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Measuring Human Development: An alternative index to the HDI-2010. Special Focus on Latin American Countries

Ernesto J. Veres Ferrer*

Abstract

This paper presents an alternative index to the Human Development Index (HDI). It uses the same statistical information as the HDI. We obtain an alternative ranking of countries according to their human development. The new index is not grounded in the values of the indicators on which it is based, but rather on the position that each indicator has with respect to other indicators. Then each indicator is classified in the corresponding quartile. The design of this new index downgrades indicators if they fall into lower development quartiles. An application focuses particularly on Latin American countries.

Key words: Latin America, human development, indices and indicators, measurement.
JEL Classification: C430, O150, O540.

Introduction

The Human Development Index (HDI), using a new methodology implemented in 2010, is calculated as the geometric mean of representative indicators corresponding to three dimensions that characterize human development. For two of these dimensions (long and healthy life and decent standard of living), simple indicators are used: life expectancy at birth and per-capita gross national income (GNI), respectively. The third dimension (access to education), uses the geometric mean of two indicators: mean years of schooling and expected years of schooling. The HDI classifies countries according to their human development: very high, high, medium, or low.

So defined, the HDI has issues similar to any measurement: an exceptionally favorable value in one dimension is capable of making a very unfavorable

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* College of Economics at the University of Valencia, Spain, <Ernesto.Veres@uv.es>. The author thanks the journal's two anonymous reviewers for their valuable comments.

condition in another, or of hiding not particularly auspicious results in the two other dimensions. The possible presence of outliers in one dimension can hide the central position of the mean.

Further, it is logical that any country would hope to have a balanced result in these three development dimensions, given that a significant imbalance among them would tend to identify pronounced and detrimental social or economic inequalities associated with uneven development. In other words, we hold that relatively similar results among the three dimensions are indicative of a more balanced equilibrium and, thus, a more desirable situation than one in which a single dimensions is better positioned while either or both of the remaining dimensions are noticeably separated from the first on the scale of development.

As opposed to the mean, we posit that results defined not as a function of the value of indicators, but rather of the ranked position they hold in a set of similar indicators is an adequate alternative that addresses the situation described above. Beamonte *et al.* (2004) define an algebraic expression in line with our objective, which in Veres (2006; 2010) is initially applied to the concept of human development. Beamonte *et al.* use the HDI methodological criteria prior to 2010 (which used the arithmetic mean to integrate the three dimensions), while Veres applies the Index of Poverty and Social Exclusion.

In this paper we delineate an alternative index for measuring human development with its corresponding ranking of countries, comparable in its methodology to the new HDI. The index created herein is based not on the value of the indicators that define it, but rather on the position each indicator has in relation to the set of other indicators. We call it the Alternative Human Development Index (AHDI).

Schuschny and Soto's work (2009) is a complete methodological guide that analyzes the advantages, disadvantages, and issues that arise in the use of composite indices in measuring development (in the broader sense), as well as their construction and the technical requirements thereof. To understand the technique used in integrating the dimensions in indices of development, poverty, and exclusion undertaken by the United Nations Development Program (UNDP) prior to 2010, Anand and Sen (1994; 1995; 1997) should be consulted. Emes (2001) describes the methodology of a development index that can be applied with a greater wealth of information to subnational settings. Last, transformation alternatives that assure comparability and homogeneity of data when calculating aggregate indices can be found in Márquez (2008).

Methodology

The new methodology for calculating the HDI introduced in 2010 stipulates that country rankings are determined by segmenting the index into quartiles. Consequently, countries are classified as having development that is very high (HDI in the fourth quartile), high (HDI in the third quartile), middle (HDI in the second quartile), or low (HDI in the first quartile).

The AHDI outlined in this paper is based on considering the position that each country has in each of the three indicators of dimension in the set of values of those indicators. This criterion is applied to all countries. Thus, in contrast to the HDI, the AHDI does not require transformation of indicators to indices of dimension by means of the respective normalized maximum and minimum values that are used by the HDI:

$$\frac{value\,indicator - \min(indicator)}{\max(indicator) - \min(indicator)}$$

With the AHDI, original information is classified directly by indicators and in quartiles, akin to the classification procedure implemented in the HDI-2010. Thus from the start we avoid the differential effects that the normalization formula might introduce in the calculation.

For the access-to-education dimension, the representative indicator will be the arithmetic mean of the two variables involved: mean years of schooling and expected years of schooling. The arithmetic mean is used for two reasons: first, to guarantee that the result will have at most one decimal place; second, so that the result of the mean will only be null when both addends are also zero, which is not theoretically guaranteed by the geometric mean.

Thus, the information used in the AHDI is the same as that applied in the HDI: life expectancy at birth, per-capita GNI, mean years of schooling, and expected years of schooling. The application developed further on uses data published in the *Human Development Report 2010* (UNDP, 2010).

The initial index

The three indicators of dimension for each country are classified in their respective quartile, considering the set of information for all countries. In this way, each country has an associated development vector composed of four elements

(**a**,**b**,**c**,**d**), where component **a** specifies how many indicators of that country are classified in the fourth quartile, *i.e.*, highest development; **b** denotes how many indicators are in the third quartile; **c** represents how many indicators are in the second quartile; and **d** states how many indicators are in the first quartile, *i.e.*, lowest development.

Beamonte *et al.* (2004) show certain properties of the following expression applied to the set of classification vectors for all countries considered $\{(\mathbf{a}_i,\mathbf{b}_i,\mathbf{c}_i,\mathbf{d}_i)\}_{i=\text{countries}}$:

$$I_1(\mathbf{a},\mathbf{b},\mathbf{c},\mathbf{d}) = \frac{1}{6}(s_1^3 + 3s_1^2 + 2s_1) + \frac{1}{2}(s_2^2 + s_2) + \mathbf{a} + 1 \qquad [1]$$

where $s_1 = \mathbf{a} + \mathbf{b} + \mathbf{c}$ and $s_2 = \mathbf{a} + \mathbf{b}$.

Equation [1] takes its maximum value $\frac{1}{6}(k+1)(k+2)(k+3)$, where $k = \mathbf{a} + \mathbf{b} + \mathbf{c} + \mathbf{d}$, for vector $(k,0,0,0)$, corresponding to the highest-ranked country; and takes the minimum value of 1 for vector $(0,0,0,k)$, for the lowest-ranked country. In our case, where $k = 3$ indicators, the maximum and minimum values are 20 and 1, respectively. Therefore, expression [1] (that takes integer values) orders countries from 1 to 20, from the lowest place in the development ranking, which is the first position, to the highest place, which has an assigned index value of 20.

