II. COMMONALITIES AND DISPARITIES AMONG THE EU CANDIDATE COUNTRIES

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Abstract

One of the important challenges of the European Union (EU) at the beginning of the 21st century is its enlargement. After the integration of the 12 countries in 2005 and 2007, the EU continues its strategy for stability, security and prosperity in Europe. The new candidate countries, at different levels of development, are Western Balkan countries and Turkey.

The objective of the paper is to investigate the differences among the EU candidate countries according to the current measures of welfare/sustainability and to find their similarities and differences. This analysis of the differences and the similitude between candidate countries is done by using multidimensional scaling method (MDS) and hierarchical cluster analysis of sustainability, which takes into account, at the same time, economic, health, standard of living, people and environmental variables, as part of the multivariate statistical analysis technique - one of the basic methods of multidimensional scaling. Furthermore, MDS method allows a standardized (transformed) analysis of the data collected in different scales. This study is based on the data standardized by means of Z score transformation. The main conclusions of the analysis light up the differences between candidate countries and could be an important tool for the policy makers to focus their efforts on the difficult goal to join the European Union.

Key words: multidimensional scaling, hierarchical cluster analysis, statistical analysis

JEL Classification: F15. CO2

1. Introduction

One of the most powerful policy tools of the European Union (EU) is the enlargement, which represents the strategic interests in stability, security, and conflict prevention. The main goal of the enlargement is to increase prosperity and growth opportunities in

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the EU and in the candidate countries. The European perspective has contributed to peace and stability, and enabled partners to cope with major challenges.
The EU has taken steps to improve the quality of the enlargement process, considering in particular the lessons learned from previous enlargements. The pace at which a candidate or potential candidate country approaches the EU reflects the pace of its political and economic reforms, as well as its capacity to assume the rights and obligations of membership in accordance with the Copenhagen criteria.
The present enlargement agenda covers the Western Balkan countries and Turkey, which have prospects for becoming EU members once they fulfil the necessary conditions. It provides in both the Western Balkans countries and Turkey strong encouragement for political and economic reform over the past two years, and these countries have moved closer to the EU. This reflects progress made in reforms and in fulfilling the conditions requested for becoming EU member states. However, they will still face a number of challenges in the next period, which have far-reaching implications for their security, stability and well-being.
The EU is mobilizing all available policy instruments to support the region's progress. It is no easy purpose, taking into account that the level of the development in each country and the degree of compliance with the integration criteria is very different from one country to another, and a specific strategy should be developed for each country.
Currently, the countries of South-Eastern Europe and Turkey are in various stages on their road towards the EU. Croatia and Turkey are candidate countries. They started accession negotiations on 3rd October 2005. In December 2005, the European Council granted the Former Yugoslav Republic of Macedonia the status of candidate country; but accession negotiations have not started.
All the other Western Balkan countries are potential candidates: Albania, Bosnia and Herzegovina, Montenegro, Serbia, as well as Kosovo under UN Security Council Resolution 1244/99. The EU has repeatedly reaffirmed at the highest level its commitment to the European perspective of the Western Balkans, provided they fulfil the accession criteria.
Until the last year, the Balkan countries and Turkey witnessed high economic growth rates, including development of exports and investment. Moreover, institutionalized relations with the EU and increased regional ownership over regional cooperation show the political maturing of these countries.
Economic growth is a fundamental component of the development. A well-functioning economy provides employment opportunities and improves people's living standards. In transition countries, it supports democratic reforms and social transformation. To be sustainable, economic growth must, among other things, be based on information, knowledge and innovation, implying substantial investments in research and development, innovation, the widespread application of current information technologies, the sustainable use of resources and an enhanced business environment. It must also be linked to human development objectives, including the equitable provision of decent employment.
Cultivating common economic interests among neighbouring countries can also help build confidence and overcome tensions related to recent conflicts. The prospect of EU integration makes regional cooperation and good neighbourhood relations even more important.

Adequate infrastructure is fundamental not only to promoting economic development and employment, but also to ensuring proper standards of living by guaranteeing electricity and heating, and facilitating movement. Energy, transport, telecommunications and environmental protection infrastructure are powerful factors in modern, dynamic and competitive countries. From a regional perspective, the development of regional infrastructure is one of the main integrating factors in the candidate countries. Policy makers consider it as a top priority for cooperation and development of these countries. This recognizes that countries have shared interests and resources, and that regional cooperation is often the ideal mechanism to improve infrastructure in a cost-effective and efficient way.

