non-health production activity and thus outside SHA boundaries. Otherwise, the value of the software will be recorded under the acquiring health care provider.

For practical reasons, it would be advisable to exclude capital formation of Providers of health system administration and financing whenever their activity is embedded in larger units for which health administration is not the predominant activity and/or it would be impossible to identify the capital goods used specifically for health administration. For

example, consider the purchase of a new building by an insurance company that deals with all sorts of personal insurance and not just health insurance. It would be advisable to record the value of the portion of the assets used for the provision of health insurance services only so long as such estimations could be made. A similar principle should be applied to recording the capital formation of health care providers classified under "Other health care providers" (see Chapter 6), as the provision of health services is not the predominant activity. To clarify this point, consider two airline companies: the first company has as its sole activity patient transportation, while the second airline company's main activity is regular and charter passenger transportation, but its secondary activity is transport for medical emergencies and organ transportation. If both companies purchase the same specially-equipped new helicopter to operate the same health services, both acquisitions should be recorded in SHA, regardless of the fact that patient transportation is the main activity in one company and the secondary activity in the other. In other words, the guiding principle for the economic units included under HP.8 is to record the acquisition of those assets used to provide health services only, even if the provision of health services is a secondary activity of the provider.

Immovable assets owned by non-residents

Capital formation by foreign providers (that is, providers included in the rest of the world) is recorded in the accounts of the country of residence of the provider. For example, despite the fact that some French citizens use health services provided by hospitals in Luxembourg, France does not record the acquisition of assets made by the Luxembourg hospitals, as those acquisitions are already recorded in Luxembourg.

Furthermore, by convention, immovable assets such as hospital buildings are considered as belonging to the economic territory regardless of the residence of the owner. If the legal owner (or lessee under a financial lease) of an immovable asset does not qualify as a resident, an artificial statistical unit is specifically created in the economic territory. For example, the building of the American Hospital in Paris is an immovable asset on French economic territory which by convention generates a statistical unit (a SHA health provider) in France, regardless of whether the owner of that building is resident in France or not.

Relatively inexpensive tools

Tools such as medical instruments that are relatively inexpensive and purchased at a steady rate, such as hand tools, may be excluded from gross capital formation and considered as intermediate consumption (*e.g.* stethoscopes, thermometers). In a number of statistical systems a threshold value is set to discriminate between intermediate consumption and capital formation.[7] Although such a strategy would be recommendable for the compilation of SHA too, no threshold value is proposed in this Manual, and its determination is left to national compilers. In the event of the start-up of a new activity, the costs for the acquisition of large quantities of relatively inexpensive tools might be relevant. In such a case this should be recorded as capital formation.[8]

Machinery and equipment integral to buildings

Machinery and equipment integral to buildings is not reported separately from the value of the building itself. For example, if a new hospital is recorded, the value of the lifts installed is normally included in the value of the structure.

Existing fixed assets

Capital goods acquired by a health care provider are not necessarily newly produced. Since assets have a long life, they may change hands but continue to function as fixed assets for their new owners, for example, a hospital that is converted into a hotel, or vice-versa. Thus, when the ownership of an existing fixed asset is transferred, the value of the asset sold, bartered or transferred is recorded as negative gross fixed capital formation by the former owner and as positive gross fixed capital formation by the new owner. The value of the positive gross fixed capital formation recorded for the purchaser usually exceeds the value of the negative gross fixed capital formation recorded for the seller by the value of the costs of ownership transfer incurred by the purchaser (*e.g.* taxes). Generally speaking, two cases can be distinguished which are relevant:

- Both units exchanging the assets belong to the health care system. Consider, for example, the case of a hospital sold by a municipality to the central government. In this case, a negative entry would be recorded under the health care provider selling the asset (the municipality); and an equivalent value would be recorded as a positive entry for the provider purchasing the hospital (the central government). The purchasing provider will also register an additional entry to account for the costs of ownership (e.g. taxes occasioned by the change of ownership of the item) incurred in the purchasing process. As a consequence, the overall value of gross capital formation for the whole health sector increases only by the costs of ownership, as the sum of the positive and negative entries mentioned above is null.
- One of the units belongs to the rest of the economy or the rest of the world: the value of the asset acquired or disposed of by the health care provider will be recorded as above. However, the value of overall gross capital formation for the health sector increases or decreases by the same amount. It is worth noting that, in the case of immovable assets (i.e. buildings), sold by a resident unit to a unit resident abroad, by convention a new statistical unit is created in the economic territory where the immovable asset is located – in order to represent the foreign unit.

Improvements to existing fixed assets

Health care facilities have service lives of up to 50 years or more. However, in order to maintain a fixed asset in working order or to increase its performance or productive capacity, renovations and refurbishments are often required. Depending on their nature, some of the expenditure on these can be considered as ordinary maintenance and therefore recorded as intermediate consumption, while other expenditure could be recorded as gross fixed capital formation. Drawing the distinction between ordinary maintenance and capital formation is not clear-cut. Ordinary maintenance and repairs can be identified by two features:

- They are activities that must be undertaken regularly in order to maintain a fixed asset in working order over its expected service life. The owner or user of the asset has no choice about whether or not to undertake ordinary maintenance and repairs if the asset in question is to continue to be used in production.
- Ordinary maintenance and repairs do not change the fixed asset's performance, productive capacity or expected service life. They simply maintain it in good working order, if necessary by replacing defective parts by new parts of the same kind.

