Rev Clin Esp. 2017;217(9):510–517

Revista Clínica Española

www.elsevier.es/rce

BRIEF ORIGINAL

Visibility of healthcare research institutes through the *Web of Science* database☆

B. González-Albo[a,*], **L. Moreno-Solano**[b], **J. Aparicio**[a], **M. Bordons**[b]

[a] *Unidad Transversal de Apoyo a la Investigación (UTAI), Centro de Ciencias Humanas y Sociales (CCHS), Consejo Superior de Investigaciones Científicas (CSIC), Madrid, Spain*
[b] *Departamento de Ciencia, Tecnología y Sociedad, IFS, Centro de Ciencias Humanas y Sociales (CCHS), Consejo Superior de Investigaciones Científicas (CSIC), Madrid, Spain*

Received 24 February 2017; accepted 30 April 2017
Available online 8 July 2017

KEYWORDS
Healthcare research institutes;
Scientific publications;
Institutional affiliation;
Bibliometrics

Abstract
Objectives: The strategic importance of healthcare research institutes (HRIs) in health sciences research in Spain has motivated this analysis of the feasibility of studing their contribution to the Spanish scientific output through their presence as a signatory institution in the publications.
Material and methods: We identified the output of the HRIs in the Web of Science database, comparing their observed output (the institutes are explicitly listed in the authors' workplace) and potential output (estimated based on the linked hospitals).
Results and conclusions: The studies based on scientific publications do not help us reliably identify the contribution of the HRIs because their observed production is much lower than the potential output, although their visibility tends to increase over time. This article highlights the importance of HRI members including the institute among their work addresses to increase the visibility of these organizations and to facilitate studies aimed at assessing their activity in the national and international context.

☆ Please cite this article as: González-Albo B, Moreno-Solano L, Aparicio J, Bordons M. Visibilidad de los institutos de investigación sanitaria a través de la base de datos Web of Science. Rev Clin Esp. 2017;217:510–517.

* Corresponding author.
E-mail address: borja.gonzalezalbo@cchs.csic.es (B. González-Albo).

PALABRAS CLAVE
Institutos de investigación sanitaria;
Publicaciones científicas;
Afiliación institucional;
Bibliometría

Visibilidad de los institutos de investigación sanitaria a través de la base de datos Web of Science

Resumen
Objetivos: La importancia estratégica de los institutos de investigación sanitaria (IIS) en la investigación en ciencias de la salud en España motiva este análisis sobre la viabilidad de estudiar su contribución a la producción científica española a través de su presencia como institución firmante en las publicaciones.
Material y métodos: Se identifica la producción de los IIS en la base de datos Web of Science comparando su producción observada (el instituto figura de forma explícita en el lugar de trabajo de los autores) y potencial (estimada en función de los hospitales vinculados).
Resultados y conclusiones: Los estudios basados en publicaciones científicas no permiten identificar de forma fiable la contribución de los IIS, ya que su producción observada es muy inferior a la potencial, aunque su visibilidad tiende a aumentar a lo largo del tiempo. Se señala el interés de que los miembros de los IIS incluyan al instituto entre sus direcciones de trabajo para aumentar la visibilidad de estas estructuras y posibilitar estudios orientados a valorar su actividad en el contexto nacional e internacional.

Background

Healthcare research institutes (HRIs) are the result of the association among teaching hospitals of the Spanish National Health System, university research groups and other public and private centers. Their establishment is in response to the need to strengthen biomedical research in Spain and to integrate basic, clinical and public health research, enhancing translational research. The institutes' structural and accreditation requirements are regulated through various regulations (Royal Decree 339/2004[1] in effect to 2016 and Royal Decree 279/2016[2] that succeeds it). The Health Institute Carlos III (ISCIII) is responsible for performing the accreditations. These decrees recognize the excellence of scientific results and the institutes' capacity to manage translational research and generate healthcare, societal and financial results.

