Review

On conducting burden-of-osteoporosis studies: a review of the core concepts and practical issues. A study carried out under the auspices of a WHO Collaborating Center

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Abstract

Osteoporosis is a problem that is relevant to public health from the clinical, economic and social viewpoints. Except in a handful of industrialized countries, there is a considerable void in our knowledge of the magnitude of the problem. By exploring both the epidemiological and the economic impact of osteoporosis and the fractures associated with it in a particular country, studies of the ‘burden of illness’ (BOI) can fill that void. BOI analysis raises many questions at both the conceptual and the practical level. The purpose of this paper is to review the methodology underlying analyses of this type, to discuss its limitations and to provide a general format to improve their implementation in the field of osteoporosis. Investigators involved in BOI analysis should be very clear and explicit regarding the methods they adopt, so that studies in different countries can be interpreted and compared appropriately by interested parties.

Osteoporosis, a skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in the risk of fractures [1], is a problem that is relevant to public health. The condition primarily affects postmenopausal women, although it may also affect elderly men. The most common clinical outcomes of osteoporosis are fractures of the spine, forearm and hip. Of these, hip fractures are the most severe, but are also the most readily diagnosed and the best documented.

Using the operational definition used by the World Health Organization (WHO) for osteoporosis, which is based upon bone mineral density (BMD) assessment, established osteoporosis affects 30\% of postmenopausal white women in the USA (9.4 million women); the proportion rises to 70\% in women over the age of 80 yr [2]. Although data on the prevalence of osteoporotic fractures are limited, it is estimated that the number of hip fractures that occurred worldwide in 1990 approached 1.7 million [3]. Hip fractures are extremely serious and are responsible for substantial mortality: the age-adjusted 5-yr survival rate for those who suffer a hip fracture has been estimated to be 82\% of that of the unaffected population, most of the excess mortality occurring within the first 6 months after the fracture [4].

In addition to morbidity and mortality, osteoporosis and the subsequent fractures are associated with significant economic costs relating to hospitalization, outpatient care, long-term care, disability and premature death. Health-care expenditure attributable to osteoporotic fractures in the USA in 1995 was estimated to be US $13.8 billion [5]. In Belgium, a country of approximately 10 million inhabitants, 13 150 hospital stays for hip fractures yearly have generated an annual cost of BF 4.4 billion [6]. Osteoporosis has also been shown to result in significant costs in other countries [7–13]. It is of concern that the worldwide health and economic burden of osteoporosis is likely to increase in the future, as improvements in life expectancy will lead to

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a growing population of elderly people with a high risk of fracture [3, 14, 15].

At present, however, our knowledge of the magnitude of the problem in most countries remains extremely limited, except for a few, mainly industrialized, nations. A WHO study group has suggested that much more research in this area is needed [16]. Burden-of-illness (BOI) analysis, as a descriptive tool, provides a means to achieve better understanding of this disease. The appropriate interpretation of the results derived from a BOI study relies heavily upon the methods used to perform it, which can be quite variable. The objective of this article is to summarize the state of the art in the field of BOI evaluation and to propose a general format to be used for carrying out disease burden studies in osteoporosis, in both developed and developing countries. Due to the heterogeneity of situations that may be faced throughout the world (e.g. different health-care and social systems, different national accounting and statistical systems, different types and qualities of data, etc.), this paper cannot possibly cover all the practical difficulties a researcher may encounter in practice. Therefore, our goal is only to serve as a general guide based upon the major issues that investigators should be aware of when undertaking such a research project. First, we examine the role of osteoporosis burden-of-illness studies with regard to their appropriateness and usefulness; secondly, we review some of the methodological concepts relating to costs and their estimation; and finally some practical issues are considered, focusing primarily on data collection.

Role of burden-of-illness analysis of osteoporosis

Estimating the burden of a specific disease is usually undertaken by means of a cost-of-illness (or burden-of-illness, BOI) study [the terms ‘cost of illness’ and ‘burden of illness’ are often used interchangeably to convey the economic aspect of the disease of interest. However, we would rather confine the former to studies in which only the financial impact is considered (even if epidemiological data are used as the input) and to reserve the latter for studies which investigate both the cost and the health impact of the disease]. This type of analysis has been popular since the earliest days of health economics.