Modern infrastructure is also a prerequisite for the integration of the region into the European and global mainstreams. People use energy to produce goods and services, drive their household appliances, and light, heat or cool their homes. Due to high energy use and diversified needs, on one hand, and limited resources on the other, energy systems require high inputs in terms of capital, land and human resources. Today, technological advances have made it possible to achieve a higher level of human development with the same quantity of energy used in the 1960s. To achieve a higher level of human development, energy must be available, meaning that total social expenditures for energy services are covered through increased productivity, which is one of the criteria to become an EU member state.

The aim of this study is to investigate the differences among the EU candidate countries according to the current measures of welfare/sustainability and to find their similarities and differences. As coverage of the study, it was conducted with 18 indicators (our criteria). Whenever there is an increase in our criteria, the results may change. In Section 2 of the paper, data used and analysis method are described. In Section 3, analysis results are presented and major conclusions are presented in Section 4.

2. Method of Analysis

The differences and the similitude among candidate countries have been under light using different indicators and two methods: MDS and hierarchical clustering. The standard normal data by Z score transformation has been used for all indicators. The Z score transformation provides a way of standardizing data across a wide range of experiments and it allows also comparing different scales of data (the matrix of the standardised indicators is not given).

Multidimensional scaling (MDS) is used to provide a visual representation of a complex set of relationships among the EU candidate and potential candidate countries that can be scanned at a glance. In general, the purpose of a MDS analysis is to detect meaningful underlying dimensions that allow the researcher to explain observed similarities or dissimilarities (distances) among the investigated objects. According to a measure of similarity or distance based on subjects' direct assessment that has been computed for all pairs of objects, a map or configuration with located objects is developed.

In this way, MDS was used to demonstrate the similarities and disparities among these countries, as part of the multivariate statistical analysis technique - one of the

basic methods of multidimensional scaling (MDS) (Kinnucan, Nelson, and Allen, 1987). The factor analysis was complemented with a multidimensional scaling analysis using SPSS. Such an additional procedure allowed for the verification of the structural dimensions of data, particularly useful when conducting cross-cultural analyses (Leung & Bond, 1989). Multidimensional scaling allows us to explore dimensions underpinning the four goals. MDS assists the researcher in determining the perceived relative position of a set of objects or items (Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C., 1995). MDS is typically used to determine similarities among a set of objects (rather than self-report questionnaire items). It is, however, considered appropriate for use in the present study not only in terms of its heuristic value, but also in terms of its focus on mapping constructs in multidimensional space as it is relevant here. If two items are similarly rated by respondents, they will be located in multidimensional space in a way that the distance between them is smaller than the distance between other pairs of items. The resulting perceptual map indicates the relative positioning of all items. The researcher then interprets the underlying dimensions in a way that best explains the positioning of items in the map, particularly as it relates to an underlying theoretical rationale.

Furthermore, MDS method allows a standardized (transformed) analysis of the data collected in different scales. This study is based on the data standardized by means of Z score transformation. The present analysis used the multidimensional scaling procedure in SPSS 14.0, which created the similarity matrix from the raw data using the Euclidean distance measure (Howard and McCain, 1998).

A multidimensional scaling analysis is to compute coordinates for a set points (or objects) in a small number of dimensions in such a way that the distances between pairs of the points match as closely as possible to measured dissimilarities between a corresponding set of objects. By scaling the points in two dimensions, we can obtain a spatial configuration of different countries grouped together depending on the similarities of the indicators.

Cluster analysis is a kind of classification technique in which no assumptions are made concerning the number of groups or group structure. A cluster is a group of relatively homogeneous cases or observations. Grouping is done on the basis of similarities of distances (dissimilarities) using the variable values observed in each individual (Johnson RA, Wichern DW., 1982).

Hierarchical clustering techniques proceed by either a series of successive mergers or a series of successive divisions. Agglomerative hierarchical methods start with the individual objects. The results of agglomerative hierarchical method are displayed in the form of a two-dimensional diagram known as a dendogram. The dendogram illustrates the mergers or divisions which have been made at successive levels (Forgy EW., 1965).

