An important project of the World Health Organization (WHO) in the 1990s was to measure the global “burden of disease,” which the WHO staff took to be the contributions of diseases, injuries, and risk factors such as tobacco smoking to ill health. To measure the burden of disease, they, like the staff of the Institute for Health Metrics and Evaluation (IHME), who continue the project, attempted to generate summary measures of overall population health and to measure the health effects of diseases by means of these summary measures. The staff at the WHO and the IHME hoped that these summary measures would serve other purposes, such as identifying locations where health is particularly bad, assisting research, and guiding the allocation of health-related resources ([1]), but this essay is concerned mainly with the attempt to measure the global burden of diseases, injuries, and risk factors.

In particular, this essay asks whether the global burden of disease, injuries, and risk factors should be understood in terms of their consequences for health, as maintained by the WHO and IHME staff, or in terms of their consequences for well-being. It answers that the burden of disease should be understood in terms of the consequences of disease for health, and it defends the wider efforts to measure health by many others who are in other ways skeptical of the WHO’s and IHME’s projects.

The view of the burden of disease shared by the WHO and IHME staff and by most others who have attempted to measure health starts with a conception of a person’s health over a time period as the sequence of their health states. People’s health states are defined in turn by their functional deficiencies (such as cognitive problems, limitations to mobility or agility, sensory deficiencies, or affective disorders), and by aspects of their subjective states, such as pain and depression. Diseases, injuries, and risk factors, like health interventions, change the
distribution of health states within a population. This framework abstracts as far as possible from the debates concerning the concept of health.\textsuperscript{a} The burden of disease understood concretely is this change in the distribution of health states, but without a scalar measure of the change in distribution, there is no unambiguous way to compare the burdens of different causes of ill-health. So what is called the burden of disease is some scalar measure of the change in the distribution of health states due to disease.

The WHO and IHME staff, unlike those who have generated health measurement schemes such as the EQ-5D or the Health Utilities Index (HUI), have hoped literally to measure the quantity of health.\textsuperscript{b} But that is impossible, because the relation “healthier than” is incomplete. There is no way to make a quantitative comparison of the “distance” from full health of one kind of deficiency (such as a cognitive problem) with another kind of deficiency (such as pain or a vision problem) (Hausman unpublished). Though one cannot literally quantify health or health changes, one can measure population health by evaluating health states and using the values of health states to calculate the values of distributions of health states. One can then measure the effect of a disease on population health by subtracting the value of the distribution of health states that results from the disease from an estimate of the value of what the distribution would be without the disease.

John Broome argues that this way of determining the global burden of disease is misconceived ([2]).\textsuperscript{c} He maintains that those concerned with the burden of disease should attempt to measure the effects of diseases on well-being rather than attempting to measure their health effects. Although he directs his criticisms to the work of the WHO, they apply broadly to efforts to measure health, both welfarist and “extra-welfarist” ([3]).\textsuperscript{d} Broome’s position is implicitly as critical of those who attack the WHO’s efforts, such as Alan Williams ([4]), as of
the WHO’s project. Broome makes two arguments against measuring the burden of disease by its consequences for health. His first argument relies on the premise that health is and should be measured (or evaluated) in terms of its contribution to well-being.

. . . the measure should measure health as a component of well-being . . . . it is to measure how good a person’s health is for the person, or how bad her ill-health. . . . That is to say, it aims to measure the contribution of health to well-being. ([2], p. 94)

Health contributes to well-being both causally and constitutively. But Broome goes on to argue (though not in quite these terms), that a health state of any specific kind makes no uniform contribution to well-being. The contribution to well-being of a token health state of a particular kind (that is, the contribution to overall well-being of a specific person being in that health state at a specific place and time) differs depending on a person’s circumstances. The effects of health states depend on the geographical, economic, technological, and cultural environment, and the values of health states depend in addition on the tastes, values and objectives of individuals and on prevailing social values.

Well-being is thus not separable into health and non-health components. Broome points out:

Obviously, the way in which a person’s well-being is affected by the various elements of her health depends a great deal on other features of her life. For example, asthma is less bad if you are well housed, mental handicap less bad in supportive communities, blindness less bad if you have access to the internet. ([2], p. 95)

Because health states have different impacts on well-being in different contexts, token health states will have different values, and health states of a given kind will have no single value at all. Since the value of a health state (type) is not defined, it cannot be measured, and hence the
burden of disease cannot be measured by the effects of disease on the value of health states. A change in the distribution of health states should be valued instead by the change in well-being it causes. Notice that this is not just an argument against measuring the burden of diseases by their consequences for health. It is an argument that it is impossible to measure health.