The use of disease burden studies has varied over the years, but it is generally accepted that they are better used to improve understanding of the clinical and economic implications of a disease rather than for resource allocation. Resource allocation decisions are better made with studies that consider not only the costs but also the effectiveness of the related health-care interventions. Some authors [17, 18] have been more critical of disease burden studies than others [19]. The general debate on the usefulness of these studies is reviewed elsewhere [20, 21] and is beyond the scope of this article.

However, although there are certainly some limitations on how BOI analyses should be used, this does not in any way detract from their overall usefulness. Given our limited knowledge of the extent to which osteoporosis affects populations and affects health-care budgets in many countries around the world, BOI studies seem an appropriate tool for a global approach to the issue.

First, by exploring the health impact of osteoporosis, including assessment of the prevalence of men and women with low bone mass and the incidence of osteoporotic fractures, BOI analysis can help to define the magnitude of the burden, to detect areas where data are lacking and to identify country-specific target populations for screening when necessary.

Secondly, compared with estimates of morbidity and mortality considered alone, BOI analysis, by assessing the use of health-care resources and detailing the cost components involved, gives an additional insight into the magnitude of osteoporosis and its consequences. This information, even if not directly used in health policy-making, is policy-relevant in the sense that it increases awareness and may provide a much better understanding of (i) the particular contribution of the disease to the overall health-care budget and (ii) the contribution of each individual health-care resource devoted to the total budget of osteoporosis management.

Furthermore, economic and epidemiological results derived from BOI studies are very useful for predicting future trends when they are combined with demographic projections. It must be borne in mind that the number of people affected varies in each country or region according to the ethnic composition and the gender, age distributions of the population. Ageing populations alone can be responsible for a dramatic increase in the incidence of fractures [3]. Even under conservative assumptions regarding the evolution of medical technology, projecting the effect of demographic changes on the disease burden from osteoporosis can certainly help in planning for the future.

From a health policy viewpoint, full economic evaluations encompassing both outcomes and costs of different alternatives, such as cost-effectiveness analysis (CEA), cost-utility analysis (CUA) and cost-benefit analysis (CBA), are much more powerful and constitute a real aid to decision-making. Our opinion is that, if feasible, and if data are available, evaluations of interventions in osteoporosis consistent with recent recommendations [22, 23] should be conducted by means of CEA (or CUA). From a practical perspective, however, it might be premature to undertake such analyses in many developing nations because of the limited amount of data and resources that is available. Data from a BOI study could be used later, at least in part, as the input for a CEA [24]. BOI estimation can thus be a forerunner of an economic evaluation. Although it obviously provides only a partial economic evaluation, cost description is often a necessary, fundamental and laborious stage in our understanding of the impact of the condition of interest.
Methodological concepts and concerns about cost evaluation

Cost evaluation raises some questions at the conceptual level that need to be elucidated before proceeding to the practical steps required to estimate costs. Which categories of costs are eligible for inclusion? Which are controversial? Which estimation approaches should be used according to the analytical horizon? How should we account for uncertainty? Before answering these questions, however, we will introduce the important economic concept of ‘opportunity cost’. This concept can help in the understanding of both the valuation process step and the importance of the chosen perspective (which is essential in order to determine which costs it is appropriate to include).

The notions of opportunity cost and perspective of study

Health-care expenditures allocated to a particular end imply resources that could have been employed elsewhere. The ‘opportunity cost’ is the value of those resources if employed elsewhere; more precisely, it is the value of the benefit lost by not directing the resources to their best alternative use.

Whether charges or costs (the opportunity cost from the economist’s point of view) are used in valuing units will make a substantial difference to the end result, as the amount billed and paid for a resource (i.e. the charges) may very often be different from its actual cost [25, 26]. It has been estimated that direct costs represent, on average, 80% of the price billed [27]. Studies commonly use—mistakenly—charges as proxies for costs. Indeed, observed market prices reflect the opportunity costs of resources, according to economic theory, only in the case of competitive markets. As market imperfections in the health-care sector are widely recognized among economists, the relation between costs and charges should be investigated and attempts should be made to adjust the existing market price when appropriate [28, 29]. When charges are used instead of costs without adjustment (which is common practice, given that the true opportunity cost is almost impossible to estimate directly in practice and adjustments for price are not always feasible), this should at the very least be clearly stipulated in any study of the disease burden. (This issue will be further discussed below under Valuation of costs.)

