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CORRELATION BETWEEN LATIN AMERICAN AND CARIBBEAN JOURNALS IMPACT INDICATORS

CORRELACIÓN ENTRE INDICADORES DE IMPACTO DE REVISTAS DE AMÉRICA LATINA Y EL CARIBE

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ABSTRACT

Objective: Identify the levels of correlation between impact indicators from Latin American and Caribbean journals indexed in databases. The selected indicators are the Impact Factor, 5-year Impact Factor, EigenFactor Score, Article Influence Score, Journal Citation Indicator, SJR, CiteScore, h-index (SJR), Source-normalized Impact per Paper, and h5-index. **Design/methodology/approach**: Data were downloaded from Journal Citation Reports, SCimago, and Scopus. A Phyton script was used to search for journals titles and extract the h5-indexfrom Google Scholar Metrics. Pearson and Spearman coefficients tests were used to identify the level of correlation between pairs of indicators from the same set of journals. Data are analyzed in general, and according to the areas of Science, Technology and Medicine, and Arts, Humanities and Social Sciences. **Results and discusión**: The correlation coefficients are positive moderate (0.40 < 0.69) and strong (0.70 < 0.89) in most pairings, with a very strong level (> 0.90) between Impact Factor, 5-year Impact Factor, and CiteScore (CS),Science, Technology and Medicine journals have stronger correlation levels than Arts, Humanities and Social Sciences journals. **Conclusion:** Considering the relationship between

availability and average correlation, the CS and the h5-index are the most suitable indicators for journals assessment in the region. **Originality/value:** This paper provides a correlation analysis between impact indicators of all indexed Latin American and Caribbean journals. It is also innovative by using an automated technique of search and data extraction in Google Scholar Metrics.The results can contributeto the elaboration of journals evaluation policies in the countries of the region.
Keywords: Scientific journals, Latin America and Caribbean; Scholarly communication; Impact indicators; Pearson correlation; Spearman correlation.

RESUMEN

Objetivo: Identificar los niveles de correlación entre indicadores de impacto de revistas latinoamericanas y caribeñas indexadas en bases de datos. Los indicadores seleccionados son el factor de impacto, el factor de impacto de 5 años, la puntuación de EigenFactor, la puntuación de influencia del artículo, el indicador de citas de revistas, SJR, CiteScore, el índice h (SJR), el impacto normalizado por fuente por artículo y el índice h5. **Diseño/metodología/enfoque:** los datos se descargaron de Journal Citation Reports, Scimago y Scopus. Se utilizó un script de Phyton para buscar títulos de revistas y extraer el índice h5 de Google Scholar Metrics. Se utilizaron las pruebas de los coeficientes de Pearson y Spearman para identificar el nivel de correlación entre pares de indicadores del mismo conjunto de revistas. Los datos se analizan en general, y según las áreas de Ciencia, Tecnología y Medicina, y Artes, Humanidades y Ciencias Sociales**. Resultados y discusión**: Los coeficientes de correlación son positivos moderados (0,40 < 0,69) y fuertes (0,70 < 0,89) en la mayoría de los emparejamientos, con un nivel muy fuerte (> 0,90) entre Factor de Impacto, Factor de Impacto de 5 años y CiteScore (CS) Las revistas de Ciencias, Tecnología y Medicina tienen niveles de correlación más fuertes que las revistas de Artes, Humanidades y Ciencias Sociales. **Conclusión:** Considerando la relación entre disponibilidad y correlación promedio, el CS y el índice h5 son los indicadores más adecuados para la evaluación de revistas en la región. **Originalidad/valor:** Este artículo proporciona un análisis de correlación entre los indicadores de impacto de todas las revistas indexadas de América Latina y el Caribe. También es innovador al utilizar una técnica automatizada de búsqueda y extracción de datos en Google Scholar Metrics. Los resultados pueden contribuir a la elaboración de políticas de evaluación de revistas en los países de la región.
Palabras clave: Revistas científicas; América Latina y el Caribe; comunicación académica; Indicadores de impacto; Correlación de Pearson; Correlación de Spearman.

