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QALYs, DALYs, AND THEIR CRITICS

Greg Bognar

Introduction

Bioethics has its roots in the physician–patient relationship. For a long time, bioethicists mainly focused on ethical issues in clinical practice and medical research. More recently, however, there has been an increasing interest in the health of populations. Some of the factors that have fueled this interest are the heightened awareness of inequalities in health between different groups and populations, the recognition of the health-related causes and consequences of poverty, the aging of societies, and perhaps most importantly, the increasing costs of health care.

There are many ways bioethicists can contribute to the discussion of these issues. For instance, they can work out principles of justice that can be applied to domestic and global health inequalities. They can address ethical questions in public health. And they can help clarify the conceptual and normative questions that arise in the measurement of population health and the allocation of health resources. In this chapter, my focus will be on the last of these contributions.

Measuring the Value of Health

Health policy is concerned with maintaining and promoting the health of the population and with reducing health inequalities. It also has to take into account the fact that resources for health are limited. To achieve its aims, health policy needs to ensure that scarce resources are allocated fairly and efficiently. This requires the measurement of health. In the absence of a measure, it would be impossible to determine which policies are more efficient or fair. A measure of health is needed for identifying health inequalities, for carrying out economic analysis of interventions and health services, for monitoring their impact, and for comparing the health of populations.

The simplest measures of population health include life expectancy, overall mortality rates at different ages, and mortality rates from specific causes. If life expectancy at birth in one country is greater than in another, then its population may be considered healthier. One advantage of expressing population health in terms of life expectancy at birth is that it yields a single, summary value that can be used to represent the overall health of the population.

Life expectancy and mortality rates, however, are very crude measures. They reflect only premature mortality. They do not reflect morbidity at all. But morbidity should obviously be part of any measure of health.

One way to account for morbidity is to calculate the incidence and prevalence rates of different diseases and health conditions within a population. (Incidence is the rate of new cases in the population during a time period. Prevalence is the ratio of the total number of cases to the whole population.) But this approach has at least two limitations. First, it makes it impossible to express population health with a summary value. Health conditions are diverse. Using only incidence or prevalence rates, it is difficult to determine whether a population with a high prevalence of malaria, for instance, is healthier than a population with a high prevalence of diabetic disease.

Second, incidence and prevalence rates do not adequately reflect morbidity. Different diseases cause different functional limitations. They have different impacts on people's physical, psychological, cognitive, and social functioning. A measure of health should reflect these limitations, since ultimately what we care about is the impact of morbidity on quality of life. Thus, health should be measured by its impact on quality of life. In other words, a measure of health should be a measure of the *value* of health.

Any adequate measure of health, therefore, must be evaluative. It must reflect the *badness* of ill-health: The way different health conditions affect quality of life by limiting functioning. An adequate measure of health must combine mortality and morbidity through their impact on quality of life.

Evaluative measures of health come in many forms. The most commonly used are *quality-adjusted life years* (QALYs) and *disability-adjusted life years* (DALYs). They differ with respect to what they try to measure, the way they combine the harms of mortality and morbidity, and the way they establish a summary value for population health.

QALYs

QALYs are derived from *health state descriptions*. A health state is defined by levels of functioning in different aspects of health. A patient who has difficulties with mobility but no pain is in a different health state than a patient who has no difficulties with mobility but has frequent pain. A patient with severe depression is in a different health state than a patient who struggles with substance abuse. By specifying the levels of physical, psychological, cognitive, social or other kinds of functioning, any number of health states can be defined. These can also be used to describe the outcomes of different interventions. For this reason, health states are also called *health outcomes*.

The key step in QALY measurement is the evaluation of health states. This is usually done through empirical surveys, using small samples of the population. Several methods can be used for eliciting evaluations. For instance, respondents may be asked to indicate their valuation of particular health states on a visual scale. Alternatively, the value of health states can be established indirectly, by asking respondents to answer trade-off questions. One method requires respondents to indicate their preferences in situations where they have to sacrifice some time spent in good health for the sake of avoiding some health outcome with functional limitations. For instance, suppose respondents would be indifferent between 7 years in full health and 10 years with a particular health outcome. In this case, the value of the health outcome is set at 0.7. (This method is called the time trade-off method.) In another method, respondents have to determine the probability of death they would be willing to risk to avoid some health outcome. They are asked to consider a choice in which they can either live with a particular health outcome for a certain amount of time, or undergo a risky treatment that can

either return them to full health for the same amount of time with probability p , or lead to instant death with probability $(1 - p)$. The value of the health outcome is determined by the value of p at which respondents would be indifferent between the treatment and living with the health outcome. For instance, if $p = 0.7$, then the value of the health outcome is set at 0.7. (This is known as the standard gamble method.)