It is important to keep the principle of opportunity cost in mind when deciding whose costs are to be considered; in other words, when deciding from which perspective the analysis is to be conducted. The cost items that are relevant will depend on whether the decision-maker is a patient, a hospital, an insurer or a social planner. For example, from the individual patient’s perspective, total lost revenue from work or reduced career opportunities because of disability resulting from illness represent costs to consider, whereas these costs are irrelevant from a societal point of view, since the opportunity cost of replacing the worker may be much lower.

The societal or community perspective represents the general public’s interest rather than any particular party’s interest. It is the broadest perspective, and it entails consideration of all relevant costs regardless of who incurs them. Because it is only the societal perspective that never counts as a gain that which another party actually loses, and because only this perspective allows the costs (per capita) to be compared among countries (each with its own specific health-care system), it is the most appropriate study perspective.

Costs to be considered

When the societal perspective is used, all types of costs have to be considered. It is usual to divide costs into three main categories: direct, indirect and intangible costs.

Intangible costs are costs due to the pain, suffering and reduced quality of life of patients who experience the disease. As the name indicates, intangible costs refer to costs which are difficult to quantify and value. This may explain why, in practice, they are not typically included in BOI analyses. To the best of our knowledge, these costs have always been omitted in the literature on the cost of illness (at least in the field of osteoporosis).

Indirect costs (also known as productivity costs) represent the value of present and future production losses resulting from premature death, morbidity or disability caused by the disease. These costs also include a broad range of other items, such as time lost from leisure, and the unpaid activities of the patient or caregivers. The question of whether these costs should always be included in the analysis is not settled (see next section). Therefore, until a consensus has been reached, it is suggested that a conservative, modular approach should be taken when estimating BOI, by reporting results with and without productivity costs included.

Direct costs include medical costs, which are related to the treatment of disease (e.g. pharmacotherapy) or to the disease itself (e.g. hospital and nursing home costs), and non-medical costs, which are related to the treatment of disease but do not result directly from it (e.g. transport to out-patient rehabilitation, special dietary needs, etc.). These components are of primary importance in BOI appraisals and should be reported in detail in order to allow measurement of the contribution of each element to total health-care expenditure. This could be useful in revealing and comparing regional differences in treatment practices in the management of osteoporosis and its associated fractures. Because direct non-medical costs are not usually as readily accessible and as easy to identify and value as direct medical costs, their inclusion is not usually considered mandatory.

In order to give an accurate and complete picture of the economic impact of osteoporosis, BOI studies should ideally cover each of these categories of costs related to osteoporosis, since they are all relevant and represent true costs to society. However, in practice, at
the very least the direct medical costs must always be considered.

**Concerns about indirect costs**

As mentioned above, the inclusion of productivity costs as part of an economic evaluation remains controversial. This is reflected by the discrepancies found in government guidelines [30, 31]. The main criticism arises from the method used for their estimation. The traditional ‘human capital’ approach (the method used most frequently), based on gross earnings, counts the total value of income potentially lost by the worker in case of absence from work. This may overestimate the indirect costs [20, 28, 30, 32] as the opportunity cost to society may be substantially lower when the labour market supply is permitted to replace the missing worker. The ‘friction cost’ approach (a relatively new concept) attempts to resolve this problem by taking into account the degree of scarcity of labour and by considering only the time (i.e. the friction period) needed to replace the worker. The latter method is, however more demanding of data (it relies on the availability of detailed employment statistics) and has been criticized for its strong assumptions about the labour market [33]. The debate about this method continues and has recently been reviewed elsewhere [34]. For a detailed guide on how to derive productivity costs, see Koopmanschap and Rutten [35].

Indirect costs also raise some philosophical and ethical concerns. By reflecting productivity losses, indirect costs give significant weight to working people as compared with individuals who are, for example, unemployed or not of working age (such as children and people who are retired). This essentially comes down to discriminating among groups of patients. Osteoporosis affects primarily the elderly and most of the population at risk has reached the age of retirement; therefore, if results on the BOI for osteoporosis are compared with BOI results for other diseases, this may lead to inequity in programme prioritization and resource allocation to diseases, which is unacceptable ethically. It is recommended that extreme care be taken when handling indirect costs, especially when assigning a monetary value to them.

