Applying Network Analysis Method to Aid Public Policy on Health: A Case Study in Brazil

Databases on scientific publications are a well-known source for complex network analysis. The present work focuses on identifying synergy amongst researchers on Leishmaniasis, a Neglected Disease associated with poverty and very common in Brazil, India and many other countries in Latin America and Africa. Using Web of Science and PubMed database we have identified specific clusters related to collaboration between countries and its researchers. Based on those collaboration patterns and its evolution on the past 10 years we aim to find tendencies for research, specially related to treatments.

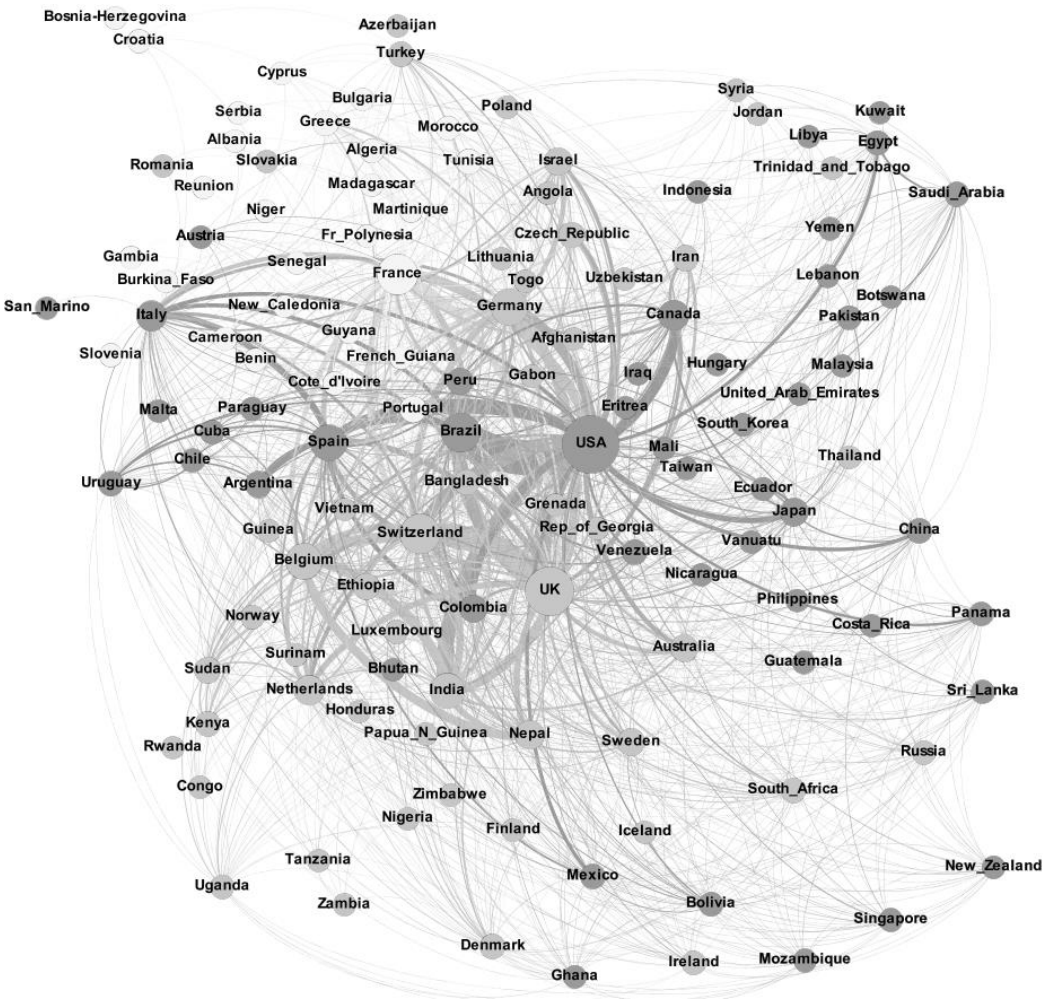
Because they are related to poverty, neglected diseases such as Leishmaniasis have traditionally ranked low on national and international health agendas. They present little incentives to the industry to invest in R&D, thus falling outside the pharmaceutical market. However, recent developments have drastically changed perspectives. Some of the countries affected by these diseases, such as Brazil and India, are now major emerging economies. In the last decade, governments and foundations have provided substantial funds intended for research programs. However, up to this point, we do not know how science has progressed and the consequences of those changes.

In order to better understand the field and its evolution we have used Network Analysis methods to map the scientific collaboration network, MeSH taxonomy to identify and classify clusters of interest related to treatments and Lexical analysis of the publications corpus to identify its applications, innovation and synergy to other related works. The first corpus included all research publications from 2005 to 2014 related to Leishmaniasis extracted from the Web of Science database and incorporated all MeSH words found in Pub Med database for those publications. After that we focused on the articles that had at least one researcher from Brazil and classified, by its MeSH, to subjects related to treatments such as “Drug Effects”, “Administration and Dosage”, “Therapeutic Use” and others. In respect to the number of publications Brazil, USA and India are the countries with the highest number of publications per year. So the decision to focus on Brazilian publication has a great effect on the understanding of the field.

The incentive for the development of this researched is based on the number of cases reported in Brazil for Leishmaniasis. Since the country is the leading research on the field by the number of publications, and the number of cases reported has grown on the past 10 years, what can be done to understand the impact of research and public policies related to science? The present work is trying to map, along with other research projects, the social impact of scientific research and how we can give new directives for scientific investments.

On figure 1 we show the collaboration network between countries in relation to Leishmaniasis. We have identified three major clusters of collaborations which could be indentified by the shades of gray on the figure. In one of the clusters we have in the middle of the figure, countries such as USA and Brazil and its main collaborators. At the top left the main country is France and its collaborators from North African countries and others. The third group has UK and India as the mais players in the botton botton of the figure with ties to South African countries. This mapping shows a clear relation between countries with high number of cases and countries with closer ties to the first ones and the means to develop research.

Figure 1: Collaboration Network between countries



From this first mapping we focused on the Brazilian researchers and the institutions where they where from. We have found that Fiocruz, a state health research institution, has the highest number of publications followed by Universities in São Paulo, Rio de Janeiro, Minas Gerais and Bahia. The next step is to understand how their researchs can be implemented in interdisciplinary form to fulfill the needs of public health.

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