

# Ten years of Altmetrics: A Review of Latin America Contributions

Thaiane Moreira De Oliveira\*, Germana Barata<sup>2</sup>, Alejandro Uribe-Tirado<sup>3</sup>

<sup>1</sup>Fluminense Federal University Rua Cacilda Ouro, 783 - Itaipu, Niterói, BRAZIL.

<sup>2</sup>State University of Campinas Rua Seis de Agosto, 50 - Reitoria V 3o piso. Campinas-SP, BRAZIL.

<sup>3</sup>Universidad de Antioquia Calle 53 - 108, UdeA Blq, COLOMBIA.

## ABSTRACT

Altmetrics studies emerged ten years ago in the Global North context and after a few years spread around the world. The paper investigates who are the Latin American researchers, which topics are covered and the relationship between South and North in Altmetric Studies. This study combines global mapping, social networks analysis and Content Analysis, using Dimensions, VOSviewer and Iramuteq to measure co-authorship, bibliographic coupling and co-citation analysis and content analysis to identify topics and types of production in Latin America outputs on alternative metrics. Results ( $n=172$ ) show the prominence of Brazil, Colombia and Mexico in altmetric research in Latin America. There is an internal national co-authorship, with a huge influence from the North as reference to Latin American altmetric studies, but with gradual recognition of Mexico and Brazil as leading exponents in the region. We identify main topics related to local issues and regional impacts and discussions about the social role of the university. We conclude that the landscape of science output on altmetrics is becoming multipolar. Latin America emerged as an alternative hub of altmetric studies, but it still depends on references and collaboration with central countries. We also observed an emerging discussion on critics about low covering of regional data and an innovative development of methodologies and technologies as alternatives to commercial platforms that provide data to evaluate the social impact of universities. Latin America altmetric community should invest in resources to strengthen regional collaboration.

**Keywords:** Altmetrics, Bibliometrics, Dimensions, Global South, Latin America.

## Correspondence

**Thaiane Moreira De Oliveira**

Fluminense Federal University Rua  
Cacilda Ouro, 783 - Itaipu, Niterói,  
BRAZIL.

Email id: thaianeoliveira@id.uff.br

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## INTRODUCTION

Altmetrics is turning 10 years old since the Manifesto<sup>[1]</sup> has described its potential uses. Altmetrics tracks the social use of scholarly publication on online platforms, as papers have been cited not only by other papers but taken part on social media posts, blogs, Wikipedia, policy documents, news outlets and so forth. Experts<sup>[2-5]</sup> have agreed that instead of alternative metrics, altmetrics should be considered complementary to traditional metrics since they provide a wider perspective of social attention to science outputs in online platforms.

Since 2010, science output about altmetrics has increased worldwide along with its use. International indexes such as Web of Science, Scopus, science publishing groups such as

Plos One, or SciELO index<sup>1</sup> have incorporated altmetrics in their platforms, and many other tools have been developed to provide and visualize data extracted, such as Impact Story, CiteULike, Kudos and Newsflo.<sup>[6]</sup>

Latin America has double science output participation worldwide since the 2000's, jumping from a little more than 2% to more than 4%.<sup>[7]</sup> Countries such as Brazil, have increased paper publication on international index databases faster than the world average. Although altmetrics was enthusiastically received as metrics that could be more inclusive for countries and topics that did not belong to the mainstream, we have seen during the decade a growing number of evidence showing that it is still reproducing the visibility that traditional metrics provided to developed, Anglo-Saxon countries. Juan Pablo Alperin was one of the first to point out in 2013 that altmetrics could have an important role in providing visibility to science contributions that have been underrepresented, including Latin America.

<sup>1</sup> Created in Brazil in 1997, the Scientific Electronic Library Online (SciELO) covers 1,409 active open access journals from 11 countries in Latin America, Spain, Portugal and South Africa. www.scielo.org

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There is a realization that scholarly communication can serve the public interest and that the modes of scholarly communication from the North are not the appropriate models to follow. The wide adoption of open access (nearly 100% of all journals based in Latin America) is indicative of the region's desire to make the shift for itself. We are seeing an adoption of open source tools and a general amity towards openness in the developing world, just as the scholarly communication networks and channels in these regions consolidate. All these developments suggest that altmetrics would likely be well received and quickly adopted".<sup>[8]</sup>

His studies have echoed in the region as he pointed out that altmetrics should not be generalized to analyze the worldwide picture.<sup>[9]</sup> Alperin has investigated altmetrics coverage of journals indexed in SciELO and concluded they were almost invisible in Altmetrics: papers received, on average, half the coverage of other studies found and only three metrics received coverage level about 2% - Mendeley, Twitter and Facebook.

Zorah Zahedi<sup>[10]</sup> talked about "altmetrics divide", showing that a third of tweets sharing papers according to Altmetric.com came from 2 countries: the US and the UK, even though other countries were among the biggest users of social media or were contributing with science output. She has then emphasized that the altmetric community should pay careful attention to "local specificities of social media, internet divide and internet access limitations".

