United Nations University
WIDER
World Institute for Development Economics Research

Research Paper No. 2004/63

Composite Indices of Human Well-being

Past, Present, and Future

Mark McGillivray[1]
and Farhad Noorbakhsh[2]

November 2004

Abstract

This paper surveys the various composite well-being indices that have been inter-country assessments over the last 40 or so years, including the well known Human Development Index (HDI). A number of issues are considered, including the choice of components, component weights, scale equivalence, non-linearity, correlations among components and the policy relevance of such measures. A number of these issues are examined in the context of a critical review of the many criticisms of the HDI and the United Nations Development Programme's responses to these criticisms (some involving changes to the design of the index). A basic premise of the paper is that indices used for international well-being comparisons should be relevant to the policies and individual priorities of countries. Possible directions for the future design and application of composite well being indicators are identified, including adoption of country-specific variables, participatory, country and time variant component weighting schemes and the inclusion of human security measures.

Keywords: human well-being, composite well-being indices, income per capita, Human Development Index, Physical Quality of Life Index

JEL classification: I31, D63, C43, C21

[1] UNU-WIDER, Helsinki, Finland and [2] Centre for Development Studies, University of Glasgow, UK

This study has been prepared within the UNU-WIDER project on Social Development Indicators (Measuring Human Well-being) directed by Professor Mark McGillivray.

UNU-WIDER acknowledges the financial contributions to the 2002-2003 research programme by the governments of Denmark (Royal Ministry of Foreign Affairs), Finland (Ministry for Foreign Affairs), Norway (Royal Ministry of Foreign Affairs), Sweden (Swedish International Development Cooperation Agency—Sida) and the United Kingdom (Department for International Development).

ISSN 1810-2611 ISBN 92-9190-660-3 (internet version)

Acknowledgements

The authors are grateful to meeting participants, especially Des Gasper, Stephan Klasen and Mozaffar Qizilbash, for helpful comments. The usual disclaimer applies.

UNU World Institute for Development Economics Research (UNU-WIDER)
Katajanokanlaituri 6 B, 00160 Helsinki, Finland

Camera-ready typescript prepared by Anne Ruohonen at UNU-WIDER
Printed at UNU-WIDER, Helsinki

1 Introduction

Human well-being is often treated as a multidimensional concept, consisting of a number of distinct, separable dimensions. Theoretical research has identified an array of dimensions. Often specific to a particular conceptualization of well-being, these dimensions can be social, physical, psychological or material in nature (Alkire 2002).[1] Empirical research has proposed a number of composite indices intended to measure multi-dimensional well-being, especially at the level of countries. At least 20 composite indices have received international attention in the last four decades (Booysen 2002). The best known, and that which has received the most attention, is the UNDP's Human Development Index (HDI) (UNDP 1990–2004). Others include the Physical Quality of Life Index (PQLI) (Morris 1979), the Combined Quality of Life Indices (CQLI) (Diener 1995), and the Human Suffering Index (HSI) (Camp and Speidel 1987, Hess 1989, Tilak 1992). Also included in these indices are United Nations Research Institute for Social Development (UNRISD) Level of Living Index (LLI) (Drewnowski and Scott 1966), General Index of Development (GID) (McGranahan *et al.* 1972), and Socioeconomic Development Index (SID) (UNRISD 1970). The designers of these indices typically emphasize that there is more to well-being enhancement than material enrichment, and therefore often combine what might be loosely termed 'economic' and 'non-economic' well-being indicators. In some instances the indices are intended to serve as alternative or competing indices, to traditional income-based measures, and therefore include non-economic variables only.

This paper critically reviews composite well-being indices. Its focus is on indices of overall national well-being achievement, as opposed to more specific indices of poverty, gender bias, sustainability or single well-being dimensions. Indices such as the UNDP's Gender-related Development Index, Gender Empowerment Measure, Capability Poverty Measure, and Human Poverty Index (UNDP 1990–2004), or the Combined Consumption Level Index (Bennett 1951), Real Index of Consumption (Beckerman and Bacon 1966), Index of Economic Well-being (Osberg and Sharpe 2002), and Human Freedom Index (Humana 1992) are not considered, therefore. A number of issues are examined, including the general structure of the index, the choice of components, universalism, component weights, scale equivalence, component transformations, the treatment of income, correlations among components and policy relevance. Most of these issues are examined in the context of a critical review of the many criticisms of the HDI and the UNDP's responses to these criticisms, some involving changes to the design of the index. Possible directions for the future design and application of composite well-being indicators are identified, including adoption of participatory, country and time variant component weighting schemes. It should be stressed that there is a huge literature on the HDI that includes studies by Acharya and Wall (1994), Cahill (2002, 2004), Gormely (1995), Hicks (1997), Ivanova *et al.* (1998), Lüchters and Menkhoff (1996, 2000), McGillivray (1991), McGillivray and White (1993, 1994), Morse (2003), Murray (1991), Neumayer (2001), Noorbakhsh (1998a, 1998b, 2002) and Sagar and Najam (1998). The current paper does not do justice to this literature as it does not look at the full ranges of issues raised in it or at the many useful revisions to

[1] For the purposes of this paper notions such as human well-being, quality of human life, human development, basic human needs fulfilment are treated as synonymous.

the HDI it proposes. Nor does it do justice to a number of innovative, but less known, measures proposed in studies such as Maasoumi and Nickelsburg (1988), Majumdar and Subramanian (2001), Slottje (1991) and Zaim *et al.* (2001). The paper is instead concerned with selected core issues.

The paper consists of a further seven more sections. Section 2 provides a critical overview of the structure of composite indices and addresses some key issues in the selection of component variables. It pays special attention to the issue of universalism. Section 3 looks at methods used to achieve scale equivalence in component variables. Section 4 examines transforming values to reflect perceived non-linear relationships, highlighting the case of the HDI income component. Section 5 looks at correlations between components and with other well-being measures and the weighting of components. Section 6 discusses, mainly in the context of the HDI, the policy relevance of composite indices used in international well-being assessments. Section 7 concludes, providing remarks on the future design and application of composite well-being indices.

