

Trends in Scientific Publications for the French West Indies and the Dominican Republic from 1990 through 2019: Infectious Diseases

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Objective: The French West Indies (FWI) and the Dominican Republic (DR) are also, by virtue of their geographical positions, exposed to infectious diseases. The objective of this study was to describe trends in scientific publication for the FWI and the DR using bibliometric analysis, to describe existing international collaborations for each site, and to identify directions for potential collaboration between the 2 sites.

Methodology: Using data (publications from 1990-2019) from the Web of Science and PubMed databases, a bibliometric analysis was performed. Three bibliometric indicators were used: quantitative, performance, and organization-specific.

Results: There were 3599 articles published in the indicated span of time, with at least 1 author affiliated with either the FWI (N = 2552) or the DR (N = 1047). Journals ranked in the first quartile, which represent the highest quality journals in each Journal Citation Record category, were the most strongly represented, (38% for the FWI and 50.32% for the DR). In terms of the FWI publications, authors from mainland France were the primary collaborators (1754, 35%); for publications from the DR, the US provided the largest number of collaborators (898; 43%). The infectious disease category predominated, with 2 clusters emerging: arbovirus infections (FWI) and HIV infection (DR).

Conclusions: This study is one of the first to perform a bibliometric analysis of the 30-year scientific output of the FWI and the DR. Both sites published articles about infectious diseases, indicating that this might be a strong area for future collaborations. [*P R Health Sci J* 2023;42(2):164-171]

Key words: Arbovirus, Public health, Caribbean collaboration, Bibliometric

The Caribbean area faces several major public health issues that require the development of scientific cooperation and clinical research at local levels. A research strategy aimed at promoting collaborations between Caribbean countries could help to focus research specifically on local health issues. Public health problems that are common to all the Caribbean islands and nations are a strong impetus for scientific cooperation and those problems feature in feature in the public health strategies offered by the Caribbean Public Health Agency and regional health authorities. The growing prevalence of chronic diseases with high morbidity (obesity, diabetes, cancer) remains a major concern in this part of the world. The French West Indies (FWI) and the Dominican Republic (DR) are also, by virtue of their geographical positions, exposed to severe climatic conditions that can be underlying factors for the spread of infectious diseases (chikungunya, dengue, Zika) (1). Indeed, arboviruses remain a significant cause of morbidity, mortality, and economic burden in the world population. In the DR, from 2010 to 2019,

a total of 92,150 cases of dengue were reported (i.e., around 9 cases per 1000 inhabitants), while in the FWI, 109,781 cases were reported over the same time period (corresponding to 140 cases per 1000 inhabitants). Dengue, with a steady increase in the world since the 2000s (2), is one of the tropical infections that is recognized as a priority neglected tropical disease by the World Health Organization (WHO) (3). Regarding the chikungunya epidemic from 2013 to 2015, the available data show that there were 539,250 cases (51 per 1000 inhabitants) in

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the DR and 153,400 cases in the FWI (196 per 1000 inhabitants) (4). From 2010 through 2019, chikungunya was the most rapidly increasing arbovirus disease in Latin America and the Caribbean (2). As for Zika, during the 2016 epidemic, there were 66,500 cases in the FWI (85 cases per 1000 inhabitants) and 5575 cases in the DR (around 1 case per 1000 inhabitants).

Over the last few decades, in the FWI, national plans have been put in place to develop research across several research organizations (university hospitals, universities, research institutes, etc.). In 2005, the DR launched the “Fondo Nacional de Innovación y Desarrollo Científico y Tecnológico” (National Fund for Scientific and Technological Development), to promote and finance scientific and technological research. Via this new organism, the Dominican state has succeeded in boosting research, with the approval, to date, of more than a thousand scientific projects in various areas. A strategic research development plan was put in place in 2015 in order to respond to public health issues (5).

Bibliometric analysis can be of immense value in characterizing the current standing of various research disciplines, identifying pre-existing publication trends, assessing the scientific output of researchers, institutions, and countries, and defining future research directions in specific subject areas (4). Several recent bibliometric studies have evaluated the scientific repercussions and temporal trends in different areas of scientific and medical research (6). Other studies have focused on the impact of the publication output of 1 or several institutions whether at the local or (7,8) an international level (9,10).