The Altmetric community in Latin America has grown since 2010, and in 2018 the first LatMetrics Conference<sup>2</sup> was organized, gathering 140 attendees in Niterói (RJ, Brazil), with 41 paper presentations as a way to strengthen collaboration, networking and discussion toward local and regional aspects and applications of social media metrics. One year later, the 2 LATmetrics was held in Cusco, Peru, and joined 46 papers and presentations and a total of 128 attendees. Therefore, this paper aims to review Latin America altmetric output since 2010, looking for authorship, collaboration networks and main topics in order to understand what role the region has played worldwide. Our research questions are the following:

**RQ1:** Have Latin American authors been able to exploit regional relevant topics?

**RQ2:** Has LA community been formed by the increase of co-authorship and citation within authors in the region?

### Objectives and Scope

The aim of this paper is to review how Latin American authors have contributed, collaborated and analyzed altmetric output during the last decade. We want to know if the region

is already mature to publish research relevant to local specificities and what type of collaboration has been established within Latin American authors and between them and authors from other countries. We also want to determine what are the main topics and local issues that have been of great interest to the altmetric community in order to provide a list of recommendations for future analysis.

Therefore, this paper is looking for altmetric outputs published between 2010 and 2020 by one or more authors from Latin America institutions. The relevant information is composed by authors, institutions, countries, references cited in the papers and the relationships settled among them during the decade, as well as paper approach, type of analysis and main concerns for the region.

### Literature review

Globalization of Science has continuously increased to a polarized world around the USA, responsible for 50% of science outputs in 2000, to a more varied tri-polar world centered around the USA, Europe and Asia and a strong semi-periphery structure composed by emerging countries as China, South Korea, India, South Africa and Brazil.<sup>[11]</sup> This new world balance has changed and included countries that are regional leaders, as Brazil in Latin America, but these countries tend to collaborate more with central countries than to the ones geographically close.

Bibliometrics output in South America has increased faster than the rest of the world.<sup>[7-12]</sup> There has been a rise in papers about science information in the region since 2014. In the analysis of science of information outputs in Latin America in Scopus from 2011 to 2016,<sup>[13]</sup> Colombia appears as a country that cites other Latin American countries. Half of the papers about science information in Latin America are published in Brazilian journals and either in Portuguese or Spanish. Brazil, Chile, Argentina, Mexico and Cuba are the most productive countries in science information in Latin America, they also have more investments in S&T and more PhD per 100,000 inhabitants.<sup>[13]</sup> According to the authors, Brazil is responsible for 64% of all papers, yet it has low co-authorship with other countries and low citation per paper (2.6). One of the reasons for this result, claim the authors, is that a third of papers are published in Portuguese and there is high endogeneity within the country. Yet, an interesting outcome of the study is that the US, the UK, Spain and China are countries that have recognized and cited Latin American science metric studies.

With a growing bibliometric and scientometric community and science output we would expect to find an interest in altmetric publications. González-Valiente *et al.*<sup>[14]</sup> reviewed the altmetric literature and verified high collaboration among authors in the USA and Europe, mainly UK, in English and in social sciences, medicine and computing. Among 447 papers

2 See: <https://www.latmetrics.com/>

analyzed there was little theoretical approach and individual authors are mainly responsible for institutions and countries output.

Specifically in the region, the publication on altmetrics begins to be broader since 2015 (as reported by Dimensions and that mostly coincides with other databases that report scientific production in the region, although there are always differences, with some texts included or not), but there are some publications from journals, that would be the pioneers, such as the discussion article by Gouveia<sup>[15]</sup> from Brazil, like the editorials from the journal *Universitas Psychologica-Colombia* by López-López.<sup>[16,17]</sup> At the same time, around 2014, the first theses whose main topic was altmetrics began to appear, Souza.<sup>[18]</sup>

On the other hand, Alperin<sup>[9]</sup> has concluded that Latin America is not well covered by altmetrics. Among almost 400,000 papers indexed in SciELO - a leading journal index in the region - he showed that only between 2% and 6% of papers had altmetrics, way below the 10% to 20% of papers reported in other countries. While Erdt and colleagues<sup>[19]</sup> concluded that different social media present different coverages and Mendeley and Twitter, for instance, have the biggest coverage. Although Brazil is among the top-10 users of Mendeley, papers with Brazilian authors are mainly cited regionally by other Brazilians, and just slightly by authors from the US and the UK due to co-authorships.<sup>[20]</sup> Sugimoto and co-authors<sup>[4]</sup> analyzed the state-of-the-art of altmetrics since 2010 and concluded that the majority of papers are in English and that there is lower citation of papers from developing countries which shows that altmetrics can reproduce the same inequality of traditional metrics.

More recently, Haustein and Peters<sup>[21]</sup> have described contributions from Judit Bar-Ilan, one of altmetrics “founding-mothers” and her co-authorship network during 30 years. This interesting analysis provides a perspective of how the still young altmetric community collaborates. Among 99 co-authors from 27 countries, a third published a single paper. The countries she had tight collaboration with were the US, the UK and Italy.

### Research Design and methods

To carry out this research, several steps were followed: a) selection of the information source to track articles and their metric data, b) debugging and construction of their own database, c) analysis of citation relationships, collaboration, etc. of different articles and data captured, d) theoretical and conceptual analysis of the relationships among different articles; e) textual analysis for topic classification.