2 Structure and components

The general structure of most composite well-being indices is:

$$W_i = \sum_{j=1}^{k} w_j C_{i,j} \qquad i = 1,...,n \qquad (1)$$

where w_j is a weight and $C_{i,j}$ is the jth component for country i. Each component is usually intended to measure achievement in some well-being dimension. Most indices have common components capturing achievement in terms of health, education and incomes, although there is some variation among them. The PQLI, for example, contained years of life expectancy, the adult literacy rate and the infant mortality rate (Morris 1979). The HDI currently contains years of life expectancy, the adult literacy rate, the combined gross school enrolment ratio and the logarithm of PPP GDP per capita (UNDP 2004).[2] Early versions of the index contained mean years of schooling instead of the third of these variables and an adjusted PPP GDP per capita based on various thresholds (UNDP 1993). The HSI combined the following ten variables: GNP per capita, inflation rate, labour force growth, urban population growth, infant mortality, daily per capita calorie supply, adult literacy and an index of personal freedom (Tilak 1992, Camp and Speidel 1987). The UNRISD SID contains 16 components, which include health and education status indicators but also newspaper circulation and a range of economic indicators such as electricity consumption, foreign trade per capita,

---

[2] The second and third of these variables are actually formed into educational attainment index, which is the second HDI component. In essence, they are sub-components, therefore. This index cab be written as follows:

$$C_{i,2} = \alpha_1 C_{i,2,1} + \alpha_2 C_{i,2,2}$$

where α_1 and α_2 are weights set at two-thirds and one-third respectively, $C_{i,2,1}$ is country i's adult literacy rate and $C_{i,2,2}$ is that county's gross combined primary, secondary and tertiary enrolment ratio. These variables are scaled with a range of zero and 100. The scaling procedure is discussed later.

economically active population with electricity, gas and water, agricultural production and GDP derived from manufacturing (UNRISD 1970).

The choice of component variables has promoted much discussion. Early indices, including the GID and SID, were criticized as measures of structural change or activity rather than measures of well-being achievement (Morris 1979, Thanawala 1990, Tilak 1992). The UNDP has, in many of its *Human Development Reports* sought to provide a solid conceptual basis for the HDI by linking the index to Amartya Sen's notion of capabilities (Sen 1985, 1990, 1993, among many other works). The *Human Development Report 1995*, for instance, noted that:

> The basis for selection of critical dimensions, and the indicators that make up the human development index, is identifying basic capabilities that must have to participate in and contribute to society. These include the ability to lead a long and healthy life, the ability to be knowledgeable and the ability to have access to the resources needed for a descent standard of living. (UNDP 1995: 18)

The three components of the HDI are intended to reflect these three (cap)abilities. The UNDP has also sought to provide a precise definition of human development, which is analogous to human well-being, linking it to the design of the HDI. The first *Human Development Report* noted:

> Human development is a process of enlarging people's choices. The most critical ones are to lead a long and healthy life, to be educated and to enjoy a decent standard of living. (UNDP 1990: 10)

The selection of component measures is subject to a number of criticisms. Irrespective of how elegantly and emphatically the justifications for components choices might be articulated, in the final analysis the selection is ad hoc. Hicks and Streeten (1979: 576) noted that in the case of the PQLI most serious scholars find it difficult to accept the results of a composite development index without stronger theoretical foundation. What is ultimately required, it would seem, is the known functional form of a well-being production function. This is acknowledged in *Human Development Report 1993*, which observed that in an ideal world the HDI's design would be guided by a meta production function for human development (UNDP 1993: 109). Unfortunately the precise form of this function is not known.

A related issue concerns the concept of universalism. As Anand and Sen (2000a) observe, universalism is the recognition of a shared claim of every person to the elementary or basic capabilities required to lead a worthwhile life.[3] This is in itself a defence of many composite indices, including the HDI, as few would deny that health, education and purchasing power are not universal elementary capabilities, and as such essential elements of a well-being vector. If so then it is appropriate to measure well-being achievement among countries on the basis of these variables. But while universalism offers a justification for inclusion of certain variables in composite indices, it also provides a telling criticism for the exclusion of others as there are indeed many other elementary, universal capabilities or values that ought in principle be included in

---

3 Strictly speaking, Anand and Sen refer to ethical universalism and not universalism per se.

them. One such value is basic human security. While human security can be variously defined, not being the victim of violence of physical or other intimidation would appear to be a universal value. Yet it is one which has received little attention in discussions centred on the HDI and other composite indices.

Another possible universal value is political freedoms or rights. Dasgupta (1990) criticized the HDI on these grounds, claiming that 'it is quite incomplete; as it is oblivious to what is commonplace to call human rights' (UNDP 1993: 105). On a similar vein, Hopkins (1991: 1471), in a critique of the HDI, observes that the index value would be high for someone living a long time with access to library in a prison. Streeten (1995), however, argues against the inclusion of human rights variables on a number of grounds, including the volatility of such variables, which if included in an index could cause its values to drop from one year to the next even though the other component variables might not have changed, and subjectivity in the measurement of these variables. One can question the first of these grounds; if the value of a variable drops, and it is a valid measure of well-being, then it is entirely appropriate that the index value, *ceteris paribus*, drops. That is exactly what should happen. The UNDP also used the same argument to defend the choice of components in the first *Human Development Report*, published in 1990, and repeated this argument in the 1993 *Report*. One suspects, however, that one important reason why human rights and many other variables are not included in composite indices is their limited cross-country availability, and the related desire to report index values for as many countries as possible. Indeed, this would appear to have heavily guided the general choice of variables included in composite indices.

While not challenging the universal nature of the HDI, Anand and Sen (1992) float the idea of different indicators for the capabilities that the index attempts to capture. Specifically, Anand and Sen consider different indicators for the low, medium, and high human development categories reported in the *Human Development Reports*. They propose, for example, combing child mortality and life expectancy as the long and healthy life component of the HDI for middle human development group countries. For high human development countries, they propose using a gini-corrected mean national income instead of PPP GDP per capita (UNDP 1993). Similarly, the CQLI consists of two main components, which in turn contain sub-component variables: a basic quality of life index and an advanced quality of life index. Both contain seven variables, chosen to discriminate between developing and industrial countries in terms of the same general well-being domains (Diener 1995). Crucial here is the distinction between the choice of components and the choice of variables used to represent these components. We return to this crucial issue below when discussing the policy relevance of indices.

Another common criticism of the choice of variables in composite indices is that measures of the means by which well-being is achieved are combined with measures of well-being ends. In the cases of the PQLI and HDI, for example, life expectancy might be considered as an end whereas adult literacy, school enrolment as means. Morris (1979), in defence of the PQLI, argued that indices based on ends alone lack relevance on the grounds that policy interventions are designed on the basis of means (Booysen 2002). Veenhoven (1996) argues against the use of means variables, as ends variables are better suited to evaluate goals or outcomes of policy, and against the combination of means and ends variables as this lacks theoretical justification (Booysen 2002).