Box 11.3. **Owners and users of fixed assets**

Every asset has both an owner and a user, though in many cases the two roles coincide. The **owner** is the economic unit that has property of the asset in law, whereas the **user** is the unit with the right to use the asset in its production process although the asset legally remains the property of the owner. The distinction is relevant when assets are leased or rented. For example, a helicopter air-ambulance could be owned by a financial corporation that leases it to a health care provider who uses it in rescue operations. The distinction is important, as it implies the inclusion or exclusion of the assets from the System of Health Accounts.

Two types of leasing are usually identified: operating leasing and financial leasing.

In *operating leasing* the lessee (user) acquires the right to use the asset for a certain period of time, which is not necessarily defined in advance. To acquire the right to use the asset the lessee pays a rental to the lessor (owner). The rental needs to be large enough to cover *i)* any direct costs incurred by the owner, including the costs of maintaining the asset, *ii)* any reduction in the value of the asset over that period, and *iii)* the interest costs on the value of the asset at the start of the period. The leasing period normally does not cover the whole economic lifetime of the asset. During the leasing period it is the responsibility of the lessor (owner) to provide any necessary repair and maintenance of the asset. When the leasing period expires, the asset is returned to the lessor (owner) in the same condition as when it was hired, apart from normal wear and tear. The lessor is then likely to hire out the asset to another lessee or to use it otherwise. The asset is recorded in the lessor's balance sheet during its entire economic life. In this case, the asset is recorded as gross fixed capital formation of the lessor.

The second type of leasing is *financial leasing***.** In this form of contract, the lessee acquires the right to use the asset in exchange for rental payments over a predetermined and protracted term. However, in this case the leasing period covers all, or most of, the economic lifetime of the asset. At the end of the leasing period the lessee often has the option to buy the asset. All risks and rewards of ownership are, de facto though not de jure, transferred from lessor to lessee. In particular it is the responsibility of the lessee (user) to carry out any necessary repair and maintenance of the asset. In this case, when acquired, the asset is recorded as gross fixed capital formation of the lessee.

In the SNA, a distinction is made between the concepts of legal and economic ownership. The legal owner of an asset is the institutional unit entitled in law, on grounds that can be legally sustained, to claim the benefits associated with the asset. By contrast, the economic owner of assets is the institutional unit entitled to claim the benefits associated with the use of the asset in question in the course of an economic activity by virtue of accepting the associated risks. Therefore, in the SNA, the economic property is transferred from the lessor to the lessee in the case of financial leasing but not in operating leasing. Some confusion might arise about the meaning of the term user: some authors see the renting activity of the lessor as usage of the asset and therefore employ the term "user" to identify the lessor. In this context, the term user identifies exclusively the economic unit using the assets in its production process (the lessee).

To constitute gross fixed capital formation, improvements to existing fixed assets must produce significant changes in some of the characteristics of existing fixed assets. The following criteria should be met:

- The decision to renovate, reconstruct or enlarge a fixed asset is a deliberate investment decision that may be taken any time, even when the good in question is in good working order and not in need of repair.

- Major renovations, reconstructions or enlargements increase the performance or productive capacity of existing fixed assets, or significantly extend their previously expected service lives, or both.

Box 11.4. **Cost of use, maintenance, consumption and return to capital**

The full cost of using a fixed asset in production can be measured by the cost of renting the asset. The rental can be either actual, if the asset is rented, or imputed, if the asset is owned by the user (see SNA 2008, 6.245). The rental (actual or imputed) needs to be large enough to cover:

- Any direct costs incurred by the owner, including the costs of maintaining the asset;
- The capital services rendered by the asset, which in turn include two categories:
  - The consumption of fixed capital: the decline, during the course of the accounting period, in the current value of the fixed assets as a result of physical deterioration, normal obsolescence or normal accidental damage:
  - The return to fixed capital: the interest costs on the value of the asset at the start of the period. The interest costs may consist either of actual interest paid on borrowed funds or the loss of interest incurred as a result of investing own funds in the purchase of the fixed asset instead of a financial asset.

Therefore the cost of use of the capital asset is larger than the consumption of fixed capital alone.

Note: The actual rental is the amount payable by the user of a fixed asset to its owner, under an operating lease or similar contract, for the right to use that asset in production for a specified period of time. When the asset is actually rented under an operating lease or similar contract, the rental is recorded under intermediate consumption as the purchase of a service produced by the lessor.

Costs incurred on acquisition and disposal of assets

Purchasing a fixed asset often involves the use of lawyers or the payment of taxes. Highly complex machinery might require significant costs associated with delivery and installation that were not included in the purchase price. All the costs associated with acquiring and disposing of assets are considered as costs of ownership transfer and also treated as gross fixed capital formation.

Financial leases

A financial lease (also called capital lease) is a contract between two parties: the lessee (in this case, the health care provider) and the lessor (for example, a finance company or a bank). The terms of the lease are such that the lessor (*e.g.* finance company or bank) purchases the assets (such as an MRI machine) and therefore is legally the owner, but the lessee takes over both the economic risks and rewards of using the asset in production. In return, the lessee pays a series of rentals or instalments for the use of that asset. Rentals paid by the lessee cover a large part or all of the cost of the asset incurred by the lessor plus a mark-up. At the end of the duration of the lease, the lessee has the option to acquire ownership of the asset (for example, paying the last rental, or bargain option purchase price). The lessee becomes the economic owner of the asset even if the lessor remains the legal owner. In SHA, the asset (*e.g.* the MRI machine) is recorded as being acquired by the

lessee (*e.g.* a hospital). This means that the value of the asset is recorded as capital formation of the lessee at the beginning of the lease. The payments due under the lease arrangement are treated as if they were repayments of the principal of a loan, of the interest and possibly of the service charge. Therefore the payments are not recorded in the capital account.