### Selection of the source of information: *Dimensions*

Dimensions is a source of scientific information that since 2018 has begun to have increasing importance in the field of scholarly communication. This source represents the collaboration among six companies from the Digital Science portfolio (Altmetric, Digital Science Consultancy, Figshare, Readcube, Symplectic and ÜberResearch) and as indicated in their presentation: “*We knew we didn’t want to simply create another A&I database. Our goal was to provide a fresh take on research information; a more open and comprehensive data infrastructure that empowered users to explore connections between a wide ranges of research data*”<sup>3</sup>.

It began around 2018, with more than 9 million open access articles and a base of 860 million academic citations that are freely available, but in two years, it has reached very significant numbers.<sup>[22]</sup> These data have allowed Dimensions, at this time, to be one of the new fastest growing sources of scientific information and metric data, which allows it to be considered among the five main sources of information today, together with Web of Science, Scopus, Google Scholar and Microsoft Academic.<sup>[23,24-27]</sup>

In this regard, Dimensions would have certain advantages over the other four most important sources, since it offers complete and transparent access to all its data, presents in general an adequate normalization, allows searches by DOI, has a greater diversity of formats (not only articles), in addition to the possibility of using an API<sup>4</sup> to carry out different metric studies.

This coverage and advantages have made Dimensions recognized as an important source for metric studies, not only as indicated directly in the promotion of its website:

*We believe it is the role of Dimensions to ensure the scientometrics community has access to the information it needs to develop open, transparent research indicators. Researchers can use Dimensions data to study how research is funded, communicated, commercialized, and makes an impact in the world*<sup>5</sup>.

But from the development of recent investigations,<sup>[28-31]</sup> which have taken into account Dimensions as the main source of information and metric data, mostly with positive results, we can see its progress year by year (2018-2020), and therefore, consider it a valid metric source.

Taking into account the above, this work assumes Dimensions as a source that provides significant and quality results to approach and emphasize the reality of scientific production on altmetrics from Latin American authors (which, so far, has

3 See: <https://www.dimensions.ai/why-dimensions/#>

4 See: <https://www.dimensions.ai/resource-type/api/>

5 See: <https://www.dimensions.ai/why-dimensions/>

not been done, considering the literature review carried out)<sup>6</sup>, since Dimensions for our geographical context has advantages:

- Over Web of Science and Scopus, the advantage that a large part of the science output from the 20 Latin American countries is published in Spanish and Portuguese, and in journals that are not part of these two commercial databases, it also considers other publishing formats;
- Over Google Scholar, the advantage that, despite the fact that GS is the database<sup>[23]</sup> with the highest coverage at present<sup>7</sup>, it offers low data normalization, does not have an API, or enable DOI recovery; does not provide better quality data for its analysis, and consequently, implies greater debugging processes, which, although possible, involve a lot of time and multiple documentary and technological resources;
- Although Microsoft Academic has greater coverage in some fields, in the case of Latin America, Dimensions has presented a greater coverage in Social Sciences in recent years. Therefore, Dimensions is key to altmetrics in the region because of the API, the DOI search and the direct altmetrics data that it offers.

### Debugging and construction of our own database

Data collection was conducted on the Dimensions platform, using the following descriptors: “altmetrics” AND “metricas alternativas” AND “métricas alternativas” AND “altmetria”, full data, selecting only scientific articles published in journals with clipping over the 20 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, El Salvador, Ecuador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela). We collected 304 papers. The files were generated in csv. After this collection step, a manual cleaning of metadata was made excluding duplicate versions and texts that had no direct relationship with the discussion on altmetrics. A significant amount of the 304 initial texts<sup>8</sup> were duplicates: 10 were published in two idioms or were different versions of the same work (preprint/postprint, proceedings/advance or final papers); and 122 papers were recovered by Dimensions because altmetrics were indirectly mentioned, therefore not considered as the main topic developed in its theoretical-conceptual or

applied aspects. After applying the exclusion criteria, the corpus for the analysis was  $n = 172^9$ .

### Clustering analysis using VOSviewer

In this paper, we use the clustering technique through VOSviewer, as our objective is to understand the co-authorship and citation behaviour of Latin American Altmetric researchers. VOSviewer is a software tool for constructing and visualizing bibliometric networks, through clustering analysis, to create, visualize and explore bibliometric maps of science.<sup>[32,33]</sup> The clustering technique determines the relatedness of publications based on direct citation relations.<sup>[34]</sup> As a parameter of analysis, the minimum number of documents ( $n=01$ ), the maximum number of co-authorship  $n=40$  and visual organization based on the Total Link Strength were adopted.