Ideology and politics can, not surprisingly, play an important role in the selection of variables and indices have been criticized accordingly. For example, it has been asserted, possibly unfairly, that the choice of the components of the HDI was intended to elevate, in country rankings, those countries which perform better in terms of non-economic well-being indicators, thus providing greater justifications for activities, projects and programmes sponsored by the UNDP. A related assertion was that the HDI was an attempt by the UNDP to differentiate its activities and policy stances, especially vis-a-vis the World Bank.

3 Scale equivalence

Most component indices combine variables that are measured in different scales. Consider the HDI. Two of its variables, as mentioned, are adult literacy and PPP GDP per capita. Adult literacy is percentage and as such has a maximum value of 100. PPP GDP has no such upper limit, and current values range from 580 to 61,190 dollars (UNDP 2004). Scale equivalence is thus an issue. This equivalence is usually achieved by ensuring that the $C_{i,j}$ range from zero to one or zero to 100. A value of zero was often assigned if $c_{i,j}$ (the actual value of $C_{i,j}$, prior to rescaling) is the lowest observed among n countries ($c_{i,j}=c_{i,j}^{\min}$). Either one or 100 is assigned if $c_{i,j}$ is the highest observed among these countries ($c_{i,j}=c_{i,j}^{\max}$). The formula used for this purpose (with the maximum being set at one) is:

$$C_{i,j} = \frac{c_{i,j} - c_{i,j}^{\min}}{c_{i,j}^{\max} - c_{i,j}^{\min}} \qquad (2)$$

This formula assumes that $\partial c_{i,j}/\partial W_i$ is positive. Alternatively, in the event of $\partial c_{j,i}/\partial W_i$ being negative, a value of zero is assigned if $c_{i,j}=c_{i,j}^{\min}$, or either one or 100 if $c_{i,j}=c_{i,j}^{\max}$, and one minus the value of (2) can instead be used.

This approach, employed by the PQLI and the 1990 HDI, attracted criticism on the grounds that a country could over time achieve improvements in each index component but experience a decline in the aggregate value of its index (McGillivray and White 1992). The underlying concern was that HDI values were not comparable over time. The reason for this is quite simple, as a closer look at (2) reveals. $C_{i,j}$ could increase, but if $c_{i,j}^{\min}$ increases by a sufficiently greater margin $C_{i,j}$ will decrease and *ceteris paribus* so too would W_i. The reverse can also happen, with $C_{i,j}$ increasing even though $c_{i,j}$ might have fallen.

The UNDP responded to this criticism, in the *Human Development Report 1994*, by fixing the maximum and minimum values above and below the actual maxima and minima, respectively. These fixed values are described as ‘goal posts’. The upper goal posts have been set at ‘limits of what can be expected within the next 30 years’ and the lower goal posts correspond to values ‘observed historically, going back about 30 years’ (UNDP 1994: 92). The lower goal posts for life expectancy, adult literacy, educational attainment and PPP GDP per capita are 25 years, zero per cent, zero per cent, and $100, respectively. The corresponding upper goal posts are 85 years, 100 per cent, 100 per cent, and $40,000, respectively (UNDP 1994–2004). These values have been used to

obtain HDI values in every year since 1994, despite a number of countries having gross school enrolment ratios exceeding 100 per cent and Luxemburg's PPP GDP well-exceeding $40,000. The UNDP's response to this is to simply cap the values of these variables at the upper goal posts.

Setting what are essentially arbitrary, but reasonable values for the upper and lower values might on the surface appear to be justifiable. It certainly does not matter as far as individual components are concerned, to the extent that the ranking of countries for individual components will not change. Yet it will matter for the ranking of countries according to the composite index if that index is constructed by either summing or averaging the rescaled variables, as is the case with the PQLI and HDI. This is due to the change in component means and variances that result from the rescaling. Consider the case of the HDI. Setting the lower value for life expectancy at 30 years would appear to be defensible, or at least no less defensible than the value of 25 years adopted by the UNDP. Yet the former results in a larger mean, standard deviation and coefficient of variation for the corresponding rescaled value of life expectancy (see Table 1). Higher lower values for the education variables, compared to those used by the UNDP, results in a lower mean but higher standard deviation and coefficient of variation for the education attainment component on the HDI, and higher lower and upper values for PPP GDP per capita gives the same results (see Table 1).[4] In each case, therefore, these equally defensible fixed values will result in different country HDI rankings.

Table 1 Mean and standard deviation of rescaled variables

HDI component	Range	Mean	Standard deviation	Coefficient of variation
Life expectancy	25 to 85 years	0.674	0.193	0.286
Life expectancy	30 to 85 years	0.645	0.210	0.326
Educational attainment	Literacy: 0 to 100% Enrolment: 0 to 100%	0.756	0.196	0.259
Educational attainment	Literacy: 10 to 100% Enrolment: 15 to 100%	0.702	0.214	0.305
PPP GDP per capita	$100 to $40,000	0.646	0.189	0.292
PPP GDP per capita	$400 to $60,000	0.496	0.225	0.454

Note: Logarithmic values of PPP GDP per capita are used, as in the HDI.

The use of the fixed lower and upper values ensures that country HDI values will not fall over time even though the component variables, prior to rescaling, might increase.

4 Furthermore, averaging three variables that are spread around different means with different variances is also questionable. The gap between the lower and upper values also has significant implications for component weights, as outlined below.

But is this necessarily a bad thing? The HDI and similar indices, including the PQLI, measure relative well-being achievement. For the HDI, this is a country's achievement relative to the goal posts, as defined. A more meaningful comparison might be achievement defined in terms of the benchmark set by the lowest and highest actual observed values of the component variables prior to rescaling. Indeed, if a country cannot match improvements achieved by the country or countries with the lowest values of each variable, then it might be especially appropriate that its HDI value falls over time.

4 Non-linearity

Well-being is usually treated as a linear function of index components. The principal exception to this is income per capita, as it is generally accepted that there are diminishing returns to the conversion of income into well-being. In the first version of the HDI income was treated as follows:

$$\begin{aligned} c_{i,3} &= \ln y_i \quad \text{for} \quad 0 < y_i \leq y^* \\ &= \ln y_i \quad \text{for} \quad y_i > y^* \end{aligned} \tag{3}$$

where $c_{i,3}$ is the income component prior to rescaling, y_i is PPP GDP per capita, y^* is the average official poverty line income in nine industrial countries adjusted for purchasing power parities of $4861 (UNDP 1990). It follows that the income component increases logarithmically with PPP GDP per capita up to the poverty, but is capped at this point. The UNDP expressed a change of view in the design of the second and many subsequent versions of the HDI, conceding that the capping of the income component was 'too drastic an adjustment' (UNDP 1991: 15). Accordingly, the 1991 to 1998 versions of the index the adjustment was as follows:

$$\begin{aligned} c_{i,3} &= y_i && \text{for } 0 < y_i \leq y^* \\ &= y^* + 2\left[(y_i - y^*)^{1/2}\right] && \text{for } y^* < y_i \leq 2y^* \\ &= y^* + 2\left[(y_i - y^*)^{1/2}\right] + 3\left[(y_i - 2y^*)^{1/3}\right] && \text{for } 2y^* < y_i \leq 3y^* \\ &= y^* + 2\left[(y_i - y^*)^{1/2}\right] + 3\left[(y_i - 2y^*)^{1/3}\right] + 4\left[(y_i - 3y^*)^{1/4}\right] && \text{for } 3y^* < y_i \leq 4y^* \end{aligned} \tag{4}$$

and so on (UNDP 1991). McGillivray and White (1992) demonstrated that the two preceding treatments of income were almost indistinguishable for incomes equal to or greater than y^*. For example, according to second equation in (4), an income per capita of $9658, twice the 1991 poverty line of $4829, is adjusted downwards to $4968, a difference of only $139 or three per cent as compared to the poverty line income of $4829. The UNDP claimed otherwise, however, asserting that (4) significantly differentiated the adjusted incomes of countries for which $y_i > y^*$ (UNDP 1993: 100). McGillivray and White (1992) and Ravallion (1997), among others, argue that the discounting due to (4) is excessive, with the former recommending the use of the logarithm of income, for all incomes, instead of (4).

The UNDP further softened its line on the treatment on income in the *Human Development Report 1999*, acknowledging (4) also too heavily penalized countries with incomes above the poverty line. Following Anand and Sen (1999, 2000b), the UNDP wanted to put the treatment of income 'on a more solid analytical foundation' (UNDP

1999: 159). Anand and Sen refer to the well-known and frequently applied Atkinson formulation:

$$W(y_i) = \frac{1}{1-\varepsilon} y_i^{1-\varepsilon} \qquad (5)$$

where $W(y_i)$ is the utility or well-being derived from income and ε is the elasticity of the marginal utility of income with respect to income and measures the extent of diminishing returns. If ε=0 there are no diminishing returns and $W(y_i)$ reduces to y_i. As ε approaches one $W(y_i)$ becomes the logarithm of y_i. In (4), ε increases with income. For example, for incomes less than y^*, between y^* and $2y^*$ and $2y^*$ and $3y^*$, ε=0, 1/2 and 2/3, respectively.

In acknowledging that (4) too heavily discounted incomes above the poverty line, the UNDP simply elected to transform all incomes into their logarithmic values, hence electing for a value of ε which approaches one. This transformation has been used in all *Human Development Reports* since 1999. While this would seem a better treatment than the transformations provided by (4), there remains profound ambiguity over precisely what the value of ε should be. In particular, one and zero can be considered extremes, with the appropriate value being some in between. Precisely what the value ought to be remains a matter of speculation.

If there is a case for discounting income due to diminishing returns there might be also be case for discounting other well-being index components on the same grounds. Noorbakhsh (1998a) considered this issue with respect to the educational attainment component of the HDI. A set of weights was devised to reflect constant rate of diminishing returns to the conversion of educational attainment to human development. These weights were applied to the individual sub-components of the educational attainment component as follows:

$$\sum_{k=1}^{K} c_{i,2,p,k} e^x \qquad p = 1,2 \qquad (6)$$

where k denotes a fraction of the pth sub-component and the exponent e^x is a decreasing function of this component given that x decreases according to successive ranges of the sub-component.[5]

5 Correlations and weights

Most composite indices are a response to the perceived inadequacies of income per capita as a measure of well-being; they are an attempt to more fully capture empirically the assumed vitality or complexity of the human well-being concept. This is not to say that income might not be an important determinant of well-being, but simply there is

---

5 For $c_{i,2,1}$ (adult literacy), for example, the following applies: $x = 0$ if $0 < c_{i,2,1} \leq 40$, $x = -0.1$ if $40 < c_{i,2,1} \leq 50$, $x = -0.2$ if $50 < c_{i,2,1} \leq 60$, and so on, through to $x = -0.6$ if $90 < c_{i,2,1} \leq 100$. For a country with a literacy rate of 50 per cent, for example, the discounted rate is calculated as 40 + 9.05 = 49.05.

more to well-being than income alone. The HDI is such a response, being an attempt to shed more light on other aspects of human development than income per capita alone (Noorbakhsh 1998a). The UNDP made much of this point in early *Human Development Reports*. For instance, in the 1990 report it is noted that:

> Human development is a process of enlarging people's choices. In principle, these choices can be infinite and change over time. … income is clearly one option that people would like to have, albeit an important one. But it is not the sum total of their lives. (UNDP 1990: 10, Box 1.1)

Correspondingly, the UNDP went on to claim that the HDI 'ranks countries very differently to GNP per capita' and that 'the reason is that GNP per capita is only one of life's many dimensions'. (UNDP 1990: 14)

A number of studies have looked at correlations between composite indices, reporting zero- and rank-order correlation coefficients. Larson and Wilford (1979) looked at the correlation between the PQLI and GNP per capita for a sample of 150 countries, reporting zero- and rank-order coefficients of 0.496 and 0.766, respectively. On the basis of these coefficients it was concluded that the PQLI was redundant, on the grounds that it 'does not provide any essential information for ranking countries other than that already provided by GNP per capita' (Larson and Wilford 1979: 583). McGillivray (1991) conducted a similar exercise for the 1990 version of the HDI, reporting for a sample of 119 countries with zero- and rank-order correlation coefficients between the HDI and the logarithm of GNP per capita of 0.859 and 0.889. McGillivray (1991: 1467) also concluded that the HDI for many country groups was empirically redundant, in that it largely provides us with little more information regarding inter-country well-being levels than the traditional indicator, GNP per capita, alone can provide.

A fundamental weakness with these studies is that it is not entirely clear what extent of statistical association deems a new indicator empirically redundant with respect to a pre-existing one. McGillivray and White (1992, 1993) and Cahill (2004) address this point. The former study specifies explicit thresholds to differentiate between redundancy and non-redundancy. Two thresholds are specified—correlation coefficient of 0.90 and 0.70—and hence tests were performed to determine whether the coefficients between the HDI and income per capita are significantly less than these thresholds. The conclusion was that both the 1990 and 1991 HDIs were redundant according to both thresholds. Cahill repeated this exercise for the 2001 HDI, drawing the same conclusion. While these two studies are empirically superior to their predecessors, the thresholds they specify are of course arbitrary. Nor do they deny the non-empirical contribution of the HDI, as outlined above.