Cluster analysis is a general for various data analytic procedures that are specifically designed to identify relatively homogeneous sub-groups in a sample. We used one particular set of approaches, called hierarchical agglomerative cluster analysis. These start with a set of individuals for whom there is a common set of measures. It then attempts to identify the two individuals with the most similar scores. At this first step in the analysis, these two individuals are merged to form a single cluster, which is

treated as one individual at the next step in the analysis. This means that at the second step in the analysis there is one less individual to be considered, and again the program aims to identify the two individuals with the most similar scores. These two are then combined before entering the next step in the analysis. You can see that by this method the number of individuals decreases, and the number of clusters of individuals increases. Thus, increasingly the computer merges clusters rather than just pairs of individuals at each step of the analysis. Eventually, the individuals are in just two clusters, which are then merged at the final step in the analysis. In this study, cluster analysis based upon the Ward's minimum-variance method is undertaken in order to find similar country groups in the multivariate data.

The analysis made is based on social and economic indicators. The main indicators concerning the level of the economy and its growth rate, the degree of the education, the health indicators, and the use of the government revenues for the society give an overview of the characteristics of each country. The analysis was based on the main indicators used also for the establishing the rank of human development in these countries.

It should be stressed that not all candidate and potential candidate countries are presented in the analysis, because for some of them, especially Kosovo, the defined indicators were not available.

The main indicators used cover the aspects of education, health, condition of life, economic situation, which allow an analysis of the similarities and differences between countries. These indicators are: percentage of population under 15 in total population**,** average life expectancy at birth (2000-2005), infant mortality rate (per 1,000 live births), HDI rank (2005), Population undernourished as percentage in total population (%) (2003-2005), population using improved water source as percentage in total population (2006), population using improved sanitation (%) (2006), adult literacy rate (2004), annual GDP growth (%)(2006), annual inflation (2006), total debt services as percentage of GDP, export of goods and services as percentage of GDP, GDP per capita in PPP, health expenditure as percentage of GDP, physicians (per 100,000 people), percentage of GDP spent on education (2002-2005), percentage of GDP spent on military expenditures (2005), carbon dioxide emissions per capita (tCO2) (see Annex).

The data are collected for Turkey, Bosnia and Herzegovina, FYR of Macedonia, Albania, Montenegro, Croatia and Serbia and are used to demonstrate graphically the relations between countries and the possible commonalities and disparities among the seven candidates of the European Union.

3. Results

3.1. Results of Candidate Countries according to Multidimensional Scaling

The scaling technique used in this study is based upon the Kruskal Theory. It is desirable for MDS analysis to determine the stress statistics to a level near zero. The compatibility of configuration distances to the original ones on the basis of stress values is expressed as follows:

Table 1

Stress Value Responses

Stress value	Compatibility
>0.20	Incompatible presentation
0.10-<0.20	Low compatibility
0.05-<0.10	Good compatibility
0.025-<0.0.5	Perfect compatibility
0.00-<0.025	Full compatibility

RSQ values are the proportion of variance of the scaled data (disparities) in the partition (row, matrix, or entire data) which is accounted for by their corresponding distances. Stress values are calculated according to Kruskal's stress formula 1 (Kruskal, 1978).

Stress = 0.04325 RSQ = 0.99488

MDS analysis in this study was carried out bi-dimensionally (k=2). It was iterated up to the value where the stress statistics for k=2 was less than 0.001. For MDS solutions, the dimensional solutions giving a stress value near 0 are considered to be desirable or appropriate.

The stress statistics, which are used for determining the appropriateness between the configuration distances and estimated distances, is found as 0.04325 for the k=2 dimension. Kruskal stress statistics is calculated by taking square root of the rate of the differences between the actual configuration dimension and the estimated ones to the estimated configuration distances, and represent the compatibility between data distances and configuration distances. In this context, for the k=2 dimension the stress value explains the data in proportion of 0.99488. The result, obtained with MDS is presented in Table 2.