### Analysis of interrelations between authors and countries

Considering the 172 articles on which this work was developed, a content analysis was carried out<sup>[35]</sup> that allowed to identify the situation of the production of altmetrics in Latin America:

- 1) Regarding the orientation of these works, as to whether their contribution and approach was more towards the Theoretical/T (reflections and conceptualizations on altmetrics and their importance); the Theoretical-Applied/T-A (from reflections and conceptual contributions, analyzes some data from altmetrics or proposes other measurements); or Applied/A (identifies the situation of a journal, author, field or organization, according to the altmetrics data that a given source of information allows to visualize or capture for their respective analysis).
- 2) Regarding the countries of institutional affiliation between the authors of the same text, and as this interrelation of authors, it allows to identify if there is more individual or collective work (number of authors per article); and if there is this collective work, if it is more local (authors from the same country), Latin American (among authors from countries in L.A region) or international (between Latin American authors and authors from other regions-continent).

### Textual analysis for topic classification

Based on the title of the papers, an attempt was made to generate a word cloud, using the wordclouds.com website to verify the frequency of words used. Based on the abstracts collected from 172 papers, we used the Iramuteq software for textual analysis and classification of topics using a dendrogram. Iramuteq is a Open Source Data processing software which

6 In Olmeda-Gómez and Perianes-Rodríguez [31], they perform a worldwide analysis using Dimensions and for the specific topic of altmetrics, but Latin American authors are not visible (see in that article: Table 4. Top authors\* in author co-citation networks, all years). <https://recyt.fecyt.es/index.php/EPI/article/view/epi.2019.nov.08/47473>

7 See: [https://albertomartin.shinyapps.io/citation\\_overlap\\_2019/](https://albertomartin.shinyapps.io/citation_overlap_2019/)

8 Table. Summary-ContentAnalysis: [https://figshare.com/articles/dataset/Content\\_Analysis\\_Altmetrics-Latin\\_America\\_Dimensions\\_data/14046584](https://figshare.com/articles/dataset/Content_Analysis_Altmetrics-Latin_America_Dimensions_data/14046584)

9 Our sample includes few preprints, proceedings and a monograph that were considered relevant to identify the Latin American community debating and investigating altmetrics.

uses R interface for Multidimensional Analysis of Texts<sup>10</sup>. The interpretation of the data was made from the observations of the classes and readings of the texts that mention the words that emerged in the classification, seeking approximations of meaning between the articles.

## RESULTS

### Clustering Analysis

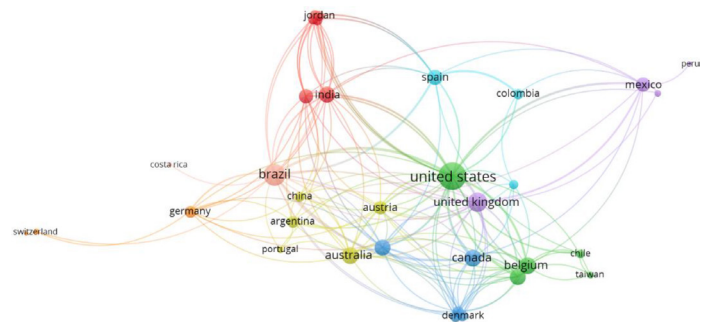
Taking into account that our discussions unfold along the axes of networks of relations between countries around international cooperation and citation relations, the clustering analysis data will be presented in three sets: the first organized from the network of 1) co-authorship 2) citation and 3) bibliographic coupling, structured based on the authors' nationality matrix through total link strength per documents.

### Co-authorship relations

The co-authorship networks were generated from the minimum number of documents ( $n = 01$ ). VOSviewer identified 35 countries, of which, among the first 10 countries, only Brazil belongs to Latin America (according to total link strength), despite the amount of production from countries such as Colombia, Mexico, Argentina, Chile and Peru [Table 1].

We observed that Latin America is divided into 8 clusters, without much relation to each other, except in three clusters: Brazil and Costa Rica (cluster 8: light pink); Mexico and Peru (cluster 5: purple) and Colombia and Venezuela, which have

relationship to a broad set of research beyond Latin America (cluster 6: blue). Among these three clusters, we noticed that Costa Rica and Peru do not have direct relationships with other clusters, except Brazil (in the case of Costa Rica) and Mexico (in the case of Peru). We have also observed a cluster of papers geolocated in the so-called Global South (cluster 1: red), formed by countries as India, Jordan, Saudi Arabia, Malaysia, Slovakia and South Africa. Regarding the co-authorship network, it was possible to observe that the United States and Brazil have a connection strengthened within the 8 clusters identified. However, the relationship networks with Latin America occur more closely with the United States than with Brazil. From Latin America, Brazil has relationships only with Costa Rica and Mexico, while the United States has relations with the following Latin American countries: Venezuela, Colombia, Mexico, Brazil and Argentina [Figure 1].



**Figure 1:** Co-authorship network of Latin American research on Altmetrics Studies.

Figure 1 Analysis based on the indicators and reports of the science output of the region have shown there are some dynamics with certain similarity, of South-South collaboration among countries themselves from the region, but also South-North, where countries, groups and researchers with the greatest international collaboration outside Latin America would be the USA, in addition to Spain and Portugal; and the countries with the highest percentage of collaboration would be: Chile, Colombia, Mexico and Argentina (RICYT).<sup>[36,37]</sup> Other studies have emphasized that Brazil appears with strong collaboration with the US, European countries and Argentina, yet with less strength among Latin American countries (MacManus *et al.*<sup>[38]</sup> Perrotta, Alonso).<sup>[39]</sup> When altmetrics output is considered, Brazil appears as the leader in the region in terms of publications and collaboration (González-Valiente, Pacheco-Mendoza and Arencibia-Jorge).<sup>[14]</sup>

### Co-citation

Co-citation analysis is a measure of semantic similarity for documents that make use of citation relationships.<sup>[34]</sup> Therefore, co-citation is defined as the frequency with which two documents are cited together by other documents. The relationship is determined based on the number of times

10 <https://sourceforge.net/p/iramuteq/wiki/Home/>

**Table 1:** Amount of Latin-American production on Altmetrics, total link strength and position according to number of documents.

