

Appendices

Appendix 1: Concepts and Definitions

Bioavailability

Bioavailability is how well a drug will reach an effective therapeutic level in the body, and may be influenced by various factors. A drug may be safe and effective, but never reach an effective level in the body if bioavailability is poor.

Burden of disease

A widely used concept based on a statistical measurement (Disability-Adjusted Life Years – see DALYs below) of the gap between current health status and an ideal situation where everyone lives into old age free of disease and disability. WHO undertook a new study of Global Burden of Disease in 2002 using DALYs to measure and compare the main causes of burden of disease in low- and middle- income countries and to study trends since 1990. This concept and the way it is measured are being called into question as they define "disability" in a way that is strikingly at odds with current thinking about what constitutes a disability and what individuals with a disability have to contribute to society, in that they: a) assume a "reduced value" of lives lived with a disability; b) use the term disability interchangeably with ill-health, c) assume that living with a disability represents a net drain on society; and d) assume that individuals with a disability lie somewhere between life and premature death.

Classification of funders and performers

A. Funders

- Public sector (government departments, national aid agencies).
- Private sector (for-profit: pharmaceutical, biotechnology, genomic, nanotechnology, medical instruments firms; not-for-profit: foundations, NGOs, private universities).
- International (multilateral, bilateral agencies).

B. Performers

- Public sector (government departments, academic/research institutes, hospitals, others).
- Private sector (for-profit: pharmaceutical, biotechnology, genomic, nanotechnology, medical instruments firms; private not-for-profit: academic/research institutes, hospitals/laboratories, NGOs).
- International (foreign institutions, government departments, others).

Disability

Within a narrow medical model, disability is defined as a defect, a problem inherent in the person, directly caused by disease, trauma or other health conditions, and a deviation from certain norms. Management of the disability of the disabled person is aimed at cure,

prevention, or adaptation of the person (e.g. assistive devices). Medical care and rehabilitation are viewed as the primary issues, and at the political level, the principal response is that of modifying or reforming health care policy.

The social model of disability on the other hand, defines disability as a socially created problem and principally as a barrier to the full inclusion of individuals into society. Disability is not an attribute of an individual, but rather a complex collection of conditions, many of which are created by the environment, particularly the social environment and socially mediated aspects of the physical environment. Hence, the management of the problem requires social action, and it is the collective responsibility of society at large to make the environmental modifications necessary for the full participation of disabled people in all areas of social life. The issue is, therefore, an attitudinal or ideological one requiring social change, which at the political level becomes a question of human rights to be seen in the same way as the issue of gender and sexual orientation.

The social model of disability does not negate that a disabled person has a certain biological reality (e.g. having paralysis of the legs) which makes her/him different in her/his abilities from the norm. But it views the “need to fit a norm” as the disability and questions whether many deviations from the norm need a medical solution (adherence to the norm) or a social solution (change/elimination of norm).

Disability-adjusted life years (DALYs)

The Disability Adjusted Life Year or DALY is a health gap measure that extends the concept of potential years of life lost due to premature death (PYLL) to include equivalent years of ‘healthy’ life lost by virtue of being in states of poor health or disability. The DALY combines in one measure the time lived with disability and the time lost due to premature mortality. One DALY can be thought of as one lost year of ‘healthy’ life and the burden of disease as a measurement of the gap between current health status and an ideal situation where everyone lives into old age free of disease and disability.

DALYs for a disease or health condition are calculated as the sum of the years of life lost due to premature mortality (YLL) in the population and the years lost due to disability (YLD) for incident cases of the health condition. YLL are calculated from the number of deaths at each age multiplied by a global standard life expectancy for the age at which death occurs. To estimate YLD for a particular cause in a particular time period, the number of incident cases in that period is multiplied by the average duration of the disease and a weight factor that reflects the severity of the disease on a scale from 0 (perfect health) to 1 (dead).