Assets produced by public-private partnerships or similar arrangements

The term public–private partnership includes a wide variety of different forms and schemes. In the health system, the term public–private partnership often refers to a concession contract. A concession awards a company full responsibility for the delivery of services from an asset, including the operational activities, although in health care this does not usually include clinical services. A typical public–private partnership example in the health system would be a hospital building financed and constructed by a private developer and then leased to the hospital authority. The private developer then acts as landlord, providing housekeeping and other non-medical services, while the hospital itself provides clinical services. Similar schemes are the private finance initiative (PFI) or the Build, Own, Operate, Transfer (BOOT) scheme, originally used in the United Kingdom and now also adopted in some other countries. Another form of public–private partnership is so-called "energy performance contracting (EPC)". The EPC is an arrangement whereby a company is contracted by a health provider to upgrade existing energy equipment (such as heating boilers and lighting systems) with more efficient and technologically advanced devices. The contracted company finances the modernising of equipment, which then becomes the property of the health care providers. The savings in energy bills resulting from the more efficient equipment are shared between the health care provider and the company under the terms of the agreement.[9] Under such schemes it is not always straightforward to establish which unit is the legal owner of the asset during the contract period. This is currently the subject of a wider accounting debate, with experts trying to identify the best possible solution to record those assets. While waiting for a conclusion, a possible temporary solution for SHA 2011 is proposed, *i.e.* that one of the following conditions should be met:

- If the owner qualifies as a health provider the asset is recorded in SHA;
- If the acquisition of the asset can be interpreted as a form of financial lease made by a health provider and then can be treated as such, the whole value of the asset is recorded at the beginning of the contract period.

Changes in inventories and acquisitions less disposals of valuables

Although gross fixed capital formation constitutes the most important component of capital formation in health systems, the two additional components making up the aggregate gross capital formation should also be considered: namely, change in inventories and acquisitions less disposals of valuables.

Changes in inventories

Changes in inventories are measured by the value of the entries into inventories less the value of withdrawals and less the value of any recurrent losses of goods held in inventories during the accounting period.

Inventories are produced assets that came into existence in the accounting period or in an earlier period, and that are held by health providers for sale, use in production or

other use at a later date. For practical reasons, we would recommend that in SHA 2011 only expenditure on inventories of considerable value be considered, such as the storage of medical goods and equipment to be used in the event of a catastrophic occurrence. Change in inventories of health care providers for their ordinary activities (*e.g.* the value of pharmaceuticals stored in hospitals) can be ignored, assuming for simplicity that the value at the beginning of the accounting period equals the value at the end of the same period.

Work-in-progress

Work-in-progress consists of output produced by an enterprise that is not yet sufficiently processed to be in a state in which it is normally supplied to other institutional units. Work-in-progress is recorded under inventories for any output that is not complete at the end of the accounting period. The only exceptions to recording incomplete work as work-in-progress are for partially completed projects for which the ultimate owner is deemed to have taken ownership, either because the production is for own use or as evidenced by the existence of a contract of sale or purchase. Consider for example the construction of a hospital, which may take years to complete: if the ultimate owner is deemed to have taken ownership, then the partial value of the asset will be recorded as capital formation rather than change in inventories.

Acquisitions less disposals of valuables

Valuables are produced goods of considerable value (for example, works of art) usually held as a store of value over time. Whilst artwork is not a central element in the provision of healthcare services, they have been acquired by some health care providers, as they seem to have an impact in the treatment of certain conditions or pathologies.

In some countries (such as the United Kingdom), art work is increasingly being displayed in long-term care facilities for older people as well as in settings dealing with physically disabled young people, mental health and outpatients, rheumatology patients, renal dialysis patients and those in need of palliative care.

Different approaches to the estimation of gross capital formation

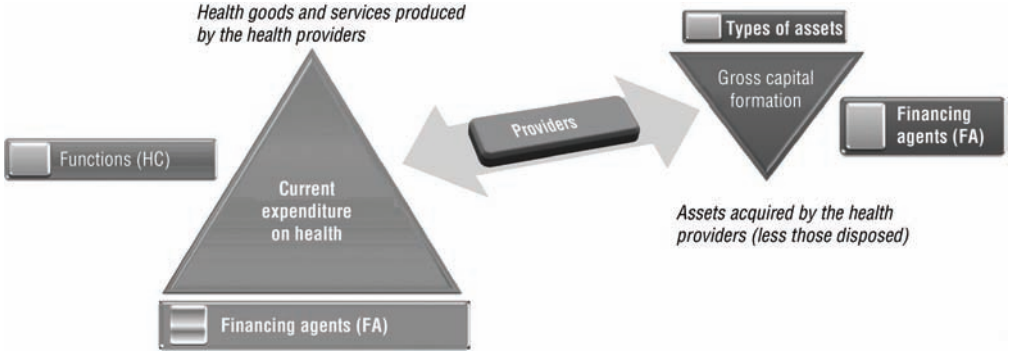
Three perspectives on the analysis of capital formation in health

As current health expenditure can be analysed from at least three view-points (functions, financing and provision), capital formation can also be analysed from at least three perspectives (see Figure 11.1): the providers who acquire the capital goods, the financing agents who fund the acquisition of the assets and the type of assets (for example, machinery, medical equipment, buildings, transport equipment).