A related and arguably more important issue, if one retains the sorts of indicators used in indices such as the HDI and PQLI, is the correlations between the individual components and also between individual components and the indices as a whole. Larson and Wilford (1979), McGillivray (1991) and McGillivray and White (1992, 1993) also consider this issue, showing that these correlations are very high, with zero- and rank-order coefficients often being above 0.90. The consequence of this is that basing either the PQLI or the HDI on any one of its component variables yields very similar insights to inter-country well-being to the indices as a whole.

Table 2 contains correlation coefficients between the HDI appearing in UNDP (2002) and its components.[6] The coefficients between the HDI and its components (shown in column 2) are all high, and typical of those reported in the literature. Of course, one would expect some level of correlation between the HDI and its components by simple virtue of the components being just that, part of the index. McGillivray and White (1992) show, however, that for large samples of countries, even after removing one of the components from the index and correlating it with what remains, (that is, the restricted index) the coefficients remain very high.[7] The reason for this is the high correlations between each individual component, as Table 2 demonstrates.

Table 2 Pearson correlation coefficients between HDI 2002 and its components

Sample	HDI	Life expectancy	Educational attainment	PPP GDP per capita
All Countries				
HDI	1.000			
Life expectancy	0.925**	1.000		
Educational attainment	0.916**	0.763**	1.000	
PPP GDP per capita	0.924**	0.794**	0.765**	1.000
High HDI countries				
HDI	1.000			
Life expectancy	0.819**	1.000		
Educational attainment	0.743**	0.395**	1.000	
PPP GDP per capita	0.869**	0.688**	0.388**	1.000
Medium HDI countries				
HDI	1.000			
Life expectancy	0.771**	1.000		
Educational attainment	0.692**	0.258*	1.000	
PPP GDP per capita	0.663**	0.264*	0.264*	1.000
Low HDI countries				
HDI	1.000			
Life expectancy	0.747**	1.000		
Educational attainment	0.611**	0.057	1.000	
PPP GDP per capita	0.567**	0.386*	–0.044	1.000

Notes: ** and *: significant at the one and five per cent levels, respectively. All component variables are scaled and GDP per capita is logged prior to scaling, as in the HDI.

6 Spearman (rank-order) coefficients were also calculated, but were very similar in value to those shown in Table 2. Both Pearson and Spearman coefficients were calculated using HDI data for earlier years, with the results also being very similar to those in Table 2. Full results are available from the authors.

7 More precisely, McGillivray and White (1992) restrict the HDI by, for example, assigning a weight of zero to the life expectancy component and correlate it against the restricted HDI. The resulting coefficient was found to be very similar in magnitude to that between the life expectancy component and the unrestricted HDI. This result held for each component.

Noorbakhsh (1998b) demonstrates, however, that while the correlation coefficients are high for the data for all countries they can be much lower, sometimes statistically insignificant, for the sub-samples of countries. This is also demonstrated by Table 2, which reports coefficients for countries that are classified by the UNDP as either high, medium or low human development. The coefficients between the HDI and its components for these sub-samples, while remaining statistically significant, are much lower than those for the full sample of countries. The correlations between individual components are lower still and often insignificant. The coefficient between the educational attainment and income components is negative. It follows that, for these sub-samples of countries, basing the index on any one component will yield very different information on well-being achievement among countries than the HDI as a whole. We return to this issue later in the paper, when discussing policy relevance of composite indices.

Observing correlation coefficients between composite indices and other well-being indicators is an interesting and informative exercise. It is also reasonable to ask whether a new index might be redundant with respect to pre-existing indicators, despite ambiguity over the extent of correlation required to deem an indicator redundant. But this question needs to be considered in its proper context. If the purpose of the composite index under question is primarily statistical, to rank countries in terms of well-being achievement, then the high correlations reported in many studies, combined with some of the technical problems outlined above and in the relevant literature, do make differences in this achievement hard to interpret. As such, the conclusions drawn by Larson and Wilford (1979), McGillivray (1991) and others might have validity.[8] However, if the prime use of the index is policy or advocacy-oriented with the purpose of highlighting the importance of social issues to human development, or shifting attention away from a possibly excessive focus on narrower well-being measure, then the statistical redundancy issue has much less relevance.

Component weighting is an especially difficult issue, and related in part to the high correlations between component variables. Ideally, as Hicks and Streeten (1979) among others point out, weights should be guided by theory. Anand and Sen (1992) note with respect to the HDI that a meta production function for human development would be specified, and the contribution of each variable to human development would be its weight (UNDP 1993). But the form of such a function is unknown, so weights must be assigned via another method. Most indices simply take the sum or the average of the components, hence giving the appearance of equal weights. The three components of the HDI, for example, are assigned weights of one-third each. This in principle is almost certainly incorrect, as it implies that each component is equally important, in terms of well-being achievement, at all points of time and levels of achievement, and in all regions, countries, cultures, levels of development, and so on. The UNDP recognizes this but justifies the HDI weighting scheme on the basis of Occam's razor; that is, since it is probably impossible to achieve agreement on what the weights should be, the simplest response is the best, that being to assign an equal weight to each component.

---

8 It is worth noting that these studies do not argue that well-being achievement should be measured or assessed using income per capita alone, contrary to what has been attributed to them. McGillivray (1991: 1467), for instance, concludes that his research 'does not imply that social or human conditions are irrelevant to the assessment of development levels'.

The UNRISD LLI (Drewnowski and Scott 1966) and GID (McGranahan *et al.* 1972) attempt a more sophisticated weighting system. The LLI employed a system of sliding weights under which deviations from the normal were given more weight than variables close to the normal (Hicks and Streeten 1979) The GID gave greater weight to components which had the greatest inter-correlation with other components. These weighting systems have been criticized heavily, largely because of their arbitrary nature. Hicks and Streeten (1979), for example, criticized the GID weighting scheme, suggesting that the absence of a correlation with other components would be an equally valid reason for giving a component a high weight.

A number of studies address this issue by proposing the use of principal components analysis (Adelman and Morris 1967, Ram 1982, Desai 1993, Ogwang 1994, Srinivasan 1994, Lai 2000, and Noorbakhsh 1998b, 2002).[9] The weights are typically those assigned to the first principal component extracted from the data. While an accepted statistical method, it is purely data-driven and the weights have no conceptual interpretation. As Hicks and Streeten (1979: 576) note, none of these attempts 'indicates that much effort was expended in developing a theoretically sound rationale for the weighting system.' One such rationale, consistent with economic theory, would be to apply a differential weighting system, in which the weights would be a decreasing function of the level of well-being achievement according to the particular component. This is broadly consistent with Veenhoven (1996), who suggested that some variables will be culturally less prominent in particular societies which have high achievement in them (Booysen 2002).