When extended to time lost from leisure and unpaid activities, the use of indirect costs raises another problem: how should these non-market items be valued? One approach is to use market wage rates as proxies. For example, unskilled wage rates could be used to approximate volunteer time. Lost leisure time could be assumed to have zero cost, or it could be valued at different wage rates, such as the average wage or the overtime rate. Obviously, each of these options is arbitrary and should be tested thoroughly by sensitivity analysis. A more prudent approach is to identify and quantify the units of time lost without imputing a monetary value to them and to report them alongside the other costs.

Following the recommendations of an expert panel [22], we suggest that indirect costs (i) should not be restricted to time lost from work but should also cover time lost from all types of activities; (ii) should also take into account the caregiver’s time; and (iii) should preferably be expressed in physical units (e.g. days lost).

**Estimation methods and the time horizon**

Cost estimates can be derived according to one of two commonly used approaches, based on prevalence or incidence.

Prevalence-based evaluation considers the prevalence of a disease during a given period of time (usually 1 or 2 yr) and estimates the costs related to the disease during this period regardless of the moment of disease onset. This method was described by Rice [36] in the 1960s and is still the most frequently used method.

Incidence-based evaluation, on the other hand, considers only new cases of disease, from disease onset until cure or death, and then produces estimates of the lifetime cost. Harturian et al. [37] have outlined the methods used in this approach.

The incidence-based approach offers the advantage of being more easily incorporated into CEA and it allows the assessment of the effects of variations in fracture incidence rates on disease-related health costs, all other things being equal. Compared with the prevalence based method, incidence-based evaluation needs substantially more data, as it requires estimates of disease progression during each stage of life and of the concomitant use of health-care resources and their costs. So, the probabilities of occurrence of future fracture events (and their costs) according to age and hypothetical health stages, and the probabilities of survival after a fracture, must all be estimated. This could be done by economic modeling, and is encouraged. Nevertheless, prevalence-based costs, which can be determined by more readily accessible data, are quite acceptable and are sufficient for giving a valuable picture of the situation in countries which lack information about the disease burden of osteoporosis.

The analytical horizon of the study will depend on the chosen method of estimation and, conversely, which approach is selected will depend on the time horizon investigated. Note that a long-term perspective encompassing the lifespan of the patients relies necessarily on assumptions rather than facts. Changes in osteoporosis management, epidemiology and demographics may occur. All this introduces some uncertainty into cost estimates. Importantly, if a lifetime perspective is chosen, the issue of discounting costs should be addressed (of course, discounting is not relevant if the analysis is conducted at one point in time, say 1 yr). Expected future costs need to be discounted to present values in order to account for time preference. Traditionally, a real (adjusted for inflation) discount rate of 3% or (more often) 5% per annum is used, and it is recommended that costs are also presented in their undiscounted form (i.e. a discount rate of 0%) in order to assess the effect of varying this parameter [22, 28, 29]. But this adds uncertainty to the analysis.
Accounting for uncertainty

Areas of uncertainty should always be checked in any cost evaluation. As we have seen, uncertainty can come
from the analytical assumptions that are made or from areas of controversy (e.g. whether or not indirect costs
are considered, the choice of a discount rate, the probability of fracture that is assumed, etc.). Other import-
ant sources of uncertainty are the unavailability of data (which may lead to reliance upon expert opinion)
and imprecision in the data (which may be the case, for example, for estimates of hospital costs when they
are based on the overall average cost per day).

Allowance for uncertainty is traditionally made by
sensitivity analysis, which consists of (i) identifying the
uncertain parameters or features, (ii) defining a plausible
range of variation of these parameters, and (iii) rework-
ing the analysis under the different options in order to
investigate the effect on the results of the study. This
approach is particularly suitable when the data are
deterministic, i.e. when they are not sampled but
are given as point estimates. However, when the data
are stochastic, i.e. when they are from a sample, they
can be characterized by a distribution with mean and
variance. Then, uncertainty due to sampling variation
can be assessed by the use of conventional statistical
inference and hypothesis-testing. Some data on the use
of resources (e.g. the number of physician visits) might
be collected during clinical trials; here, the data are
sampled and lend themselves to a statistical approach
to the analysis of uncertainty. But more often the
epidemiological and cost data coming from secondary
sources (e.g. expert opinion, retrospective databases and
reports in the literature) are deterministic and allow only
sensitivity analysis.

Note that sensitivity analysis remains the standard
approach when exploring the generalizability of study
results (e.g. when extrapolating cost estimates to the
population of the whole country or projecting demo-
graphic changes or epidemiological trends in fracture
incidence into the future).