However, the following differences are of note:

- As mentioned above, when dealing with current health expenditure, health care providers represent the supply side; when capital formation is analysed, they represent the demand side.
- The boundaries of current health expenditure and those of capital formation aggregates are different, in that the products included in one aggregate are not included in the other.
- The products included in current health expenditure are classified using the functional classification of the health care goods and services consumed by the resident

Figure 11.1. **Current health expenditure and gross capital formation in SHA**



Source: IHAT for SHA 2011.

population, while it is more relevant to classify capital goods by type of assets (see Table 11.1).

- The agents financing current health expenditure do not necessarily finance capital formation, and vice-versa. Some might, but not all of them. Consider, for example, the case of European Union (EU) Structural Funds, which can provide grants for the purchase of capital goods (such as the building of a new hospital) but are not used for current health expenditure. The most important difference is that health care providers can fund the purchase of capital goods using their own resources (*i.e.* savings). Depending on the institutional setting in place in each country, savings could be a source of funding for capital formation both for private and public providers. Consider, for example, the case of those countries where health services provided to households are paid by the financing agent through a product-based price system that reimburses both current and capital expenditure incurred by providers, and then it is up to the provider to save a part of the income received to then purchase the capital goods. The consequence is that health care providers will then also appear among the financing agents whenever a part or all of the value of the capital goods and services they have purchased is funded out of savings. In that case, providers would be included under corporations or non-profit institutions serving households (NPISH), depending on their status.
- Finally, households might play a role in funding capital formation through donations, as might the Rest of the economy and the rest of the world, which can fund the acquisition of non-financial assets through capital transfers either in cash or in kind.

Estimation

Different approaches can be used to estimate the value of gross capital formation. In principle, each of the three main dimensions mentioned above (financing agent, provider and type of assets) can represent a valid starting point to estimate capital formation. Among OECD countries currently reporting capital formation, the majority seem to rely essentially on information coming from the financing agents. A few countries have direct access to providers' annual accounts from which they can retrieve the value of capital formation acquired in the accounting period. As the "type of assets" is a new categorisation, it remains to be seen whether countries have access to sources (*e.g.* national registries) that could be used to estimate capital formation.

Depending on the institutional setting in place in each country, and consequently on the way data sources are organised, a blend of the three approaches could be employed to estimate the value of capital formation or its components. However, each approach has its strengths and weaknesses. The following paragraph briefly describes the three approaches and highlights some of their limitations.

- The *financing agent* approach relies essentially on the information on capital transfers made by the financing agents to the providers (*e.g.* capital grants awarded by public bodies to health care providers, the EU structural funds). The main shortcoming of this approach is that while the estimation of capital formation refers to the total value of the goods and services acquired in the accounting period, capital transfers may represent only a part of the value of the assets. This can occur whenever the transfer is just one of many instalments made over several accounting periods by the financing agent. In addition, this approach is limited in that it provides no information about the providers receiving the funds and, most importantly, is unable to detect the "savings" made by the providers nor the donations providers receive from households, NPISH and corporations. Often countries employing this approach alone confront difficulties in reporting capital formation for the private sector.
- The *provider* approach aims at estimating gross capital formation using the providers' balance sheet for successive accounting periods. In practice this method consists of taking the "Book value" of "fixed assets" reported in the balance sheet at the end of the reference period t, and subtracting the corresponding "Book value" of "fixed assets" reported in the balance sheet at the end of the period t-1. The difference between the two should equal the actual amount paid for the acquisitions, less disposals, of fixed assets during the accounting period. Similarly, the change in inventories can be estimated by subtracting the values for "Stocks and work in progress" also reported in the accounts of the providers. The main shortcoming of this approach is that it provides no information about financing agents.
- The *type of assets* approach uses direct data on the value of the fixed assets purchased by providers (*e.g.* using information from the commodity flow method[10]). As some of the capital assets are registered in public registers (*e.g.* building, transport means), the latter can represent an additional source of information. However, this approach, like the previous one, provides no information on financing agents.

To conclude, as none of the three approaches can be regarded as the "perfect" approach, a blend of the three methods (sometimes called "integration of sources") would appear to be the best option. The national availability of data will determine the extent to which one method should be preferred for the estimation of the different components of gross capital formation.