The range assigned to a country in the previous ranking can be used as an approximation of the level of development achieved. From this perspective, countries will fluctuate between two opposite extremes: maximum development, in which the three indicators are in the fourth quartile, and minimum development, in which the three indicators are in the first quartile.

Equation [1] follows the following ranking:

Given two countries with development vectors $(\mathbf{a}_1,\mathbf{b}_1,\mathbf{c}_1,\mathbf{d}_1)$ and $(\mathbf{a}_2,\mathbf{b}_2,\mathbf{c}_2,\mathbf{d}_2)$ respectively, we say that the first country has achieved greater human development than the second if and only if:

$$\begin{aligned} &1.\ d_1 < d_2 \\ &2.\ d_1 = d_2 \text{ y } c_1 < c_2 \\ &3.\ d_1 = d_2 \text{ y } c_1 = c_2 \text{ y } b_1 < b_2 \end{aligned} \qquad [2]$$

The two countries have the same human development if and only if they have the same associated development vector.

Ranking [2] is very demanding: it is sufficient for a country to have one indicator classified in a low quartile, even though the other two are in a high one, to be classified in the ranking associated with that low quartile. This apparently severe criterion begins losing strength if we allow that, for any country, the three dimensions are equally important for human development, and thus, likewise, so are the variables that represent those dimensions. Thus we can rightly demand a relatively homogeneous result from all three. As discussed before, the presence of an indicator with an atypical value vis-à-vis the others should be interpreted as an undesirable situation of strong disequilibrium. Further, we would also hope that these extreme situations, one low indicator and two very high ones, or one extraordinarily high indicator and two very low ones, would not occur very often.

To avoid a situation whereby a single indicator has overwhelming influence, such that it drags down its human development classification, we consider a complementary situation: a country's development deficit, *i.e.*, what needs to be done to achieve maximum potential development. In this way, the notion of human development has two complementary sides of a coin: the degree of development already achieved by a country, and its development deficit that compels it to take steps to achieve maximum development.

In Veres (2006) —for human development as such— and in Veres (2010) —for measurement of poverty and social exclusion— the need to complement both of these notions is discussed, *i.e.*, achieved development and the deficit to achieve maximum potential development, in order to evaluate correctly a country's human development or its poverty and social exclusion, respectively. Both papers propose a modification of [1] in order to measure the second of those realities, *i.e.*, the degree of development deficit. In concrete terms, we have the expression:

$$I_2(\mathbf{a},\mathbf{b},\mathbf{c},\mathbf{d}) = \frac{1}{6}(k+1)(k+2)(k+3) - \left[\frac{1}{6}(s_3^3 + 3s_3^2 + 2s_3) + \frac{1}{2}(s_4^2 + s_4) + \mathbf{d}\right] \quad [3]$$

where $s_3 = \mathbf{b} + \mathbf{c} + \mathbf{d}$ and $s_4 = \mathbf{c} + \mathbf{d}$, with the following ranking:

Given two countries with development vectors $(\mathbf{a}_1,\mathbf{b}_1,\mathbf{c}_1,\mathbf{d}_1)$ and $(\mathbf{a}_2,\mathbf{b}_2,\mathbf{c}_2,\mathbf{d}_2)$ respectively, we can say that the first one should try harder than the second to achieve full human development if and only if:

$$\begin{aligned} &1.\ a_1 < a_2 \\ &2.\ a_1 = a_2 \text{ y } b_1 < b_2 \\ &3.\ a_1 = a_2 \text{ y } b_1 = b_2 \text{ y } c_1 < c_2 \end{aligned} \qquad [4]$$

The two countries should make the same effort if and only if they have the same associated development vector.

The maximum, minimum, and range of values for equation [3] –that takes integer values– are the same as those in equation [1], although, obviously, the values for intermediate vectors do not coincide and, arithmetically, are not complementary. While in [1] greater emphasis is given to the higher number of indicators placed in higher quartiles, in [3] emphasis is placed on the least number of those indicators. This is the meaning of the complementarity of the two realities to which we alluded.

In an initial stage, the index proposed here for measuring a country's degree of human development is simply the sum of equations [1] and [3]:

$$I(\mathbf{a},\mathbf{b},\mathbf{c},\mathbf{d}) = I_1(\mathbf{a},\mathbf{b},\mathbf{c},\mathbf{d}) + I_2(\mathbf{a},\mathbf{b},\mathbf{c},\mathbf{d}) \qquad [5]$$

an expression that we shall call Initial Index (*I*). By construction, both the level of development achieved and the deficit to obtain maximum potential development are taken into account to the same degree.

Index *I* takes on integer values in the [2,40] range, since it is the sum of two integer values from the [1,20] range, and the sequence, to be defined later, will always be a two- digit expression, even if the first is 0.

This index is calculated for all countries with sufficient existing data (which are, in fact, the 169 countries for which an HDI has been calculated). Given the range of possible values, frequent ties occur that, logically, must be broken. The procedure involves reiterating the process used to calculate [5], duly adapted given the nature of ties, as we discuss in the following section.

Resolving ties: an index with no ties

In case four or more countries have the same initial index, the process of calculating equation [5] is reiterated from the beginning, thus obtaining the corresponding development vector just for the countries whose tie is to be broken. A new

index, the $I[1^{st}\ \text{tie}]$, is obtained for these countries with the same methodology used previously. The index for these countries that results from breaking the first tie with be the sequence of I with $I[1^{st}\ \text{tie}]$:

$$I1 = I \triangleright I[1^{st}\ \text{tie}] \qquad [6]$$

where the $\triangleright$ symbol indicates the sequence of a numerical series of I and $I[1^{st}\ \text{tie}]$ respectively.