Secondly, Broome argues that “we should be concerned with all of well-being” ([2], p. 98) and hence with “the whole reduction in people’s well-being, which is caused by disease” ([2], p. 97) not with “only the part that consists in a reduction in people’s health” ([2], p. 93). I take the “we” here to include those who make health policy. The implications of this view extend far beyond efforts to carry out summary measures of population health. For example, Broome’s view implies that the National Institute for Health and Clinical Excellence (NICE) should determine what treatments the National Health Service should provide by examining their effectiveness at promoting well-being, rather than by examining their effectiveness at promoting health.

Both of Broome’s arguments depend on the premise that what ultimately matters is well-being (and fairness). So, Broome argues, the burden of disease should be quantified by the impact of disease on well-being and the value of a token health state lies in its bearing on well-being. Broome writes, for example,

Disease causes harms of a great many sorts, which are often not themselves specifically changes in health. For example, some diseases prevent their victims from working, and so deprive them of income and the other benefits that accompany work: companionship, self-esteem and so on.

Indeed, the harms that are always treated as changes in health often consist in deprivation of goods other than health. . . .
So we ought not to be trying to measure the harm done by disease in terms of health only, but in terms of the whole of well-being. ([2], p. 98)

Up until the last sentence, the quotation seems to me correct, indeed obviously so – provided that one does not forget that the direct effects of disease are virtually entirely effects on health and that the other harms diseases cause are the indirect effects of the changes in health they cause. But the conclusion that those concerned with health policy should be measuring the harm done by disease “in terms of the whole of well-being” does not follow without additional premises.

Health matters to people in many ways. For example, certain health states damage or destroy people’s ability to manage their own lives. In doing so, they typically also diminish well-being, but one may reasonably question whether the value of a loss of autonomy is captured by the extent to which that loss of autonomy diminishes well-being. Other health states interfere with people’s abilities to pursue objectives that they value. The inability to pursue those objectives will not necessarily diminish people’s well-being, because the objectives people pursue are often irrelevant to their well-being and sometimes even detrimental to it. Someone who is too ill to join the army to help resist an enemy invasion may be better off for his or her illness, even if he or she is deeply committed to sharing in the effort at defense. And even when limitations on people’s ability to pursue their objectives diminish their well-being – as they typically do – the significance of the limitation need not coincide with the extent to which those limitations diminish well-being. In fact, economists assign values to health states by measuring people’s preferences among them. Although many economists mistakenly identify what people prefer with what is good for them, people’s preferences do not always coincide with their judgments of what would be best for themselves ([5], chapters 8 and 9). The actual methods of assigning values to the consequences of disease by measuring preferences neither focus
exclusively on the consequences of disease for well-being nor on the consequences of disease specifically for health.

It might be argued that even though the bearing of health states on well-being does not exhaust the ways in which health states matter to individuals, only their bearing on well-being should influence social policy. If the sole ultimate goal of social policy were to enhance welfare (within the limits of fairness), then it would seem that the burden of disease that is relevant to the ultimate goal of social policy consists of the consequences of disease for well-being.

This view of social policy is controversial. Libertarians would argue that the ultimate aim of social policy is to enhance individual freedom, and that people’s well-being is their own responsibility, not at all a social concern. Most liberals would, in contrast, concede that one aim of social policy is to promote welfare, but they would insist that policies may have other independent aims, including protecting freedom and expanding opportunities. Since health influences opportunity and people’s ability to make use of their freedom, liberals should deny that the value of health is exhausted by its bearing on well-being.

Even if one held that ultimate aim of social policy is to promote well-being within the constraints of fairness, it does not follow that the burden of disease should be measured by the impact of disease on well-being. To enhance well-being within the constraints of fairness, policy makers need information about the consequences of alternative policies. Information that does not specify how those consequences bear on individual well-being may nevertheless be useful. For example, findings concerning the consequences of a disease for mortality in different age groups, given alternative public health initiatives, helps policy makers to estimate the effects of the proposed public health plans on well-being without itself saying anything about well-being. From the premise that policy-makers need to know the consequences for well-being, it does not
follow that health should be measured in terms of well-being. All that follows is that policy makers be able to draw inferences concerning well-being from measures of health.