Material for conducting BOI studies
of osteoporosis

Although this section focuses on data collection, it will
also examine the main tasks required when conducting
a BOI study, including the assessment of the health (see
below, Evaluating the health burden of osteoporosis)
and financial burden (see below, Evaluating the financial
burden of osteoporosis).

Concerning cost valuation, only direct medical costs
are addressed hereafter. This does not imply that other
cost components should not be investigated (see
previous section). It should be kept in mind that the
practical issues discussed in this section fall within
the framework of a prevalence-based study and a societal
perspective.

Of primary importance is the fact that the quantity
and quality of the cost, utilization and epidemiological
data are likely to differ among countries. This means
that flexibility and ingenuity should be practised when
collecting data. All data sources used should be clearly
documented in standard bibliographic format.

Evaluating the health burden of osteoporosis

Two key aspects of the health impact of osteoporosis
must be considered in the analysis: the morbidity and
the mortality associated with the condition.

Magnitude of the disease: morbidity. In order
to attain a better understanding of the magnitude of
the disease in terms of morbidity, the number of individ-
uals with osteoporosis should be estimated, i.e. the
prevalence (using the WHO operational definition of
osteoporosis: BMD less than 2.5 standard deviations
below the gender-specific mean for young adults) and
the incidence of its major consequences: hip, spine
and wrist fractures. When estimating the occurrence of
fractures, it is important to keep in mind that the skele-
tal fragility that results from osteoporosis is not always
the underlying cause of a fracture event. In other
words, it is necessary to estimate the proportion of
fractures which could be attributable to osteoporosis.
To address this issue, existing site, gender- and
age-specific attribution rates of an expert panel could be
used [38, 39].

Results should be presented by gender and age group
(as gender and age are both strong independent risk
factors for osteoporosis and fracture). Recommended
age strata are 0–44, 45–54, 55–64, 65–74, 75–84
and 85 yr and above. Age- and gender-specific results
should be presented as both numbers and rates. Finally,
current results may be projected into the future on
the basis of the expected demographic evolution of
the country under study. The data required for these
computations as well as potential data sources are
listed in Table 1.

Magnitude of the disease: mortality. Hip fractures
associated with osteoporosis may be responsible
for considerable mortality. The excess death rate for
each gender and age stratum can be estimated by
comparing figures for mortality from all causes with
corresponding figures for deaths where a fracture
is mentioned as a primary or underlining cause
(Table 1).

Evaluating the financial burden of osteoporosis. When
estimating overall disease costs, it is necessary first to
quantify the resource utilization (see Measurement of
resource utilization) and then to assign a unit cost to
the identified resources (see Valuation of costs). The
method used to calculate the disease costs may not
always be the same.

Computation procedures. Cost calculations can be
undertaken using one of two techniques: ‘top-down’
calculation, in which medical expenditures devoted to
the disease of interest are derived from the total cost
per health-care sector (hospital, physician, pharmacy,
nursing home care, etc.) by attributing a fraction of
Table 1. Data collection for the evaluation of health burden

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Data required</th>
<th>Data sources</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of osteoporosis</td>
<td>Age- and gender-specific distribution of population meeting WHO BMD definition of osteoporosis (i.e. T-score &lt; 2.5 s.d below mean)</td>
<td>Preferred: population based sample</td>
<td>BMD measures should preferably have been performed by DEXA, although DPA, SPA and ultrasound techniques are acceptable. Key sites of measurement are the hip, spine and wrist.</td>
</tr>
<tr>
<td>Incidence of site-specific osteoporotic fractures</td>
<td>Annual number and rate of osteoporosis-related fractures by fracture site, gender and age group</td>
<td>Hip fractures: hospitalization data (ICD-9/10-CM classification) agree with accepted expert panel attribution rates. Non-hip fractures: same as hip fracture but out-patient and emergency room visits are also used</td>
<td>Suggested expert panel attribution rates: Phillips et al. [38], Melton et al. [39]. Keep in mind that because spine fractures often do not present clinically, hospital emergency room and out-patient data will underestimate the true incidence of spine fractures.</td>
</tr>
<tr>
<td>Projections</td>
<td>Age- and gender-specific population estimates</td>
<td>Country census projection data</td>
<td>Annual age- and gender-specific osteoporosis prevalence and fracture incidence rate estimates are multiplied by the age and population projections.</td>
</tr>
</tbody>
</table>

This list is intended to facilitate the investigator’s task. It is neither exhaustive nor mandatory. It should be adapted according to the data specificity of the country under study.

