Health economics:
Scope and application in the African Region

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Introduction

Available resources are not always adequate to tackle the priority public health problems in a country. Therefore, it is necessary to ensure that available resources are used efficiently. Health economics is concerned with health maintenance choices in the context of resource scarcity. This article provides an overview of the scope of health economics and its application in the African Region. The discussion below refers to *Figure 1*.

Health, health indices and health determinants

Boxes A and *B* in *Figure 1* deal with a definition of health, its measurement and valuation, and its broader determinants (e.g. genetics, environmental factors, consumption patterns, education, income, capital). Social scientists define health as the ability to perform one's expected societal roles or functions.

Diseases inhibit a patient's mobility, capacity for social participation, performance of usual activities (e.g. work or schooling), ability for self-care (especially during the severe stage) and causes pain and discomfort (psychological and physical) as well as anxiety and depression. Diseases deplete an individual's quality of life (QoL) and length of life (LoL).

Health indices combine changes in both QoL and LoL due to disease onset or intervention. Examples of such indices are quality adjusted life year (QALY), disability adjusted life year (DALY) and disability adjusted life expectancy (DALE). The effect of health intervention will be the difference between total expected DALE with intervention and total expected DALE without intervention. Detailed nation-wide DALY (burden of disease) studies have been undertaken in Algeria, Mauritius, South Africa and Zimbabwe.

Individual and household demand for health care

Scarcity necessitates choices of many different forms. Individuals (households) must decide how to use their resources: physical (e.g. land, equipment) and intellectual (e.g. knowledge and skills) assets, material wealth and labour time. Box C considers the analyses of the health-related demands and choices of individuals and households.

Choice of a particular commodity or course of action (e.g. whether or not to seek care) is usually assumed, in health economics (and in economics generally), to be a function of personal socioeconomic characteristics (e.g. age, marital status, religion, health education, secular education, income, risk attitudes, epidemiological environment, genetic endowment, etc), and commodity-level attributes (e.g. service price, travel cost to service source, waiting time at the source, perceived effectiveness of service, etc).

In the African Region, demand analysis has been used to explain individual choice of source of health care; use of condoms to prevent HIV infection; use of addictive substances (cigarettes and alcohol); choice of contraceptives;[1] toilets ownership; health insurance ownership.

Supply of health care

Supply refers to the maximum quantity of services health providers are able to produce and are willing to sell at the going market prices (Box D). The quantity willingly supplied during a specified period of time is positively related to market prices, *ceteris paribus*. A higher price gives profit motivated producers (e.g. private health care providers) the incentive to increase production. In addition, in the short run, the quantity supplied is affected by input prices, technology and prices of other goods. Underlying the supply of any good or service is the production function, that is, the relationship between the output of that good or service and the input used to produce it. If the output were outpatient and inpatient care, then included in the input would be the number of physicians, nurses, technicians, pharmaceutical supplies, non-pharmaceutical supplies, beds, space, etc.

Even for public health care providers who are service-driven, it is critically necessary to use them efficiently for maximum output, given that health input is in limited supply. Inefficiencies represent wasted opportunities for improving at least one citizen's health status at no extra cost.

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[1]Jones AM and Kirigia JM, The determinants of the use of alternative methods of contraception among South African women, *Applied Economics Letters*, 7:501–504, 2000.

Health economists use mathematical (linear, integer and goal) programming and econometric methods to estimate efficiency scores and excess inputs (or output deficit) for individual decision-making units, e.g. hospitals, health centres, etc. Data envelopment analysis (DEA) has been used in estimating the magnitude of inefficiencies among individual hospitals and clinics in Ghana, Kenya[2], Namibia, Sierra Leone, South Africa[3] and Zambia. Similar analyses have been undertaken in Nigeria using econometric methods.

Microeconomic evaluation at prevention and control level

Economic evaluation is a comparative analysis of costs and consequences of at least two or more interventions into a public health problem. Cost-effectiveness, cost-utility, and cost-benefit analysis of alternative ways of delivering care (e.g. mode, place, timing or amount) at all phases (detection, diagnosis, treatment, after-care) takes place in Box F.

Cost-effectiveness analysis

Cost-effectiveness analysis (CEA) compares two or more interventions, measuring the input in monetary terms and the outcome in natural or physical units. CEA is appropriate when there is one, unambiguous objective of the intervention(s) and therefore a clear dimension along which effectiveness can be assessed.

