

# Importance of Input and Output Parameters in Analysing Economical Cost of Healthcare

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**Abstract:** Financing health care has remained a challenge to the governments for a long time. There seems to be very high investment in health by the governments, and inappropriate allocation of resources within the government health budget would cause inefficiency and waste in resources. Given that health is a basic human right, the health situation remains a significant concern for the policy makers. guidance by health economics research will make more efficient reforms and polices in light of accurate information. The understanding and knowledge in the indicators for healthcare economics will help make better study methodologies and give better useful results. In this paper we listed possible methods of classifying health programs costs and we listed the major healthcare and public health indicators. In addition, we discuss the classification of health programs costs and the importance of cost analysis.

**Keywords:** Econometric Indicators, Health and Healthcare, Health Cost Analysis, Quality of Life Indicator

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## 1. Introduction

Health is defined By the dictionary as the free from illness or injury, But the world health organization stated that it is a complete physical, mental and social well-being and not merely the absence of disease or infirmity 1948 while the McKinley health center at the university of Illinois IL defines wellness as a state of optimal well-being that is oriented towards maximizing individuals potential this is a life by process of moving towards enhancing your physical, intellectual, emotional, social, spiritual of environmental well-being [1]

While other definition of health is a state that allows the individual to adequately cope with all demands of daily life. and third health definition is a state of balance and equilibrium that an individual has established with in himself and between himself and his social of physical environment.

### 1.1. Public Health

Public health is the science and art of preventing disease, prolonging life, and improving health through

community-organized efforts, associations, and personnel. This also includes collaborative strategies to define the pathologies of epidemics and biostatistics as well as healthcare; we can observe that this covers both behavioral and occupational health as well as many other sub-sections of public health [2].

As its major role, public health aims to improve the entire population's health and quality of life through preventive and curative measures to address both physical diseases and mental health. By controlling and following up with disease cases and improving financial practices, some major public health activities include vaccinations, birth control, and hand-washing protocols. Implementing these activities requires a substantial team collaboration, for example, among physicians from a variety of specialties, such as family medicine epidemiology, biostatisticians, and community medicine; clinical pharmacists; nurses; pathologists; environmental health control agents; dentists; nutritive healthcare specialists; veterans; lawyers; and social workers [3].

Public health is essential for disease prevention in both developed and developing countries; similarly, while the

WHO is interested in coordinating and handling global public health issues, such as poverty-related diseases, governmental organizations are especially dedicated toward public health policy.

### **1.2. Public Health Policy**

Public health policies can be defined by the plans, procedures, and decisions made to achieve specific healthcare goals in a community. These become feasible through a clear, comprehensible healthcare policy, and by clarifying a future vision regarding the expected roles of different groups and their different goals to coordinate opinions among individuals [2].

Many different policies address individual healthcare, such as pharmaceutical embracement policies, vaccination programs, and tobacco cessation or breastfeeding campaigns. Further, these policies include stipulations to address financial, managerial, and operational (technical) issues, as some governments have strategies for distributing different healthcare personnel and clear plans to achieve their target healthcare goals. As such strategies are based on evidence from healthcare service research, the resulting policies may include local or international medical research or recruitment plans [4].

### **1.3. Health Effect on Economical Growth**

We can assume that economic growth creates better health through its ability to increase food availability, health expenditures, and demands on healthcare. However, one question remains: Does better health also affect economic growth, and if so, how important is this compared with other causes? The WHO's department concerned with macro-economics and health recommends increasing health expenditures to increase economic growth and improve the population's health status and family income.

Many researchers have attempted to answer this question, but the results are still uncertain due to a lack of data and the many factors included in economic growth. Therefore, we can conclude that countries with good healthcare services typically have good infrastructure and educational sectors, among other characteristics. This makes it more difficult to define the marginal contributions of health.

Regardless of the previous question, health itself is a goal, as this increases well-being and the satisfaction with living, but economists claim that human capital substantially contributes to economic growth, and good health is a major indicator of the human capital that affects economic growth [5].

### **1.4. Health Economics and Health Care Economics**

Health economics involves the production of health and the consumption of healthcare. As a branch of economics, it studies such issues as the value, efficiency, and effectiveness of a functioning healthcare system as well as how such behaviors as smoking can impact health.

More broadly, economics is a science that studies human

behavior to connect society's endless needs and goals with the scarce available resources that can be used in various ways. Specifically, one major issue in economics is the scarcity of resources and how to use them in the most efficient way.

Any market must address three major questions:

- 1) What to produce?
- 2) How to produce?
- 3) To whom is it produced?

The first question addresses the prioritization of commodities to best increase the population's well-being. In considering the second question, we should decide the most efficient way to produce a particular commodity, as this may define a specific combination of capital and human capital as the most efficient. Moreover, the third question defines the target population that demands this commodity [6].