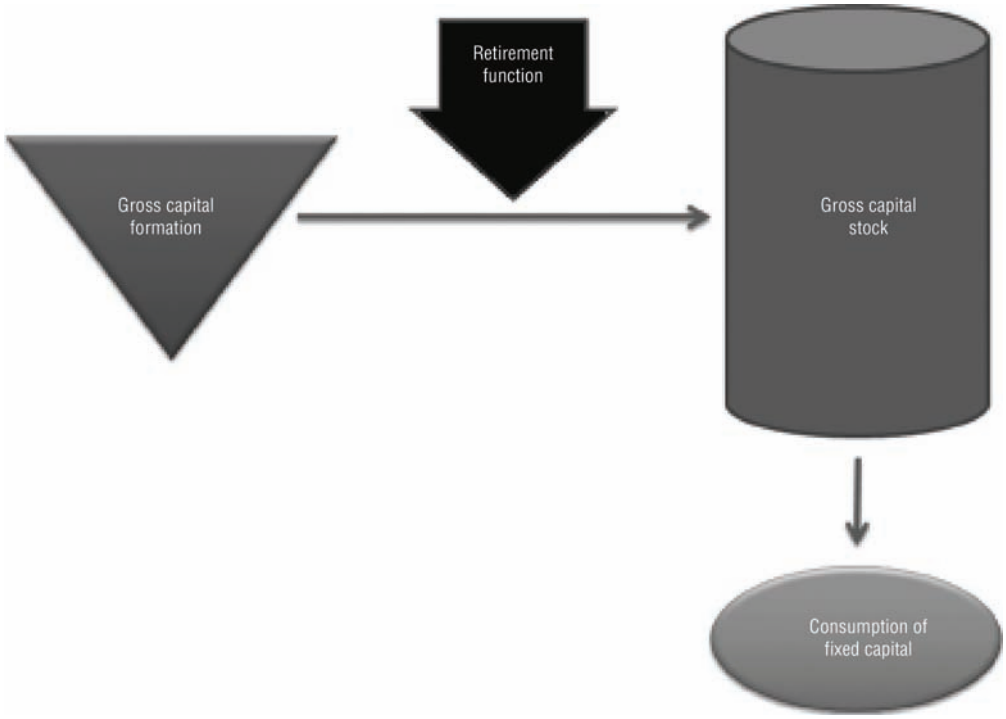
The consumption of fixed capital in SHA

The consumption of fixed capital is an essential variable in SHA. As shown in Chapter 3, the estimation of consumption of fixed capital is required to value the non-market services produced by government units and NPISH. In the absence of economically significant prices, non-market services are valued by the sum of the costs incurred in their production: that is, by the sum of intermediate consumption, compensation of employees, taxes (less subsidies) on production, and the consumption of capital. Hence, the omission of the consumption of fixed capital in countries where non-market services represent an

extensive component of the health provision can result in a serious under-estimation of overall health expenditure.

The consumption of fixed capital is defined as the decline, during the accounting period, in the current value of the stock of fixed assets owned by health care providers. The consumption of fixed capital is the result of physical deterioration, normal obsolescence or normal accidental damage. It is sometimes also called capital consumption.

Figure 11.2. **Consumption of fixed capital in SHA**



Source: IHAT for SHA 2011.

To derive a measure of the consumption of fixed capital (see Figure 11.2), it is necessary to know the current value of health care providers' gross capital stock. The gross capital stock is basically estimated by cumulating gross fixed capital formation (GFCF) year by year and deducting retirements.[11]

Retirements, in turn, are calculated by applying a retirement function[12] to the gross capital formation flows. As various types of capital assets have different service lives (for example, buildings are likely to last longer than transport equipment), to apply specific retirement functions it would be advisable to identify cohorts of assets of similar ages and cluster them by type of asset.

Finally, to calculate the consumption of fixed capital, a pattern of decline in value over time (an age-price profile) is applied to the capital stock (for a complete overview, see the OECD 2009 "Measuring capital" and SNA 2008).

Capital account

Besides information on how much has been spent to acquire the health capital assets, it can be of interest to policy makers and stakeholders to know which financing

mechanisms have been used to cover the capital costs. For example, it could be of interest to know whether the construction of a new hospital has been funded out of transfers from government or through public-private partnerships, as well as the extent to which the costs were covered with donations from philanthropic organisations, households, or from abroad, or indeed whether providers' own accumulated resources have been used. In other words, it could be of interest to explicitly record all the transactions underlying the acquisitions of the assets (*e.g.* capital transfers, grants, capital transfers in kind). Such information can be recorded in the capital account (see Table 11.2), which reports the transactions to acquire and dispose of the non-financial assets and shows the change in net worth due to savings and capital transfers as a balancing item.

The top part of the capital account reports the value of gross capital formation, possibly broken down by type of assets, plus the acquisition (less disposals) of non-produced non-financial assets (*e.g.* land[13] acquired to build health structures). The sum of the latter two components is called the "Change in assets". The acquisitions (purchases, barters or production for own use) are reported as positive entries, while the resources coming from the disposal of existing assets are registered as negative entries in the same side of the account. Consumption of fixed capital is also recorded, as a negative change in assets in the top part of the capital account, to calculate the net change in non-financial assets (acquisitions less disposals of produced and non-produced non-financial assets, less the consumption of fixed capital).

The bottom part of the capital account reports the "Changes in liabilities and net worth". This aggregate represents the amount available to the providers for the acquisition of non-financial and financial assets. The amount, which could be positive or negative, results from the sum of two components: net savings and capital transfers.

Net savings

Net savings is the first item recorded on the bottom part of the capital account and could be either positive or negative. When positive, it means that during the accounting period income available to health providers exceeded expenditure for recurrent costs. The excess income is then necessarily used to acquire either non-financial or financial assets, including cash, or to repay liabilities. Negative net savings represents the amount by which expenditure on recurrent costs has gone beyond disposable income. That amount needs to be financed by disposing of assets or incurring new liabilities.

Capital transfers

A transfer is defined as a transaction in which one institutional unit provides a good, service or asset to another unit without receiving any direct counterpart from the latter. Transfers may be either current or capital. Wherever required, a breakdown by financing agents can be employed to break down capital transfers received by health care providers. To be considered as capital, a transfer needs to meet at least one of the following two conditions:

- The party receiving the transfer is obliged to acquire an asset (other than cash);
- The party making the transfer realises the funds involved by disposing of an asset (other than cash or inventories), relinquishing a financial claim (other than accounts receivable).

Transfers may take place in cash or in kind. A capital transfer in kind necessarily concerns the change of ownership of a product previously recorded as a non-financial asset in the accounts of the donor.