The evaluations that emerge from using these methods are on a numerical scale between 1 and 0, where 1 represents perfect health and 0 represents a health outcome that is no better than death. All health outcomes are assigned values along the scale. The values are interpreted as the *health-related quality of life* associated with health outcomes. They represent how bad (or good) different health outcomes are.

The health-related quality of life scale is an interval scale. This means that the differences between pairs of values can be compared. Hence it becomes possible to compare changes in health-related quality of life. For instance, a treatment that increases health-related quality of life from 0.4 to 0.6 and another that increases it from 0.8 to 1 result in improvements of the same magnitude. Thus, it can be determined which alternative treatment results in the greatest improvement. Interventions that target different conditions can be compared by their impact on health-related quality of life.

A QALY is a combination of the health-related quality of life associated with health outcomes and the time spent with those health outcomes. For convenience, years are used as the unit of time. The numbers on the health-related quality of life scale are used as quality adjustment factors. Thus, 1 year in full health has the QALY value of 1; 1 year at the health-related quality of life level of 0.5 has a QALY value of 0.5. Consequently, 1 QALY can represent a year in full health, or 2 years with a health outcome whose value is 0.5, or 4 years of life with a health outcome whose value is 0.25, and so on.

For example, suppose a cancer treatment provides, on average, a remission of 5 years, but it is accompanied by severe functional limitations. The health-related quality of life during these years is 0.3. An alternative treatment provides, on average, 4 years of remission, but it is accompanied by less severe functional limitations, so that the health-related quality of life during these years is 0.4. The first treatment results, on average, in 1.5 QALYs (5×0.3) per patient, and the second treatment results in 1.6 QALYs (4×0.4). Since the second treatment results in more QALYs, it brings about a greater health improvement. Other things being equal, it can be considered better—that is, it offers a greater benefit for patients.

QALYs are usually calculated for alternative treatments and interventions, but they can also be used as a summary measure of population health. To take an obviously oversimplified example, suppose that people in a population have a life expectancy of 75 years at birth. They typically spend 65 years in full health, then 5 years at the health-related quality of life level 0.8 and another 5 years at 0.6. Their *health-adjusted life expectancy* (also known as HALE) is 72 years. Compared with another population, people in this population may have a lower life expectancy, but a higher HALE. Taking into account both mortality and morbidity, this population may be considered healthier.

Needless to say, things are much more complicated in practice. Life expectancies change with age and time. Health outcomes differ across patient groups. For estimating QALYs, researchers must use standard life tables for calculating life expectancies, observational studies of cohorts, epidemiological data, mathematical models based on the outcomes of clinical research, and other sources of information.

QALYs have been used since the late 1960s in health economics and health policy. Their primary use has been in *cost-effectiveness analysis*, a method for evaluating the aggregate health benefits of different interventions and health services, taking into account their costs. Health economists calculate cost-effectiveness ratios for interventions by dividing their costs by their health benefits, expressed in QALYs. The smaller this ratio, the more cost-effective the intervention is.

Suppose two interventions have the same outcomes in terms of QALYs. One of them, however, costs more than the other. The cheaper intervention, therefore, is more cost-effective, since it realizes the same health benefits for a lower cost. More often, however, interventions differ both in terms of costs and benefits. One intervention may require fewer resources, but result in fewer QALYs; another intervention may be more costly but result in more QALYs. Cost-effectiveness analysis can determine which of these interventions is “better value for money.” The one with the lower cost-effectiveness ratio yields greater benefits per unit of cost.