Furthermore, regardless of the ultimate aims, social policy has many interim aims, and with respect to the interim aims, measures of health states in terms of their impact on overall well-being or fairness may be inferior to other health-state measures. Suppose, for example, that a government is attempting to diminish poverty and that it wants information about the health of members of various social groups both to diagnose how serious the poverty of different groups may be (since poverty clearly affects health) and because it is considering undertaking public-health measures as a way of addressing poverty (since health clearly affects poverty). Information concerning the well-being of social groups is not what is needed, nor is information about the effects on overall well-being of the contemplated public-health initiatives. In measuring health, health analysts are generating data that will be used for many purposes, and Broome has provided no argument for the claim that information concerning the impact of health states for well-being will serve these purposes better than other sorts of information. Whether or not one holds that the sole ultimate aim of social policy is to boost individual welfare fairly, there is little to be said for the claim that health is valuable only insofar as it is part of or a cause of welfare or that the burden of disease should be quantified by the consequences of disease for well-being.

Moreover, there are strong reasons not to measure the burden of disease by its consequences for well-being. Broome's measure of health conflicts with most people's judgments concerning the severity of diseases and health states, and it would imply policies that most people would reject. Consider disabilities, such as blindness, deafness or paraplegia, to which many people successfully adapt. If one measures the severity of a health state by its
consequences for an individual's well-being, then blindness, deafness or paraplegia could turn out to be minor disabilities. In that case, health policy devoted to preventing or curing those conditions would have to be defended mainly in terms of the well-being costs of adapting to the loss, the costs to others of accommodations for the disabled, or the diminished contribution those with these disabilities make to the well-being of others. To deny that deafness, blindness, or paraplegia involve significant disabilities and to justify health policies that prevent or cure them on the basis of factors such as productivity or the cost of accommodation seem mistaken.

Broome does not maintain that his measure of the burden of disease matches our intuitive judgments concerning the severity of diseases and health states, and he could maintain that popular opinion about the significance of these disabilities is mistaken. If he had a well-supported theory and our pretheoretic views about the significance of disease had no rationale, then the conflict of Broome’s views with popular judgment would not be a very serious criticism. But, on the one hand, the common view that health states such as blindness, deafness, and paraplegia are significant disabilities can be explained and rationalized by pointing to the effects of health on things other than well-being, such as opportunity, and, on the other hand, as I argued above, Broome's view is not well-supported.

The conflict between Broome's measure of the burden of disease and people’s judgments concerning health is stark. If one were to measure the burden of disease in the way that Broome defends, two countries that have exactly the same distribution of health states and whose distribution is changed in exactly the same way by a disease would nevertheless be burdened differently by the disease, whenever its effects on well-being were not the same in both countries. The health states are the same, the health effects of the disease are the same, yet the burden of disease is not the same. For those who want to measure the consequences for health,
this result is intolerable. On Broome’s view, in contrast, this result is unsurprising. Broome is, after all, denying that the burden of disease should be calculated in terms of the consequences for population health. So what if the effects of disease on health are just the same? The burden of disease – the consequences of disease for well-being – is not the same.

It is hard to accept this view of the burden of disease, because people are concerned specifically about health, not just well-being. Learning that the burden of disease conceived of in Broome’s way is greater in one country than another would tell us that the effects of the disease are worse, but it would not tell us that there was a greater health problem or that more resources that are earmarked to address health problems should go to one country rather than the other. A measure of the burden of disease in terms of the consequences for well-being may fail to tell those who are concerned about health what they want to know.

There are also practical problems with Broome’s proposal to measure the burden of disease by the effects of disease on well-being. Though it is hard to assign a scalar measure to health and hence to measure the health effects of disease, it seems to be harder still to assign a scalar measure to well-being. What constitutes a person’s good is even more multi-dimensional than what constitutes their health. There are methods of quantifying preferences, but preference satisfaction does not coincide with welfare. Furthermore, whereas there are clear constraints on interpersonal health comparisons, since people’s health is the same when they are in the same health state, it is far from clear how to make interpersonal comparisons of preferences or well-being. If it is not possible to measure well-being on at least an interval scale and, in addition, to make interpersonal comparisons of well-being, then it is not possible to aggregate individual well-being or to compare changes in well-being across populations. So it would be impossible to
estimate the effect of disease on overall well-being. Implementing Broome’s proposal poses very serious problems.