If only three countries are tied, the indices of dimension are not classified by quartiles, but rather by tertiles. In Veres (2006), we discuss an adaptation of expressions [1] and [3] if there are only three categories for classifying information. These expressions are:

$$I_{1t}(\mathbf{a},\mathbf{b},\mathbf{c}) = \frac{1}{2}\left[(\mathbf{a}+\mathbf{b})^2 + \mathbf{a} + \mathbf{b}\right] + \mathbf{a} + 1 \qquad [7]$$

$$I_{2t}(\mathbf{a},\mathbf{b},\mathbf{c}) = \frac{1}{2}(k+1)(k+2) - \left[\frac{1}{2}\left[(\mathbf{b}+\mathbf{c})^2 + \mathbf{b} + \mathbf{c}\right] + \mathbf{c}\right] \qquad [8]$$

in which **a** designates the number of that country's indicators classified in the third tertile, *i.e.*, pertaining to highest development, **b** specifies those indicators in the second tertile, and **c** those in the first tertile, pertaining to least development. Sub-index t specifies that it is the adaptation of expression [1] or [3] at the level of three classification categories, while sub-indices 1 and 2 express the measure of development achieved or the deficit to achieve the maximum, respectively.

For $k = 3$, equations [7] and [8] take integer values in the [1,10] range, ½$(k + 1)(k + 2)$ is the maximum value, with $k = \mathbf{a} + \mathbf{b} + \mathbf{c}$, corresponding to vector $(k,0,0)$, designating the highest-ranked country; and take the minimum value of 1 for vector $(0,0,k)$, indicating the lowest-ranked country.

Continuing a methodology similar to that used to break quadruple o more ties, triple ties are resolved by defining the $I[1^{st}\ \text{tie}]$ as the sum:

$$I[1^{st}\ \text{tie}] = I_{1t}(\mathbf{a},\mathbf{b},\mathbf{c}) + I_{2t}(\mathbf{a},\mathbf{b},\mathbf{c}) \qquad [9]$$

Now the $I[1^{st}\ \text{tie}]$ takes integer values in the [2,20] range, since it is the sum of two integer values in [1,10].

The *I*1 index, obtained by breaking the first triple tie for those countries in that situation, will be the sequence of *I* with the *I*[1st tie] defined in equation [9], where we will also assume that [9] is always expressed by two digits, even when the first is 0.

Finally, in the case of double ties, the process is similar but duly adapted to that used in other multiple-tie situations. In this case, indicators are classified in one of two possible halves. The vector of classification is denoted as (**a**,**b**), with **a** equal to the number of three indicators located in the second half and **b** the number in the first half. We now define:

$$I[1^{st}\ \text{tie}] = 2 \times \text{no. of indicators in the second half} \qquad [10]$$

In this case there is arithmetic complementarity between development achieved and the development deficit, so that in equation [10] there is only one addend. Factor 2 appears so that the minimum value of the expression will be 2, the same as that for equations [5] and [9]. Since k is the number of indicators, "no. of indicators" in the second half now takes on $k + 1$ possible values. Consequently where there are three indicators, equation [10] takes on even and integer values in the [2,8] range.

The index obtained by breaking the first double tie will be, for countries in this situation, the sequence of *I* with *I*[1st tie] defined in equation [10]. We also assume that this equation will always be expressed by two digits, with the first digit being zero.

For those countries that had no initial tie, *I*1 will be:

$$I1 = I \triangleright 40$$

since 40 is the maximum possible value.

After breaking ties among four or more countries, if there are still quadruple, triple, or double ties, the preceding processes would be repeated, in order to define the *I*[2nd tie], *I*[3rd tie] … successively, until all ties are broken or further tiebreakers are impossible, given that remaining ties would be due to the original indicators having equal values. Each tiebreaker would define the corresponding *I*2, *I*3,… as a sequence of the previous *I*1, *I*2,… and the respective *I*[2nd tie], *I*[3rd tie]… successively.

The No-Tie Index (NTI) is the result of this successive sequence of two-digit chains. In this way, the initial scale of differences between country rankings is

maintained, and "distances" are introduced, measured in terms of the differences between positions for countries whose indicators are initially classified in the same quartiles.

The NTI not only leads to a ranking of countries in terms of their development, it also reveals the difference between one country and the previous one in the ranking:

$$NTI = I \triangleright I1 \triangleright I2 \triangleright I3\ldots \qquad [11]$$

The minimum value of [11] is 020202…, and it is a longer or shorter chain as determined by the tie-breaking rounds. The same number of digits has a maximum value of 404040… The NTI is thus composed of a succession of figures that are multiples of two.

The tie-breaking process has another objective. It can establish pertinent differences among countries whose indicators are initially classified in the same quartile. These differences are again established in order according to the indicator's relative position, not by its value.

The NTI can be represented and interpreted in a way similar to a stem-and-leaf diagram. Our case involves tree trunks (*i.e.*, the initial index and therefore the first two digits of the NTI), branches (successive two-digit grouping that branch out from the trunk), and stems (the last two digits of the NTI chain). To correctly depict the diagram, when a certain subgroup coincides with two-digit subgroups, the latter ones are eliminated. Visually we can depict the country ranking within each one of the trunks, and the stems within each branch. Each two-digit subset, from the third on, is a branch or the final stem. Digits three and four are the result of breaking the first tie for all countries of the same trunk; digits five and six are the result of breaking the second tie for those countries of the same trunk and same first branch; and so successively. The last two-digit group is the stem resulting from the last tie-breaking process. This last process has the following order:

$$\frac{\text{no. of } NTI \text{ digits} - 2}{2}$$

Thus, there can be countries without branches or stems, countries with a stem that sprouts directly from the trunk, or countries with one or more branches and stems.

The visual picture that the preceding diagram provides is the degree of similarity in human development given by the NTI. The first level of similarity comes by belonging to the same trunk. As branches appear on the trunk, the countries on each one have a greater similarity in their human development. The greater the number of similar branches, the greater the similarity of human development, as seen in the following application.

The alternative human development index

The HDI is expressed on the [0,1] scale. To reduce the NTI to a similar scale that allows for comparisons with the HDI, we next define the AHDI by means of the following transformation:

$$AHDI = \frac{NTI - 020202...}{404040... - 020202...} \qquad [12]$$

that also takes on values in [0,1], so that higher index values correspond to higher human development.

Application

To carry out a long calculation example, we shall consider the following countries for which I takes a value of 15. We omit the first step in generating the AHDI, since its technique can be surmised in the following first tie-breaking process:

Country indicators with an initial I = 15

HDI position	*Country*	*HDI*	*Life expectancy at birth*	*Access to education**	*Per-capita GNI*	*I*
90	El Salvador	0.659	72.0	9.9	6 498	15
94	Surinam	0.646	69.4	9.6	7 093	15
101	Egypt	0.620	70.5	8.8	5 889	15
103	Micronesia	0.614	69.0	1.3	3 266	15
104	Guyana	0.611	67.9	10.4	3 302	15
108	Indonesia	0.600	71.5	9.2	3 957	15
114	Marocco	0.567	71.8	7.5	4 628	15
117	Equatorial Guinea	0.538	51.0	6.8	22 218	15

Note: */ The arithmetic mean of average years of schooling and expected years of schooling.