INTRODUCTION

In recent years, there has been a significant increase in the number of Latin American and Caribbean (LAC) journals indexed in databases (Machin-Mastromatteo et al., 2017; Machin-Mastromatteo, 2019; Vladimir Chuchco, 2020). The improvement in the quality of publications and scientific production in some countriescontributed to this growth (Vélez-Cuartas et al., 2016; Lancho-Barrantes & Cantú-Ortiz, 2019). Increased coverage of emerging regions in databases is also a possible cause of the increased visibility of LAC publications (Chinchilla-Rodríguez et al. 2015). Historically, Scopus coverage was broader for science from developing countries (Collazo-Reyes, 2014). It was a more complete source than Web of Science (WoS) for regional, non-English and humanities publications. Due to its characteristics, Scopus was more suitable for geographic studies focusing on LAC countries (Chinchilla-Rodríguez et al., 2015).

In 2015, however, the launch of the Emerging Sources Citation Index (ESCI) promoted the indexing of hundreds of journals in the region, making WoS coverage more comprehensive (Machin-Mastromatteo et al., 2017; Machin-Mastromatteo, 2019). Until 2020, journals indexed in ESCI were not included in the Journal Citation Reports (JCR), therefore, the metrics were not calculated annually. With the recent update of the JCR in July 2021, the ESCI and Arts & Humanities Citation Index (AHCI) were added, and some analyses can now be performed for the journals in these two collections.

At the same time, Google Scholar Metrics (GSM) already occupies a significant position in LAC scholarly communication. The use of the h5-index in public assessment systems, such as Qualis/Capes in Brazil (Costa et al., 2020; Dias, Dias & Moita, 2022), Publindex/Colciencias in Colombia (Palacios-Gómez, 2017) and CRMCYT/CONACYT in Mexico (Vasen and Vilchis, 2017), places it as an alternative to the JCR and Scopus indicators (Jacsó, 2012; López-Cózar & Cabezas-Clavijo, 2013;

de Araújo Telmo, de Medeiros Matos Autran & Araújo da Silva, 2021). GSM has broader coverage, including many publications not indexed in other databases. In addition, the h5-index registers citations of various types of documents, which allows for an analysis detached from the other databases (Prins et al., 2019; Pinto et al., 2020).

Notwithstanding the use of indicators in national scientific evaluation policies is controversial, they are useful and relevant criteria (Bornmann et al., 2012; Vasen & Vilchis, 2017). Currently, there are indicators with different parameters, including not only the number of citations received, but also other variables such as productivity, influence and thematic adherence. In addition, the standardization of indicators aims to obviate the differences of citation patterns and to allow comparison between publications from different subject areas (Bornmann & Marx, 2015; James et al., 2019).

Therefore, this research aims to carry out a comparative analysis of the main bibliometric indicators available for LAC journals. Data were extracted from JCR, Scopus, SCimago Journal & Country Rank (SJR), and GSM. The publications are analyzed in general and according to the research areas of Science, Technology and Medicine (STM), and Arts, Humanities and Social Sciences (AHSS). Pearson and Spearman statistical tests were used to identify correlation coefficients between pairs of indicators from the same set of journals.

With the results we aim to answer the following research questions: How many LAC journals are indexed in JCR, Scopus, and simultaneously in GSM? What is the overlap of journals between these sources? What bibliometric indicators are available in JCR, Scopus, SJR and GSM for LAC country journals? What is the level of correlation between the indicators, considering the Pearson and Spearman coefficients?

It also aims to contribute to the debate about the use of methodologies with the combined use of indicators from different sources, as are being adopted in some countries in the region.