Even if one had an interpersonally comparable interval-scale measure of overall well-being, health economists are in no position to estimate the consequences of diseases, injuries, and risk factors or of health policies on overall well-being. To estimate consequences of a disease or a policy on well-being requires that one compare what well-being would be in the future with or without the disease or the policy. To make such a comparison demands much more than knowledge of the direct effects of diseases or health policies on health states. In addition one needs estimates of economic growth, technological progress, climate change, educational achievement, political stability, and so forth. One cannot expect health economists to have this knowledge. Though one might reasonably expect them to be able to estimate the effects of diseases or policies on health, one cannot reasonably expect them to be able to estimate the effects of diseases or policies on well-being.

Insofar as policy makers aim to enhance well-being, they need to be able to estimate the well-being consequences of social policies. What they can reasonably expect from health economists are data from which to draw inferences concerning what the consequences for well-being will be of diseases or health policies coupled with education policies, agricultural policies, transportation policies and so forth. They cannot expect that health economists tell them what the consequences for well being would be.

Instead of defining the mission of the various state sectors (health, education, occupational health and safety, environmental policy, and so forth) to be to promote well being by manipulating the particular causal factors within the purview of the particular state agency – which seems to be Broome's view ([2], p. 98) – contemporary governments assign different goals
to different sectors. They do this, because there is no feasible alternative, even if everyone accepted Broome's view that the ultimate goals of policy are well-being and fairness. Of course current practices result in many misdirected efforts and mistaken policies. Coordination among various agencies is needed. But the department of health cannot be feasibly charged with the promotion of well-being by influencing health, while the department of education aims to promote welfare by influencing education, and the department of transportation aims to promote welfare by building roads, transit systems, and airports. Those working in specific departments do not know how to enhance overall well-being, and their clumsy efforts to do so would inevitably collide. The goals of those concerned with health policy are narrower, and the information they need concerns more immediate consequences of policy or disease.

Although these considerations cast doubt on Broome’s claim that the burden of disease should be identified with the consequences of disease for well-being, they leave his critique of health measures intact. Indeed, if anything, they magnify the difficulties facing those who purport to measure health. Those difficulties did not depend on the view that the value of health consists in its bearing on well-being. To measure health and hence to provide a scalar measure of the consequences of disease for health requires that one assign values to kinds of health states, as defined by some health-state classification system. But the consequences of tokens of the same health-state type and hence the values of the tokens differ depending on the context. Health states types do not have values. The burden of disease must consequently be measured by the values health states have in different contexts.

This appears to be a very serious problem. How can a health economist assign a single number to many different values? As difficult as it may be to provide a scalar measure of the consequences of disease for well-being in a specific context, it is harder still to provide an
overall measure of the various intrinsic and instrumental values of health states across a whole range of contexts.

Fortunately, there are some possible solutions to this problem. The staff at the WHO and the IHME have suggested two. One possibility to take the value of a health state of a particular type to be the average over all the different contexts of the intrinsic values of its tokens, where this average is weighted by the frequency of the contexts ([6], p. 34). Context-dependent health-state values might be inferred from preferences among health states – though such an inference would be precarious and would place heavy demands on the methods employed to elicit those preferences. Although the global weighted average of the values of the tokens will often differ from both the value of any specific token and from the average value health states have in individual countries or regions, relying on these global average values is arguably a reasonable way to quantify the global health effects of diseases, injuries, and risk factors. The second way of coping with the problem that tokens of the same health state have differing values is to take the value of a health state to depend upon the value of its consequences in some specified “standard” context ([7], p. 304). Provided that the choice of a standard context can be justified, one can also use the standard values of health states to assign a value to the effects of diseases, injuries, and risk factors on the distribution of health states. Whether average or standardized values of health states will serve the other purposes that a summary measure of population health was designed to serve is another question, which I have addressed in another essay (Hausman unpublished). But if the distribution of contexts is held constant (as it must be in order to implement Broome’s own proposal that one calculate the effects of diseases on well-being), then the effects of diseases on the value of population health can be calculated from their effects on the distribution of health states and the average or standard values of health states.
Conclusions:

Many problems remain, and different measures may be needed for different purposes. Yet the prospects for assessing the burden of disease in terms of the consequences of disease, injuries and risk factors for health itself are not so bleak as they may have appeared earlier in this essay. Evaluating health states by the weighted average of the values of their tokens or by the value they have in a standard context is a compromise that grows out of the impossibility of quantifying health itself. But it is a compromise worth making, because (in contrast to Broome’s proposal) some measure of health itself is needed for policy purposes.