### **1.5. Health as a Capital Product**

The services offered by the healthcare market cannot be perceived as traditional services or commodities, as these do not directly add pleasure or utility. Further, these may even cause pain or unwanted side effects, or the results may not be as anticipated, because many factors affect the unique health commodity concept:

- (1) The uncertainty of results at every healthcare level.
- (2) The information asymmetry between patients and caregivers.
- (3) Externalities, including individual behaviors, can increase costs or benefit others.

According to Grossman (1972), the healthcare demand curve for individuals that demand health itself offers the perspective that health can perhaps be considered a capital good [7].

### **1.6. Health Economics and Healthcare Economics**

Many studies fail by using the terms "health economics" and "healthcare economics" concepts interchangeably, as they assume these concepts share the same meaning.

While healthcare economics is a division of health economics, the former does not exist independently, but as a part of a larger picture in which environmental, demographic, and technical factors are a part of producing community health.

The health production industry is a complex industry that needs efficient measures to sustain the quality of production with minimal cost, this needs information for decision makers that should be from different disciplines medical and pharmaceutical non the less economical and managerial.

The economical studies face the problem of complexity of pricing the health outcome and that was the reason for the creation of new definitions for outcome measures as well as appropriate indicators.

## **2. Econometric Indicators for Health and Healthcare**

Healthcare is a complicated sector that includes a variety of

factors. This reflects the need for healthcare indicators to help measure progress or degeneration in healthcare services, or even in health itself. These indicators are taken from a certain state or reflection of that state, and are identified through variables that measure the change. The indicator requirements can be summarized as follows:

- a Sensitivity to the measured change.
- b Objectivity regardless of who takes the measure.
- c Sensitivity to measuring exactly what should be measured.
- d Specificity toward what is measured, with no other factors.

In reality, few indicators include these four criteria, and thus, we must use more modest indicators to potentially measure only a part of a more complex situation. However, these indicators may serve as a measurement baseline, and may indicate a direction and speed of change that may help in comparing different groups at any given time. The choice of healthcare indicators is not limited to any set of indicators, and field researchers still seek the perfect indicator [8].

Each researcher or country can choose from hundreds of indicators to select those that suit their economic, social, and/or health status and allow the indicators to be collected and analyzed. Although researchers still search for a perfect indicator, healthcare indicators are also used to indicate quality of life, and as an indirect indicator of social and economic development.

### 3. The Quality of Life Indicator

The QALYs (quality-adjusted life years) indicate a particular health status to gauge health programs and intervention effectiveness. These can be illustrated at the national health program level, or department or social levels, among others. Further, policymakers need these indicators to make operational, technical, and managerial decisions in the health sector based on national-level data collected from national or private surveys.

Additionally, the data should be collected to answer a specific query, such as the quality of life for depressed patients using antidepressants, or vaccination percentages, and disease incidences.

The indicator should be measurable, as this is essential for data collection, and should be low-cost with simple, accurate technical measures. Governments need this data to decide where resources should be distributed for maximum efficiency. Consequently, the research costs should be weighed against the benefits of its results, and the government should have the financial and technical resources to collect this data [9].

### 4. Data Source for Indicators

There is more than one source for accurate data that helps us calculate indicators.

- (1) Civil registration system, those records are for births and deaths and marital cases, and those records cover the nation and it is accurate and objective and easy to

obtain because of the computerized network.

- (2) General population census and this is an important source for the economic, social, demographic information and the population demographics are a major factor for the indicators calculations.

And that is of utmost importance for any study or decision made by decision makers, and this census is done by National Statistics department.

- (3) Medical records

This is done in the medical field and it is a major source of information about disease incidence, prevalence, deaths, health services provided even though the records are available, but usually missing data is an issue as well as lack of accuracy. This usually happens if the personnel who fills the data is not well trained, or there is no supervision on filling the data, or no feedback, and improving this source is achievable with little resources, but good governance[10].

- (4) Epidemiological surveillance

And this is another useful source especially for epidemic diseases and efforts to prevent it, and those records should be national.

- (5) Sample survey

And this the most used for it is simplicity and when there is no data available or no updates and it is not expensive.

On the other hand, there are international surveys that are conducted by the united nations, and world bank, as well as the world health organization (WHO), and their surveys are studied to be comparable between countries.

### 5. Major Healthcare and Public Health Indicators

Many national-level indicators and those recommended by the WHO can be used in research; these can be categorized in the following groups:

- 1) Death Indicators:

- a Crude death rate.
- b Age-specific death rate.
- c Life expectancy rate.
- d Infant mortality rate.
- e Mortality rate of those under age 5 (as a proportion of the total population).
- f Maternal mortality.
- g Disease-specific death rates.
- h Potential life-years lost.
- i Case fatality rate.
- j Proportional mortality [10]

- 2) Morbidity Indicators

- a Incidence: New cases of a specific disease or group of diseases in a given time period.
- b Prevalence: All cases of a specific disease or group of disease divided by the risky population at a given time.