To break this first tie the vectors of development are calculated by classifying the indicators in the previous table by quartiles:

I1 of countries with an initial I = 15 index

Country	Quartile to which the following belong:			Vector of development				
	Life expectancy at birth	*Access to education*	*Per-capita* GNI	**a**	**b**	**c**	**d**	*I*1
El Salvador	4	3	3	1	2	0	0	1534
Surinam	2	3	4	1	1	1	0	1530
Egypt	3	2	3	0	2	1	0	1523
Micronesia	2	4	1	1	0	1	1	1519
Guyana	1	4	1	1	0	0	2	1515
Indonesia	3	2	2	0	1	2	0	1519
Marocco	4	1	2	1	0	1	1	1519
Equatorial Guinea	1	1	4	1	0	0	2	1515

For example, for El Salvador the $I[1^{st}\ \text{tie}]$, with $s_1 = 1 + 2 + 0 = 3$, $s_2 = 1 + 2 = 3$, $s_3 = 2 + 0 + 0 = 2$ and $s_4 = 0 + 0 = 0$ would be calculated:

$$I_1 = \frac{1}{6}\left(3^3 + 3\times 3^2 + 2\times 3\right) + \frac{1}{2}\left(3^2 + 3\right) + 1 + 1 = 18$$

$$I_2 = \frac{1}{6}\times 4\times 5\times 6 - \left[\frac{1}{6}\left(2^3 + 3\times 2^2 + 2\times 2\right) + \frac{1}{2}\left(0^2 + 0\right) + 0\right] = 16$$

$$I[1^{st}\ \text{tie}] = 18 + 16 = 34$$

$$I1 = I \triangleright I[1^{st}\ \text{tie}] = 1534$$

The result continues to produce a triple and a double tie. To break the triple tie, the original information from the first table (only countries with a triple tie from the previous process), is classified by tertiles:

Resolution of the triple tie for countries with an initial I = 15

Country	Tertile to which the following belong:			Vector of development			
	Life expectancy at birth	*Access to education*	*Per-capita* GNI	**a**	**b**	**c**	*I*2
Micronesia	1	3	1	1	0	2	151908
Indonesia	2	2	2	0	3	0	151910
Marocco	3	1	3	2	0	1	151913

For Micronesia, the $I[2^{nd}\ tie]$ in expressions [7] and [8] would be:

$$I_{1t} = \frac{1}{2}\left((1+0)^2 + 1 + 0\right) + 1 + 1 = 3$$

$$I_{2t} = \frac{1}{2} \times 4 \times 5 - \left[\frac{1}{2}\left[(0+2)^2 + 0 + 2\right] + 2\right] = 5$$

$$I[2^{nd}\ tie] = 3 + 5 = 08$$

$$I2 = I1 \triangleright I[2^{nd}\ tie] = 151908$$

To resolve the double tie, the original information from the first table (only countries with a double tie from the previous process), is classified by halves:

Resolution of the double tie for countries with an initial I = 15 index

Country	Halves to which the following belong:				
	Life expectancy at birth	*Access to education*	*Per-capita GNI*	*No. of indicators in the second half*	*I*2
Guyana	2	2	1	2	151506
Equatorial Guinea	1	1	2	1	151504

In the case of Guyana, the $I[2^{nd}\ tie]$ is calculated:

$$I[2^{nd}\ tie] = 2 \times (2 + 1) = 06$$

$$I2 = I1 \triangleright I[2^{nd}\ tie] = 151506$$

For countries with an initial $I = 15$ index, all ties have now been broken. But it is possible that other countries with an initial index other than 15 will still have to undergo a tie-breaking process with a third or possibly even a fourth round. For this reason, the *I*2 for countries with $I = 15$ should be completed by adding the "4040" series to obtain the final NTI. Fox example, for Guyana:

$$NTI = I3 \triangleright I[4^{th}\ tie] = I2 \triangleright I[3^{rd}\ tie] \triangleright I[4^{th}\ tie] = 1515064040$$

that leaves us with the following AHDI:

$$IADH_{Guyana} = \frac{1515064040 - 0202020202}{4040404040 - 0202020202} = 0.34208$$

Results of calculating the AHDI for the 169 countries that have a HDI rank in 2010 are shown in the Appendix. The table shows the ranking of each country according to the HDI and the AHDI. Once countries were ranked by their HDI, they were grouped by quartiles that connote very high, high, middle or low development.

Results

Results for the set of all countries

Pérez-Mesa (2008) demonstrates the expected correlation between the indices of poverty and development prepared by UNDP; and in Veres (2006; 2010) an equal result is obtained for UNDP indices and for indices constructed therein. The AHDI defined here is also significantly correlated with the HDI, thus confirming that the HDI and the AHDI measure the same concept of human development. Pearson's correlation between both country rankings appears as: coefficient of linear correlation 0.960, with a (two-sided) 0.01 significance level. The correlation among the HDI and AHDI is even greater: Spearman's correlation coefficient is 0.988, also with a (two-sided) 0.01 significance level.

The fact that the HDI and the AHDI measure the same concept of human development does not imply equality in their rankings, given that their respective classification sensitivities are different. Indeed, the AHDI classification is more stringent in terms of segmentation, since this aspect is established by a strict categorization among the three components; in the case of the HDI, this is less stringent since a mean is used for its calculations (arithmetic or geometric, depending on the methodology applied either before or since 2010, year of the methodological change.)

Therefore, it is worthwhile to examine the distribution of differences/similarities in the HDI and AHDI country rankings. The frequency distribution of the absolute value of the differences between the rankings is shown in the following table:

Number of countries by the absolute difference between the HDI and AHDI rankings

Difference in rankings (absolute value)	*Frequency*	*Percentage*
0	8	4.7
1	23	13.6
2	25	14.8
3	21	12.4
4	18	10.7
5	11	6.5
6	9	5.3
7	10	5.9
8	6	3.6
9	6	3.6
10	4	2.4
11	6	3.6
12	1	0.6
13	7	4.1
14	3	1.8
15	4	2.4
16	1	0.6
17	2	1.2
19	1	0.6
22	2	1.2
28	1	0.6
Total	169	100.0

Eight countries have identical rankings: Finland, Andorra, Romania, Jordan, Guatemala, Sudan, Guinea, and Burkina Faso. At the other extreme, Zimbabwe has the greatest difference (28 positions) in the rankings, and is rated as having greater development in the AHDI than with the HDI. Gabon and Belize follow, with a difference of 22 positions; Belize is ranked higher in the AHDI, and Gabon ranks higher in the HDI.