High correlations between components are relevant to weighting schemes. Even if we had sufficient information or an accepted procedure to assign differential weights the exercise may be fruitless if these correlations are high. Table 3 reinforces this point. It reports correlation coefficients between the 2002 HDI and 12 versions of that index with different component weights. The weights of the first index version have been obtained by the principal components method. The weights are similar in value, reflecting the high correlations between components reported above in Table 2. The remaining 11 HDI versions have been obtained from various arbitrary combinations of weights. The weights vary from zero to 0.8 and as such are very different to those used by the UNDP to calculate the HDI. Each combination sums to one, as is the case with the UNDP HDI. Yet the correlation coefficients are all close to one.[10]

As mentioned above, the UNDP assigns weights of one-third to each of the HDI components. Seemingly overlooked by the UNDP and others, there is, however, an implicit HDI weighting scheme that operates prior to the application of these explicit weights. It results from the rescaling procedure outlined above, where a gap between the upper and lower goal posts operates as an implicit reciprocal weight. The higher this gap relative to the mean value of the variable under consideration, the lower is the implicit weight (or higher the reciprocal weight) attached to the variable under consideration. In essence, this gap operates as a reciprocal weight. In the case of the HDI, income has the highest reciprocal weight and its influence on the index is reduced

9 It is worth noting that the variant of principal component analysis used by a number of these studies relies on the high correlation among the components (Noorbakhsh 1998b, 2002).

10 See Cahill (2004) for a more detailed elaboration of this point.

as a consequence.[11] In contrast, the chosen upper and lower values for the educational attainment variables leaves the impact of these variables unchanged.[12] The general point to be made here is that component transformations—in the case of the HDI its rescaling procedure—can introduce a form of implicit weighting. This not only applies to the HDI but potentially to any index which combines transformed variables.[13]

Table 3 Human Development Index with alternative weights

	Correlation coefficient	
HDI Re-weight	Pearson (zero-order)	Spearman (rank-order)
$HDI_i = 0.93LE_i + 0.91EA_i + 0.93Y_i$	0.935	0.941
$HDI_i = 0.4LE_i + 0.0EA_i + 0.6Y_i$	0.974	0.977
$HDI_i = 0.2LE_i + 0.8EA_i + 0.0Y_i$	0.954	0.935
$HDI_i = 0.6LE_i + 0.4EA_i + 0.0Y_i$	0.979	0.970
$HDI_i = 0.4LE_i + 0.6EA_i + 0.0Y_i$	0.977	0.961
$HDI_i = 0.8LE_i + 0.2EA_i + 0.0Y_i$	0.961	0.963
$HDI_i = 0.2LE_i + 0.6EA_i + 0.2Y_i$	0.985	0.979
$HDI_i = 0.2LE_i + 0.4EA_i + 0.4Y_i$	0.997	0.996
$HDI_i = 0.2LE_i + 0.2EA_i + 0.6Y_i$	0.987	0.986
$HDI_i = 0.0LE_i + 0.2EA_i + 0.8Y_i$	0.960	0.961
$HDI_i = 0.0LE_i + 0.8EA_i + 0.2Y_i$	0.953	0.946
$HDI_i = 0.2LE_i + 0.0EA_i + 0.8Y_i$	0.957	0.977

6 Policy relevance

One of the greatest impacts of composite indices intended to assess national well-being achievement relates to the signals they send to policymakers. Both the PQLI and the HDI, for instance, were explicitly intended to send the message that there is more to well-being achievement than improvements in incomes alone. The HDI has been particularly successful in this regard, reminding policymakers in developing countries that achieving better levels of health, education and incomes are particularly desirable outcomes. Noorbakhsh (2002) observes, however, that the history of composite measures tells us that their impact is limited and not sustained over time if they are not

11 It must be noted that the weight changes the magnitude of the index for all countries though not the country ranks.

12 Consider the variables within the educational attainment component. An adult literacy value 78 per cent, for example, according to the rescaling procedure outlined above becomes (78-0)/(100-0) = 0.78. A combined gross school enrolment of 56 per cent becomes 0.56 as the same range is used. As a result the contribution of these variables to HDI values is purely determined by their levels and weights, and not the rescaling procedure.

13 The HDI rescaling procedure also reduces the variance of the life expectancy and income components, further reducing the impact of differential explicit weights, and hence in part driving the results shown in Table 3.

geared to policy implementation at the national or sub-national levels. This observation is not new. Three decades earlier, Seers (1972: 32) and Drewnowski (1972: 77) respectively observed that the 'most important use of development indicators is to provide the targets for planning' and 'welfare indices are supposed to serve not only for assessing the results of development but also as targets for development plans'.

Consider the HDI. Policymakers in developing countries readily accept the basic message of the HDI. Given also that the literature has now identified vast, interrelated well-being domains and corresponding indicators, one is tempted to conclude that the UNDP's index might be seen in the same light as GNP per capita was when more than a decade ago, when the HDI first appeared. That is, policymakers might simply attend to show inter-temporal improvement in the HDI in its present form at the cost of possibly more urgent priorities, in the same way many sought simply to increase income growth in the decades preceding the 1990s. That the country-specific *Human Development Reports* tend to emphasize the universal HDI, with a limited policy orientation, attests to this. Alternatively, attempts to increase HDI values might be half-hearted if they were not directly involved in the construction of the index, in the selection of components, the variables on which these components are based and the weights. The underlying issue here is one of country-level ownership.

A core issue in making composite indices more policy relevant would appear be to universalism. Consider again the HDI. The issue here is not so much the chosen components of the index as it would appear reasonable to identify a common set of measurable well-being components, applicable to all people in all societies. As Anand and Sen (2000a) noted 'not working toward bringing the elementary capabilities [that the components are intended to reflect] within the reach of the deprived would be outrageous'. The issue would instead appear to turn on the selection of a common set of variables that empirically capture each component. Are the four variables on which the HDI is based appropriate for measuring well-being in all countries, in terms of policy relevance, or at least for the 170 or more countries for which HDI values are reported?

The answer to the preceding question would appear to be a clear 'no', since universal indices such as the HDI are currently more concerned with a measurement for ranking countries and less concerned with operational capability of the index in terms of policymaking at a more practical level for different countries. A simple response would be to simply drop a universal index and adopt a set of country-specific ones. But this would be at the cost of no longer being able to make inter-country well-being achievement comparisons. Such a cost is significant.