Incidence and prevalence may indicate the community's

overall health state for a specific list of major diseases, such as cancer, chronic pain, depression, obesity, diabetes, asthma, and high blood pressure.

### 3) Disability Indicators

These indicators represent the daily life activities performed without limitations.

### 4) Nutritional Indicators

- a Preschool height and weight.
- b Following up on children's growth.
- c Low birth weight.

### 5) Indicators for offered healthcare services

- a The number of physicians per population
- b The number of nurses per population
- c The number of hospital beds per population
- d The number of healthcare centers per population

### 6) Utilization indicators

These reflect real coverage, announced as a percentage of the real population in need of this service during a specific time frame, which is typically one year. This also depends on the availability and easy access to health services as well as the individual's behavior towards the health system and the health institutions' direct social responsibility in providing the service.

which involves the following:

- a Admission percentage
- b Average utilization of beds
- c Average patient stays in the hospital
- d Average death rate in the hospital.

### 7) Social and psychological health indicators, which indirectly indicate such psychological and social diseases as suicide, murder, traffic accidents, drug addiction, and domestic violence.

### 8) Environmental indicators

These indicators may explain contagious diseases, as they reflect the environmental and biological quality of the surroundings that may affect the health of the individuals living there, such as sanitary water.

### 9) Socio-economic indicators

- a Gross domestic product (GDP)
- b Gross national product (GNP)
- c The GDP per capita
- d Literacy rate
- e Fertility rate
- f Inflation rate
- g Unemployment rate
- h Population size

### 10) Health policy indicators

- a Health expenditures as a percentage of GDP.
- b Health-related sectors' expenditures, such as sanitation, nutrition, and the water supply as a percentage of GDP.
- c The percentage of health resources assigned for primary health care.
- d The degree of equitability in health resources' distribution.

### 11) Quality of life indicators

Quality of life is a broad concept that includes many

dimensions, as well as elements and factors that complement each other to create unity. This can be measured through a variety of indicators covering different aspects of the broader picture:

- a Quality-adjusted life-years: This method quantifies a disease's burden, and resembles a quantification of the quality of life for individuals proportionate to a full, healthy life-year by accounting for any one disability in performing daily activities, or whether the social or psychological disability can be scored as less than one. The years can then be summed to show the effect on expected life-years.
- b Disability-adjusted life-years: This indicator quantifies the life-years lost plus the quality of life lost in non-fatal disease cases, where zero represents full health and one indicates life-years have been lost.

The life-years lost reveals the difference between expected life-years for a specific age and the life-years after a disease or a condition has developed.

#### *Analysis for Healthcare Programs*

The data collection and analysis processes to calculate healthcare program costs is of utmost importance to allow for an evaluation of healthcare services. Aside from sources of financial diversity, we can evaluate the different inputs for healthcare and efficient resource utilization and analyze the program either as a whole or in its program divisions. Further, such a cost evaluation could highlight any waste in the programs' resources by comparing the costs to the services provided and the population size served.

Regarding the financial costs per unit (cost categories), determining the elements that comprise a health program are essential to predict their costs, which are the value of resources used to produce an output.

Health program costs can be categorized into groups, as follows:

#### 1) Classification according to input

This classification is simple, general, and can be applied to any program; it differentiates two resource groups first by their operating costs consumed and routinely purchased over one year, and second, as capital costs that last more than one year and include the costs of equipment, buildings, and vehicles.

#### 2) Classification according to a position, activity, or utilization

This classification depends on the activity or job the resources perform. For example, many such activities exist under the general umbrella of mother and child health, including the vaccination of pregnant women, pre-term and delivery care, and newborns' vaccinations. Each activity requires many materialistic inputs, such as health workers; and equipment or facilities that require training, supervision, management, governance, evaluation, catering, and transportation. Further, costs must be assigned to each activity when evaluating a multi-activity program in such a way that denotes the resources that each activity requires.

#### 3) Classification according to level

A known sequence of events exists for each activity in most

health programs. For example, some national program resources are used locally, while others are used nationally, or even classified to health centers specific to a community, village, or certain households; some resources may even be used in more than one level.

#### 4) Classification according to source

Funding sources are of utmost importance, as these could include the Ministry of Health or other governmental institutions, international funding, or non-governmental organizations.

Preferably, costs would be divided by source so as to provide such sponsors a financial report on the funding provided to different activities. This could help predict future expenses for national programs, and could help us study the efficiency of expenditures for each individual source.