Investment grants

Investment grants are of particular importance in the health sector. These consist of capital transfers made to health care providers to finance all or part of the costs of the acquisition of their assets. The health care providers receiving the grants are obliged to use them for the purpose of gross fixed capital formation (often represented by specific investment projects, such as the construction of hospitals). If the investment project continues over a long period of time, investment grants in cash may be paid in instalments. Payments of instalments continue to be classified as capital transfers even though they may be recorded in a succession of different accounting periods.

For example, the US Hill-Burton Programme awarded hospitals, nursing homes and other health facilities grants for construction and modernisation (between 1946 and 1997). Similarly, NHS trusts can allocate grants to fund completely, or in significant proportions, the refurbishment of hospitals, hospices, medical practices and so on. The Scottish Dental Access Initiative makes grants of up to GBP 100 000 to establish a new NHS dental practice or to purchase or relocate an existing NHS dental practice.

Investment grants may also be made in kind, for example, transfers of transport equipment like ambulances, machinery and other health equipment made to health care providers. Investment grants in kind may also include the direct provision of buildings.

Other capital transfers

The item "All other capital transfers" includes all other funds received by health care providers to finance the acquisition of assets. Of particular importance are the donations received from households, enterprises and NPISH. For example, philanthropists and religious groups can play a major role in financing capital in some countries.

Net lending/borrowing

The difference between "Change in assets" and "Changes in liabilities and net worth" is the "Net lending (+)/net borrowing (–)" which represents how much can be lent or needs to be borrowed.

Memorandum items: loans, accumulated savings and public-private partnerships

Other financing methods available to health providers include loans, accumulated savings and public-private partnerships, which are separately recorded as memorandum items, as they differ in nature from the financing mechanisms mentioned above. Loans and accumulated savings in fact imply that savings were either put aside in the past (accumulated savings) or will be realised in the future to repay the loans (principal plus interest and expenses). As the implementation of a full financing account is beyond the scope of SHA 2011, those transactions are reported below the capital account in the form of memorandum items.

Loans

Loans to health care providers are recorded as memorandum items of the capital accounts. The category includes all the funds (*i.e.* overdrafts, instalment loans, hire-

Table 11.2. **Capital account**

SHA Capital account					Health care providers								
					HP.1	HP.2	HP.3	HP.4	HP.5	HP.6	HP.7	HP.8	**Total**
					Hospitals	Residential long-term care facilities	Providers of ambulatory health care	Providers of ancillary services	Retailers and other providers of medical goods	Providers of preventive care	Providers of health care system administration and financing	Rest of economy	
Changes in assets (Acquisitions less disposals)	**HK.1 Gross capital formation**												
	HK.1.1 Gross fixed capital formation												
	HK.1.1.1 Infrastructure												
	HK.1.1.1.1 Residential and non-residential buildings												
	HK.1.1.1.2 Other structures												
	HK.1.1.2 Machinery and equipment												
	HK.1.1.2.1 Medical equipment												
	HK.1.1.2.2 Transport equipment												
	HK.1.1.2.3 ICT equipment												
	HK.1.1.2.4 Machinery and equipment *n.e.c.*												
	HK.1.1.3 Intellectual property products												
	HK.1.1.3.1 Computer software and databases												
	HK.1.1.3.2 Intellectual property products *n.e.c.*												
	HK.1.2 Changes in inventories												
	HK.1.3 Acquisitions less disposals of valuables												
	HK.1.1.c Consumption of fixed capital												
	HK.1.1.n Net capital formation												
	HK.2 Non-produced non-financial assets												
	HK.2.1 Land												
	HK.2.2 Other non-produced non-financial assets												
Changes in net worth	HKF.1 Saving, net												
	HKF.2 Capital transfers	HKF.2r Receivable	HKF. 2.1 Investment grants from:	FA.1									
				FA.2									
				….									
				FA.6									
			HKF.2.2 Other capital transfers										
		HKF.2p Payable											
Net lending (+) /net borrowing (–)													
	Memorandum Items												
	HKR.1 Loans												
	HKR.2 Accumulated savings												
	HKR.3 Public-private partnership												
	HKR.4 Research and development in health (Funded by)			FA.1									
				FA.2									
				….									
				FA.6									
				Total									
	HKR.5 Education and training of health personnel (Funded by)			FA.1									
				FA.2									
				….									
				FA.6									
				Total									

Source: IHAT for SHA 2011.

purchase credit and loans to finance trade credit) lent by creditors to health care providers to purchase non-financial assets (they must be evidenced by documents that are not negotiable).

Accumulated savings

"Accumulated savings" refers to the sum of savings that have been put aside over past accounting periods.

Public-private partnerships

Although the whole value of assets acquired by health providers through public-private partnerships is included in the capital account together with all other assets acquired (less disposed) by health care providers, it may be of interest to policy makers and stakeholders to know the extent to which investment in the health system has been financed using public-private partnership mechanisms. Therefore, a memorandum item is included below the line in the capital account to separately record the value of the assets that have been acquired by health care providers using public-private partnership programmes.

Other memorandum items

In SHA 2011, expenditure on "Research and development in health" and "Education and training of health personnel" are considered as investments and as such are recorded as additional memorandum items to the capital account. In SHA 1.0 these items were included as health care-related expenditure under the functional classification (HC.R.3 and HC.R.2 respectively).

The approach used in SHA 2011 diverges from SNA 2008 where R&D is included in the capital account while "Education and training of health personnel" is regarded as an input in the production process of health care providers and thus recorded as intermediate consumption. The exclusion of R&D from the capital account in SHA is guided exclusively by practical considerations. At the time of the preparation of SHA 2011, information on R&D in the health systems was available only for a few countries, so its inclusion would likely impair international comparability of the data. The health policy relevance of expenditure on "Education and training of health personnel" has instead guided the need to report this item separately from other production inputs (see Chapter 9).