Country	n.d.	t.l.s	#n.d.
United States	17	60	#4
Brazil	80	39	#1
United Kingdom	06	31	#7
Canada	08	23	#6
Australia	04	23	#9
Belgium	04	23	#10
Netherlands	04	21	#11
Italy	03	21	#15
India	04	20	#12
Spain	12	19	#5
Colombia	37	08	#2
Mexico	22	16	#3
Argentina	05	12	#8
Chile	04	06	#13
Peru	04	01	#14

\*n.d. - Number of documents; t.l.s. - Total Link Strength; #n.d. - Ranking per documents



Sciences<sup>11</sup>. Twenty-three journals are responsible for 50.6% of papers published in Latin America, with 3 or more papers each (Table 3), and publish mostly in open access (87%). Latin America publishes 15 of those journals, followed by the US (5), and other countries in Europe (3).

While considering the whole sample, the majority (67.9%) of journals publish in open access and are responsible for 72.1% of papers about altmetrics in Latin America, which reinforces the relevance of open access in the region, due to the vanguard tradition in the creation of infrastructure and open access policies in the region.<sup>[43-45]</sup>

**Typologies and Topics**

After the content analysis, it was identified that an important majority of the works are of practical application (107/TA and A) [Figure 4].

However, theoretical works (65 - T) are mainly essays that reflect and invite us to consider the importance of new models of measurement of science and scientific communications, where altmetrics is an alternative, as we can observe in the

<sup>11</sup> Dimensions uses the Australian and New Zealand Standard Research Classification (ANZSRC) as a classification of Fields of Research.

**Table 3: Journals with most altmetrics output in Latin America.**

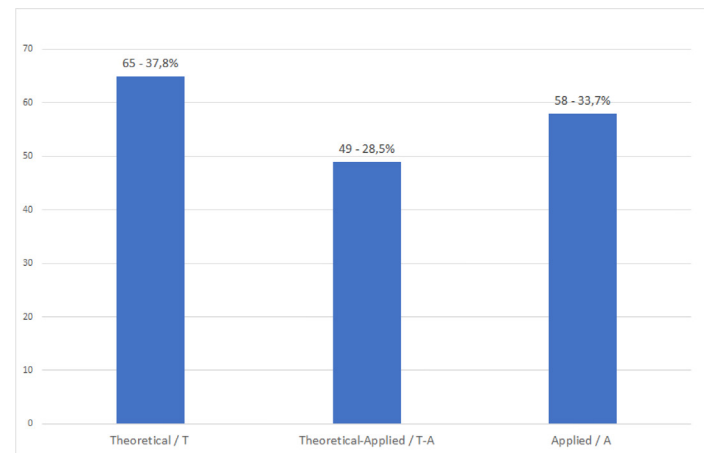
Journals	Country	n. papers	Type access
SSRN Electronic Journal	NE	11	OA
Transinformação	BR	10	OA
Scientometrics	HU	9	Hybrid
Revista Interamericana de Bibliotecología	BR	6	OA
Em Questão	BR	5	OA
Palabra Clave (La Plata)	CO	5	OA
Information Development	US	4	Hybrid
Informação e Informação	BR	3	OA
Plos One	US	3	OA
Perspectivas em Ciências da Informação	BR	3	OA
Revista Eletrônica de Comunicação	BR	3	OA
Revista de Administração Contemporânea	BR	3	OA
A to Z novas práticas em informação e conhecimento	BR	2	OA
Brazilian Journal of Physical Therapy	BR	2	OA
Biblionline	BR	2	OA
Cuadernos de Documentación Multimedia	SP	2	OA
E-ciencias de la Información	CR	2	OA
Educação & Pesquisa	BR	2	OA
International Urogynecology Journal	US	2	Hybrid
PeerJ Preprints	US	2	OA
Plos Biology	US	2	OA
RDBCI Revista Digital de Biblioteconomia e Ciência da Informação	BR	2	OA
Revista Médica Clínica Las Condes	CL	2	OA

\* Brazil (BR); United States of America (US); Colombia (CO); Costa Rica (CR); Chile (CL); Hungary (HU); Netherlands (NE); Spain (SP); Hungary (HU).

word cloud generated by the titles of the papers [Figure 5]. The frequency of words in the titles shows a concern about the social impact of science and a comprehension of altmetrics related to visibility in online environments. It is also possible to highlight a presence of local issues of global interest, such as Zika virus<sup>[46]</sup> [Figure 5].