CEA data requirements are direct costs, indirect costs (time lost from work), intangible costs (anxiety, pain) and externality costs; and outcome measured in natural units such as deaths averted, cases detected and treated, etc. Decision criteria require choice of the intervention with least incremental cost-effectiveness ratio. CEA does not resolve the problem of option selection whenever different interventions yield more than one kind of beneficial effect with the mix of benefits differing between options.

In the Region, there have been CEA of tuberculosis, malaria[4], schistosomiasis, HIV/AIDS, distance education[5] and school health programmes, among others.

Cost utility analysis

Cost utility analysis (CUA) is a method that compares two or more interventions, measuring input in monetary terms and the outcomes in a health index, e.g. QALY, DALY, and DALE. It is appropriate when the problem facing, for example, a schistosomiasis decision-maker is: "From the societal perspective, does drip molluscicide, household health education visits, vented improved pit latrines, mass population chemotherapy with oxamniquine, or mass population chemotherapy with praziquantel promise the highest incremental health improvement per incremental cost?"

CUA undertakes costing in the same way as CEA. On the effectiveness side of the equation, data requirements will depend on the health index that one decides to use. CUA decision criteria dictate that the intervention with the least incremental cost-utility ratio should be chosen.

CUA methodology can only be used in pursuit of production efficiency, but not allocative efficiency, mainly because cost and benefits are not measured in the same manner. CUA has been used in Kenya to identify the optimal schistosomiasis intervention strategy. [6]

Cost-benefit analysis

Cost-benefit analysis (CBA) is the technique employed in identifying, quantifying and valuing in money all important costs and consequences to society of health interventions. It is appropriate to use when the issue is whether health intervention benefits are greater or equal to costs. An example of a CBA policy question is: "From the social perspective, is it worth continuing the status quo HIV/AIDS preventive intervention instead of STD treatment, social marketing of condoms, safe blood provision or needle exchange/bleach provision options?"

Within CBA methodology intervention benefits are measured in money using the "human capital" approach, the "implied values" approach or the "willingness to pay" approach. The CBA decision rule recommends choice of the intervention with the highest net present value.

CBA issues revolve around measurement and valuation of intervention benefits, valuation of statistical life, derivation of a social welfare function from individual utility functions, incorporation of equity concerns, and uncertainty and time preference. CBA has been used to appraise schistosomiasis interventions in Kenya.[7]

Macroeconomic analysis

Disease and development

A disease has a number of negative effects on development (Box G). Firstly, it depletes quality and quantity of human resources, and thus, economic productivity. Secondly, it relegates its victims to a culture of social and economic dependence leading to a reduction in their self-esteem or self-worth. Lastly, the condition deprives its victims of the freedom from avoidable ill-health and from escapable mortality.

The WHO Commission on Macroeconomics and Health, employing regression methods, demonstrated that investments in health would boost economic growth in developing countries. Use of similar methods in the Region revealed that maternal mortality and

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[2]Kirigia JM, Sambo LG and Emrouznejad A, Technical efficiency of public hospitals in Kenya, *Journal of Medical System*, 26(1): 39–45, 2002.
[3]Zere EA, Addison T and McIntyre D, Hospital efficiency in sub-Saharan Africa: evidence from South Africa. *South African Journal of Economic.* 69(2): 336–358, 2000.
[4]Goodman C, Coleman P and Mills A, Economic analysis of malaria control in sub-Saharan Africa. Geneva: Global Forum for Health Research, 2003.
[5]Kirigia JM, Sambo LG, Phiri M et al, Cost-effectiveness analysis of establishing a distance-education programme for health personnel in Swaziland, *African Journal of Health Sciencies,* 9(3-4): 3–15, 2002.
[6]Kirigia JM, Cost-utility analysis of schistosomiasis intervention strategies, *Environment and Development Economics*, 3(3): 319–346, 1998.
[7]Kirigia JM, Sambo LG and Kainyu LH, A cost-benefit analysis of preventive schistosomiasis interventions, African Journal of Health Sciences, 7(3–4): 4-10, 2000.

disaster-related deaths had a significant negative impact on the gross domestic products of individual countries.[8]

Health economics is useful in estimating the effects of morbidity (and mortality) on economic growth (including volume or value of trade); disease and levels of self-esteem among individuals and communities; disease and degree of freedom in making various choices; and health provider responsiveness to patient's rational expectations.