Impact indicators

Impact indicators have their main application in systems for evaluating scientific production, especially through the citation analysis of journal articles in databases (Waltman & Jan van Eck, 2013; Bornmann & Marx, 2015). At the individual level, indicators are used to measure the performance of researchers and professors and are criteria in matters of tenure, promotion, grants, funding and other academic evaluation (Ding et al.2020). At the institutional level, impact indicators are used in the evaluation of graduate programs, departments, laboratories, and universities. Wider applications include geographic analyses, that is, descriptions of scientific impact from location, such as cities, states, countries and even continents (Yang & Wang, 2015).

Indicators include in their mathematical formulations the main variables related to scientific production, such as productivity (volume of publications) and impact (number of citations received), analyzed for a certain period (between two and five years) (James et al., 2019). Prestige or influence indicators consider the level of impact of the citing journal and the thematic adherence between the citing and cited journals. Therefore, they are based on network analysis techniques and graph theory (Waltman, 2016). Standardized indicators aim to resolve differences between citation patterns, aiming at comparing disciplines with different citation patterns (Waltman & Jan van Eck, 2013; Bornmann & Marx, 2015). The main databases that calculate impact indicators are Journal Citation Reports, Scopus/Elsevier, Scimago Journal & Country Rank and Google Scholar Metrics. The similarities and differences of these sources have already been well explored in the literature (Jacsó, 2012; López-Cózar & Cabezas-Clavijo, 2013; Waltman, 2016; Vera-Baceta et al., 2019).

The use of indicators in evaluation procedures is not unanimous. One of the opposing arguments is that commercial databases criteria should not be used to define academic and scientific public policies. Also, because these sources are biased towards English-language publications, of Anglo-Saxon origin and hard sciences. Furthermore, the indicators provide only a partial view of scientific impact, without covering all the numerous aspects involved in scholarly communication (Waltman, 2016; Vera-Baceta et al., 2019; Amaral & Araújo, 2022).

On the other hand, indicators allow an objective evaluation, less prone to manipulation and personal or institutional favoritism. They also facilitate large-scale analysis, useful for reducing resources and time spent on procedures (Costa et al., 2020).

Aiming to cover more characteristics of the citation phenomenon, the variety of indicators was expanded. Different forms of calculation, period windows, and document types considered characterize the current indicators. Other factors such as updating, transparency and access to data are also relevant (Waltman, 2016; James et al., 2019). Table I shows the most currently used indicators and their general characteristics.

Table 1: Summary of the impact indicators and their parameters

Indicator	Source	Citing publication year	Cited publication year	Citing documents types	Cited documents types
AIS	JCR	1 year	5 years	All indexed publications	Articles, reviews
ES	JCR	1 year	5 years	All indexed publications	Articles, reviews
IF	JCR	1 year	2 years	All indexed publications	Articles, reviews
IF5	JCR	1 year	5 years	All indexed publications	Articles, reviews
JCI	JCR	3 year	3 year	All indexed publications	Articles, reviews
CS	Scopus, SJR	4 years	4 years	Articles, reviews, conference papers, book chapters	Articles, reviews, conference papers, book chapters
h-index	Scopus, SJR	All years	All years	Articles, reviews, conference papers, book chapters	Articles, reviews, conference papers, book chapters
SJR	Scopus, SJR	1 year	3 years	Articles, reviews, conference papers, book chapters	Articles, reviews, conference papers, book series
SNIP	Scopus, SJR	1	3 years	Articles, reviews, conference papers, book chapters	Articles, reviews, conference papers, book series
h5-index	GSM	5 years	5 years	Journals, proceedings papers, books, reports, dissertations, master's thesis	Articles, conference papers in Engineering and Computer Science

Source: Clarivate (2021), Elsevier (2021), Google Scholar (2021) and adapted from James et al. (2019)

Based on the increase in indicators and their parameters (Bornmann et al., 2012), previous studies analyzed the levels of correlation between them, mainly from the Pearson and Spearman tests (Elkins et al., 2010; Kim et al., 2014; Salvador-Oliván & Agustín-Lacruz, 2015; Okagbue & Teixeira da Silva, 2020). Correlation levels vary according to the sample of journals and the period analyzed (Okagbue & Silva 2020). In general, the results suggest that there are significant levels of positive correlation between all indicators, which indicates stability and convergent validity (Salvador-Oliván & Agustín-Lacruz, 2015).