Through content analysis of abstracts, using the Iramuteq software, it was possible to observe five types of classes in our sample:

**Class 1 (red)** - An understanding of alternative metrics for measuring the dissemination of science output in digital environments, understanding altmetrics as social metrics used for a more democratic science,<sup>[47]</sup> despite recognizing its limits on the circulation of knowledge restricted mainly to scholarly experts' community.<sup>[48]</sup> Discussions on alternative



**Figure 4:** Types of science production on Altmetrics Studies.



**Figure 5:** Word Cloud generated by titles.

metrics predominate as a way of measuring the visibility of science output, from the repercussion and online attention, as well as monitoring and evaluating the social impact of science through contextual analysis<sup>[49]</sup> and mixed methods,<sup>[50,51]</sup> bringing, among local topics, issues of global interest such as Zika.<sup>[46-52]</sup>

**Class 2 (grey)** - A set of articles investigate data from universities, scientific institutions and institutional repositories as bases of reliability to provide data for institutional evaluation. It brings information that fulfils demands of the growing use of the web environment for the production, storage, dissemination and access to scientific and technological information and which impacts the entire structure of scholarly communication.<sup>[53,54]</sup> This class requires institutional preparation in the face of this alternative demand for advice from scientific institutions.<sup>[55,56]</sup> From multidisciplinary perspectives, the papers in this set reflect on changes in evaluation and preservation of scientific production of institutions, especially based on case studies.<sup>[57]</sup>

**Class 3 (green)** - This set focus on science output evaluation of countries, networks of international research collaboration between scientific fields or specific topics<sup>[58-60]</sup> or from a journal or publisher,<sup>[61,62]</sup> in addition to comparative studies of science policies and evaluation systems between countries.<sup>[63]</sup> The papers are mainly based on traditional databases as Scopus and Web of Science, pointing out their limitations and emphasizing the importance of regional databases as SciELO and Redalyc<sup>[64]</sup> for the development of more relevant alternative metrics for Latin America.<sup>[65]</sup>

**Class 4 (blue)** - Papers focuses on questions about the research evaluation impact to maximize scientific, social and economic returns on investment in research. It can be noticed, even by bringing up social topics as gender equality,<sup>[66]</sup> an aspect focused on efficiency and mechanisms to evaluate productivity to foster stimulus to innovation and develop methodologies for decision-making investments in Science and Technology<sup>[67]</sup> and maturity assessment.<sup>[68,69]</sup>

**Class 5 (purple)** - An approach based on quantitative metrics, looking for correlations with other traditional metrics. Methods to measure the correlation between metrics - traditional and alternative - and compare them are constant in this type of approach.<sup>[70-72]</sup> Metrics, numbers, scores and impact factor are among the most frequent terms in this set,<sup>[73-75]</sup> predominantly in Health Sciences [Figure 6].

We highlight a few works that contribute to the conceptualization of altmetrics as one of the current informetrics,<sup>[76,77]</sup> which means that Latin American authors are being more followers than contributors, although it is an expected step from our context, due to the same bibliometric tendencies,

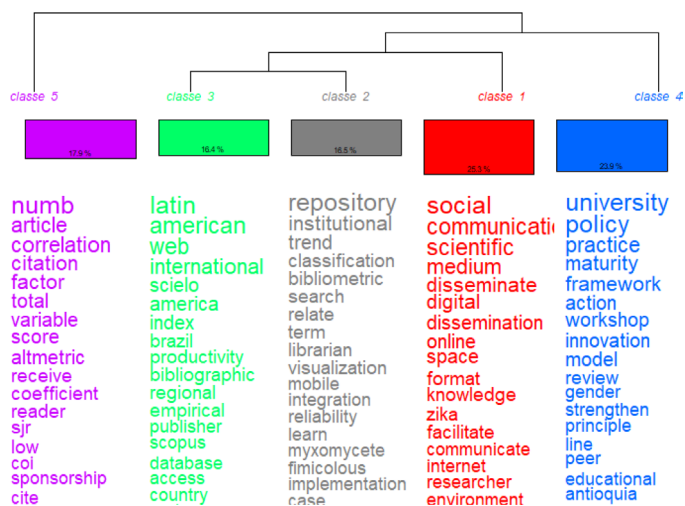


Figure 6: Classification based on the analysis of abstracts.

Table 4: Distribution in relation to the number of authors.

Authors	n.
1 Author	43
2 Authors	40
3 Authors	36
4 Authors	18
5 Authors	10
6 Authors	11
7 or + Authors	14

more from north to south, than from south to north, for now (As is starting to propose from: AmeliCa, FOLEC, CoLaV<sup>12</sup>).

**Authors**

Regarding the number of authors for these 172 articles, the average is 3.79 authors (although this data has a distribution, for example, between 43 articles by 1 single author, to 14 articles by more than 7 authors).

Regarding these works by more than 1 author (129 texts), the collaboration, which we call international (Latin American author with authors from other regions/continents) is represented by 40 texts; among authors from different Latin American countries, it reaches 10 texts; and among authors from the same country, it reaches 79 texts.