Interventions and health services can be ranked according to their cost-effectiveness ratios, and policy makers can use these rankings to decide how to allocate resources by excluding interventions and services with unfavorable ratios. They can use cost-effectiveness analysis to determine which interventions should be funded publicly or covered in a health insurance package. In practice, policy makers are usually interested in *incremental cost-effectiveness*—comparing the benefits of a new intervention, with the additional resources it requires, to the costs and benefits of interventions already in place.

In the United Kingdom, for instance, the National Institute for Health and Care Excellence (NICE) advises the National Health Service (NHS) on cost-effectiveness. It considers new interventions and services to be worth providing in the health care system when their incremental cost-effectiveness ratio is lower than approximately £20,000–30,000 per QALY (Rawlins and Culyer 2004).

The idea that resources for health should be allocated by using cost-effectiveness analysis is often characterized by its critics as the simple view that the maximization of QALYs should be the only objective of health resource allocation (e.g., Harris 1987). This is both imprecise and somewhat unfair. It is imprecise because, as we have just seen, QALYs are used in a more complex way in cost-effectiveness analysis. It is also unfair because very few health economists and policy experts would argue that cost-effectiveness should be the *only* morally relevant consideration in health resource allocation.

In the last two decades, a second evaluative measure has also become prevalent. I will briefly present its methodology before returning to the ethical issues of using QALYs for setting priorities in health care.

DALYs

The Global Burden of Disease (GBD) project began in the early 1990s with the support of the World Health Organization (WHO) and the World Bank. Its aim is to quantify the burden of mortality and morbidity from disease and injury in different regions of the world. The GBD studies use DALYs as their measure of the value of health. DALYs are designed to compare the health of different populations, to assist in international health and development policy, and to be used in cost-effectiveness analysis.

As new data became available in the last two decades, the GBD project has published a number of updates. The most recent is the 2010 update, which also introduces a number

of methodological revisions (*The Global Burden of Disease Study 2010*). Some of the revisions were prompted by ethical objections. The overview below reflects the most recent methodology, but it also traces some of the debates.

Originally, DALYs were designed to represent the badness of particular diseases and injuries. Disability weights were assigned to conditions such as HIV, malaria, ischemic heart disease, and so on. In the early GBD studies, approximately 800 conditions were included, many of them in both treated and untreated forms (Murray and Lopez 1996).

The 2010 version takes a somewhat different approach. It begins by identifying slightly less than 300 general causes of disease and injury. They include such diverse causes as cancers, different forms of heart disease, malaria, rheumatoid arthritis, Down's syndrome, road injuries, falls, and so on. Of course, these causes may lead to different pathological conditions. Thus, each cause is associated with a number of pathological conditions—called *sequelae*. Altogether, the cause sequelae list has 1,160 pathological conditions. Therefore, at the most general level, there are causes of disease and injury. At the next level, there are different conditions as the consequences of those causes. For instance, anemia is associated with 19 items on the cause list, including malaria, maternal hemorrhage, iron deficiency, peptic ulcer disease, and sickle cell disorder.

Anemia, of course, can be more or less severe. Thus, from the perspective of the burden of different pathological conditions, what matters is the level of disability that anemia from malaria or iron deficiency or sickle cell disorder may lead to. Within each form of anemia, therefore, mild, moderate, and severe forms are distinguished. They are treated as different *health states*. Altogether, 220 different health states are defined. Each of the 1,160 pathological conditions is associated with one health state. Thus, mild anemia due to malaria leads to the same health state as mild anemia due to iron deficiency or sickle cell disorder. The associated health state represents the same disability.

The 220 health states each have their separate disability weights. The disability weights in DALYs are assigned on a numerical scale from 0 to 1. This scale is inverted from the one that is used for QALYs: 0 represents full health (absence of any disease or injury) and 1 represents loss of life. Thus, on this scale, the *smaller* its disability weight, the *less* of a burden a health state is. The scale is inverted between QALYs and DALYs because QALYs represent health benefit and DALYs represent harm.

For instance, the disability weight associated with mild anemia is 0.005; the weight associated with moderate anemia is 0.058; and with severe anemia it is 0.164. This procedure makes it possible to determine the burden associated with mild, moderate, or severe anemia in a population. In addition, it also makes it possible to determine how much of that burden can be attributed to malaria, iron deficiency, or other causes.