Table 2

Two-Dimensional Coordinates of the EU Candidate Countries Resulting from MDS

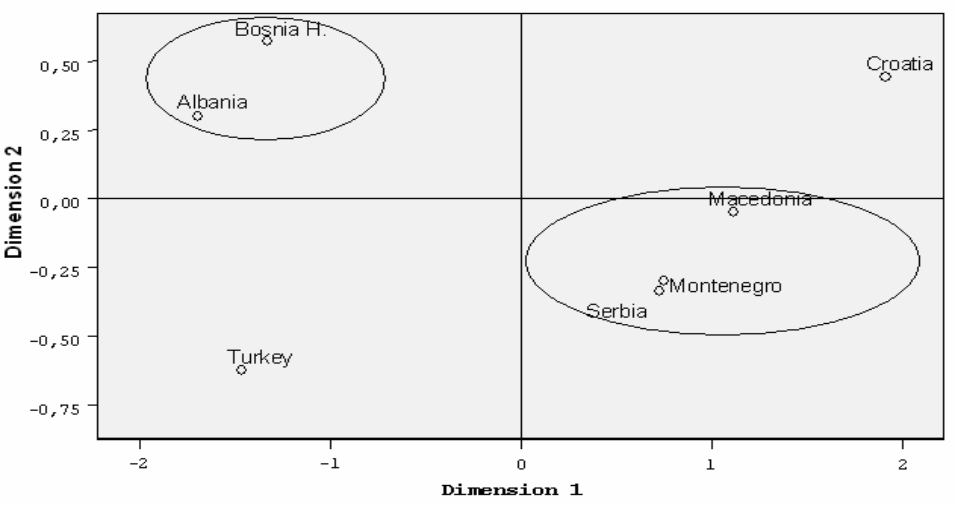
Stimulus Number	Stimulus Name	Dimension	
		1	2
1	Turkey	-1.4670	-0.6266
2	Bosnia and Herzegovina	-1.3326	0.5739
3	FYR of Macedonia	1.1134	-0.0507
4	Albania	-1.6974	0.3007
5	Montenegro	0.7509	-0.3017
6	Croatia	1.9102	0.4427
7	Serbia	0.7224	-0.3383

The above table shows the bi-dimensional coordinates (stimulus coordinates) of variables. It is understood from the table that Croatia, Macedonia, Montenegro and Serbia at the first dimension are higher than other countries. These countries are perceived similar. Also, in the first dimension, dissimilar countries are Albania and Croatia. In the second dimension, Turkey and Bosnia and Herzegovina are very different.

The scatter plot resulting from MDS (see Figure 1) indicates the distance among the EU candidate countries.

Figure 1

Euclidean Distance Model in Terms of Countries



Source: Human Development Report, 2007/2008.

This graph is a representation of the countries in two dimensions. The scatter plot resulting from MDS indicates that Croatia is ranked first among the EU candidate countries. The preference distance among FYR of Macedonia and Serbia and Montenegro, based on the 18 aspects of expatriate assignment evaluation criteria, is very short (i.e., they are very similar). In other words, Macedonia and Serbia and Montenegro have the common feature of all indicators. The same way, Albania and Bosnia Herzegovina have the near feature of all indicators. Albania and Croatia are most dissimilar to the other countries.

The results of dissimilarity matrix, obtained with MDS Proximity Matrix, are given in Table 3.

One may notice the same results in Table 2. According to the matrix, it could be stressed that the most similar countries are Serbia and Montenegro, followed by FYR of Macedonia. Dissimilar countries are Albania and Croatia.

Table 3

The Results of Dissimilarity Matrix

	Euclidean Distance						
	Croatia	Albania	Bosnia H.	Turkey	Montenegro	Serbia	Macedonia
Croatia	.000						
Albania	.209	.000					
Bosnia H.	.112	.148	.000				
Turkey	.153	.094	.088	.000			
Montenegro	.055	.191	.082	.123	.000		
Serbia	.055	.190	.081	.121	.021	.000	
FYR of Macedonia	.045	.207	.090	.138	.032	.033	.000

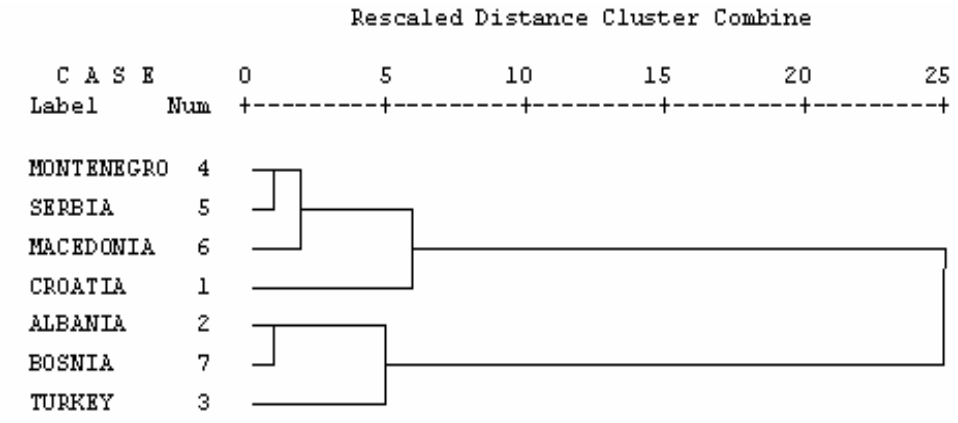
3.2. Results for Candidate Countries according to Hierarchical Clustering Method