In some pairings the correlation coefficients are very strong, as in the case of among indicators based on average citations per article, even from different sources (IF and CS) (Okagbue et al., 2019), and with a different time frame (FI and FI5) (Kim et al., 2014; Salvador-Oliván & Agustín-Lacruz, 2015).

Very strong Spearman rho values were also detected between SJR and FI (González-Pereira et al., 2010), and between SJR and AIS in a large sample of journals indexed simultaneously in WoS and in Scopus (Salvador-Oliván & Agustín-Lacruz, 2015).

Analyzes with other indicators show different results, but still at statistically relevant values. These variations are normal considering that changing the parameters used in each indicator tends to produce a different score, maintaining a minimum standard of agreement (Elkins et al., 2010; Salvador-Oliván & Agustín-Lacruz, 2015; Okagbue et al., 2019).

The use of indicators in evaluation policies is not unanimous in the region (Cientí et al., 2013; Chinchilla-Rodríguez et al., 2015; Vasen & Vilchis, 2017). One of the opposing arguments is that commercial databased criteria should not be used to define academic and scientific public policies, as these sources focus on publications in English, of Anglo-Saxon origin, and of the hard sciences (Cientí et al., 2013; Waltman, 2016). Thus, LAC publications would be harmed, as many of them have themes with a local and regional focus, human and social sciences, and regional languages, especially Portuguese and Spanish (Collazo-Reyes, 2014). On the other hand, indicators are objective criteria, less subject to manipulation and subjective favoring. They also facilitate large-scale analysis, which is increasingly necessary due to the exponential growth of scientific activities (Costa et al., 2020).

Brazil, Colombia and Mexico, countries with the highest number of indexed LAC journals, have journal evaluation policies based on impact rankings from international databases. In the case of Brazil, the new evaluation model is basically based on IF and CS, or on the h5-index for non-indexed journals (Costa et al., 2020). The Mexican system adopts the IF, the SJR, the h-index and other metrics from JCR and Scopus (Vasen & Vilchis, 2017). The Colombian journals evaluation system is based on the JCR and Scopus quartiles, and on the h5-index with Google Scholar data calculated from Publish or Perish for assessment of non-indexed journals (Cientí et al., 2013; Palacios-Gómez, 2017). The Argentine system, on the other hand, has a more critical position, favoring regional indexing systems without the use of indicators for journal classification (Vasen & Vilchis, 2017).

In all these countries, however, there is concern that the use of indicators will result in harm to national journals, due to the low impact rates compared to international standards (Cientí et al., 2013; Vasen & Vilchis, 2017; Pinto et al., 2020). This debate is relevant, as it is currently necessary to value regional scientific production. And considering that evaluation systems guide the allocation of research resources, fairer methodologies must be developed that are aware of the geographical peculiarities of science.

METHODOLOGY

The research data were drawn from the Journal Citation Reports (JCR), Scopus, Scimago Journal & Country Rank (SJR) and Google Scholar Metrics (GSM). In the SJR search filter, the document type “Journal” and the region “Latin America” were selected. Editorial data and SJR, h-index values of the year 2020 were extracted from the publications found. In the search for sources from Scopus, the master list of journals was downloaded, and data from the CS and SNIP values were extracted.

JCR does not have a region/continent search filter. Then the country search was used, considering the list of 48 countries and territories in Latin America and the Caribbean presented by Minniti et al. (2018). All collections (SCIE, SSCI, AHCI and ESCI) were selected, based on the year 2020. Editorial data and AIS, ES, IF, IF5 and JCI indicators were extracted.