Disease and poverty

Poverty predisposes the poor to disease in through inaccessibility to preventive information and commodities; "forced" migration (in search of paid jobs), and need to embark on high-risk economic behaviour (e.g., commercial sex) and social behaviour that increases the risk of infection (e.g. alcohol consumption and drug use). Once established, disease exposes its victims to income poverty via productivity losses (resulting from reduced stamina, absenteeism and death); increased dependency ratio, as the productive portion of the population decreases; increased number of orphans, and hence, the cost of taking care of them; catastrophic health care costs, and hence, diversion of resources from economic growth-generating activities; overload of national health systems, and hence, their capacity to respond effectively to increased needs.

Econometric methods can be used to study the impact of disease on various forms of human deprivations. Such studies would inform policy-makers on how various specific disease interventions impact on poverty levels.

Programme planning, budgeting, monitoring and evaluation mechanisms

A plan is a course of action consisting of objective(s), target(s), expected result(s), activities, resources, and a monitoring and evaluation element. Monitoring is meant to keep track of the

[8]WHO, Macroeconomics and health: Investing in health for economic development, Geneva, World Health Organization, 2001.

Figure 1 : **Scope of Health Economics**

[A] **What is health? how can it be measured and valued?** Perceived attributes of health; health status indices; value of life; utility scaling of health.	**[B]** **What influences health (other than health care)?** Genetics; water; sanitation; consumption patterns; education;- income; culture; housing; clothing; food; human and physical capital; etc.	**[C]** **What factors influence demand for promotive, preventive and curative health care?** Influences of A + B on care-seeking behaviour; barriers to care seeking (price, time, psychology); agency relationship; need; altruism; insurance; quality of care.
[D] **What factors influence supply of health care?** Costs of production; alternative production techniques; input substitution; markets for health inputs (human resources, drugs, equipment, etc); provider remuneration methods and incentives.	**[E]** **What factors determine health care market?** Money prices; time prices; waiting lists and other non-price rationing systems as equilibriating mechanisms and their effects on health facility services.	**[F]** **Microeconomic evaluation at prevention and control level** Cost-effectiveness, cost-utility, and cost-benefit analysis of alternative ways of promoting health while preventing, detecting, diagnosing and treating disease.
[G] **Macroeconomic analysis** Health and development (including trade/globalization, debt-forgiveness); Iil-health; poverty.	**[H]** **Planning, budgeting, regulation and monitoring mechanisms** Use of planning in pursuit of efficiency; interplay of budgeting, human resource allocations, regulation and the incentive structures they generate; monitoring efficiency in use of resources to achieve results.	**[I]** **Sectoral formative and summative evaluation** Health sector performance in stewardship, financing (revenue collection, fund pooling, purchasing), resource generation and provision of health services; health sector performance in enhancing health status, responding to clients' non-medical expectations and fair financing.

Source: **Adapted from Williams AH, Welfare economics and health status measurement. In *Health, economics and health economics* (ed. van der Gaag J and Perlman M), Amsterdam: North-Holland, pp. 271–281, 1981.**

progress in implementation of planned activities, to assess the effectiveness of the programme in achieving expected results, to keep track of the rate of resource use and to identify factors that enhance or inhibit implementation (Box H). Evaluation is the assessment of effectiveness, relevance, quality, adequacy, utilization and equity of a public health programme[9] *(Box I).*

The effectiveness of public health programmes largely hinges on the effectiveness of the underlying health system. This is why it is necessary to assess performance of health systems in enhancing the health status of populations; responding to clients' non-medical expectations and providing fairness in financing.[10] Knowledge of health economics is necessary in the assessment of how equitably and efficiently a health system performs its functions: stewardship, resource generation, financing, provision of health services.

Concluding remarks

In the context of public health, the discipline of economics is critically important for measuring health impact of disease and interventions; evaluating the cause-effect relationship between care-seeking behaviour and the specific attributes of individuals and health systems; estimating the statistical association between patient compliance and personal as well as intervention-specific attributes. Health economics can also measure inefficient resource use by individual health institutions; guide the choices in public health interventions; assess the macroeconomic relationship between disease, development, poverty, and globalization; and assess health systems performance.

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[9]Sambo LG and Kirig□
[10]Murray CJL and Frenk J, A framework for assessing the performance of health systems, Bulletin of WHO, 78(6): 717–731, 2000.