Belize is a clear example of how both indicators work. Belize has two dimensions (long and healthy life and access to education) that register significantly higher values than the mean (0.694 and 10.8, respectively). Nonetheless, per-capita GNI takes a very low value (US$5 693 under purchasing power parity, PPP), dragging the geometric mean with which the HDI is defined to a much lower country ranking. On the other hand, two higher indicators and a single lackluster one is sufficient to boost its position in the AHDI, above other countries

whose geometric mean is higher than Belize's, but whose indicators are placed in lower quartiles than Belize's.

This same line of reasoning can explain the differences in Zimbabwe's positions, last in the HDI ranking. Indeed, the three indicators of dimension are below their respective mean: life expectancy at birth, 47.0 years; average years of schooling, 7.2 years; expected years of schooling, 9.2 years; and per-capita GNI, US$176 PPP. In fact, its per-capita GNI is the lowest of all countries, also virtually the case for its life expectancy. These figures then drag the geometric mean down to the lowest ranking. Yet by studying the rankings of these three indicators with respect to the values of other countries, we can see that the indicator corresponding to access to education is in position 116, not exceeding low, right in the middle of the second quartile, meaning that the AHDI methodology boosts its position upwards, to 141, ahead of other countries whose three indicators are in the third and fourth quartiles.

Gabon's three indicators are not very far from their respective means: life expectancy at birth, 51.3 years; average years of schooling, 7.5 years; expected years of schooling, 12.7 years; and per-capita GNI, US$12 747 PPP. The closeness of the indicators to their respective means results in a HDI value that is also close to the intermediate value. Yet, when the indicators' relative positions are studied together, both life expectancy and access to education are in the second quartile: the former close to the first quartile, and the latter close to the median. Yet the decent-standard-of-living indicator is in an intermediate position within the third quartile. Given that the AHDI downgrades unfavorably-classified dimensions, the country's ranking is dragged downward in comparison to its HDI ranking, while the relatively favorable value of the other two dimensions raises its HDI value (ranking 115 with AHDI and 93 with HDI).

Summarizing, 95 countries (56.2%) have differences in ranking that are less than five positions, meaning that their rankings are practically the same. Intermediate differences, between five and nine positions, occur in 42 countries (24.9%). Appreciable differences, between 10 and 14 positions, occur in 21 countries (12.4%). And the 11 remaining countries (6.5%) have a sizable difference of 15 or more positions.

Differences in AHDI and HDI rankings mean, in turn, that ten countries (5.92%) shift in terms of their world development ranking. Specifically, the HDI classifies the United Arab Emirates and Qatar in the lower portion of the first quartile (very high human development), while the AHDI classifies them in the

higher portion of the second quartile (high development). The opposite case prevails for Chile and Argentina: the HDI classifies them in the higher portion of the second quartile, while the AHDI puts them in the lower portion of the first quartile (very high development). The HDI also classifies Mauritius in the high development quartile, in the lower portion of the second quartile, while the AHDI classifies the country in the higher portion of the third quartile (middle development). The Dominican Republic, on the other hand, is classified by the AHDI in the last position of the second quartile, while the HDI places it in the higher portion of the third quartile. Togo and Yemen are classified by the HDI in the lower portion of the third quartile (middle development), while the AHDI places them in the high portion of the fourth quartile (low development). Finally, the Solomon Islands and São Tomé and Príncipe are classified by the HDI in the higher portion of the fourth quartile (low development), while the AHDI places them in the lower portion of the third quartile (middle development). Schematically:

Countries that change their global development classification according to the HDI and AHDI

Human Development	*According to HDI*	*According to AHDI*
Very high	Lower portion of fourth quartile: United Arab Emirates Qatar	Lower portion of fourth quartile: Chile, Argentina
High	Higher portion of third quartile: Chile, Argentina Lower portion of third quartile: Mauritius	Higher portion of third quartile: United Arab Emirates, Qatar Lower portion of third quartile: Dominican Republic
Medium	Higher portion of second quartile: Dominican Republic Lower portion of second quartile: Togo, Yemen	Higher portion of second quartile: Mauritius Lower portion of second quartile: Solomon Islands, São Tomé and Príncipe
Low	Higher portion of first quartile: Solomon Islands, São Tomé and Príncipe	Higher portion of first quartile: Togo, Yemen

A special zone: the Latin American countries

The comments in this section focus on results obtained for 25 Latin American and Caribbean countries that appear in following table. The analysis is centered

on results found in the Appendix, so differences in the rankings should be understood in the context of the 169 countries studied.

Results for Latin American countries pulled from the Appendix are:

Comparison of hdi and ahdi rankings
Latin American and Caribbean countries

Rank ahdi	*ahdi*	*Country*	*hdi*	*Rank hdi*	*Difference in rank (ahdi-hdi)*
42	0.838157666	Argentina	0.775	46	–4
44	0.838140211	Bahamas	0.784	43	1
56	0.732085158	Belize	0.694	78	–22
94	0.448382421	Bolivia	0.643	95	–1
67	0.651848263	Brazil	0.699	73	–6
34	0.942329895	Chile	0.783	45	–11
81	0.551578562	Colombia	0.689	79	2
53	0.733914053	Costa Rica	0.725	62	–9
85	0.548768421	Dominican Republic	0.663	88	–3
66	0.652978947	Ecuador	0.695	77	–11
106	0.347121053	El Salvador	0.659	90	16
116	0.163621947	Guatemala	0.56	116	0
112	0.342082474	Guyana	0.611	104	8
149	0.007358263	Haiti	0.404	145	4
96	0.447379395	Honduras	0.604	106	–10
84	0.549716737	Jamaica	0.688	80	4
59	0.659674474	Mexico	0.75	56	3
101	0.446287789	Nicaragua	0.565	115	–14
60	0.659664053	Panama	0.755	54	6
93	0.448387632	Paraguay	0.64	96	–3
64	0.655750947	Peru	0.723	63	1
107	0.346078947	Surinam	0.646	94	13
72	0.629792105	Trinidad and Tobago	0.736	59	13
43	0.838157588	Uruguay	0.765	52	–9
74	0.554406211	Venezuela	0.696	75	–1

Results for these 25 countries are in line with the previous discussion regarding the other countries. The ahdi and hdi also measure here the same human-development concept. Indeed, the correlation between hdi and ahdi continues to be high and significant (Pearson correlation coefficient: 0.919, (two-sided) 0.01 significance level. And, unsurprisingly, rankings are also correlated (Spearman coefficient: 0.932, (two-sided) 0.01 significance level).