The hierarchical clustering technique proceeded by the average linkage method and the result is shown in a dendogram (see Figure 2). Here it can be seen that this technique is called hierarchical because a cluster is subsumed under just one cluster at a higher level, and it is called agglomerative because, starting from single separate cases in the figure it is gradually merged to form one whole group. As expected from 1, FYR of Macedonia, Serbia and Montenegro are most similar to each other among the seven countries. Croatia, Turkey and Albania and Bosnia and Herzegovina are most dissimilar from other countries. These cluster analysis results are similar to those of the multidimensional scaling analysis (Figure 1).

Dendrogram using Average Linkage (Between Groups)

Figure 2

Country Comparison on Dendogram Using Ward Method



4. Conclusion

Over the past two years, the countries of the Western Balkans have moved closer to the EU. This reflects progress, albeit uneven, in reforms and in meeting the conditions.

Based on MDS and cluster analysis, the results obtained reflect the differences between candidate and potential candidate countries to the European Union. The historical, economic and social backgrounds of each country are causing the discrepancies. The analysis made taking into account the first dimension emphasize the similarities between some countries and the disparities between others. It can be observed that there are two countries very different one from another, Montenegro and Turkey. Turkey's strategic importance to the EU has further increased in key areas such as energy security, conflict prevention and resolution and regional security in the Southern Caucasus and the Middle East.

The MDS analysis results indicate that FYR of Macedonia, Serbia and Montenegro have the common feature of the economic and social indicators. In the same way, Albania and Bosnia and Herzegovina present similarities of their indicators. Between Albania and Croatia is the highest dissimilarity.

It is important that the countries and the policy makers understand their specificities and develop a real strategy to meet European requirements and allow them to integrate as soon as possible. The results of the statistical analysis represent a synthetic picture of the differences between candidate countries and are, at the same time, an important tool for the consolidation of stability and enhancement of reforms necessary in these countries.

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ANNEX

Criterion	Croatia	Albania	Bosnia and Herzegovina	Turkey	Montenegro	Serbia	FYR of Macedonia
People							
Percentage of population under 15 in total population Source: U.N. Development Programme (UNDP) 2007	15.5	26.3	17.6	28.3	19.6	19.6	19.7
Standard of living							
Average life expectancy at birth (2000-2005) Source: U.N. Development Programme (UNDP) 2007	75.3	76.2	74.5	71.4	74	73.5	73.8
Infant mortality rate (per 1.000 live births) Source: U.N. Children's Fund (UNICEF) – State of the World's Children 2009	5	13	13	21	9	7	15
HDI rank (2005) Source: U.N. Development Programme (UNDP) 2007	47	68	66	84	74	74	69
Population undernourished (% in total population) (2003-2005) Source: U.N. Food and Agriculture Organisation (FAO) 2008	7	6	9	3	9	9	5
Population using an improved water source (% in total population)(2006) Source: UNICEF and WHO 2008)	99	97	99	97	98	99	100
Population using improved sanitation (%in total population) (2006) Source: UNICEF and WHO 2008	99	97	95	88	91	92	89
Adult literacy rate (2004) Source: UNDP – Human Development Report 2006	98.1	98.7	96.7	87.4	96.4	96.4	96.8
Annual GDP growth (%)(2006) **Source:** World Bank Data Profile Tables 2008	4.8	5.0	6.0	6.1	16.2	5.7	3.0