These data led us to consider that a significant percentage of Latin American authors join authors from other regions/continents, to take advantage of their advances in altmetric studies and learn from these processes (*quests and followers*), although these studies are focused and led from those other non-Latin American regions.

12 AmeliCa: <http://amelica.org/index.php/en/home/>  
 FOLEC: <https://www.clacso.org/en/folec/>  
 CoLaV: [http://colav.udea.edu.co/?page\\_id=59](http://colav.udea.edu.co/?page_id=59)



However, some Latin American integration works are taking place, which is an initial potential to create a community of altmetric measurements from the region, since there is a majority of works by authors from the same country, who could join authors from other countries, in order to grow in this type of measurement, hopefully from topics and problems of interest and led from the region, which, as this study shows, are still few.

The potential to create a Latin American community of researchers on altmetrics can be more based on the works than on this research we highlight, both for their theoretical contribution and/or application to our context and some data of their citation, considering their scope: from Latin America to other regions “of the Global South”, but also towards the north.

## DISCUSSION

Altmetrics has only 10 years of recognized history (From the Altmetrics Manifesto –2010 to The State of Altmetrics 2020)<sup>13</sup>, and it has been developed mainly in contexts such as the United States and the United Kingdom as evidenced by previous graphs. The results here presented are lined up with two other papers by Latin American authors on alternative metrics. González-Valiente, Pacheco-Mendoza and Arencibia-Jorge<sup>[14]</sup> analyzed the science output of papers about altmetrics indexed in the Web of Science (WoS) and Scopus databases as an emerging field to evaluate research. Their study identifies investigative trends and collaboration networks between authors and institutions. The results show a homogeneous community around topics such as (1) social media and networks, (2) internet, (3) scholarly and scientific communication and publication, (4) open access and public libraries, (5) citations analysis, (6) impact factor measurements, (7) metrics subjects, (8) information analysis, retrieval and processing, (9) search engines and databases, and (10) evaluative bibliometrics. The authors pointed out that a group of collaborators have tried to strengthen the field of knowledge with emerging principles of high theoretical consistency. However, the focus was not on Latin America, which shows the relevance of this study to understand how studies of alternative metrics have unfolded in the region. Another study<sup>[78]</sup> addressed the influence of national and international authors in the Brazilian scientific literature on “altmetrics” through the analysis of citation and quotation of publications indexed in the Reference Database of Journal Articles in Information Science. The results suggest: (1) predominance of American and European researchers in the co-authorship network of the cited works and in the co-citation network of the cited authors, (2) low presence of national researchers in the ranking of most cited

authors, (3) significant thematic proximity in the co-citation network arising from co-authorships and conceptual links between cited national and international authors. Such discussions reinforce the predominance of Anglophone literature and European and North American authors among the cited references, including the Latin American scientific literature on the subject.

In 2013, papers by Latin American authors started to disseminate altmetrics by explaining its properties, meaning, limitations and applications. They shared international concerns of altmetrics as the limited social media presence of Altmetric.com,<sup>[79]</sup> low scholarly relevance to communicate on social media<sup>[80]</sup> and contributed to a better understanding of altmetrics. By that time, altmetrics was still little used in Brazil and authors tried to promote its use.<sup>[80,81]</sup> The papers cited international authors and authors from the region that were publishing blog posts, proceedings, chapter, thesis, as a result of the initial debate developing in Latin America.

In addition to introductory studies on alternative metrics<sup>[80,82]</sup> or fields and scientific professional performance,<sup>[83]</sup> we have noticed a trend towards comparative metric studies, observed in other global studies,<sup>[84-89]</sup> Uribe-Tirado and Alhuay-Quispe<sup>[60]</sup> carried out a comparative study of the correlation between citations and mentions about the presence, productivity and influence of Ibero-American authors on information literacy in eight academic platforms, three social networks and data provided by a commercial provider (Altmetric.com). Although a central argument in favor of alternative metrics is around the possibility of measuring the social impact of science,<sup>[81-83]</sup> Araújo and Furnival<sup>[48]</sup> identified that the online attention metrics indicate an audience of experts, and the debate and circulation of scientific information is concentrated in the scholarly community.

From the Brazilian Institutional Repositories, Reis, Spinola and Amaral<sup>[55]</sup> compared bibliometric indicators and alternative metrics, showing incipient coverage in both types of metadata. The low coverage of altmetric data was also discussed by Araújo *et al.*<sup>[79]</sup> despite the clamor that it is more inclusive and democratic.<sup>[47]</sup> Barata<sup>[65]</sup> also points out limitations of altmetrics for Latin America’ science, taking as analysis the behavior of use of social networks of scholars and society in general, the presence of different idioms to share articles on the same topic, as well as data from platforms that generate altmetric data, focusing on the English data provider Altmetric.com. She argues that altmetrics has not been able to portray the attention Brazilian science articles receive on social networks, despite the efforts made by journals in science communication and the relative social engagement to social media. Oliveira<sup>[90]</sup> also relativizes the use of alternative metrics as a measure of social impact at a time of democratic fragility. In an editorial about alternative metrics and open science in Latin America, as a

13 See: [http://altmetrics.org/manifesto/\(2010\)-https://www.altmetric.com/about-altmetrics/the-state-of-altmetrics/\(2020\)](http://altmetrics.org/manifesto/(2010)-https://www.altmetric.com/about-altmetrics/the-state-of-altmetrics/(2020))

result of the first meeting of the LATmetrics Network, the author questions alternative metrics as a way of democratizing knowledge in a context of risk to democracy itself, privatization of scientific institutions and systematic attacks to delegitimize quality and public higher education in the region.

