Science, technology and innovation indicators to support research management: the case of Oswaldo Cruz Foundation (Fiocruz)

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Background

The mission of Oswaldo Cruz Foundation (Fiocruz) is to produce, disseminate and share knowledge and technologies to strength and consolidate the Brazilian Unified Health System (SUS), ultimately contributing to the health promotion and quality of life of the population. The Foundation is present in 10 Brazilian states and has an office in Mozambique. Nowadays, there are 16 scientific and technical units and 32 post-graduate programs in different areas of the health field, including Clinical Research, Development of Prophylactic and Therapeutic Vaccines, Molecular and Genetic Epidemiology in Health, Education and Health, History of Science, among others.

As a public and strategic institution, Fiocruz develops health research to generate benefits for society. However, there are few established mechanisms to assess the influence of the knowledge produced by the institution on the cultural, educational, economic, political and social fields. Most of the models that guide research evaluation and monitor processes are based on a productivity logic, in which quantitative data is used as qualitative indicators of research performance, neglecting the existent diversity of the various knowledge areas. To overcome these limitations, it is necessary to adopt new approaches to evaluate research impact.

This work aims to present the experience of developing the Fiocruz's Observatory in Science, Technology and Innovation (ST&I) in Health, as well as to highlight some of the institutional indicators produced in this context. The platform intends to contribute to Fiocruz's research management and ST&I policies formulation, through the production of indicators, studies, technical documents and news that support decision-making processes. It also aims to increase the social perception about the institution's potential, in terms of the achieved research and technological development advances.

Method

This paper is based on a case of participant observation of an ST&I indicators project to monitor and evaluate research and technological development of a public health institute. For the scientific production indicators, publications with at least one author affiliated with Fiocruz were extracted from the Web of Science (WoS), Scopus and SciELO databases. For patents, the Questel Orbit database was used. In both cases, the VantagePoint software was used for database harmonization, duplicate records removal and institutions standardization and Kibana e Elasticsearch for data visualization.

Results

During the pilot experiment in 2016, working groups from different units of Fiocruz produced diverse indicators, including bibliometric, demographic, scientific collaboration and technological development. Despite the progress achieved, the governance model was not effective. InCites and 'Plataforma Stela Experta' were contracted to support the development of these indicators, but due to financial constraints, the maintenance of the signatures became impracticable.

In 2018, the Observatory's governance was reformulated and it is currently coordinated by the Vice-Presidency of Education, Information and Communication and has an Executive Committee comprised of ST&I and bibliometric specialists, which is responsible for coordinating partnerships and the operational team.

The scientific production indicators of Fiocruz provided information about year, database, keyword, journal, funding and collaboration. It is also possible to filter and combine these indicators and access the articles through their DOI. Between 2010 and 2018, Fiocruz published 18,769 documents with a 48% growth rate over the years. A database analysis showed that Scopus (74%) and WoS (71%) had the highest number of records, while SciELO indexed just 17%. Among the 21 journals that published more than 100 Fiocruz's publications, 9 of them were foreign. The top five were: Ciência e Saúde Coletiva (886), Cadernos de Saúde Pública (780), PloS One (692), Memórias do Instituto Oswaldo Cruz (561) and PloS Neglected Tropical Diseases (407). United States, United Kingdom and France-

based institutions were the most frequent international partners of Fiocruz, sharing authorship in 2,590 (14%); 1,182 (6%) and 622 (3%) publications, respectively. Among the 10 most frequent partner countries, just Argentina was a developing economy, with 449 co-authored publications. Overall, 5% of Fiocruz's publications were in collaboration with South American countries and 23% with seven major developed economies countries (G7) (UN, 2019).

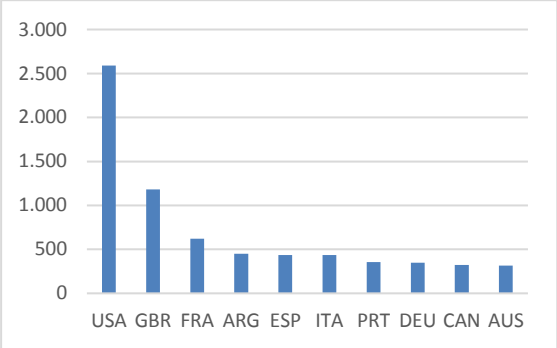

Figure 1. Top ten most frequent Fiocruz's partner countries.

The most frequent partners of Fiocruz were national public universities located in the Southeast Region of Brazil, including: Federal University of Rio de Janeiro (UFRJ), Federal University of Minas Gerais (USP), São Paulo University (USP), Rio de Janeiro State University (UERJ) and Fluminense Federal University (UFF), with 3,013 (16%), 1,583 (8%), 1,503 (8%), 1163 (6%) and 1,123 (6%) publications in collaboration, respectively. Our data also showed that the main sources of funding were public agencies, such as CNPq, Capes and Faperj.

Patents indicators provided information about number of patents, inventor name, partner institution, deposit region, classification and the link to access the document. Fiocruz has 197 patent families, 122 of them alive. Most of the patent families were filled without partnership (75%) and focused on drugs (52%), biotechnology (22%) and biological materials analysis (21%).

The Observatory's web portal (www.observatorio.fiocruz.br), relaunched in 2018, also integrates a document collection about institutional data and several contents that articulate and contextualize the indicators, such as reports, interviews, expert opinions, scientific articles and full texts of dissertations and theses.

Conclusions

Aligned with the open science movement and public transparency, the Observatory's is an important instrument for Fiocruz's research advancement and technological development. Despite the advances, some limitations must be acknowledged. Although most SciELO's articles derived from the health sciences area, in Portuguese and published by Brazilian authors[1], a more complete data source is necessary to consider other types of publications, such as books and book chapters. To accomplish this, an institutional tool to collect and standardize the data of the curricula registered in the 'Plataforma Lattes' is being developed[2].

The Observatory also intends to implement indicators of vaccines, biopharmaceuticals and diagnostic kits production, funding and education. In addition, considering that Fiocruz is currently elaborating an internal policy for managing and opening research data, the Observatory aims to develop indicators to measure the impact of such policy on research and technological development.

Finally, as the quantitative indicators should support qualitative analysis (Hicks et al. 2015), a group of specialists from different health areas was formed to analyse the data and propose new indicators considering the characteristics of each area. Journals published by Fiocruz also play an important role in the dissemination of the knowledge produced by the institution. For this reason, it is necessary to evaluate the rate of endogeneity with caution. Moreover, although Fiocruz has encouraged collaboration with South American and Portuguese speaking countries in more recent years (Ferreira et al., 2010), our data showed that the initiative has not yet reflected on higher collaboration rates. A large part of the collaborations to date has been with developed countries.

References

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[1] Source: Scielo

[2] http://lattes.cnpq.br/