To date, and to the best of our knowledge, no bibliometric study has investigated the state of scientific collaboration between the FWI and the DR in terms of medical research. In view of the overlapping public health issues in these 2 countries, it would be interesting to assess the trends in research and the degree of collaboration between the 2 countries. The objectives of this study were to describe the trends in scientific publication for the FWI and the DR using bibliometric analysis, to describe the existing international collaborations of each site, and to identify directions for potential collaboration between the 2 sites.

Methodology

We performed a bibliometric analysis using the international databases Web of Science (WOS) and PubMed, including in our analysis all the articles that had been published during the period of 1990 to 2019, inclusive (30 years). The search was performed on all the publications indexed in Medline, without limits as to the research area.

Presentation of both sites

The DR is a country in the Greater Antilles region of the Caribbean, between the Caribbean Sea and the Atlantic Ocean, occupying approximately two-thirds of the island of Hispaniola, which it shares with Haiti (11). Guadeloupe and Martinique

(hereinafter referred to as “the FWI”) are 2 French territories in the Americas that have been, an integral part of France since 1946. The archipelago of Guadeloupe is the larger of the 2 island territories, with a land area of 1703 km², compared to 1128 km² for Martinique (11).

Search strategy

To search for publications involving both the FWI and the DR, we used InCites, an analytical tool developed and marketed by Clarivate Analytics (Clarivate Analytics, Philadelphia, PA, USA) (12), which combines citations and summary measures of scientific output at different levels: countries, organizations, and specific disciplines. An organization-enhanced feature available in the WOS allows the user to search by country, to yield comprehensive and specific search results.

All the publications containing at least 1 author affiliated with either Martinique or Guadeloupe (regardless of the author’s position on the authors list) were selected and attributed to the FWI. Publications from the FWI with authors from both Martinique and Guadeloupe were counted only once, in order to avoid having duplicate publications. All the publications containing at least 1 author affiliated with the DR were attributed to the DR. The search was performed in March 2020 on the WOS website.

Publications with authors affiliated with French Guiana, which is a French overseas department and located on the northern Atlantic coast of South America, were not included in the FWI publications in order to focus on the French departments located in the Caribbean. Publications with authors from both the FWI and the DR were counted as 1 publication for each site.

To summarize the search method: All the indexed publications were initially identified on the WOS website using the InCites tool, then extracted from PubMed and saved to an XML text file to identify the organization-specific indicators described below.

Bibliometric indicators

- Quantitative indicators: We recorded the number of publications per 5-year period to measure the scientific output of each country by type of publication;
- Performance indicators: We analyzed the quality of publications as measured by the Journal Citation Reports journal rankings in the WOS for each of their 256 categories. Journal Citation Reports rankings are easily quantifiable measures of quality. Briefly, quartiles are calculated as follows: Let X be the journal’s rank in a given category according to the metric (journal impact factor, total citations, etc.) and Y the number of journals in the category. The journal rank is calculated as $Z = \text{percentile rank}(X/Y)$. The quartiles of journal rankings are classified as Q1 ($0.0 < Z \leq 0.25$), Q2 ($0.25 < Z \leq 0.5$), Q3 ($0.5 < Z \leq 0.75$), and Q4 ($0.75 < Z$), whereby Q1 represents the highest quality journals in each category. A harmonic mean of Category Expected Citations was performed for journals that belong to multiple WOS categories (13).

-Organization-specific indicators, also known as structural indicators, were used to measure links between publications, organizations, countries, authors, and research fields. To estimate the structural indicators, the full set of data for each Medline-indexed publication identified in WOS was extracted from PubMed, and the affiliations of the first and last authors were identified. Each affiliation thus identified was classed by country. The FWI authors were identified with codes distinct from that of mainland France in order to avoid having duplicate publications.

We analyzed the articles published in the final 5 years (2015-2019) of the 30-year span of interest; all the articles came from the FWI and the DR. Keyword searches (using VOSviewer) allowed us to narrow our search to the field of infectious diseases.

The specific keywords extracted from the WOS category “infectious disease” used in VOSviewer were *transmission, Zika virus, emergence, arbovirus, chikungunya, outbreak, dengue, fever, epidemic, mortality, antiretroviral therapy, HIV, prevention, condom use, French West Indies, and Dominican Republic*. These keywords obtained a significant total link strength in the VOSviewer software (at least 5 occurrences per keyword) and were selected to best represent the diseases indicated in the 2015 through 2019 publications.