Considering that GSM does not have ISSN search and data extraction tools, a script in Python language was used to search for previously identified titles in the SJR and JCR and download the h5-index. This tool, also used by Pinto et al. (2020), has been updated to increase its effectiveness. The search was carried out in the 2020 version of the GSM, which calculates the h5-index for works published between 2015 and 2019 and with citations received until June 2020. For titles not found in an automated way, a manual search was performed, title by title.

The collected data were standardized. Duplicate titles were eliminated and the overlap between sources was identified. Based on the JCR and Scopus subject categories, the journals were grouped into the research areas of Science, Technology and Medicine (STM), or Arts, Humanities and Social Sciences (AHSS) (Waltman, 2016).

Pearson (p) and Spearman (rho=r) analyses were used to identify the level of correlation between pairs of indicators from the same journal. These two statistical tests are frequently used in metric studies (Chinchilla-Rodríguez et al., 2015, Salvador-Oliván & Agustín-Lacruz, 2015). The main difference between the two techniques is that the Pearson coefficient is sensitive to variable values; Spearman coefficient considers the positions occupied (ranking) by the variables. To interpret the coefficients, a perfect positive correlation was considered for values of p and r being equal to 1, very strong for values between 0.90 and 0.99, strong between 0.70 and 0.89, moderate between 0.40 and 0.69, weak between 0.10 and 0.39, and negligible between 0.01 and 0.09 (Akoglu, 2018).

RESULTS AND DISCUSSION

A total of 1,498 journals published in 18 LAC countries were identified, being 878 indexed in Scopus, 1,031 in JCR and 1,169 in GSM. Of the total, 590 journals are classified in the JCR and Scopus in subject categories with adherence to the STM areas and 908 in the AHSS areas. Table II shows coverage by country and the overlap between sources. GSM is also the source with the greatest overlap, comprising almost 85% of the titles indexed in Scopus and 80% in JCR. The overlap between Scopus and JCR is less than 50%, which suggests the adoption of different indexing criteria for LAC publications.

GSM and JCR have broader coverage by country, indexing titles from 17 countries, while Scopus indexes 13. In the case of Scopus, attention is drawn to the lack of publications from Uruguay, a country that has 10 titles indexed in WoS and 15 in GSM.

Table 2: Number of LAC journals indexed and the overlap in the databases

Country	Journals			Overlap		
	Scopus	JCR	GSM	Scopus/ JCR	Scopus/ GSM	JCR/ GSM
Argentina	66	90	72	28	38	58
Bolivia	0	2	1	0	0	1
Brazil	392	412	524	183	345	350
Chile	111	105	104	67	89	71
Colombia	114	181	195	52	102	144
Costa Rica	6	27	21	4	4	19
Cuba	23	19	38	2	23	17
Ecuador	3	17	16	1	2	15
El Salvador	0	1	0	0	0	0
Jamaica	3	1	2	1	2	1
Mexico	112	99	126	56	97	83
Nicaragua	0	2	1	0	0	1
Paraguay	0	2	2	0	0	2
Peru	13	23	23	6	11	18
Puerto Rico	3	0	2	0	2	0
Trinidad & Tobago	1	1	1	1	1	1
Uruguay	0	15	10	0	0	10
Venezuela	31	34	31	8	21	15
Overall	878	1,031	1,169	409	737	806

Source: Research data (2022)

Table III shows the number of journals per country evaluated in each of the indicators analyzed. Considering the broader coverage of GSM, the h5-index is the indicator available for the largest number of journals and countries. The JCI and the ES are available for the second largest number of publications, reflecting the inclusion of the titles of ESCI and AHCI in the JCR in 2021.