Additionally, time discounting and non-uniform age weights that give less weight to years lived at young and older ages are used in calculating standard DALYs as reported in recent World Health Reports. With age weights and discounting, a death in infancy corresponds to 33 DALYs, and deaths at ages 5 to 20 to around 36 DALYs. Thus a disease burden of 3,300 DALYs in a population would be the equivalent of 100 infant deaths or to approximately 5,500 persons aged 50 years living one year with blindness (disability weight 0.6).

Foundation

The foundation and charity sector is a subset of the private non-profit sector also known as the “third sector”. What is defined as a foundation in one country may not qualify as such in another country. In 2001 Anheier proposed a useful definition that a foundation shall:

- be an asset-based entity, financial or otherwise
- be a private entity, institutionally and structurally separate from government
- be self-governing
- serve a public purpose.

Foundation types include:

- endowed organizations that engage in grant making for specific purpose, e.g. Wellcome trust in the UK;
- organizations that operate their own programs and projects, e.g. Institute Pasteur in France;
- a mix of the above.

Genomics

The term “genomics” was coined by mouse geneticist Tom Roderick to describe an approach to the study of DNA at the level of chromosomes, entire genomes, or large clusters of genes. The purpose of the term was to distinguish it from more traditional genetic approaches that focused on one gene or a family of functionally or structurally related genes or sequences. In addition, the concept of genomics was also associated with a large scale and high tech approach. Implicitly, genomics implied creating and using large databases, extensive use of laboratory automation, and generally a more “capital intensive biology,” than was the norm in the mid-1980s.¹

Gross domestic expenditure on R&D (GERD) includes R&D performed within a country and funded from abroad but excludes payments made abroad for R&D. According to the Frascati Manual, the national R&D expenditure breaks down into four performance sectors:

1. The business enterprise sector (private for-profit)

This sector includes: all firms, organizations and institutions (other than higher education) whose primary activity is the market production of goods and services for sale to the general public at an economically significant price, and those private non-profit institutes mainly serving these firms, organizations and institutions.

2. The government sector

This sector includes all organizations whose funds are administered by the central (federal), state, or local government authorities.

¹ Source: World Survey of Funding for Genomics Research Final Report to the Global Forum for Health Research and the World Health Organization September 2000, Robert Cook-Deegan, Carmie Chan, and Amber Johnson
Stanford-in-Washington Program, 2661 Connecticut Avenue, NW
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3. The higher education sector

This sector includes: all universities, colleges of technology, other institutes of post-secondary education, and all research institutes, experimental stations and clinics operating under the direct control of or administered by or associated with higher educational establishments.

Generally, Higher Education is funded from Direct Government, General University Funds (public or private) and private sources. The distinction between these categories remains fuzzy. Research in the Higher Education sector may also be funded by private sources such as public-private partnerships or the private not-for-profit sector.

General University Funds (GUF) generally refer to funds that have been paid by education ministries in forms of grants to higher education for research. GUF may be divided in two sub-categories whether it is composed of public or private sources. Private GUF administered by universities are also classified as private not-for-profit.

4. The private not-for-profit sector (PNP)

This not-for-profit sector encompasses: non-market, private not-for-profit institutions serving the general public, as well as private individuals and households. In addition to funding from foundations, general university funds not from public sources but still administered by universities are also classified as private not-for-profit. Research in the private not-for-profit sector in LMICs usually refers to research performed in universities funded by the PNP sector.

Health Research/Research and Development (R&D)

"Research and experimental development comprise creative work undertaken on a systematic base in order to increase the stock of knowledge, including knowledge about man, culture and society, and the use of this knowledge to devise new applications" – Frascati Manual.

The type and nature of health research differ across sectors of the economy. Health research includes applied research; experimental development; research capacity strengthening; health policy research; research on health determinants; and other types of health related research.

Research-related decisions in the for-profit sector are largely – and by definition – driven by potential. The not-for-profit sector focuses on issues such as the impact of remedies on health and providing high-quality information to decision-makers.