Given the strategic goal guiding the creation of HRIs,[3] there is an obvious interest in analyzing their activity and assessing the fulfillment of their functions over time. The institutes publish annual activity reports, and their accreditation must be periodically renewed, assessing (among other aspects) their participation in clinical trials, patents and clinical practice guidelines and obtaining basic bibliometric indicators, such as the number of publications, the number of citations received and the percentage of publications that are disseminated through high-impact journals.[4]

The implementation of more developed bibliometric studies would help provide a better understanding of the HRI activity reflected in publications and their comparison with other healthcare organizations within and outside Spain. This knowledge is essential for the follow-up, conducted by the HRIs themselves, of their strategic plan. Nevertheless, the accurate and comprehensive identification of the HRIs' output is a basic premise for performing these analyses. Given that the HRIs are partly ''virtual'' organizations, which include diverse centers and groups, the validity of identifying their output through their authors' workplace will depend in considerable measure on whether these authors systematically include the institute among their affiliations. Analyzing this latter aspect is the objective of this study, to assess the viability of examining the contribution of the HRIs to Spanish research through their presence as the signatory institution in the scientific publications.

Material and methods

The data source for this study was the Web of Science Core Collection (WoS) (selecting the Science Citation Index-Expanded, the Social Sciences Citation Index and the Art & Humanities Citation Index), a multidisciplinary database that stores a wide selection of high-quality scientific journals, constituting a reliable reflection of mainstream science and providing good coverage of the biomedical area.[5] This study, which started from a download of the scientific output of Spain stored in this database during 2009–2015, is focused on the analysis of the period 2009–2011, although it shows some data from the triennium 2013–2015 to report a number of trends.

The output of the HRIs is identified based on the authors' ''Address'' field in the documents through 2 approaches: 1) we identified the observed output, which includes those publications in which an HRI was specifically mentioned in the authors' work address, and 2) assuming that the hospitals linked to an HRI constitute the institute's core and that all hospital staff are linked to the institute, we identified the potential or estimated output, which includes the publications signed by a specific HRI and those signed by the hospitals linked to the HRI. Although this delimitation does not capture the output from extrahospital members (e.g.,

academic groups or groups from other research centers) nor the output from healthcare organizations within the hospital's area of influence (e.g., health centers), the delimitation is considered adequate for understanding the trend of hospital groups to include HRIs among their affiliations. We also did not assign to the HRIs those documents in which an institute and an encompassing superorganization (e.g., a research network or corporation) appear in the same line as the work address. Our own data indicate that this situation occurs in a very small percentage of a center's output (approximately 5%).

Given that the names of the hospitals and institutes are not standardized in the publications and can appear under different names or variants, we conducted a semi-automatic coding of the work locations, followed by a manual verification phase, which helped unify and properly identify the institutions' output.[6] We calculated the visibility of the HRIs in 2009–2011, comparing it with the visibility during 2013–2015.

The study analyzes citable items (original articles, notes and reviews), which are the main types of documents used in research dissemination and that are called ''articles'' in this study. We used the total count method, which assigns each document to each of the signatory institutions. As an indicator of the journals' prestige, we used the percentage of articles published in journals ranked in the first quartile (Q1). This figure was calculated by considering the relationship of journals in descending order of impact factor in each discipline listed in the Journal Citation Reports of the articles' publication year and, for journals assigned to more than one subject category, we considered the subject category in which they were better positioned.

We analyzed 34 HRIs, including 29 accredited institutes according to the ISCIII website (June 2016), along with 5 others not registered on this page but that contained the term ''healthcare research institute'' and might be candidates for accessing this accreditation in the future. We indicated the date of the establishment of the various institutes, obtained through their website or, in lieu thereof, by asking the center by e-mail. It should be noted that the establishment date was, in some cases, much earlier than the accreditation date.

Results

During 2009–2011, the scientific output of Spain included in the WoS database rose to 141,118 articles, 50,514 (35.8%) of which corresponded to health sciences; i.e., the articles were published in journals assigned by WoS to biomedical and clinical medicine disciplines. The potential output of the HRIs rose to 19,613 articles (39% of those corresponding to health sciences), while only 5525 articles (28% of the potential output) explicitly mentioned an HRI in the work location.

Table 1 shows the output of the 34 identified HRIs. For each institute during 2009–2011, Table 1 lists the number of articles in which the institute is expressly mentioned (A), the institute's potential output (B) and the percentage represented by the number of articles signed by each HRI compared to its potential output (C), which is an indicator of the institute's visibility.