The other JCR's indicators (IF, IF5 and AIS) are available for the smallest number of publications, as they are still restricted to journals indexed in SCIE and SSCI. It is noteworthy that only six countries have journals with IF and IF5. Thus, although in recent years Clarivate has promoted an expansion of LAC coverage in its databases, restrictions are still observed in some metric analysis.

Table 3 - Number of LAC journals available per indicator

Country	AIS	ES	IF	IF5	JCI	CS	h	SJR	SNIP	h5
Argentina	15	82	15	15	82	51	62	62	50	72
Bolivia	0	1	0	0	1	0	0	0	0	1
Brazil	117	381	118	116	367	370	389	389	365	524
Chile	32	92	33	33	82	105	110	109	104	104
Colombia	20	167	20	20	164	109	113	112	108	195
Costa Rica	1	23	1	1	26	6	6	6	6	21
Cuba	0	18	0	0	18	21	23	23	22	38
Ecuador	0	16	0	0	17	3	3	3	3	16
El Salvador	0	0	0	0	1	0	0	0	0	0
Jamaica	1	1	1	1	1	1	3	3	1	2
Mexico	39	88	41	41	94	101	111	110	99	126
Nicaragua	0	1	0	0	1	0	0	0	0	1
Paraguay	0	2	0	0	2	0	0	0	0	2
Peru	0	22	0	0	23	11	13	13	10	23
Puerto Rico	0	0	0	0	0	2	3	3	2	2
Trinidad & Tobago	0	1	0	0	1	0	1	1	0	1
Uruguay	0	12	0	0	13	0	0	0	0	10
Venezuela	4	25	5	4	31	22	31	29	22	31
Overall	229	932	234	231	924	802	868	863	792	1,169

Source: Research data (2022)

Even with lower coverage, Scopus and SJR calculate metrics for the entire collection, which allows a broader analysis of the impact in the region. In addition, Scopus and SJR provide free access and download of all indicators, which makes these sources more advantageous compared to JCR, a service accessible only by subscription.

Table IV shows the correlation indexes between the indicators, based on Pearson p and Spearman r coefficients. Most coefficients have a positive moderate or strong correlation level, and the means of all coefficients are moderate in both tests (p = 0.62, r = 0.67). The correlation levels are very strong between IF and IF5 (p = 0.95, r = 0.93), between IF and CS (p = 0.90) and between IF5 and CS (r = 0.92).

This result is attributed to the similarity of formulas based on average citations per article (Salvador-Oliván & Agustín-Lacruz, 2015). IF and IF5 are also the ones with the highest mean correlation (p = 0.73, r = 0.76) and (p = 0.76, r = 0.79) considering all pairings. There are also strong levels of correlation in the SJR analysis, as well and among the JCR's indicators, especially in pairings with IF or IF5.

Table 4: Pearson and Spearman correlation coefficients between LAC journals indicators

		Spearman										
		AIS	ES	IF	IF5	JCI	CS	h	SJR	SNIP	h5	μ (*r*)
Pearson	AIS	#	0.64	0.73	0.80	0.76	0.69	0.43	0.74	0.75	0.55	0.68
	ES	0.47	#	0.72	0.80	0.61	0.67	0.75	0.72	0.63	0.64	0.69
	IF	0.69	0.57	#	0.93	0.85	0.89	0.63	0.78	0.69	0.62	0.76
	IF5	0.75	0.62	0.95	#	0.84	0.92	0.69	0.79	0.67	0.68	0.79
	JCI	0.69	0.35	0.83	0.81	#	0.36	0.21	0.60	0.55	0.37	0.57
	CS	0.66	0.60	0.90	0.92	0.30	#	0.77	0.83	0.65	0.64	0.71
	h	0.42	0.76	0.61	0.65	0.13	0.73	#	0.68	0.46	0.65	0.59
	SJR	0.75	0.60	0.80	0.82	0.32	0.85	0.66	#	0.78	0.62	0.73
	SNIP	0.73	0.45	0.67	0.66	0.39	0.59	0.40	0.70	#	0.44	0.62
	h5	0.43	0.76	0.55	0.62	0.28	0.61	0.67	0.57	0.41	#	0.58
	μ (*p*)	0.62	0.58	0.73	0.76	0.46	0.68	0.56	0.67	0.56	0.54	0.62/0.67