Criterion	Croatia	Albania	Bosnia and Herzegovina	Turkey	Montenegro	Serbia	FYR of Macedonia
Total debt services as % in GDP **Source:** U.N. Development Programme (UNDP) 2007	12.8	1	2.7	11.6	4.8	4.8	4.1
Export of goods and services as % in GDP **Source:** U.N. Development Programme (UNDP) 2007	47	22	36	27	27	27	45
GDP per capita in PPP **Source:** U.N. Development Programme (UNDP) 2007	13,042	5,316	7,032	8,407	7,640	7,640	7,200
Health and others							
Health expenditure as % in GDP **Source:** U.N. Development Programme (UNDP) 2007	6.1	3.0	4.1	5.2	7.3	7.3	5.7
Physicians per 100.000 people (2000-2004) **Source:** U.N. Development Programme (UNDP) 2007	244	131	134	135	206	206	219
Education expenditure a as % in GDP (2002-2005) **Source:** UNDP – Human Development Report 2007/2008	4.7	2.9	3.1	3.7	3.3	3.3	3.5
Military expenditure as % in GDP (2005) **Source:** UNDP - Human Development Report 2007/2008	1.6	1.4	1.9	2.8	2.6	2.6	2.2
Environmental							
Carbon dioxide emissions per capita (tCO2) **Source:** UNDP - Human Development Report 2007/2008	5.3	1.2	4.0	3.2	4.9	4.9	5.1

Indicators (http://www.alertnet.org/db/cp/countries(data))

Carbon dioxide emissions: Anthropogenic (human originated) carbon dioxide emissions stemming from the burning of fossil fuels, gas flaring and the production of cement. Emissions are calculated from data on the consumption of solid, liquid and gaseous fuels; gas flaring; and the production of cement. Carbon dioxide can also be emitted by forest biomass through depletion of forest areas.

GDP (gross domestic product) and PPP (purchasing power parity): Differences in this ratio over time and across countries partly reflect structural changes in the economy, changes in energy efficiency of particular sectors, and differences in fuel mixes.

Debt service, total: The sum of principal repayments and interest actually paid in foreign currency, goods or services on long-term debt (having a maturity of more than one year), interest paid on short-term debt and repayments to the International Monetary Fund.

Education expenditure, public: Includes both capital expenditures (spending on construction, renovation, major repairs and purchases of heavy equipment or vehicles) and current expenditures.

Exports of goods and services: The value of all goods and other market services provided to the rest of the world. Included is the value of merchandise, freight, insurance, transport, travel, royalties, license fees and other services, such as communication, construction, financial, information, business, personal and government services. Excluded are labour and property income and transfer payments.

GDP per capita annual growth rate: Least squares annual growth rate, calculated from constant price GDP per capita in local currency units.

Health expenditure per capita (PPP US$): The sum of public and private expenditure (in purchasing power parity terms in US dollars), divided by the mid-year population. Health expenditure includes the provision of health services (preventive and curative), family planning activities, nutrition activities and emergency aid designated for health, but excludes the provision of water and sanitation.

Human development index (HDI): A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living. For details on how the index is calculated

Life expectancy at birth: The number of years a newborn infant would live if prevailing patterns of age-specific mortality rates at the time of birth were to stay the same throughout the child's life.

Literacy rate, adult: The proportion of the adult population aged 15 years and older which is literate, expressed as a percentage of the corresponding population, total or for a given sex, in a given country, territory, or geographic area, at a specific point in time, usually mid-year. For statistical purposes, a person is literate who can, with understanding, both read and write a short simple statement on his/her everyday life.

Military expenditure: All expenditures of the defence ministry and other ministries on recruiting and training military personnel as well as on construction and purchase of military supplies and equipment. Military assistance is included in the expenditures of the donor country.

Mortality rate, infant: The probability of dying between birth and exactly one year of age, expressed per 1,000 live births.

Physicians: Includes graduates of a faculty or school of medicine who are working in any medical field (including teaching, research and practice).

Population, total: Refers to the de facto population in a country, area or region as of 1 July of the year indicated.

Sanitation facilities, improved, population using: The percentage of the population with access to adequate excreta disposal facilities, such as a connection to a sewer or septic tank system, a pour-flush latrine, a simple pit latrine or a ventilated improved pit latrine. An excreta disposal system is considered adequate if it is private or shared (but not public) and if it can effectively prevent human, animal and insect contact with excreta.

Undernourished people: People whose food intake is chronically insufficient to meet their minimum energy requirements.

Water source, improved, population not using: Calculated as 100 minus the percentage of the population using an improved water source. Unimproved sources include vendors, bottled water, tanker trucks and unprotected wells and springs.