Again it is interesting to examine the distribution of the differences/similarities in the country rankings between both development indices. Thus the frequency distribution of the absolute values of the differences between rankings is:

Number of Latin American countries by absolute difference of their HDI and AHDI rankings

Difference in positions (absolute values)	*Frecuency*	*Percentage*
0	1	4.0
1	4	16.0
2	1	4.0
3	3	12.0
4	3	12.0
6	2	8.0
8	1	4.0
9	2	8.0
10	1	4.0
11	2	8.0
13	2	8.0
14	1	4.0
16	1	4.0
22	1	4.0
Total	25	100.0

Twelve countries (48%) practically coincide, with less than a five-position difference. Five more countries (20%) have small differences, between six and nine positions. Appreciable differences, of between 10 and 14 positions, appear in 6 countries (24%). There are only two with significant differences, Belize and El Salvador (8%), *i.e.*, with differences equal to, or greater than, 15 positions.

The behavior of Belize has already been discussed. The AHDI gives El Salvador a lower ranking than the HDI. In effect, just the per-capita GNI (US$6 498 PPP) is below the average of the other countries. The means of the other two dimensions (life expectancy at birth, 72.0 years; average years of schooling, 7.7 years, and expected years of schooling, 12.1 years) are slightly above average. Yet, when examining their relative standing compared to the entire set, the three indicators are within the second quartile, in positions that are very close to the median, in other words, in their highest portion. Since no indicator is within the first quartile, the AHDI assigns El Salvador an intermediate position, but not close to the middle, since the development deficit is high (there are

three dimensions that should improve with a jump of two quartiles, from the second to the fourth.)

As a whole, the AHDI classifies Latin American countries in slightly lower positions. This is due to the fact in that the vector of classification for these countries often contains components located in the first two quartiles. This means, given the handicap that this indicator places on indicators located in the initial quartiles, that their global classification shifts to lower positions. By contrast, in the HDI the presence of a high value in any of the three indicators influences the arithmetic mean and the country ranking is pulled in the opposite direction.

The diagram of NTI's trunk, branches, and stems for 25 Latin American and Caribbean countries displays the location of their development with respect to other countries in this group:

Diagram of NTI's trunk, branches, and stems for Latin American and Caribbean countries

Country	*trunk*	*branch 1*	*branch 2*	*branch 3*
Chile	38	19	04	
Argentina	34	19	19	10
Uruguay	34	19	19	07
Bahamas	34	19	12	
Costa Rica	30	19	06	
Belize	30	12	04	
Mexico	27	34	10	
Panama	27	34	06	
Peru	27	19	04	
Ecuador	27	08		
Brazil	27	04	06	
Trinidad and Tobago	26	19		
Venezuela	23	30	04	
Colombia	23	19	19	04
Jamaica	23	12	04	
Dominican Republic	23	08		
Paraguay	19	23	10	
Bolivia	19	23	08	
Honduras	19	19	23	
Nicaragua	19	15	04	
El Salvador	15	34		
Surinam	15	30		
Guyana	15	15	06	
Guatemala	08	30	06	
Haiti	02	30	26	

We observe, for example, that the degree of development is closer among Argentina and Uruguay (two branches in common, differing in the third), than the case of Mexico and Panama (one branch in common, differing in the second). Colombia has a degree of development very similar to other non-Latin American countries, specifically Azerbaijan (see the Appendix), since the tie-breaker occurred at the third branch. Ecuador and Dominican Republic have a degree of development that is quickly differentiated from that of the rest of the countries in their vicinity on their trunk, diverging from the rest after reaching branch one. Trinidad and Tobago has similar behavior but with respect to the rest of the non-Latin American countries. El Salvador and Surinam differentiate among themselves immediately within their trunk, since the divergence occurs on the trunk's first branch.

Note that in this diagram no column incorporates the final stem. This is because, for the 25 countries considered here, it was not necessary to have a fourth tie-breaker (at the stem level), which was necessary in the case of United States and Sweden, with their respective NTI of 4023231006 and 4023231004 (see the Appendix).

The case of Mexico

The following basic information about Mexico appeared in the *Human Development Report 2010* (UNDP, 2010):

Dimension	**Long and healthy life**	**Access to education***		**Decent standard of living**
Indicator	*Life expectancy at birth (years)*	*Mean years of schooling*	*Expected years of schooling*	*Per-capita GNI* (US$)
Mexico	76.7	8.7	13.4	13 971 PPP
Mean 169 Countries	68.86	7.54	12.13	13 737.5 PPP
Median 169 Countries	72.10	8.00	12.40	7 258.0 PPP
3rd Quartile 169 Countries	76.67	10.00	14.40	21 658.0 PPP

Note: */ Arithmetic mean of average years of schooling and of expected years of schooling.

This basic information leads to a HDI value of 0.750, corresponding to high human development. The AHDI value is 0.660, which means that it too includes Mexico in the higher portion of the second quartile of countries. Mexico ranks 56th in the HDI and 59th in the AHDI.

As opposed to countries discussed in previous sections, Mexico's case is an example of both indices' classification neutrality. The four indicators have values above the mean and the median posted by all countries. Life expectancy at birth is slightly above the third quartile, and thus belongs to the set of countries with very high development. The values of the other two dimensions are higher than the median and lower than the third quartile, even though they are closed to the latter than to the former, and so Mexico is included with other high-development countries. We can see then that the criteria of the geometric mean as well as those derived from its inclusion in quartiles are similar, accounting also for the fact that the values of all indicators are not very far above or below the third quartile. Therefore, substantial uniformity exists in the three indicators, insofar as none of the values is excessively high or low. Consequently, Mexico's final ranking is practically identical in both indices.

That said, the neutrality of the rankings in Mexico's case shows how the AHDI works with countries having more disparate indicators and dimensions. These are the extreme cases discussed previously of Belize and El Salvador in Latin America, or Zimbabwe and Gabon in Africa, where the HDI and AHDI rankings are clearly different.