Explanatory notes for tackling the boundary problems arising from health-related functions are given below.

Research and development in health

The *Frascati Manual* (OECD, 2002a) provides detailed guidelines for the estimation of expenditure on research and development, which are also deemed appropriate for R&D in health according to the functional boundaries described in Chapter 5. Where R&D is an ancillary activity in medical industries that cannot be assigned to a separate institutional unit of homogeneous production, a serious double-counting problem arises from the definition of national totals on expenditure in health accounting that adds R&D to health care goods and services.

A major innovation introduced in the 2008 edition of the SNA is the capitalisation of research and development. Although there seems to be a wide consensus on the

theoretical motivation guiding this choice, the practical implementation of reporting that aggregate remains an issue for a number of countries.

Therefore, SHA 2011 has opted to suggest a pragmatic approach that keeps a separate recording of expenditure on R&D as a memorandum item "below the line", without capitalising expenditure on health R&D.

Explanatory notes

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 A4). 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.

This item defines R&D in health as follows:

"*R&D programmes directed towards the protection and improvement of human health. It includes R&D on food hygiene and nutrition and also R&D on radiation used for medical purposes, biochemical engineering, medical information, rationalisation of treatment and pharmacology (including testing medicines and breeding of laboratory animals for scientific purposes) as well as research relating to epidemiology, prevention of industrial diseases and drug addiction.*" (OECD, 1994, *Frascati Manual*, p. 122)

Note: Government involvement in health R&D is classified in the COFOG (UN, 1999) as part of the health function (COFOG, 07.5 R&D Health).

The *Frascati Manual* (OECD, 1994) provides detailed definitions of R&D in business and government activities, including non-profit institutions and institutions of higher education. The *Frascati Manual* is the joint product of national experts on R&D in OECD Member countries, the OECD Secretariat and other international organisations. These guidelines are consistent with UNESCO recommendations.

The *Frascati Manual* discusses boundary problems between R&D, education, health care and other industries. It provides guidelines for standard reporting in these and other fields and draws the boundary line that distinguishes the field from health care and from the education and training of health personnel.

The *Frascati Manual* provides a basic definition of R&D:

"*Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications. R&D covers three distinct activities: basic research, applied research and experimental development. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience that is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.*" (OECD, 1994, *Frascati Manual*, p. 29)

The basic criterion for distinguishing R&D from related activities is "the presence in R&D of an appreciable element of novelty and the resolution of scientific and/or

technological uncertainty, *i.e.* when the solution to a problem is not readily apparent to someone familiar with the basic stock of commonly used knowledge and techniques in the area concerned." "... In the field of medicine, routine autopsy on the causes of death is simply the practice of health care and not R&D; special investigation of a particular mortality in order to establish the side effects of certain cancer treatments is R&D. Similarly, routine tests, such as blood and bacteriological tests carried out for doctors are not R&D but a special programme of blood tests in connection with the introduction of a new drug is R&D." (OECD, 1994, p. 33)

The following recommendation regarding the borderline between specialised health care and R&D from the *Frascati Manual* on R&D statistics should be adopted for the collection of health care statistics: "In university hospitals where, in addition to the primary activity of health care, the training of medical students is of major importance, the activities of teaching, R&D and advanced as well as routine health care are frequently very closely linked". "Specialised health care" is an activity which normally is to be excluded from R&D. However, there may be an element of R&D in what is usually called "advanced health care", carried out, for example, in university hospitals. It is difficult for university doctors and their assistants to define that part of their overall activities which is exclusively R&D. If, however, time and money spent on routine health care are included in the R&D statistics, there will be an over-estimate of R&D resources in the medical sciences. Usually such advanced health care is not considered R&D and all health care not directly linked to a specific R&D project should be excluded from the R&D statistics" (OECD, 1994, p. 37). R&D in health, when measured according to the rules of the *Frascati Manual*, excludes outlays by pharmaceutical firms, shown separately. For data collection on R&D, international standards exist. More details on data collection and international standards for reporting in R&D are documented in the *Frascati Manual*. Activities of R&D in health care should exclude all education and training of health personnel in universities and special institutions of higher and postsecondary education. However, research by postgraduate students carried out at universities and university hospitals in medical sciences should be counted, wherever possible, as part of R&D in health care. R&D outlays by pharmaceutical firms have to be distinguished from other related scientific and technological activities (OECD, 1994, pp. 30-33), such as, for example, patent and licence work.

Education and training of health personnel

Estimation strategies for expenditure on the education and training of health personnel in general are provided in the UNESCO/OECD/Eurostat (1995) guidelines. For education and training, similar problems of double-counting are encountered whenever national totals of expenditure on health are calculated that include education and training. A separate reporting constitutes an adequate way of handling the question.

Explanatory notes

This item comprises government and private provision of education and training of health personnel, including the administration, inspection or support of institutions providing education and training of health personnel. This corresponds to post-secondary and tertiary education in the field of health (according to ISCED-97 code) run by central and local government, and private institutions such as nursing schools run by private hospitals.

Note: If properly accounted for, the education and training of health personnel is not an overlapping function between health and education. In teaching hospitals, for example,

it would be desirable to have separate budgets for care provision, R&D and training. Where detailed accounts are missing, an alternative option would be the statistical practice designed for UNESCO/OECD/Eurostat data collections on education and training (UNESCO/OECD/Eurostat, 1995).