Competing Interests:

There are no conflicts of interest or competing interests.

Author’s information:

The author is a philosopher who has worked on issues at the boundaries between economics and philosophy. He is sympathetic to the project of attempting to generate summary measures of population health but also concerned about the conceptual difficulties the project involves.

Acknowledgments:

I am indebted to John Broome, Dan Brock, Dennis Fryback, Emanuella Gakidou, Dean Jamieson, Christopher Murray, Joshua Salomon, Daniel Wikler, and Yukiko Asada for discussion of these issues.
Endnotes:

a It is compatible with the so-called “biostatistical view” defended by Christopher Boorse ([8], [9], [10], [11]) and the related views defended by Jerome Wakefield ([12], [13]). It is also compatible with many more purely evaluative views of health. For general discussions of the concept of health see [14] and [15].

b “The health state valuations . . . represent quantifications of the overall health levels associated with different states” ([16], p. 324). “[W]e consider a health state valuation to provide a scalar cardinal index of the overall level of health associated with a multidimensional health state” ([7], p. 307. See also [17], p. 16, and [18], p. 431. The EQ-5D is used by the National Institute for Health and Clinical Excellence in the United Kingdom and elsewhere, mainly in Europe, while the HUI was developed in Canada and has been used there more often than elsewhere. Both take the weights they assign to health states to be measures of the health-related quality of life associated with that health state. For further information on the EQ-5D and the HUI see http://www.euroqol.org/home.html and http://www.fhs.mcmaster.ca/hug/.

c In an unpublished essay, “Measuring the Burden of Disease,” Broome develops his argument in more detail, but I shall document my claims about his argument exclusively from his published essay.

d This claim oversimplifies a complicated subject-matter. Broome maintains that purported measurements of health are really defective measures of well-being, and his arguments imply that health cannot be measured at all. The controversy between welfarists and non-welfarists or extra-welfarists turns instead on whether other factors than overall preference satisfaction should enter into the appraisal of health states. Indeed, as Brouwer et al. characterize welfarism, Broome turns out not to be a welfarist, because he does not equate welfare and preference satisfaction and because he is as concerned with fairness and interpersonal welfare comparisons as with increasing welfare.

e Broome makes clear that health policy must be guided by considerations of fairness as well as by concerns about well-being. Saving the life of a poor patient or a disabled patient may contribute less to well-being than saving the life of someone richer or not disabled, but that does not, in Broome’s view, justify treating the rich or non-disabled rather than the poor or disabled, because doing so would be unfair ([2], p. 99). Although Broome believes that fairness ultimately matters because of its contribution to the overall good ([2], p. 100), he maintains that it is useful to separate concerns about fairness from concerns about increasing well-being. In Broome’s view one should measure the burden of disease by the consequences for both well-being and fairness. Like Broome, I shall leave the issues about fairness largely implicit.

f Yet many still believe that health should be measured by its bearing on well-being. For example, Dan Brock asserts, “When people make these judgments [evaluating health-states], . . . they must be making judgments about the goodness of health, the degree to which different functional limitations reduce overall well-being” ([19], p. 117). Later in the same essay Brock does, however, consider a different way to evaluate health states.

g Those who deny that diminished functional abilities such as deafness constitute disabilities maintain, quite reasonably that those who cannot hear
Let $V(h)$ be the value (the quality adjustment) of a health state of type $h$ and let $v_i(h)$ be the value of tokens of $h$ that occur in context $i$. $v_i(h)$ would depend on the intrinsic value of $h$ in the $i$’th context and on the value of the consequences of $h$ in that context, which would include the consequences of $h$ for well-being. One could then specify $V(h) = \sum f_i v_i(h)$ where $f_i$ is the frequency of the $i$’th context. Though $v_i(h)$, the value of a health state in a context, depends heavily on the value of its consequences, it is the value of the health state in the context, not the value of its consequences. There is no feasible way of eliciting all the many context-dependent values of health states and then averaging. The average values must be inferred from evidence such as that provided by preferences.

References:


2002.

Additional files provided with this submission:

Additional file 1: HWB-Abs-Keywords-Jan2012.doc, 29K
http://www.pophealthmetrics.com/imedia/5505699836613747/supp1.doc
Additional file 2: HWB-title-jan2012.doc, 29K
http://www.pophealthmetrics.com/imedia/1497516871661374/supp2.doc