The results are presented in a table format for the quantitative indicators and in a graphical format for the qualitative and organization-specific indicators. The data were extracted from PubMed in XML and analyzed using SAS, version 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

From 1990 through 2019, a total of 3599 indexed publications were published with at least 1 author affiliated with either the FWI (N = 2552) or the DR (N = 1047). For the authors from the DR, the 2 main languages of the publications were English (at 97%) and Spanish (at 2%). For the authors from the FWI, the 2 main languages were English (81%) and French (19%).

Quantitative indicators are presented in Table 1.

For both sites, there was a steady increase in the number of publications published over time, reaching a peak in the most recent period (i.e., 2015-2019), with 506 publications for the DR and 1064 for the FWI (Figure 1).

The majority of the publications from the 2 sites were original research articles (89% for the DR and 83% for the FWI) (Table 1). For the FWI and the DR, the proportion of publications in journals ranked in quartile 1 is greatest starting in the

year 2000 (Figure 2). The 5 countries/regions with which the first and last authors of the FWI-derived and the DR-derived publications were most frequently affiliated over the last 30 years are shown in Figure 3. For the FWI, the first and last authors of the publications published were mainly from the FWI, with 2951 (59%) authors being affiliated with the 2 islands and 1754 (35%) being affiliated with mainland France. Regarding the DR, the majority of the first and last authors were from the USA, with 868 authors (43%) being from that country and 344 authors (17.2%) being from the DR. During the most recent 5-year period (2015-2019), there was a net increase in the number of first and last authors from mainland France in the FWI publications, and in first and last authors from the USA in DR publications. From 2010 through 2019 (comprising the 2 ranges of 2010-2014 and 2015-2019), there was a 3.32-fold increase in the number of authors from mainland France in the publications from Martinique, and a 2.21-fold increase in authors from the USA in the publications from the DR.

Figure 4 presents the number of publications published, by research discipline, over the study period for both the FWI and the DR. In the DR, over the last 30 years, the main research areas have been public, environmental, and occupational health and infectious diseases. These 2 disciplines together accounted for 27.6% of all the publications from the DR over that period, with the highest number being published in the grouped fields of public, environmental, and occupational health (n = 161). In the FWI, the infectious diseases category was predominant,

Table 1. Number of articles published by the French West Indies and the Dominican Republic from 1990 through 2019.

Article type	French West Indies N = 2552	Dominican Republic N = 1047
Original article	2117 (83%)	931 (89%)
Letter	204 (8%)	31 (3%)
Review	113 (4%)	51 (5%)
Editorial	84 (3%)	23 (2%)
Notes & Others	34 (1%)	11 (1%)

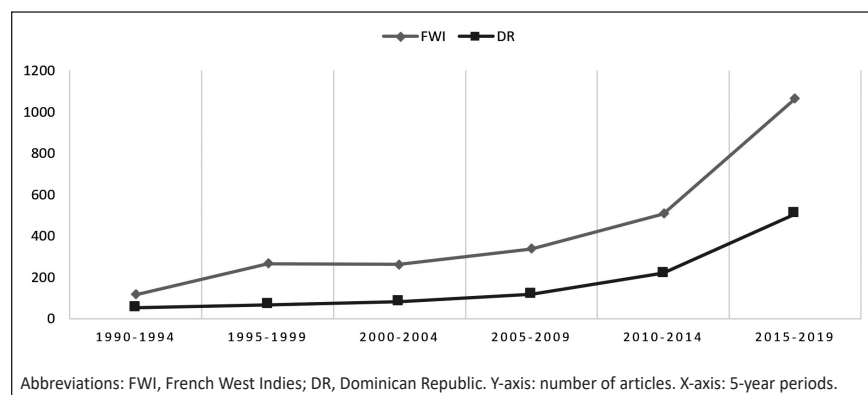


Figure 1. Temporal trends in publications from the French West Indies and the Dominican Republic from 1990 through 2019.