DALYs are a *gap measure*: They represent the shortfall in health in a population. Like QALYs, they combine the time spent in a health state with its disability weight. Thus, for instance, the burden of severe anemia for 1 year is 0.164 DALYs, for 2 years it is 0.328 DALYs, and so on. If there is only one patient in a population who has severe anemia for a year, then the overall burden of severe anemia is 0.164 DALYs; if there are a thousand, it is 164 DALYs. These values represent the gap between actual population health and the health that the population would have if it were free of a particular disability.

This is, however, only one part of the calculation of DALYs. It reflects only the harm of morbidity. This component of DALYs is called *years lived with disability*, since it is determined by the weights of disabilities and the time spent with those disabilities. But diseases and injuries also kill people. Thus, DALYs have another component: *Years of life*

lost due to premature mortality. This component reflects the harm of early death due to disease and injury. In summary, DALYs are the sum of two components: Years lived with disability and years of life lost due to premature mortality.

Years of life lost due to premature mortality is simply the number of years that a person loses due to premature death. But how many years does a person lose when he or she dies? People in different countries and regions of the world have different life expectancies. Years of life lost could be calculated on their basis. But if the prevailing life expectancies were used, a death in Sub-Saharan Africa would represent a smaller harm than a death at the same age in Western Europe. This would be an objectionable implication, since a death in Sub-Saharan Africa should not matter any less morally. The developers of the DALY, therefore, chose to measure years of life lost on the basis of an *ideal* life expectancy: Years of life lost due to premature mortality is the gap, in years, between the actual age of death and the ideal life expectancy.

The idea behind using ideal life expectancies is that all populations should be able to reach the highest life expectancy in the world. It is a harm if they cannot do this, and the burden of that harm should be reflected in DALYs. This, of course, is a normative consideration. Thus, it should not be considered a harm if a population cannot reach a life expectancy of 100 years, but it should be considered a harm if it cannot reach what is possible for others. The burden of premature mortality, therefore, should be determined by the shortfall from what the longest-living population can achieve. The country with the longest-living population is currently Japan.

Originally, the ideal life expectancy was set at 80 years for men and 82.5 years for women, reflecting life expectancies at birth in Japan in the early 1990s. One argument for different life expectancies for men and women was that women have a greater biologically determined “survival potential” (Murray 1996). In addition, men tend to take greater risks with their health. The consequence of this discrimination is that the death of a man counts for less than the death of a woman at the same age. This is morally problematic. In the *2010 Update*, therefore, the ideal age for both men and women was set at 86 years. This also reflects the gains in life expectancy in the last two decades, and the narrowing of the gap between male and female life expectancies (Murray et al. 2012).

A summary measure of population health can be calculated by aggregating DALYs for different diseases and injuries. A disease can cause a health loss for a person for a certain amount of time. This part of its burden is represented by years lived with disability. The disease might also kill the person prematurely. This part of its burden is represented by years of life lost. The sum of these two components determines the burden of the particular disease in DALYs. DALYs associated with different disabilities can be added up, and the aggregated number of DALYs represent the overall disease burden in a population.

Ethical Issues

The use of QALYs and DALYs in health policy raises a number of ethical issues. One set of issues concerns measurement. How should the quality adjustment factors be determined? Another set of issues concerns the use of QALYs and DALYs in health resource allocation. Does their use in cost-effectiveness analysis lead to unfair discrimination against some patient groups? A third set of issues concerns their social or moral value: Do all QALYs and DALYs have the same value regardless of their distribution?

Whom to Ask?

Researchers customarily use a small sample of the general population for determining the quality adjustment factors in QALYs. The developers of the DALY originally used the responses of an international group of health professionals to assign disability weights. In the latest revision of the GBD studies, they used household surveys in several countries and a general, web-based population survey. Questions have been raised about the use of different preference elicitation methods as well as the cross-cultural applicability of the quality adjustment factors and disability weights.

Broadly speaking, there is a fair degree of convergence in the evaluation of health outcomes across different methodological approaches and socio-economic and cultural settings. There remains, however, an important source of discrepancy. When health outcomes are evaluated by members of the general population, their responses often imply *lower* quality adjustment factors than those that result from the evaluations of people who have direct or indirect experience of those health outcomes. It appears that the general population considers many health outcomes worse than health professionals do, who in turn consider them worse than patients who live with those outcomes.