Overall, we can see that only 28% of the HRIs' total potential output during 2009–2011 explicitly mentioned an institute, although there are variations among the centers. A number of the HRIs, especially the recently founded ones, are not visible through the publications (6 of the 10 HRIs founded after 2009). The greatest visibility was detected in 3 HRIs, with the institute appearing in two-thirds of its potential output (all of them founded before 2006). The HRIs with greatest visibility (>50%) are located in Catalonia (IISPV, IRBLLEIDA, IMIM, IDIBELL, IDIBAPS, IDIBGI), which is the autonomous community with the institutes with the greatest experience (8 of the 10 created before 2006), thus favoring their greater current consolidation. Nevertheless, it is worth noting the low visibility of the 2 Valencian institutes created before 2006, which suggests the possible influence of the policies of the regional health systems on the institutes' visibility.

The last 2 columns of Table 1 show the visibility of the HRIs during 2013–2015 and the increase in visibility compared with previous periods, which is positive in virtually all cases, and is lower for the HRIs that already had a relatively high rate of explicit presence in the publications (>50%) in the first period (IDIBGI, IDIBELL, IISPV, IDIBAPS). Overall, the visibility of the HRIs in the scientific publications increased 23 percentage points, increasing from 28% in 2009–2011 to 51% in 2013–2015.

The Q1 articles constituted 46% of the Spanish scientific output in health sciences during 2009–2011, 59% of the HRI output and 44% of the HRIs' potential output. The increased use of Q1 journals in the output explicitly signed by the HRIs is observed in most of the institutes (Fig. 1). This use could indicate differences in the type of research performed, such as its basic-clinical character. It is possible that the researchers are more likely to include the HRIs in the articles performed in collaboration with other nonhospital members of the HRI (e.g., academic groups), who commonly perform more basic research (for which more impact has been reported[7]) and who could have greater targeting of Q1 journals.

Discussion

Firstly, it is important to indicate that the results of this study should be interpreted with caution while being aware of its limitations, which are briefly outlined in the methodology. These limitations include the fact that the HRIs' output is probably underestimated, because it does not consider the output of its extrahospital members. Despite this limitation, we believe that the methodology is useful and valid for the study goals (i.e., exploring whether the researchers include the institute in their institutional affiliation). Nevertheless, if the HRI's actual output is greater than that demonstrated in this study, its visibility (percentage of output in which the institute is mentioned) will be even lower than that observed here. After identifying the previous limitation, we can conclude that analyzing the HRIs' contribution to Spanish research through their presence as the signatory institution in the scientific publications included in the WoS database is not viable.

Table 1 Visibility of the healthcare research institutes through the research publications stored in the Web of Science (institutes ordered by founding date).

Founding date	HRI	Community	Number of HRI articles (2009–2011)		% Observed output/potential output (2009–2011) (C)	% Observed output/potential output (2013–2015) (D)	Increased visibility (D) – (C)
			Observed output (A)	Potential output (B)			
1947	Medical Research Institute Hospital del Mar (IMIM)	CA	906	1424	63.62	64.91	1.29
1973	La Fe Healthcare Research Institute	VA	117	939	12.46	23.46	11.00
1994	Research Institute Vall d'Hebron (IR-HUVH)	CA	263	1592	16.52	24.11	7.59
1995	Health Sciences Research Institute Germans Trias i Pujol (IGTP)	CA	83	589	14.09	23.19	9.10
1996	Biomedical Research Institute August Pi i Sunyer (IDIBAPS)	CA	1584	2944	53.80	60.48	6.68
2000	INCLIVA Healthcare Research Institute	VA	152	611	24.88	54.07	29.19
2004	Biomedical Research Institute of Bellvitge (IDIBELL)	CA	821	1411	58.19	70.39	12.20
2004	Biomedical Research Institute of Lleida (IRBLLEIDA)	CA	209	316	66.14	61.34	−4.80
2005	Biomedical Research Institute of Girona Dr. Josep Trueta (IDIBGI)[a]	CA	179	343	52.19	67.95	15.76
2005	Healthcare Research Institute Pere Virgili (IISPV)[a]	CA	322	470	68.51	75.00	6.49
2006	Biomedical Institute of Seville (IBiS)	AN	211	933	22.62	16.93	−5.69
2008	Biodonostia Healthcare Research Institute	PV	40	257	15.56	58.26	42.70
2008	Biomedical Research Institute of A Coruña (INIBIC)	GA	98	462	21.21	30.78	9.57
2008	Healthcare Research Institute BioCruces	PV	1	368	0.27	30.08	29.81
2008	Healthcare Research Institute Galicia Sur[a]	GA	3	250	1.20	27.16	25.96