An possible index design that avoids this cost is to retain a universal set of components, but with variables on which these components are based varying across countries. It has already been pointed out that Anand and Sen (1992) proposed the use different indicators for the low, medium and high human development categories, with, for example, the longevity component of the HDI being based on a combination of child mortality and life expectancy instead of life expectancy alone. Likewise, the Diener CQLI uses different variables for developing and industrial countries, as was also mentioned above. A more radical approach would be to allow policymakers in each country, or possibly even citizens, to select the variables for each component that are most appropriate to their own country. One could also do the same with component weights. Participatory techniques could be used to select variables and assign weights, which would need to be periodically re-assessed as conditions within countries change.

The chosen variables should be better, more incisive and more relevant measures of each component in each country.[14] But because the same components are used across countries, a degree of inter-country comparability is maintained. The weights would presumably reflect contemporary priorities, with higher weights being attached to components that are more prominent and important. For example, in sub-Saharan Africa the longevity component would probably at present receive a very high weight given the enormity of the HIV/AIDS problem being faced on those countries. Country specific variables and weights might also mean that the index provides more information, better capturing the assumed vitality of the well-being concept. Such a scheme might also address the redundancy of components and weights issue discussed above.

7 Conclusion

This paper surveyed the various composite well-being indices which have been used over the last 40 or so years, looking mainly at the Physical Quality of Life Index and the very well-known Human Development Index of the United Nations Development Programme. A number of issues are considered, including the choice of components, component weights, scale equivalence, component transformations, the treatment of income, correlations among components, and correlations with other well-being measures. Among the issues highlighted is the often very high correlation between the PQLI and the HDI and its components. It was argued that a main consequence of these correlations is that assigning differential component weights, which is appropriate on conceptual grounds, is largely a fruitless exercise. That is, such weighting produces index values which are generally indistinguishable from values of the equally weighted index.

Also highlighted was the issue of the policy relevance of composite indices such as the HDI and PQLI. It was observed that the history of composite measures of development is such that their impact is limited if they are not geared to policy implementation at a practical level. It was argued that one way of addressing this issue is to retain a universal set of components, chosen on the basis of universal elementary capabilities, but with variables on which these components are based and their weights varying across countries. Thus the variables and weights may well vary across countries and over time. Theory tells us that well-being components or dimensions will assume different priorities in different countries, depending on their levels of achieved well-being, different cultural priorities and so on. Empirical observation tells us that a standard set of variables, used across countries, will not appropriately measure the capabilities or other criteria indices. Selection would either be based on the preferences of policymakers or citizens, gauged through participatory techniques. Essentially, this would involve surveys in which policymakers or citizens determine their own variable weights. This would be no small task, but if we can devote sufficient resources, for example, to obtaining information on purchasing power parities to adjust per capita incomes, then we could also devote resources to the gathering of such information on component weights and measures. Might the UNDP consider this for the HDI? Might it

---

14 Streeten (2000: 26) argues in the case of the HDI that ‘work along the lines that improve the index or apply it to regions or groups within a country is most welcome’. For examples of the application of the index to policymaking at a country level (Iran and India) see Noorbakhsh (2002, 2003).

also consider adding a human security variable to the HDI, as it is a fundamental, universal well-being component? Time will tell, or course, but as Amartya Sen observed, 'the infant has now grown up and can take the rough with the smooth' (2000: 22).

References

Acharya, A. and H. J. Wall (1994). 'An Evaluation of the United Nations' Human Development Index'. *Journal of Economic and Social Development*, 20(1): 51–65.

Adelman I. and Morris C. F. (1967). *Society, Politics and Economic Development: A Quantitative Approach.* Baltimore: John Hopkins University Press.

Alkire, S. (2002). 'Dimensions of Human Development'. *World Development*, 30(2): 181–205.

Anand, S. and A. Sen (1992). 'Human Development Index: Methodology and Measurement', background paper prepared for the *Human Development Report 1993*. New York: United Nations Development Programme.

Anand, S. and A. Sen (1999). 'The Income Component of the Human Development Index', background paper prepared for the *Human Development Report 1999*. New York: United Nations Development Programme.

Anand, S. and A. Sen (2000a). 'Human Development and Economic Sustainability'. *World Development*, 28(12): 2029–49.

Anand, S. and A. Sen (2000b). 'The Income Component of the Human Development Index'. *Journal of Human Development*, 1(1): 83–106.

Bennett, M. K. (1951). 'International Disparities in Consumption Levels'. *American Economic Review*, 41: 632–49.

Beckerman, W. and R. Bacon (1966). 'International Comparisons of Income Levels: A Suggested New Measure'. *Economic Journal*, 76: 519–36.

Booysen, F. (2002). 'An Overview and Evaluation of Composite Indices of Development'. *Social Indicators Research*, 59(2): 115–51.

Cahill, M. (2002). 'Diminishing Returns to GDP and the Human Development Index'. *Applied Economics Letters*, 9(13): 885–7.

Cahill, M (2004). 'Is the Human Development Index Redundant?'. *Eastern Economic Journal*, forthcoming.

Camp, S. L. and J. J. Speidel (1987). *The International Human Suffering Index*, Washington: Population Crisis Committee.

Desai, M. (1993). 'Income and Alternative Measures of Well-Being', in D. G. Westendorff and D. Ghai (eds), *Monitoring Social Progress in the 1990s*. Aldershot: United Nations Research Institute for Social Development, Avebury.

Dasgupta, P. (1990). 'Well-being in Poor Countries'. *Economic and Political Weekly*, 4 August: 1713–20.

Diener, E. (1995). 'A Value-based Index for Measuring National Quality of Life'. *Social Indicators Research*, 36: 107–27.

Drewnowski, J. (1972). 'Social Indicators and Welfare Measurement: Remarks on Methodology'. *Journal of Development Studies*, 8(3).

Drewnowski, J. and W. Scott (1966). *The Level of Living Index*. Geneva: United Nations Research Institute for Social Development, Report No. 4.

Gormely, P. J. (1995). 'The Human Development Index in 1994: Impact of Income on Country Rank'. *Journal of Economic and Social Measurement*, 21: 253–67.

Hess, P. (1989). 'The Military Burden, Economic Growth, and the Human Suffering Index: Evidence from the LDCs'. *Cambridge Journal of Economics*, 13: 497–515.

Hicks, D. A. (1997). 'The Inequality Adjusted Human Development Index: A Constructive Proposal'. *World Development*, 25(8): 1283–98.

Hicks, N. and P. Streeten (1979). 'Indicators of Development: The Search for a Basic Needs Yardstick'. *World Development*, 7: 567–80.

Hopkins, M. (1991). 'Human Development Revisited: A New UNDP Report'. *World Development*, 19(10): 1469–74.

Humana, C. (1992). *World Human Rights Guide*. Third Edition. New York: Oxford University Press.

