Brief original article

Human rights in the Horn of Africa: an index of child and maternal health

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A B S T R A C T

Objective: To construct a territorial measure and classification of child and maternal health in the countries of the Horn of Africa based on the 2030 Agenda for Sustainable Development adopted by all United Nations Member States in 2015.
Method: The design of our index includes the variables child and maternal health defined in the Sustainable Development Goals (SDGs) to enable territorial ranking of the countries. For this purpose, we used Pena's distance method for 2017.
Results: The results indicate a relatively high territorial disparity in maternal health between the countries of the Horn of Africa according to the differing values of the SDGs variables of child and maternal health.
Conclusions: We propose a territorial classification in the countries of the Horn of Africa. We believe that the most striking differences between countries relate to basic variables of maternal health such as being attended by skilled health personnel.

Los derechos humanos en el Cuerno de África: un índice de salud infantil y materna

R E S U M E N

Objetivo: Elaborar una medida y clasificación territorial de la salud infantil y materna en los países del Cuerno de África, basada en la Agenda 2030 para el Desarrollo Sostenible, que fue adoptada por todos los Estados miembros de las Naciones Unidas en 2015.
Método: El diseño del índice incluye variables de salud infantil y materna definidas en los Objetivos de Desarrollo Sostenible (ODS), para permitir la clasificación territorial de los países. Para este propósito, utilizamos el método de distancia de Pena para 2017.
Resultados: Los resultados revelan una disparidad territorial relativamente alta en salud materna entre los países del Cuerno de África, de acuerdo con los diferentes valores de las variables ODS.
Conclusiones: Proponemos una clasificación territorial en el Cuerno de África. Consideramos que las mayores diferencias entre los países se relacionan con variables básicas de salud materna, como la asistencia de personal de salud cualificado.

Introduction

On 1st January 2016, the world officially began implementation of the action plan based on Sustainable Development Goals (SDGs). Goal three aims to ensure health and well-being for all people of all ages by improving reproductive, maternal and child health.[1]

Study of the Horn of Africa countries is especially important, as the situation remains disastrous.[2] The Horn of Africa region is plagued by a set of complex,[3] often interrelated factors including environmental degradation, climate-related disasters such as droughts and floods.[4,5]

Multiple factors hinder access to and utilization of health services in the Horn of Africa. These factors include lack of a functional health system, geographical accessibility, financial barriers and limited availability of services.[1,2]

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In particular, this study aims to construct a synthetic indicator of maternal and child health to enable comparison between five countries in 2017 in the Horn of Africa.

The index also allows to study the impact of each variable individually so as to determine disparities in the variables associated with the SDGs for each country. Additionally, the research explores the relative impact of each variable by using the correction factor.

Method

The methodological approaches used in this study are based on the construction of a synthetic index that follows Pena's method (DP_2).[6] The DP_2 provides an ideal solution to the problems involved in devising a synthetic indicator, particularly those related to aggregation and weighting of simple indicators and information duplicity.[7]

The DP_2 measures the distance between the issue studied in each country and a fictitious base reference. We take as reference a theoretical country that obtains the worst values for the variables studied[7].

The DP_2 from country j is defined as follows:

$$DP_2 = \sum_{i=1}^{n} \left\{ (d_i/\sigma_i)(1 - R^2_{i,i-1,\dots,1}) \right\}$$

where $d_i = |x_{ji} - x_{*i}|$ is the distance between the value of variable i in country j and the reference base. The reference base comprises the results from an imaginary country which reflects the worst possible scenario for all the variables where $X_* = (x_{*1}, x_{*2}, \dots, x_{*n})$ coincides with the minimum vector. The reference base would therefore be attributed a value of zero in the synthetic indicator.[7] n is the number of variables, σ_i is the standard deviation of variable i, and $(1-R^2_{i, i-1, \dots, 1})$ is a "correction factor"[6] that avoids redundancy.[2,6–9] The coefficient of determination, $R^2_{i, i-1, \dots, 1}$, is the determination coefficient in regression X_i over $X_{i-1}, X_{i-2}, \dots, X_1$, which is already included, with $R^2_1 = 0$. Put differently, the coefficient measures the part of the variance of each variable explained by the linear regression estimated using the preceding variables.[2] The ordering of the variables corresponds to their relative weight measured in terms of linear correlation with the final synthetic indicator.[7] The input order of the variables is determined by an algorithm that reaches convergence when the indicator fulfils a number of desirable properties.[2,6–9]

It is also possible to establish an order or hierarchy based on the amount of information that each variable contributes to the DP_2. To determine this, we construct the Ivanovic Discrimination Coefficient (IDC).[10–12] This indicator finally shows us the amount of information provided by the i-th variable. It can range from 0 (in the event that the values of X_i are identical in all the countries) to 2 (in the event that the variable has total discriminatory power, that is, when the amount of information varies greatly across territories). Thus, the closer the IDC value is to 2, the more useful information it provides to explain the differences in the level of child and maternal health in the countries studied.[11,12]

Data were collected from the work of the United Nations Statistical Commission, which created the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs). In particular, we used five variables of child and maternal health associated with the goal 3[1] (Table 1), using as a reference the detailed information contained in a set of variables set out under the SDGs in the Report 2018,[13] which provide a more extensive and more reliable set of statistics on the SDG 3 of Horn of Africa. The countries included into the analysis were Ethiopia, Kenya, Somalia, Eritrea and Djibouti. To guarantee fulfilment of the properties of the synthetic indicator, we multiply specific variables whose increase implies a worsening of the child and maternal health by −1.