Some critics argue that this raises a fundamental problem. Why should health outcomes be evaluated by those who have less experience of them? Shouldn't QALYs and DALYs reflect the values of those who have the best knowledge of health outcomes and health conditions?

The problem is not merely lack of knowledge and experience. People living with chronic conditions and permanent disabilities tend to consider their conditions less bad when they have *adapted* to them. Faced with long-term illness, people tend to change their activities, aims, and values in light of their functional limitations. Adaptation is often a healthy way of coping with adverse conditions. People with chronic conditions and disabilities can compensate for their health loss by adjusting their pursuits and life plan. As a result, their *overall* quality of life need not be lower. Critics point out that QALYs and DALYs that are not based on "patient values" do not reflect this (see Menzel *et al.* 2002; Brock 2004).

Yet using evaluations that reflect adaptation leads to a problem. QALYs and DALYs are used in cost-effectiveness analysis to determine how scarce social resources should be allocated. When the patients' evaluations are used, the prevention and treatment of their conditions can turn out to be less urgent. Because the evaluations of health professionals and members of the general population generate lower QALY values—reflecting a greater impact on quality of life—using their values makes the prevention, treatment, and rehabilitation of these conditions more important.

Some health economists also argue that using the responses of a sample of the general population reflects "community values"—the value that society places on the prevention and treatment of different conditions. Using community values may confer legitimacy on health resource allocation choices, which they would lack if only patient values were used.

Finally, adaptation to disability is not always desirable or admirable. A patient can adapt to her functional limitations by substituting her aims and activities with worthwhile alternatives. Sometimes, however, adaptation can take the form of giving up worthwhile aims and activities, and finding satisfaction with the limited opportunities that remain. It would be problematic if health outcomes and health conditions were considered less bad just because patients become resigned to the limitations imposed by them. A practical proposal

is to use the lowest QALY values in order to avoid neglecting any health needs: It is worse to fail to address a health problem that is more severe than empirical surveys suggest than to address one that is less severe than it appears (Wolff *et al.* 2012).

Disability Discrimination

The most persistent moral debate associated with QALYs and DALYs is their use in the allocation of health resources. In one form or another, scarcity is always present in health care systems. Whether explicitly or implicitly, “rationing” decisions are routinely made by politicians, health policy makers, insurance providers, health care administrators, and many other actors in the health care system.

Cost-effectiveness analysis is one of the most important tools for evaluating health resource allocations. According to its critics, however, if cost-effectiveness analysis is used for setting priorities in health care, lower priority will be given to those whose capacity to benefit from interventions is limited (see Brock 2009). Some patient groups, including people living with disabilities and chronic health conditions, may have a limited capacity to benefit compared with those who can be returned to full health. Thus, their treatment will be given lower priority. They will be unfairly discriminated against.

This problem is most acute when it comes to life-saving interventions. It seems that patients who can be returned to full health will always be favored by the cost-effectiveness calculus. Suppose that two patients suffer from the same life-threatening disease. The costs of treatment are equal, but only one of them can be treated. The first patient can be returned to full health for another 10 years; treating her will result in 10 QALYs. The second patient would also survive for another 10 years, but she cannot be returned to full health—her health-related quality of life would be 0.8. Saving her would result in only 8 QALYs. Thus, according to the cost-effectiveness calculus, the first patient should get the treatment. But this is unfair towards the second patient who would not receive the treatment because of her preexisting disability.

There are several possible replies to this objection. One is to deny that people with disabilities and chronic conditions would be discriminated against on account of their condition. The objection misunderstands the way QALYs, DALYs, and cost-effectiveness analysis are used in practice. Another reply concedes the possibility of discrimination, but argues that not all forms of it are unfair. When people with disabilities are treated unequally, it is either not an instance of unfairness or, all things considered, the unfairness can be justified. The third reply is simply to point out that cost-effectiveness should not be the only consideration in health resource allocation. It should be used along with other moral principles to avoid unfairly discriminating against anyone (for a fuller account of these replies, see Bogner and Hirose 2014).

I will return to the third reply in the next section. Here I will focus on the first and the second.