The education and training of health personnel takes place mainly at ISCED-levels 5 (non-university degree tertiary level) to 7 (university tertiary level of education, leading to a second or further university degree or equivalent). The following institutions are involved:

- Paramedical schools (ISCED 5);
- Undergraduate schools, in medical/paramedical departments (ISCED 6);
- Graduate schools, in medical/biomedical departments (ISCED 7).

In the list of fields of study (at the tertiary level of education) provided by the ISCED Manual (UNESCO, 1996), medical education and training corresponds to the category Medical science and health-related (ISCED code 50). The ISCED Manual, furthermore, has a category Health-related auxiliary programmes (ISCED 50) at the upper secondary level of education for vocational and technical programmes. Complete costs would include expenditure for universities and other training institutions. Salaries of medical interns and residents or trainee nurses are reported under expenditure on health, for the services rendered. Training expenditure is also reported in the educational accounts. The intent of this SHA category is to include expenditure for the training of personnel already operational in the patient care. The following recommendation for university hospitals is taken from the UNESCO/OECD/Eurostat Manual: "Expenditure of or for teaching hospitals (sometimes referred to as academic hospitals or university hospitals) should not be included in education expenditure, except to the limited extent that they are directly and specifically related to the training of medical personnel. In particular, all costs of patient care other than general expenses of academic hospitals should be excluded from the education figures, even if the education authorities must pay such expenses. Expenditure for research in academic hospitals should also be excluded, except that no attempt should be made to distinguish between the research and non-research portions of the time of teaching staff whose compensation is otherwise considered part of education expenditure" (UNESCO/OECD/Eurostat, 1995).

Notes

1. The term "gross" indicates that the loss of value due to use or obsolescence is not taken into account. A more refined measure called "net" capital formation can be obtained by subtracting the value of capital consumption from Gross capital formation.
2. An exception to the principle of legal ownership is represented by financial leasing. In that case, the value of the capital goods is recorded as capital formation of the lessee at the beginning of the leasing period, although the lessee could became the legal owner of the asset only at the end of the leasing period (see Box 11.3).
3. For example, if a hospital in Luxembourg acquires diagnostic equipment that is used to provide diagnosis to patients from France, Belgium or Germany, the acquisition of the assets is recorded in Luxembourg only.
4. By convention, all infrastructures within the economic territory are owned by the resident unit regardless of whether the economic owner (or lessee under a financial lease) is resident abroad. For example, if the construction of a new building (*e.g.* a new hospital) is completely funded by transfers from abroad, a resident health provider is automatically established in the economic territory for statistical purposes.

5. The availability of the MRI machine is important information that can be recorded in health on-expenditure statistics.

6. When the transfer occurs, the value of the asset originally attributed to the local government is cancelled from the local government accounts by a negative capital transfer in kind made to the government unit (and registered as a positive entry in its account).

7. ESA95 suggests using a threshold to discriminate between capital formation and intermediate consumption (see ESA95 10.9). Therefore, tools and appliances are recorded as fixed capital formation if their purchaser's expenditure exceeds EUR 500 (at 1995 prices) per item (or, when bought in quantities, for the total amount bought). If their value does not exceed the threshold, they are recorded as intermediate consumption.

   Another example is the thresholds set by the Scottish Government for the Scottish NHS reporting. The Scottish Executive adopted a GBP 5 000 capitalisation threshold for individual assets, although assets of lesser value may be capitalised if they form part of a group, with a group value in excess of GBP 20 000, including VAT where this is not recoverable (SEHD, 2008).

8. For example, the glasses used in laboratories are regarded as small, inexpensive tools and are therefore usually recorded as intermediate consumption even if they are used repeatedly, or continuously, in production over many years. However, if glasses are purchased in quantity, say at the start-up, the total value of the acquisition is recorded as capital formation.

9. The upgrade of the central heating system in the Bulovka Teaching Hospital in Prague is an example of "energy performance contracting" (EPC).

10. The term "commodity flow method" refers to the compilation of goods and services accounts for detailed product groups. The method relies on the accounting identity Supply=demand (Uses) which can be further broken down:

    Output + Import = Intermediate cons. + Final consumption + Gross capital formation + Export.

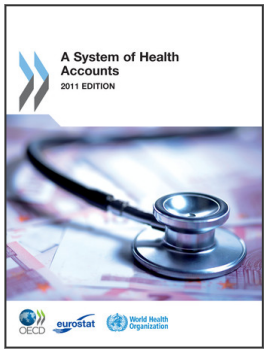
    Using the above equation, all goods and services are traced from different sources of supply to different categories of use. If a component in the equation has no data but the other components do, the unknown data can be derived through this equation. For example, if the value of the MRI machine acquired in the accounting period is unknown but data on the value of the MRI produced is known as well as the value of those imported and exported, it is possible to estimate the missing information as:

    Gross capital formation in MRI= MRI produced (output) + MRI imported – MRI exported.

11. Retirement refers to the removal of an asset from the capital stock, when the asset is exported, sold for scrap, dismantled, pulled down or simply abandoned.

12. The retirement function expresses the probability that an asset is removed during its life length.

13. There are at least two reasons to treat land differently from other assets that are owned by the health providers and included in gross fixed capital formation. Firstly, land is not the outcome of a production process. Secondly, land is not usually "used up" in the production process, and therefore capital consumption is not accounted for land. An exception is contaminated land, in which case the loss in its value should be considered.



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