Health policy research assesses the impact of policies on public health in a broad manner. Such policies generally relate to funding decisions, programmes, models and regulations that have a direct impact on health.

Health R&D to total national R&D expenditure

Most countries distinguish between civilian and non-civilian R&D within total national R&D expenditures. Cross-country comparability of the ratio of health R&D to total R&D ratio can be severely affected depending on whether non-civilian R&D is included in the national total.

- **Fields of science**

Unesco proposed a classification of S&T and R&D by fields of science, described in the Frascati Manual. Health-related R&D usually includes Medical Sciences, portions of research reported under Natural and Exact Sciences and the General Knowledge field. The Environment field is excluded from health R&D, although environmental issues have an impact on health.

Medical sciences field includes R&D on food hygiene and nutrition; radiation used for medical purposes, biochemical engineering; medical information; rationalization of treatment and pharmacology (including the testing of medicines and the breeding of laboratory animals for scientific purposes): as well as research relating to epidemiology, prevention of industrial diseases and drug addiction. Not all countries have a published field for medical sciences.

- **Non-oriented and fundamental research**

Non-oriented research such as environment and life-sciences overlaps with health research globally. The extent to which environment and life-sciences research contributes to the health field is not well known. The Eurostat series for recent years do permit one to break-out non-oriented research in advancement of research and in GUF but full responses are available for only half a dozen countries.

- **Medical instruments and equipments**

The OECD collects industrial R&D data broken down according to the International Standard Industrial Classification (ISIC) Rev 3. These results are pretty consistent with the European NACE rev 1 classification. However, the OECD survey does not show a field for medical instruments and equipment, but for "instruments watches and clocks". The exact title should be "Medical, precision and optical instruments, watches and clocks" according to ISIC and NACE class 33.

The United States and Canada use another classification: the North American Industrial Classification System (NAICS). The different nomenclature and classification systems make it difficult to compare medical instruments and equipment R&D across countries.

The Medical instruments and equipment field includes: medical and surgical equipment and appliance, measuring and testing equipment as well as diagnosis equipments, electro-medical instruments.

- **Research funded by the ODA sector**

Most ODA health research includes operational research, capacity strengthening, health policy and other types of health-related research.

Health research as described by DFID (United Kingdom) includes: health policy, developing new products and technologies that meet the needs of poor people, testing the practical application of new knowledge and technologies, communicating new knowledge and transferring new technologies to users, refining and validating methods for data collection, capacity strengthening research.

Health Research Resource Flows Classification:

The Global Forum for Health Research proposes the following classification scheme (it is a modified version of what was included in Monitoring Financial Flows 2001).

- A.1 Non-oriented, fundamental research**
 - No further disaggregation
- A.2 Health conditions, diseases and injuries**
 - A.2.1 Group I (communicable, maternal, perinatal and nutritional conditions)
 - A.2.2 Group II (non-communicable diseases)
 - A.2.3 Group III (injuries)
- A.3 Exposures, risk factors and determinants**
 - A3.1 Within the health system
 - A3.2 Outside the health system
- A.4 Health systems research**
 - A.4.1 Policy and planning research
 - A.4.2 Health services delivery research
- A.5 Research capacity building**
 - A.5.1 Recurrent expenses
 - A.5.2 Capital expenditures

High-Income Countries (HIC)

Countries classified as high-income based on national income levels. For countries identified as HIC in this report, see Appendix 3

Inequities

Partiality that is not fair or equitable; injustice by virtue of not being equitable.

Low- and Middle-Income Countries (LMIC)

Countries classified as low- or middle-income countries based on national income levels. For countries identified as LMIC in this report, see Appendix 3

MicroNano Technology

Product miniaturization and development of sound manufacturing processes are major goals of microtechnology research. The scope of micro- and nano- research may be described as following:

- Fundamental research: micro- and nano-structures for research in physics. Micro-electrodes for chemistry and biology. Microstructures for the characterization of new materials
- Manufacturing processes: new manufacturing processes in silicon and other materials. Integration and encapsulation techniques for microsystems. New processes for microelectronics. Silicon post-processing.
- Components and microsystems: multidisciplinary research on new microsystems.