Source: Research data (2022)

The h-index and the h5-index maintained moderate levels of correlation, with means of p = 0.56 and r = 0.59, and p = 0.54 and r = 0.58, respectively. This result can be considered normal, considering its formulation based only on highly cited articles, as well as for its value presented in integer. It also implies stability and reliability to h5-index, because even its calculation being from the Google Scholar citation data presented coefficients very close to its "brother" from Scopus.

The JCI is the indicator with the lowest overall level of correlation (p = 0.46 and r = 0.51). As it is a standardized indicator and defined based on specific JCR criteria, it is natural that it presents oscillation compared to indicators from other sources. Thus, the exclusive use of JCI for impact analysis of LAC journals is not recommended, as it can lead to distortions.

Table V shows the correlation between the indicators of STM journals. The correlation coefficients between STM publications are higher than those observed in the general analysis, with general means of p = 0.73 and r = 0.77. Correlation levels are very strong between IF and IF5, AIS and IF5, AIS and SJR, CS and IF5, CS and SJR, that is, with greater numbers when compared to the general analysis. The other coefficients register strong mean levels of correlation, except for the EF, which has a moderate level of p, and the h and h5indexes, which have moderate mean levels of coefficients in both analyses.

Table 5: Pearson and Spearman correlation coefficients between STM LAC journals indicators

		Spearman										
		AIS	ES	IF	IF5	JCI	CS	h	SJR	SNIP	h5	μ (*r*)
Pearso n	AIS	#	0,71	0.83	0.91	0.82	0.82	0.60	0.85	0.80	0.65	0.78
	ES	0.59	#	0.67	0.72	0.78	0.73	0.81	0.79	0.69	0.87	0.75
	IF	0.81	0.66	#	0.94	0.84	0.91	0.62	0.83	0.81	0.66	0.79
	IF5	0.88	0.65	0.95	#	0.83	0.93	0.66	0.83	0.80	0.71	0.81
	JCI	0.76	0.55	0.82	0.80	#	0.85	0.54	0.86	0.84	0.68	0.78
	CS	0.84	0.60	0.89	0.91	0.81	#	0.72	0.90	0.86	0.64	0.82
	h	0.55	0.77	0.58	0.62	0.47	0.72	#	0.73	0.63	0.65	0.66
	SJR	0.90	0.57	0.82	0.84	0.80	0.90	0.65	#	0.90	0.65	0.82
	SNIP	0.78	0.57	0.82	0.82	0.82	0.83	0.60	0.86	#	0.57	0.77
	h5	0.54	0.80	0.57	0.64	0.57	0.62	0.68	0.58	0.59	#	0.68
	μ (*p*)	0.74	0.64	0.77	0.79	0.71	0.79	0.63	0.77	0.74	0.62	0.72/0.74

Source: Research data (2022)

It is noteworthy, however, the strong levels of correlation of h-index among ES and CS, as well the strong coefficients resulting from the pairing between h5-index and ES (p=0.80 and r=0.87).

A significant change in relation to the overall analysis was the result of the JCI, which performed similarly to the other indicators, with an overall average of 0.71 and a strong correlation with five other indicators. This result suggests that the JCI is a more reliable indicator when used with STM publications.