Consider again the example of the two patients, where treating the first one would result in 10 QALYs and treating the second would result only in 8 QALYs. When only cost-effectiveness is taken into account, the judgment that the first patient should be saved is simply a matter of arithmetic. It would be pointless to debate arithmetic. Thus, if resources for health are allocated in the way described, people with limited capacity to benefit will indeed be disadvantaged. But the example is misleading. It does not represent the way cost-effectiveness analysis is used in practice.

To begin, note that cost-effectiveness analysis ranks those interventions and health services the highest whose *relative* benefits are greatest (given their costs). If some patients have a low health-related quality of life, their treatment can potentially realize the greatest relative benefit. Thus, the treatment of people with disabilities and chronic health conditions will often have a favorable cost-effectiveness ratio, since the treatment and rehabilitation of disabling conditions have both immediate and long-term benefits. To be sure, the treatment of disabling conditions can be costly or uncertain, and chronic conditions might require long-term management. Nevertheless, the point is that the use of cost-effectiveness analysis does not *inherently* discriminate against anyone: Its rankings depend on how costs and benefits work out in particular cases.

Critics will point out that this is not the case in the example of life-saving interventions, when the person with the preexisting disability can only be returned to the level of 0.8. But in practice, QALYs are not assigned to specific patients or patient groups, but to treatments and interventions. Cost-effectiveness analysis is used to rank alternative *resource uses*, not to rank patients. When NICE in the UK recommends a new treatment or medical technology to the NHS, it calculates its benefits in QALYs. It does not calculate different QALY values for different patient groups. There are no separate cost-effectiveness ratios for patients with and without disabilities. An intervention is recommended if it has a favorable cost-effectiveness ratio. When it does, its use is recommended for all patients who need it, regardless of their other characteristics.

Therefore, it is misleading to object to the use of QALYs and DALYs on the basis of examples like the one above. Cost-effectiveness analysis is not used to ration treatments for specific patients. A patient with a preexisting disability or chronic condition is just as eligible for treatments and life-saving interventions as anyone else, once it is determined that the intervention should be provided by the health care system because of its favorable cost-effectiveness ratio.

Nevertheless, critics might insist that it is sometimes an inevitable consequence of the use of QALYs and DALYs that some groups of patients will be disadvantaged. For instance, some health care systems do not provide certain cancer treatments due to their high costs and limited benefits. Patients who need these treatments but are unable to pay for them themselves will be left untreated. These patients are “rationed out” as a consequence of using cost-effectiveness analysis (Bognar 2010).

This point leads to the second reply to the discrimination objection. Priority setting in health care is about the use of common resources, pooled from the contributions of many people. This is as true of private health insurance as of publicly funded health care. Scarcity requires putting limits on what can be provided. The objection in its present form amounts to denying that considerations of costs and benefits can ever be used in setting limits. It argues that it is unfair to use them when they lead to the unequal treatment of some groups. But not all unequal treatment is unfair. If costs and benefits are ignored, there will inevitably be others whose health needs cannot be met because of the inefficient allocation of the available resources. Ultimately, the health care system becomes a “bottomless pit,” in which resources are spent on providing small benefits to a few and neglecting the greater benefits of the many. In order to avoid this, some inequalities can be justified. They are not unfair (Fenton 2010).

Alternatively, it could be argued that ignoring the greater benefits of others is in itself a form of unfairness. Refusing to fund an intervention with an unfavorable cost-effectiveness ratio is not unfair. It may be unfortunate that some patients cannot have free or subsidized access to a beneficial treatment, but when resources are scarce, it would be even

more unfair to deny treatments that bring greater benefits to others at lower costs. Refusing to take into account costs and benefits in conditions of scarcity is morally more problematic than not funding a particular intervention because of its limited effectiveness or high costs.

Cancer treatments are a case in point. Many cancer drugs offer limited benefits for very high costs. For instance, Provenge, a prostate cancer drug, extends life by an average of 4 months, but it costs \$93,000 per patient. Yervoy, a melanoma drug, costs \$120,000 and extends life by an average of 3 and a half months (*The Economist* 2011). NICE was widely criticized when it did not recommend to the NHS the use of Avastin for advanced bowel cancer, arguing that the £21,000 that it cost for each patient was not worth the six weeks of extra life that it provided (*The Guardian* 2010).