Table 1 (*Continued*)

Founding date	HRI	Community	Number of HRI articles (2009–2011)		% Observed output/potential output (2009–2011) (C)	% Observed output/potential output (2013–2015) (D)	Increased visibility (D) − (C)
			Observed output (A)	Potential output (B)			
2008	Healthcare Research Institute of Santiago (IDIS)	GA	129	684	18.86	35.87	17.01
2008	The Maimonides Biomedical Research Institute of Cordoba (IMIBIC)	AN	162	619	26.17	56.15	29.98
2009	Biomedical Research Institute Sant Pau (IIB Sant Pau)	CA	171	1040	16.44	37.90	21.46
2009	Research Institute of Hospital 12 de Octubre (i+12)	MA	40	1020	3.92	28.98	25.06
2009	Healthcare Research Institute of Fundación Jiménez Díaz (IISFJD)	MA	79	527	14.99	48.11	33.12
2009	Healthcare Research Institute Gregorio Marañón (IISGM)	MA	13	1000	1.30	29.58	28.28
2009	Healthcare Research Institute of University Hospital La Paz (IDIPAZ)	MA	203	1476	13.75	39.46	25.71
2009	Healthcare Research Institute of Hospital de la Princesa	MA	100	855	11.70	40.49	28.79
2009	Healthcare Research Institute Ramón y Cajal (IRYCIS)	MA	114	1005	11.34	32.78	21.44
2010	Biomedical Research Institute of Malaga (IBIMA)	AN	1	646	0.15	29.61	29.46

Table 1 (*Continued*)

Founding date	HRI	Community	Number of HRI articles (2009–2011)		% Observed output/potential output (2009–2011) (C)	% Observed output/potential output (2013–2015) (D)	Increased visibility (D) – (C)
			Observed output (A)	Potential output (B)			
2010	Healthcare Research Institute of Aragon	AR	17	707	2.40	23.52	21.12
2011	Biomedical Research Institute of Salamanca (IBSAL)	CL	–	451	0.00	54.98	54.98
2011	Healthcare Research Institute San Carlos (IDISSC)	MA	15	1041	1.44	29.30	27.86
2011	Murcia Biosanitary Research Institute Virgin de la Arrixaca (IMIB)	MU	–	547	0.00	27.85	27.85
2012	Biosanitary Research Institute of Granada (ibs.Granada)	AN	6	605	0.99	21.50	20.51
2012	Healthcare Research Institute of Navarra (IdiSNA)[a]	NA	–	1047	0.00	8.42	8.42
2012	Healthcare Research Institute Puerta de Hierro (IDIPHIM)	MA	–	433	0.00	10.78	10.78
2013	Healthcare Research Institute of Palma (IdISPa)[a]	BI	–	330	0.00	24.42	24.42
2014	Research Institute Marqués de Valdecilla (IDIVAL)	CN	–	529	0.00	22.40	22.40
	Total		5525	19,613	28.17	50.85	22.68

Abbreviations: AN, Andalusia; AR, Aragon; CA, Catalonia; CL, Castilla y León; CN, Cantabria; GA, Galicia; BI, Balearic Islands; MA, Madrid; MU, Murcia; NA, Navarra; BC, Basque Country; VA, Community of Valencia.

[a] Institutes that are not listed as accredited on the ISCIII website.