#### 5) Classification according to currency

This classification involves the currency needed to purchase resources. It is essential to differentiate between resources purchased with local versus other currencies, and especially in developing countries with a shortage of foreign currencies. This is also useful when the donor country ceases its funding to a particular country, as the latter must continue buying supplies regardless to maintain the program. Some amendments may be made to such costs if currency rates happen to fluctuate.

There is a variety of approaches to economic analysis, the suitability of any of which depends on the purpose of an assessment and the availability of data and other resources. It is rarely possible or necessary to identify and quantify all costs and all outcomes (or outputs or benefits), and the units used to quantify these may differ.

Main types of economic analysis used in HTA (Health Technology Assessment) include the following.

- (1) *Cost-of-illness analysis*: a determination of the economic impact of an illness or condition (typically on a given population, region, or country) e.g., of smoking, arthritis, or diabetes, including associated treatment costs
- (2) *Cost-minimization analysis*: a determination of the least costly among alternative interventions that are assumed to produce equivalent outcomes
- (3) *Cost-effectiveness analysis (CEA)*: a comparison of costs in monetary units with outcomes in quantitative non-monetary units, e.g., reduced mortality or morbidity, and this follows the equation

A: Technology A

C: Technology C (a comparator)

Cost-Effectiveness Ratio:

$$\text{CB Ratio} = \frac{\$CostA - \$CostC}{\text{EffectA} - \text{EffectC}}$$

For example: “\$8,000 per life-year saved” or “\$1,000 per cardiovascular case averted”

*Cost-utility analysis (CUA)*: a form of cost-effectiveness analysis that compares costs in monetary units with outcomes in terms of their utility, usually to the patient, measured, e.g., in QALYs

Cost-Utility Ratio:

$$\text{CU Ratio} = \frac{\$CostA - \$CostC}{\text{UtilityA} - \text{UtilityC}}$$

Utilities, units of utility or preference, are often measured in QALYs. So, for example: “\$150,000 per QALY gained” or “\$12,000 per QALY gained”

- (1) *Cost-consequence analysis*: a form of cost-effectiveness analysis that presents costs and outcomes in discrete categories, without aggregating or weighting them
- (2) *Cost-benefit analysis (CBA)*: compares costs and benefits, both of which are quantified in common monetary units.
- (3) *Cost-Benefit, Ratio Approach*:

$$\text{CB Ratio} = \frac{\$CostA - \$CostC}{\$BenefitA - \$BenefitC}$$

- (4) *Budget-impact analysis (BIA)*: determines the impact of implementing or adopting a particular technology or technology-related policy on a designated budget, e.g., of a drug formulary or health plan [11].

## 6. Discussion

- 1) Responsibility for activities and the ability to track their expenses

It is insufficient to assume that expenses occur exactly as planned with no changes, which is why most government institutions implement not only financial policies to prevent waste and inefficiency in expenses, but also mechanisms to follow up with these expenses to prevent future waste and inefficiency.

The failure to carefully follow a financial plan and assigned budget could cause major problems, and if the project needs extra resources this may jeopardize the program's efficiency. Further, a failure to provide the necessary supplies would hinder the program's achieving of their goals.

Alternatively, a failure to use the assigned resources would compel the funding source to decrease their financial resources in the future, as they may assume the program was unable to use the initial resources provided.

- 2) Efficiency evaluation

Any health program could be more efficient if the intended outcome is maximized by using the specific assigned resources, and this could help decision-makers decide which program is more efficient.

- 3) Evaluate equality in offering the service

Equality is defined as the fairness in providing healthcare services or accessibility to a target population, or those who need the service. The distribution of health resources is a major indicator of equity, and a first step for further evaluation.

Another major factor in calculating the cost per individual is the size of the target population. Regarding the broader picture of equality, the other services offered to the same target population, whether governmental or non-governmental,

should also be considered.

When a substantial difference exists in the average cost per person for a service from one area to another, this could be justified by the following reasons:

- a Population density and topographic issues may increase cost.
- b Waste may be higher in specific areas.
- c The severity of disease may be higher in one area than in others.
- d Politics may influence the government in certain areas.

#### 4) Prioritization

We can evaluate the costs for specific prioritized programs to compare them to the costs of other specific programs.

#### 5) Predict future expenditures

A program's annual expenses depend on expenses for the following years, and maintaining the program involves annual, ongoing operational costs. Thus, analyzing these costs can predict future costs.

#### 6) Price assigned for the service

It is important to know the cost of the service to recognize an appropriate price to be refunded the money spent on the service [12, 13].

## 7. Conclusion

Healthcare economics is one major discipline that is of utmost importance, and the demand for healthcare resources is a major issue worldwide where economical information through well designed studies will be a major step towards more efficient systems. and better understanding of the indicators and cost analysis will enhance the studies methodology.

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