Table 1

Variables of child and maternal health according to the Ivanovic Discrimination Coefficient (IDC) and to the correction factor.

Partial indicators	Ivanovic (IDC)	Correction factor
Attended by skilled health personnel, percentage (positive sign +)	0.88	0.69
Maternal mortality ratio per 100,000 live births (negative sign −)	0.61	1.00
Children under five mortality rate per 1,000 live births (negative sign −)	0.42	0.33
Adolescent birth rate, per 1,000 women (negative sign −)	0.18	0.19
Prevalence of underweight (% of children under) (negative sign −)	0.14	0.10

Table 2

Synthetic indicator of child and maternal health in the Horn of Africa, 2017. Countries ordered by Pena's relative distance (DP_2) method.

	Indicator Pena's relative distance (DP_2)	Total population of the Horn of Africa (%)	Human Development Index (HDI)[a]
Djibouti	4.56	0.51	0.48
Kenya	3.46	29.00	0.59
Eritrea	2.71	1.02	0.44
Ethiopia	1.85	63.00	0.46
Somalia	0.10	6.47	NA

NA: not available.

[a] Countries with high HDI (≥ 0.8), with medium HDI (0.5-< 0.8) and with low HDI (HDI < 0.5).

The year of analysis is 2017, but for those variables where information was not available for that date, the nearest year was taken as an alternative. This has occurred in the variable "Attended by skilled health personnel, percentage", whose available information is from 2016.

Results

Constructed from the variables included in Table 1, the result is shown in Table 2, which ranks the five countries by level of child and maternal health.

The resulting classification (Table 2) shows, first, a distance of almost 5 points between the best-positioned country (Djibouti) and the worst-positioned (Somalia) in 2017. These results indicate a relatively high disparity between the countries analysed.

The results show that Djibouti made the greatest progress toward the goals for child and maternal health, with a distance of 4.56 from the baseline (Table 2). It was followed by Kenya (3.46), which accounts for 29% of the total population of the Horn of Africa.

Taken together, Somalia and Ethiopia account for nearly 70% of the population of the Horn of Africa. They, in contrast, are the countries with the worst theoretical scenarios (Table 2).

If we analyse the results obtained for the variables with the greatest inequality in intercountry values (IDC),[10] the most discriminating variable is "Attended by skilled health personnel, percentage" (Table 1). The second-most-discriminating variable is "Maternal mortality ratio per 100,000 live births".

In addition, by means of correction factors, the synthetic indicator DP_2 only includes the new information from each variable.[9] In particular, the variable "Maternal mortality ratio per 100,000 live births" contains all of its information, so the corresponding

correction factor is 100%, as a result of being most closely correlated with it (Table 1).

Discussion and conclusion

The DP$_2$ method shows territorial disparities in child and maternal health in the Horn of Africa in 2017. We obtained a difference of 4.56 units between Djibouti and the reference value. Djibouti achieved a higher level of child and maternal health, but it accounts for only 0.5% of the total Horn of Africa population. At the opposite extreme, Somalia registers extremely low values in the set of partial indicators.

Priority must be given to interventions to address the variables that have greater power to explain the differences in the values ??between countries relative —primarily the variable "Attended by skilled health personnel, percentage".

The differing values of these variables suggest that progress in maternal health is uneven throughout the Horn of Africa, while fewer territorial differences exist in the variables associated with child health as defined in the SDGs.

In summary, delivery of health services is greatly in need of improvement, especially in Somalia and Ethiopia, and there is an urgent need to increase the number of health workers throughout the region to lower maternal and infant mortality.[14]

In general, the DP$_2$ classification for these countries differs from that made by the Human Development Index (HDI) for countries with low human development in 2017 (Table 2). In this sense, our analysis takes into account a range of SDGs variables, some of which are not included in the HDI.

What is known about the topic?

Several factors must be analysed and monitored on a priority and constant basis in the decision-making process for distribution of international aid to the countries of the Horn of Africa to improve maternal and child health. Research on the evolution of variables associated with maternal and child health in these countries is very limited.

What does this study add to the literature?

The study provides a complete, up-to-date classification of the Horn of Africa, based on the values of the variables associated with maternal and child health. It also provides information on the variables that best explain the differences between countries. We conclude that the heterogeneous situations of the countries differ from the goals projected by United Nations. The most notable differences relate to the number of births attended by qualified health personnel.

Editor in charge

Miguel Ángel Negrín Hernández.

Transparency declaration

The corresponding author on behalf of the other authors guarantee the accuracy, transparency and honesty of the data and information contained in the study, that no relevant information has been omitted and that all discrepancies between authors have been adequately resolved and described.

Authorship contributions

K.A. Zermeño, J.A. Rodríguez and J.M. Martín conceived the study and supervised all aspects of its performance. J.A. Rodríguez, K. Añaños and J.A. Salinas gathered data, interpreted the results and participated in writing the first draft of the manuscript. K.A. Zermeño, J.M. Martín and K. Añaños were in charge of the bibliographic research. J.A. Salinas and J.M. Martín were in charge of the data analysis. All authors contributed comments and ideas, interpreted the findings and reviewed the drafts of the manuscript. All of the authors approved the final version of the paper.

Conflicts of interest

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