Setting priorities among alternative resource uses requires a complex balancing of harms and benefits. It will often be impossible to provide benefits to some groups without foregoing benefits for others. Critics who worry about patients with limited capacity to benefit may in the end be troubled by the assumption that all QALYs and DALYs have the same value in cost-effectiveness analysis, regardless of their distribution. Perhaps the solution is to give different weights to the QALYs and DALYs of different groups of people.

Weighting QALYs and DALYs

DALYs are used for calculating the burden of disease. Before the *2010 Update*, their calculation in the GBD studies had a unique feature: DALYs were given different weights depending on the age of the person who suffered from disability. DALYs were age weighted.

The age-weighting function that represented the relative weights of DALYs at different ages started from a low value at birth, increased until young adulthood, and steadily diminished afterward. Thus, a disease or injury was considered worst when a person was 25 or 30. It was considered less bad at age 5 or 65.

The researchers in the GBD project justified age weighting the following way. People are more productive in their young adulthood. They are more likely to be employed. They also contribute to social productivity in other ways: They often take care of their children and elderly parents. Hence the welfare of children and older people depends, to a large extent, on their contributions. This sort of *welfare interdependence* has a crucial role in society. In particular, the illness of a young adult is likely to negatively affect the welfare of others. Therefore, it should have more weight when the burden of disease is calculated. Age weighting was introduced to take welfare interdependence into account (Murray 1996).

Age weighting in the GBD studies became very controversial, and not only because the idea of welfare interdependence may be a form of cultural bias. As I explained above, DALYs are an evaluative measure of health. When the DALYs of young adults are given more weight, considerations that should be irrelevant to measuring the burden of disease are introduced—namely, considerations about the *social* value of health. Disability in a young adult is considered worse not because it is worse for him or her, but because it is worse *for others*. Arguably, that sort of consideration should have no place in a measure of health. Moreover, even if the burden of disease is interpreted in the broad way that the argument from welfare interdependence suggests, age weighting leads to double counting, since the care that some people provide to others is already reflected in the measure of the burden of those who receive care (see, e.g., Bognar 2008).

Because of the objections, age weighting was abandoned in the *2010 Update*. Nevertheless, some philosophers and health economists argue that giving different weights to QALYs and DALYs at different ages can be justified in other ways.

One proposal is to age weight QALYs according to socio-economic group. In all societies, people lower down the socio-economic ladder have shorter life expectancies and worse health outcomes than people who are better educated, do less hazardous work, and have higher incomes. These inequalities can be mitigated if the QALYs of people from disadvantaged socio-economic groups are given greater weight. On this proposal, extra resources should be spent on extending healthy life for disadvantaged groups. This would necessitate trade-offs between overall population health and equality in life prospects, but the trade-offs could be made explicit by the weighting (Williams 1997).

A more general extension of the use of QALYs in health resource allocation is the introduction of *equity weights*. Equity weighting is proposed to reflect the idea that health improvements for people who have a lower health-related quality of life should have greater moral weight. Giving more weight to their QALYs would lead to more equal outcomes. Societies are concerned with the fair distribution of health benefits. There is a lot of empirical evidence showing that people prefer to give more weight to the treatment of those who are more severely ill and to those who have a limited capacity to benefit from treatment. People also believe that life-saving interventions are more important than health-improving interventions. Equity weights have been suggested as a method for taking these moral concerns into account (Nord 1999).

Nevertheless, equity weighting has not been used in practice, in part because many questions remain as to whether this method can capture all of the moral considerations that should be taken into account in health resource allocation.

Conclusion

This chapter has presented only some of the many challenging ethical issues in the measurement of population health and the allocation of health resources. The intersection of ethics and health policy remains a largely uncharted area, and so it is a fertile ground for new questions and challenges for bioethicists.

Related Topics

Chapter 1, "The Right to Health Care," John D. Arras

Chapter 2, "Social Determinants of Health and Health Inequalities," Sridhar Venkatapuram and Michael Marmot

Chapter 3, "The Ethics of Rationing," Daniel Callahan

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Further Reading

Useful collections include:

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- For a broader treatment of the issues in this chapter, see Bognar, G. and Hirose, I. (2014) *The Ethics of Health Care Rationing*, New York: Routledge.