DEXA, dual X-ray absorptiometry.
DPA, dual photon absorptiometry.
SPA, single photon absorptiometry.

Each sector’s costs to the disease of interest; and ‘bottom-up’ calculation, in which the total disease cost is determined by aggregating the resource consumption of individual patients.

The choice of procedure will be driven by the availability of the data within the individual country.

Measurement of resource utilization. Once the various cost items eligible for inclusion within the framework of the study have been identified, the next task is to measure the resource quantities. Collecting health-care resource utilization data is a time-intensive yet fundamental task in estimating the disease burden. The researcher should distinguish between the health-care resources used for the treatment and management of osteoporotic fractures in the acute setting and those resulting from rehabilitation after fractures.

It is important to keep in mind that the health-care consumption of many osteoporotic patients, especially the elderly, who are likely to suffer from multiple conditions, will often not result wholly from their osteoporotic state. In other words, one must be attentive to the existence of comorbidities. Comorbidities are responsible for overestimation of the contribution of the primary diagnosis to health-care resource use when secondary diagnoses are neglected. Adjusting for competing causes of health resource consumption after a hip fracture could be accomplished, for example, by measuring the different items of costs 1 yr before and 1 yr after the fracture event. Then, the extra costs can be estimated as the difference in health-care consumption between the two time periods [13].

Table 2 provides some suggestions concerning which data are required and where they may be found.

Valuation of costs. The task of valuation consists of assigning the appropriate unit cost to each resource utilization item as identified above, namely those related to the utilization of pharmacotherapy, all sources of inpatient care, outpatient care and home health-care. Costs should be reported separately as well as aggregated whenever possible.

The value assigned to most health-care resource items is commonly based on observed market prices (or charges). It must be kept in mind that, due to market imperfections, these prices do not reflect opportunity costs (see above, The notions of opportunity cost and perspective of study). Prices charged may deviate from costs, for example, for in-patient hospital care when a hospital has a monopoly or for physician fees when the prices charged do not reflect the relative skill level and care time spent by the practitioner. Another example of price distortion commonly observed in the health-care sector is that resulting from hospital cross-subsidization. Cross-subsidization occurs when the price charged for a given procedure or service is inflated in order to cover another service that operates at a financial loss.

Therefore, attempts should be made, when feasible, to adjust market prices through the use of appropriate methods such as the cost-to-charge ratio to adjust
hospital prices, for example. The feasibility of making an adjustment by using the cost-to-charge ratio depends on the availability of a detailed accounting system. This may not be the case when hospital charges are not detailed enough, as is the case in many countries. Using the average daily hospital cost may be the only option. However, as emphasized earlier, when using charges to approximate costs, this should at the very least be clearly specified.

Also, it is recommended that the quantities of resources used (i.e. numbers of units) should be reported separately from the valued resources, in order to allow total cost estimates to be updated easily should better cost valuations become available. Drummond et al. [28] have recommended reporting physical quantities as well as charges, ‘so as to facilitate generalization of study results to other settings’.

It may happen that utilization data for various types of health services and related cost data are not available for the same year. In such a case, the different reference periods should be stated explicitly, and costs should be expressed with reference to a common base year (constant value), i.e. taking into account inflation over the years. Deflating cost is obtained by using the consumer price index, or when available, the more relevant medical component of the consumer price index.

Also, costs should be expressed in the local currency as well as in a benchmark foreign currency, such as US dollars or euros.

**Conclusion**

Given the potentially huge impact on society of osteoporosis and the fractures associated with it, it is of primary importance to assess the burden of this disorder in countries around the world. As a first step, it is essential from a public health perspective to assess the extent of the problem, because simply allowing the disease to take its course may eventually lead to a disastrous, unmanageable situation of high morbidity, mortality, disability and costs. In nations lacking such studies, BOI evaluations of osteoporosis provide a valuable means of assessing the problem. A more global and accurate international picture of the magnitude of the osteoporosis problem could be achieved if future BOI studies conducted in different countries throughout the world were to adopt reasonably harmonized methods of computation and standardized reporting formats. The first step towards this goal is to make it possible to interpret and compare the results of studies in an appropriate way. This can only be accomplished if investigators are thoroughly explicit about the methods used.
and techniques employed, and if they report their results in the most detailed fashion possible.

References