Table VI shows the correlation between the indicators of the AHSS journals. There was a drop in the coefficients in most of intersections, resulting in general averages of moderate correlation (p = 0.47 and r = 0.50). The decrease is more evident in the coefficients of the JCR's indicators, which can be explained by the bias of this database. The focus on hard sciences and the non-availability of the main indicators for the AHCI and ESCI journals result in the discrepant coefficients observed.
Table VI – Pearson and Spearman correlation coefficients between AHSS LAC journals indicators

Table 6: Pearson and Spearman correlation coefficients of theAHSS LAC journals indicators

		Spearman										
		AIS	EF	IF	IF5	JCI	CS	h	SJR	SNIP	h5	μ (*p*)
Pearson	AIS	#	0.71	0.53	0.61	0.61	0.37	0.35	0.43	0.66	0.16	0.49
	EF	0.23	#	0.32	0.41	0.48	0.34	0.53	0.47	0.53	0.37	0.46
	IF	0.47	0.19	#	0.89	0.86	0.77	0.46	0.54	0.44	0.34	0.57
	IF5	0.52	0.27	0.93	#	0.81	0.82	0.67	0.58	0.43	0.49	0.63
	JCI	0.56	0.23	0.88	0.86	#	0.00	0.05	0.10	0.30	0.17	0.38
	CS	0.28	0.29	0.93	0.90	0.03	#	0.70	0.76	0.58	0.62	0.55
	h	0.29	0.56	0.72	0.77	0.01	0.71	#	0.62	0.42	0.63	0.49
	SJR	0.36	0.47	0.69	0.70	0.03	0.73	0.64	#	0.71	0.56	0.53
	SNIP	0.60	0.36	0.48	0.42	0.19	0.50	0.37	0.65	#	0.35	0.51
	h5	0.12	0.54	0.40	0.52	0.06	0.55	0.65	0.50	0.27	#	0.41
	μ (*p*)	0.38	0.35	0.63	0.63	0.25	0.55	0.52	0.53	0.43	0.40	0.47/0.50

Source: Research data (2022)

JCI showed weak levels of correlation with indicators from other sources. In some pairings, the coefficients were negligible. In addition, indicators with JCR influence analysis (AIF and ES) also showed weak correlation levels with indicators from other sources and moderate with those from the same source.

The only coefficients that did not decrease in the AHSS analysis were in the pairings between h-index, h5-index and CS, whose p and r values remained without significant variation. This result can be attributed to better coverage of these research areas by Scopus and GSM, as reported in previous studies (Waltman, 2016).

This stability of the h5-index between the different areas of research reinforces the arguments in defense of its use as an alternative indicator, complementary to the other indicators, or even as the main criterion in the cases of journals not indexed in JCR and Scopus.

FINAL CONSIDERATIONS

The expansion of the coverage of emerging publications in databases provided an increase in the number of impact indicators for LAC journals. Indicators based on the average of citations per article are those with the strongest levels of correlation with the others, considering the averages of all pairings. However, IF and IF5 are available for a small fraction of indexed journals, not allowing a comprehensive analysis of the impact of the region.

The JCR indicators showed contradictory results in the analysis of AHSS journals, as a consequence of its indexing policy. The need for precaution is reinforced with the use of this source to analyze the LAC scientific production, which has a large proportion of publications in these areas. It is recommended to establish different criteria based on the peculiarities of each research area.

In this sense, CS is a more suitable indicator, as it has broad coverage and very strong correlation coefficients with the other indicators. In addition, the CS suffered less variation in results by thematic scope, reflecting the multidisciplinary approach given by Scopus.

The h5-index results are also noteworthy, considering a large number of journals represented and the stability in the variations among research areas. Although the correlation coefficients are moderate in most of the pairings, this result can be explained by its alternative calculation formula, based only on highly cited articles. In this sense, the h5-index seems to represent the impact of publications from the region and level of equality with indicators from other sources.

Finally, the results suggest that no indicator can fully accurately reflect all the complexities of the scientific impact phenomenon. It is recommended that the evaluation policies do not use the indicators as the only criteria. The ideal is to complement it with other ways of measuring quality and scientific impact, including objective and subjective parameters. Otherwise, the evaluation may incur distortions that would not reflect the numerous peculiarities of scientific science in different regions and research areas.

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