However, alternative metrics are key to the Latin American context to achieve other views of research and science output in the region considering scientific and social attention and visibility. In this context, Latin America has emerged in the development of innovative research on alternative metrics. We highlight the work of Fábio Gouveia<sup>[91]</sup> who, based on the Lattes curriculum, the Brazilian metadatabase on research output, teaching and science outreach activities, revealed that approaches on research on alternative metrics have been evolving, taking a path that goes from most theoretical to practical, evaluative, critical and institutional and regional context. Vilchez-Román, Huamán-Delgado and Alhuay-Quispe<sup>[92]</sup> argue that most altmetric research in developing countries is descriptive and has not tested models that explore the relationships between contextual factors at the article level, understanding that social dimension is fundamental to activates the use and citation of open access publications in the Andean countries. Uribe-Tirado, Gutiérrez, Ruiz-Núñez and Fajardo-Bermúdez<sup>[93]</sup> propose a model to identify the connection degree of the University of Antioquia (Medellín-Colombia) with its surroundings. Finally, we highlight the work of Maia, Lenzi, Rabello and Oliveira<sup>[94]</sup> in the development of a tool to map the impacts from altmetric data. The authors argue that governments and research institutes are very concerned about assessing the population's awareness of science innovations. Therefore, their web tool can be understood as an alternative to the market of altmetric providers, empowering developing countries to produce their own data and services and, therefore, making them less dependent on large science publishing companies.

We have observed that international studies present a relationship that involves “followers”, methodologies and epistemologies in this emerging field. But, little by little, collaborative works between countries and regions are being improved. We argue that this is key to advancing the Lat-Altmetric community, and having an international presence that will transform followers to producers of new knowledge and altmetric applications. The criticism and innovation of Latin-American researchers can make contributions to altmetric studies, parting from their own contexts, to shift the low presence which Alperin identified a few years ago.<sup>[8-9]</sup>

## CONCLUSION

Despite being a recent issue, research and reflections on alternative metrics are prominent in Latin America. It was possible to observe that, despite following trends in discussions

on alternative metrics that are developed in the North, and although they frequently use commercial scientific data providers, there is an emerging discussion on critics about low covering of regional data and an innovative development of methodologies and technologies as alternatives to commercial platforms that provide altmetrics data, which considers altmetrics an option to the scientific evaluation models of universities and countries, an alternative metric that is a complement, as part of the responsible metrics. This alternative agenda that develops on altmetrics in Latin America strengthens both regional topics of local interest, as well as social methodologies and innovative alternative technologies for a better understanding of the circulation of Latin American science. This debate has been done mostly in open access and in Latin American journals which shows a clear need to direct to and empower the regional community.

We also observed that the landscape of science output on altmetrics is becoming multipolar. Latin America emerged as an alternative hub of altmetric studies, but it still depends on references and partnership collaboration with central countries. Therefore, Latin American community should invest in resources to boost regional collaboration.

But it is necessary to reiterate that the community and the interest in the Latin American context are growing, as evidenced in the last years (2018-2019), based on the two past LatMetrics Conferences (<https://www.latmetrics.com>). In turn, the dynamics of periodically holding this type of conference will continue to allow this growth, in addition to achieving more evaluative integration, by conglomerating different metrics, as is projected for 2021, by integrating the LatMetrics Conference with an event and network of Researchers, with a more bibliometric tradition (Lat-Metrics 2021, Medellín-Colombia: <https://latmetricas.wordpress.com/>), considering responsible metrics in scientific evaluation adapted to the Latin American context, in relevant scientific and social impacts, that is, both north-south and south-south, as well as international, regional and local.

It is also important to ensure that current studies, focused so far on few countries in the region (Brazil, Mexico, Colombia, Peru, Costa Rica and Cuba) are also conducted by researchers from the other 20 Latin American countries, and that they are shared both in upcoming LatMetrics/Lat-Metrics Conferences, as well as in different regional or international publications, to make them more visible.

This achievement would also enable the expansion of both the theoretical or theoretical-applied contribution studies, as well as the studies applied to our own contexts since, so far, they have focused on a few cases for certain journals or faculties and universities (in addition to studies different from our context, when working with authors and research from

other continents). The growth of altmetrics in the Latin American region will depend on the increase in jobs in different countries and the generation of a wider collaborative network.

Thus, from these new contributions and a greater awareness-dissemination, we would like to contribute to the recognition of altmetrics as a valid metric view, both from researchers from different fields of research, as well as from universities, research centers and science evaluation bodies in the region, which would provide a more comprehensive evaluation (scientific and social impacts) and current (digital context) assessment, instead of keeping on reproducing only the traditional model of impact factor and *H*-index, which have been criticized worldwide, but especially in Latin America.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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