Ivanova, I., F. J. Arcelus, and G. Srinivasan (1998). 'An Assessment of the Measurement Properties of the Human Development Index'. *Social Indicators Research*, 46: 157–79.

Kelley, A. C. (1989). 'The "International Human Suffering Index": A Reconsideration of the Evidence'. *Population and Development Review*, 15(4): 731–7.

Kelley, A. C. (1991). 'The Human Development Index: "Handle with Care"'. *Population and Development Review*, 17(2): 315–24.

Lai, D. (2000). 'Temporal Analysis of Human Development Indicators: Principal Component Approach'. *Social Indicators Research*, 51(3): 331–66.

Larson, D. A. and W. T. Wilford (1979). 'The Physical Quality of Life Index: A Useful Social Indicator?'. *World Development*, 7(7): 581–4.

Lüchters G. and L. Menkhoff (1996). 'Human Development as a Statistical Artifact'. *World Development*, 24(8): 1385–92.

Lüchters G. and L. Menkhoff (2000). 'Chaotic Signs from HDI Measurement'. *Applied Economics Letters*, 7(4): 267–70.

Maasoumi, E. and G. Nickelsburg (1988). 'Multivariate Measures of Well-being and an Analysis of Inequality in the Michigan Data'. *Journal of Business and Economic Statistics*, 6(3): 327–34.

McGillivray, M. (1991). 'The Human Development Index: Yet Another Redundant Composite Development Indicator?'. *World Development*, 19(10): 1461–68.

McGillivray, M. and H. White (1992). *Measuring Development? A Statistical Critique of the Human Development Index*. Institute of Social Studies Working Paper No. 135. The Hague: Institute of Social Studies.

McGillivray, M. and H. White (1993). 'Measuring Development? The UNDP's Human Development Index'. *Journal of International Development*, 5(2): 183–92.

McGillivray, M. and H. White (1994). 'Inter-country Quality of Life Comparison: Does Measurement Error Really Matter?'. *Asian Journal of Economics and Social Studies*, 13(1): 1–13.

McGranahan, D. V., C. Richard-Proust, N. V. Sovani, and M. Subramanian (1972). *Contents and Measurement of Socioeconomic Development.* A Staff Study of the United Nations Research Institute for Social Development. New York: Praeger.

Morris, M. D. (1979). *Measuring the Conditions of the World's Poor: The Physical Quality of Life Index*. New York: Pergamon.

Morse, S. (2003). 'For Better or for Worse, till the Human Development Index do us Part?'. *Ecological Economics*, 45: 281-96.

Majumdar, M. and S. Subramanian (2001). 'Capability Failure and Group Disparities: Some Evidence from India for the 1980s'. *Journal of Development Studies*, 37(5): 104–40.

Murray, C. J. L. (1991). *Development Data Constraints and the Human Development Index*, Discussion Paper 25. Geneva: United Nations Research Institute for Social Development.

Neumayer, E. (2001). 'The Human Development Index and Sustainability—A Constructive Proposal'. *Ecological Economics*, 39: 101–14.

Noorbakhsh, F. (1998a). 'A Modified Human Development Index'. *World Development*, 26(3): 517–28.

Noorbakhsh, F. (1998b). 'A Human Development Index: Some Technical Issues and Alternative Indices'. *Journal of International Development*, 10: 589–605.

Noorbakhsh, F. (2002). 'Human Development and Regional Disparities in Iran: A Policy Model'. *Journal of International Development*, 14: 927–49.

Noorbakhsh, F. (2003). 'Human Development, Poverty and Disparities in the States of India'. Paper presented in the United Nations University, World Institute for Development Economic Research conference on Inequality, Poverty and Human Well-being, 30–31 May 2003, Helsinki, Finland.

Ogwang, T. (1994). 'The Choice of Principal Variables for Computing the Human Development Index'. *World Development*, 22(12): 2011–114.

Osberg, L. and A. Sharpe (2002). 'An Index of Economic Well-being for Selected OECD Countries'. *Review of Income and Wealth*, 48(3): 291–316.

Ram, R. (1982). 'Composite Indices of Physical Quality of Life, Basic Needs Fulfilment, and Income: A "Principal Component" Representation'. *Journal of Development Economics*, 11: 227–47.

Ravallion, M. (1997). ‘Good and Bad Growth: The Human Development Reports’. *World Development*, 25(5): 631–8.

Sagar, A. and A. Najam (1998). ‘The Human Development Index: A Critical Review’. *Ecological Economics*, 25: 249–64.

Seers, D. (1972). ‘What are we Trying to Measure?’. *Journal of Development Studies*, 8(3): 21–36.

Sen, A. K. (1985). *Commodities and Capabilities*, Elsevier, Amsterdam.

Sen, A. K. (1990). ‘Development as Capability Expansion’, in K. Griffin and J. Knight (eds), *Human Development and the International Development Strategy for the 1990s*. London: Macmillan.

Sen, A. K. (1993). ‘Capability and Well-being’, in A. Sen and M. C. Nussbaum (eds), *The Quality of Life*. Oxford: Clarendon Press.

Sen, A. (2000). ‘A Decade of Human Development’. *Journal of Human Development*, 1(1): 17–23.

Slottje, D. (1991). ‘Measuring the Quality of Life Across Countries’. *The Review of Economics and Statistics*, LXXIII(4): 684–754.

Srinivasan, T. N. (1994). ‘Human Development: A New Paradigm or Reinvention of the Wheel?’. *American Economic Review Papers and Proceedings*, 84: 238–43.

Streeten, P. (1995). ‘Human Development: The Debate about the Index’. *International Social Science Journal*, 47(143): 25–37.

Streeten, P. (2000). ‘Looking Ahead: Areas of Future Research in Human Development’. *Journal of Human Development*, 1(1): 25–48.

Thanawala, K. (1990). ‘Economic Development and All That’. *International Journal of Social Economics*, 17(2): 14–21.

Tilak, J. B. G. (1992). ‘From Economic Growth to Human Development: A Commentary on Recent Indexes of Development’. *International Journal of Social Economics*, 19(2): 31–42.

United Nations Development Programme (UNDP) (1990–2004). *Human Development Report*. New York: Oxford University Press.

United Nations Research Institute for Social Development (UNRISD) (1970). *Contents and Measurements of Socioeconomic Development*. Geneva: United Nations Research Institute for Social Development.

Veenhoven, R. (1996). ‘Happy Life Expectancy: A Comprehensive Measure of the Quality-of-Life in Nations’. *Social Indicators Research*, 39: 1–58.

Zaim, O., R. Fare, S. Grosskopf (2001). ‘An Economic Approach to Achievement and Improvement Indexes’. *Social Indicators Research*, 51(1): 91–118.