Returning to our previous trunk-branch-stem diagram, Mexico is on the same trunk as Panama, Peru, Ecuador, and Brazil, occupying the highest branch. Therefore, although its development is initially equivalent to the other four countries, in terms of human development Mexico diverges sooner from the three latter and places higher than Panama only after reaching the second branch.

Conclusions

It would not make sense to undertake an evaluation of any magnitude without a subsequent comparison of the value obtained for other magnitudes. Hence the full validity of the rankings to evaluate it, obtained by the application of indices or indicators. In the case of human development the HDI or the AHDI.

As defined herein, the AHDI has certain advantages and certain issues when compared to the HDI. The main disadvantage is the difficulty and complexity of its calculation. Although it uses the same information as the HDI, the calculation of the AHDI, particularly in breaking ties, is obviously more complicated. Yet these disadvantages do not alter the theoretical properties of its definition

or design. Further, the difficulty of its calculations is more apparent than real, since it is easily overcome with adequate computer programming.

Notwithstanding this clear disadvantage, the AHDI has these four patent advantages:

- The AHDI combines two aspects of human development: actually achieved development and the deficit in achieving maximum potential development. In other words, it takes into account both the level of development actually achieved by a country and also the effort needed to completely eliminate the deficit that hinders it from achieving its maximum development. Therefore, the information given by the AHDI offers a more rounded picture than the HDI.
- It has a strict requirement derived from the handicap imposed on indicators corresponding to low levels of development. Since the AHDI is measured by the position that each indicator has in a ranking, and not by its numerical value, it is not affected by either very high or very low outliers that would move the corresponding geographic mean (which defines the HDI) upwards or downwards, which could mask a country's true state of development. Indeed, the AHDI is not affected by possible value outliers or values outside the range of any of its three indicators.
- The AHDI's precise ranking responds to our requirement that the three development dimensions should behave in a relatively uniform manner, based on the hypothesis that one development dimension that significantly distances itself from the other two is indicative of strong disequilibrium. This disequilibrium is undesirable and leads to a lower final ranking of those countries in such a situation. This explains why countries that lack uniformity in their indicators score lower with the AHDI than with the HDI.
- A more operational advantage has to do with the fact that, as opposed to the HDI, he AHDI does not require transformation of indicators into indices of dimension to account for their respective maximum and minimum values, given that the AHDI directly classifies original information by indicators and in quartiles. In this manner we obviate the differential effects that the normalization formula might introduce.

Both indices measure the same human-development concept as shown by the high and significant correlation among their values and rankings. Yet, when ranking countries according to both indices, some countries end up ranked quite differently, sometimes significantly so. Where these differences occur, the geometric mean's pull is always present when one of the factors has an outlier value that is significantly above or below the others. By contrast, results from the alternative index are not affected by this influence, given that they are defined as a function of the position that each indicator achieves in its respective set. When establishing a ranking of countries, it seems much more logical to rank according to the relative position of the information that defines a country's

development that by basing it on a numerical value derived from the mean of that information.

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Appendix

Compared ranking of countries by their AHDI and HDI

AHDI order	Country	NTI	AHDI	HDI order
	Very high development as per AHDI			
1	Australia	4040404040	1.0000000000	2
2	Norway	4038404040	0.9994789474	1
3	Netherlands	4030404040	0.9973947368	7
4	Switzerland	4027134040	0.9965428158	13
5	Iceland	4027104040	0.9965350000	17
6	Canada	4027074040	0.9965271842	8
7	Japan	4026274040	0.9963187632	11
8	Ireland	4026264040	0.9963161579	5
9	France	4026164040	0.9962901053	14
10	Korea	4026084040	0.9962692632	12
11	New Zealand	4023231140	0.9955260076	3
12	United States	4023231006	0.9955259727	4
13	Sweden	4023231004	0.9955259722	9
14	Germany	4023154040	0.9955059211	10
15	Belgium	4019264040	0.9944924737	18
16	Finland	4019230640	0.9944837721	16
17	Spain	4019230440	0.9944837200	20
18	Italy	4019154040	0.9944638158	23
19	Israel	4016034040	0.9936509737	15
20	Austria	4016024040	0.9936483684	25
21	Liechtenstein	4015404040	0.9934868421	6
22	Denmark	4012064040	0.9926166842	19
23	United Kingdom	4012044040	0.9926114737	26
24	Czech Republic	4008404040	0.9916631579	28
25	Greece	4004404040	0.9906210526	22
26	Slovenia	4002404040	0.9901000000	29
27	Hong Kong	3834404040	0.9463315789	21
28	Luxemburg	3826404040	0.9442473684	24
29	Singapore	3823304040	0.9434397368	27
30	Andorra	3823234040	0.9434215000	30
31	Malta	3823154040	0.9434006579	33
32	Cyprus	3823124040	0.9433928421	35
33	Portugal	3819064040	0.9423351053	40
34	Chile	3819044040	0.9423298947	45
35	Brunei	3815404040	0.9413815789	37
36	Barbados	3808404040	0.9395578947	42

***Compared ranking of countries,…* continuation**

AHDI order	Country	NTI	AHDI	HDI order
	Very high development as per AHDI			
37	Slovakia	3430404040	0.8410789474	31
38	Poland	3427404040	0.8402973684	41
39	Hungry	3426404040	0.8400368421	36
40	Bahrein	3419304040	0.8381871052	39
41	Estonia	3419191440	0.8381577700	34
42	Argentina	3419191040	0.8381576658	46
	High development as per AHDI			
43	Uruguay	3419190740	0.8381575876	52
44	Bahamas	3419124040	0.8381402105	43
45	United Arab Emirates	3415064040	0.8370824737	32
46	Kuwait	3415044040	0.8370772631	47
47	Montenegro	3412404040	0.8363894737	49
48	Saudi Arabia	3408134040	0.8352770263	55
49	Latvia	3408114040	0.8352718158	48
50	Romania	3408064040	0.8352587895	50
51	Albania	3402404040	0.8337842105	64
52	Lithuania	3030404040	0.7368684210	44
53	Qatar	3019064040	0.7339140526	38
53	Costa Rica	3019064040	0.7339140526	62
55	Kazakhstan	3012064040	0.7320903684	66
56	Belize	3012044040	0.7320851579	78
57	Croatia	2738404040	0.6607947368	51
58	Libya	2734144040	0.6596848947	53
59	Mexico	2734104040	0.6596744737	56
60	Panama	2734064040	0.6596640526	54
61	Malaysia	2723064040	0.6567982631	57
62	Bulgaria	2723044040	0.6567930526	58
63	Serbia	2719064040	0.6557561579	60
64	Peru	2719044040	0.6557509473	63
65	Bosnia-Herzegovina	2712404040	0.6540210526	68
66	Ecuador	2708404040	0.6529789473	77
67	Brazil	2704064040	0.6518482631	73
67	Tunisia	2704064040	0.6518482631	81
69	Georgia	2634064040	0.6336114210	74
70	Tonga	2634044040	0.6336062105	85
71	Ukraine	2627404040	0.6318763158	69
72	Trinidad and Tobago	2619404040	0.6297921052	59
73	Macedonia	2330064040	0.5544114210	71