Nanotechnology

Nanotechnology or nanosciences enables a new paradigm of science and technology that sees different technologies converging at the nanoscale namely (a) nanoscience and nanotechnology; (b) biotechnology and biomedicine, including genetic engineering; (c) information technology, including advanced computing and communications; (d) cognitive science (neuro engineering) ("NBIC" – nano-bio-info-cogno).

NBIC technologies

The convergence of nanotechnology, biotechnology, information science and cognitive science in research and research applications.

Pharmaceutical R&D

Pharmaceutical R&D includes preclinical trials and Phase I-IV studies.

Preclinical studies

Such studies include animal studies to test whether a drug is carcinogenic, mutagenic, or teratogenic (causing fetal malformations), and to understand how the drug is absorbed and eliminated.

Phase I studies

Phase I studies are primarily concerned with the safety of a drug. They are performed on a small number of volunteers who are usually healthy. The purpose is to determine how the drug is absorbed, metabolized, and eliminated. They also look at what side effects occur as dosage levels increase, as well as to obtain early evidence on drug effectiveness.

Phase II studies

Phase II studies are performed with patients who have the disease or condition that the experimental drug is expected to improve or cure. In addition to ensuring that the experimental drug is safe, Phase II studies are designed to evaluate the effectiveness of the drug. The typical approach is to give one group of patients the experimental drug, and a second "control" group a standard treatment or placebo. Phase II studies are often designed to determine optimal dosage most effective with the least number of side effects.

Phase III studies

During Phase III studies, the drug is tested in several hundred to several thousand patients with the disease to provide a more thorough understanding of the drug's effectiveness, benefits, risks, and possible adverse side effects.

Phase IV studies

Phase IV studies include post-marketing and surveillance studies. One of the purposes is to continue gathering specific information about an approved product. A Phase IV clinical trial is a post-marketing study in the sense that one of the purposes is to delineate the drug's benefits and side-effects, optimal use and potential, in large groups of patients world wide.

Purchasing Power Parity

According to the World Bank definition, PPP is a method of measuring the relative purchasing power of different countries' currencies for the same types of goods and services. Since goods and services may cost more in one country than in another, PPP allow more accurate comparisons of standards of living across countries. PPP estimates use price comparisons of comparable items but since not all items can be matched exactly across countries and time, the estimates are not always "robust." The underlying assumption is that the goods and services consumed do not differ across countries and economies.

Poverty

According to one World Bank definition, poverty can be measured by the proportion of population living on less than US\$1.08 per day. This poverty line includes consumption from own production and income in kind.

Absolute poverty is generally considered to be a level of poverty at which certain minimum standards – for example for nutrition, health and shelter go unmet.

The **poverty line** is the level of income below which one cannot afford to purchase all the resources one requires to live. People who have an income below the poverty line have no discretionary disposable income, by definition. (<http://www.fact-index.com/>).

Research capacity strengthening

Research Capacity Strengthening (RCS) may be viewed as a way to foster self-reliance in biomedical science research in LMICs by building a critical mass of human resources, institutional capacity, and an environment conducive to public research needs.

RCS includes the development of an adequate in-country resource base of:

- healthcare infrastructures, devices, products and services for the diagnosis, treatment, prevention and control of diseases and injuries in both urban and rural areas;
- research centers for the improvement of knowledge and for the training of staffs, professionals and specialists;
- laboratories with proper equipments, storage and maintenance;
- systems for the storage and delivery of such products and services.

Unsustainable

Any practise that cannot be continued indefinitely because it uses up the resources on which it depends is unsustainable.