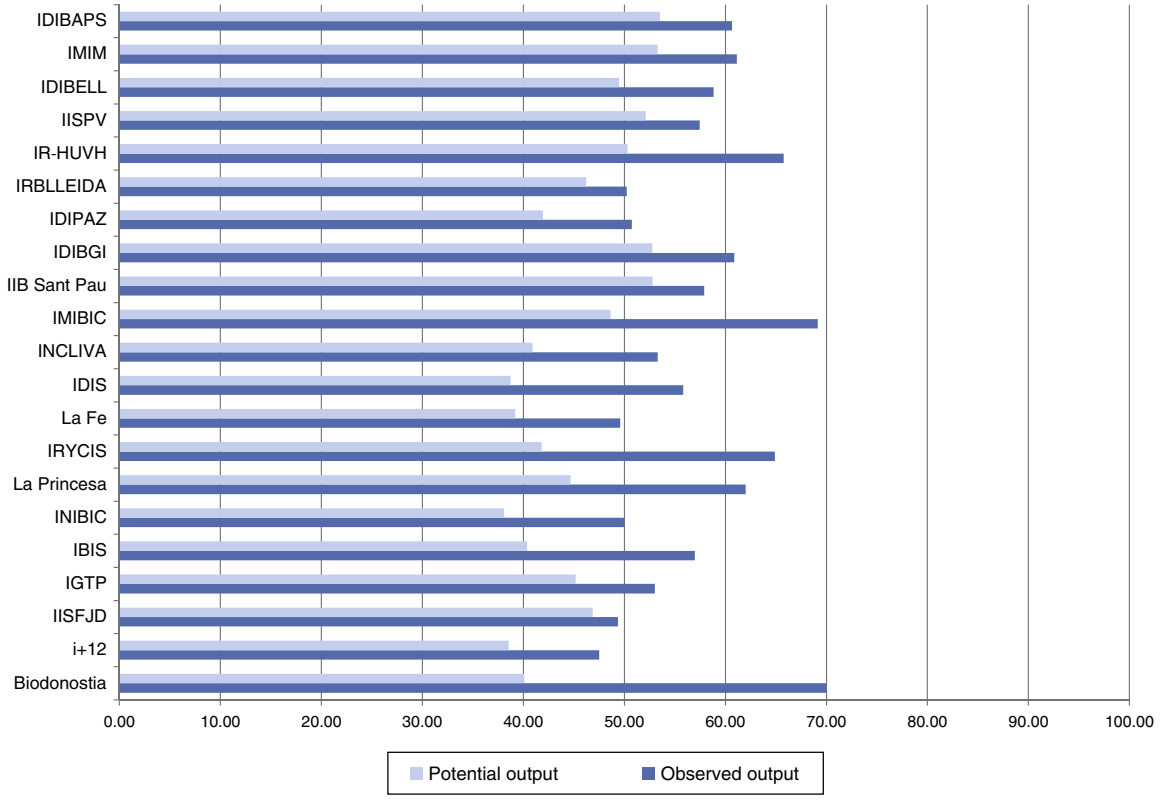

Figure 1 Percentage of Q1 articles in the output of the health research institutes (WoS 2009–2011) (only institutes with at least 40 articles signed by the HRI, in descending order by number of articles; names of the institutes listed in Table 1).

The presence of the HRIs in the publications is much lower than their potential or estimated output. We observed variations in visibility by center that could be related to the depth of their experience (less visibility for very recently founded institutes), the rate of collaboration among members of the HRIs of different centers (in which it can be more intuitive to mention the institute as the common framework for the research) and the centers' degree of involvement in promoting the institutes.

The visibility of the HRIs increased over time, from 28% in 2009–2011 to 51% in 2013–2015. This increase could have been the result of the ISCIII recommendations and changes in institutional policies aimed at a greater promotion of the institute, achieving greater integration among its members and generating a feeling of belonging to the HRI by the researchers.

It would be advisable for researchers to include the HRIs in their publications, which could be promoted institutionally. Standards and regimens for the method for signing publications (what to include and how) are being established in numerous institutions to guide their researchers and ensure the center's visibility. The systematic inclusion of the HRI among the institutional affiliations of its members will internally facilitate the management of the HRIs and will help to externally increase the institutes' visibility, monitoring their activity in the national and international context and assessing the fulfillment of the strategic objectives that guided their creation, supplementing the information provided by other types of indicators.

Acknowledgements

We would like to thank Carlos Segovia (Healthcare Institute Carlos III) for his invaluable comments on a previous version of this document. We would also like to thank the reviewers for their comments, which have helped improve on the original.

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