***Compared ranking of countries,…* continuation**

AHDI order	Country	NTI	AHDI	HDI order
		High development as per AHDI		
74	Venezuela	2330044040	0.5544062105	75
75	Belarus	2327064040	0.5536298421	61
76	Russia	2327044040	0.5536246315	65
77	Armenia	2323404040	0.5526763157	76
78	Turkey	2319230640	0.5515890352	83
79	Iran	2319230440	0.5515889831	70
80	Azerbaijan	2319190640	0.5515786142	67
81	Colombia	2319190440	0.5515785621	79
82	Jordan	2316404040	0.5508526315	82
83	Algiers	2312064040	0.5497219473	84
84	Jamaica	2312044040	0.5497167368	80
85	Dominican Republic	2308404040	0.5487684210	88
		Middle development as per AHDI		
86	Sri Lanka	1930064040	0.4502008947	91
87	China	1930044040	0.4501956842	89
88	Turkmenistan	1927404040	0.4495078947	87
89	Mauritius	1926144040	0.4491796315	72
90	Fiji	1926074040	0.4491613947	86
91	Thailand	1926064040	0.4491587894	92
92	Syria	1923134040	0.4483954473	111
93	Paraguay	1923104040	0.4483876315	96
94	Bolivia	1923084040	0.4483824210	95
95	Philippines	1919304040	0.4473976315	97
96	Honduras	1919234040	0.4473793947	106
97	Moldavia	1919194040	0.4473689736	99
98	Kirghizstan	1919154040	0.4473585526	109
99	Maldives	1916404040	0.4466421052	107
100	Vietnam	1915064040	0.4462929999	113
101	Nicaragua	1915044040	0.4462877894	115
102	Mongolia	1912404040	0.4455999999	100
103	Uzbekistan	1908404040	0.4445578947	102
104	Botswana	1606404040	0.3658789473	98
105	South Africa	1604404040	0.3653578947	110
106	El Salvador	1534404040	0.3471210526	90
107	Surinam	1530404040	0.3460789473	94
108	Egypt	1523404040	0.3442552631	101
109	Morocco	1519134040	0.3431428157	114
110	Indonesia	1519104040	0.3431349999	108

***Compared ranking of countries,…* continuation**

AHDI order	Country	NTI	AHDI	HDI order
	Middle development as per AHDI			
111	Micronesia	1519084040	0.3431297894	103
112	Guyana	1515064040	0.3420824736	104
113	Equatorial Guinea	1515044040	0.3420772631	117
114	Tajikistan	1206404040	0.2616684210	112
115	Gabon	1204404040	0.2611473683	93
116	Guatemala	0830064040	0.1636219473	116
116	Cape Verde	0830064040	0.1636219473	118
118	Namibia	0827084040	0.1628455789	105
119	Swaziland	0827024040	0.1628299473	121
120	India	0823404040	0.1618868420	119
121	Cambodia	0812264040	0.1589845789	124
122	Congo	0812230640	0.1589758773	126
123	Pakistan	0812230440	0.1589758252	125
124	Togo	0812124040	0.1589481052	139
125	Laos	0808064040	0.1578903683	122
126	Yemen	0808044040	0.1578851578	133
127	East Timor	0430154040	0.0594348683	120
	Low development as per AHDI			
128	Solomon Islands	0430104040	0.0594218420	123
129	Kenya	0430074040	0.0594140262	128
130	São Tomé and Príncipe	0427404040	0.0587184210	127
131	Bangladesh	0426064040	0.0583693157	129
132	Ghana	0426044040	0.0583641052	130
133	Papua New Guinea	0423064040	0.0575877367	137
134	Lesotho	0423044040	0.0575825262	141
135	Comoros	0419134040	0.0565638683	140
136	Myanmar	0419114040	0.0565586578	132
137	Djibouti	0419074040	0.0565482367	147
138	Cameroon	0416404040	0.0558526315	131
139	Nepal	0415154040	0.0555269736	138
140	Angola	0415104040	0.0555139473	146
141	Zimbabwe	0415074040	0.0555061315	169
142	Madagascar	0412304040	0.0547844736	135
143	Benin	0412274040	0.0547766578	134
144	Uganda	0412164040	0.0547479999	143
145	Liberia	0412084040	0.0547271578	162
146	Mauritania	0238404040	0.0094789473	136
147	Senegal	0234064040	0.0083482631	144

***Compared ranking of countries,…* continuation**

AHDI order	Country	NTI	AHDI	HDI order
		Low development as per AHDI		
148	Ivory Coast	0234044040	0.0083430525	149
149	Haiti	0230264040	0.0073582631	145
150	Tanzania	0230230640	0.0073495615	148
151	Rwanda	0230230440	0.0073495094	152
152	Malawi	0230124040	0.0073217894	153
153	Nigeria	0227144040	0.0065454210	142
154	Sudan	0227104040	0.0065349999	154
155	Gambia	0227064040	0.0065245788	151
156	Guinea	0226404040	0.0063526315	156
157	Zambia	0223064040	0.0054824736	150
158	Afghanistan	0223044040	0.0054772631	155
159	Ethiopia	0219064040	0.0044403683	157
160	Burundi	0219044040	0.0044351578	166
161	Burkina Faso	0216404040	0.0037473683	161
162	Mali	0212064040	0.0026166841	160
163	Guinea-Bissau	0212044040	0.0026114736	164
164	Chad	0208154040	0.0015980262	163
165	Niger	0208104040	0.0015849999	167
166	Democratic Republic of the Congo	0208074040	0.0015771841	168
167	Sierra Leone	0204154040	0.0005559210	158
168	Mozambique	0204134040	0.0005507104	165
169	Central African Republic	0204034040	0.0005246578	159