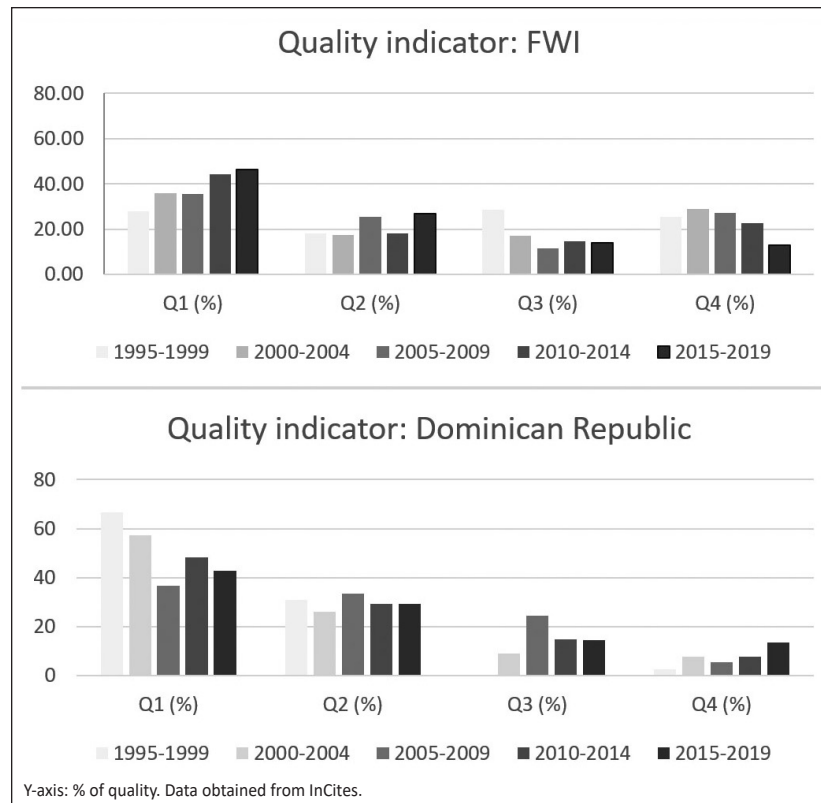


Figure 2. Proportion of publications from the French West Indies and the Dominican Republic in each quartile of journal classification, 1990-2019.

with 237 publications, followed by microbiology ($n = 192$) and clinical neurology ($n = 174$). There was a substantial increase in the number of publications in the most recent 5-year period in the discipline of infectious diseases and discipline of public, environmental, and occupational health, with the number of publications in these fields multiplying by 2 and 2.3, respectively, from the period of 2010 through 2019 (comprising the 2 ranges of 2010-2014 and 2015-2019). Similar findings were observed for the DR, with the number of publications in the areas of infectious diseases and public, environmental, and occupational health increasing by 3.5 and 3.3, respectively, from 2010 through 2019. Figure 5 represents a network visualization of all the keywords related to infectious diseases that were used in publications from the FWI and the DR. Keywords related to the FWI and the DR were added in VOSviewer in this analysis. The figure shows a map with different keywords pertinent to infectious diseases, with 2 specific clusters of research areas linked to infection-related keywords. In this graphic, each cluster represents all keywords with the most common frequency and are represented in VosViewer by a colour. In the figure, the keywords in the red cluster represent those found in FWI-derived publications and are associated with arbovirus infections; those in the green cluster were found in publications from the DR and are associated with HIV infections related to HIV infection.

Discussion

Our study shows that over the last 30 years, the scientific production of the FWI and the DR has increased progressively, with a majority of the associated publications appearing in journals ranked in the first quartile. The 2 sites tended to collaborate mainly with 2 major international partners: the USA for the DR and mainland France for the FWI. The field of infectious diseases is one of the most commonly represented for both sites, with each having its own specialty within this subject area, namely arbovirus infection for the FWI and HIV for the DR.

In the FWI, the increase in the number and quality of publications over the last 3 decades was particularly marked in the last 5-year period of the study (2015-2019). This could be due to the implementation of local strategies stimulating research and/or to the increase in the number of physicians with academic teaching positions.

The number of publications over the last 30 years was higher for the FWI than for the DR, with 2552 publications compared to 1047, respectively. This quantitative difference can be explained by the fact that the economic strength of a country may have repercussions on its scientific performance. Indeed, the DR has a gross domestic product (GDP) per capita of 7223 US dollars and is defined as an upper-middle-income country, while the FWI, defined as a high-income country, had (in 2017) a GDP of 28,117 US dollars (14).

Over the past 30 years, for the FWI, there has also been a progressive increase in the support for academic training through Ministry of Higher Education science and technology scholarship programs, more higher education professionals, and a greater number of specialized hospitals and teachers, as a strategy to promote research and development, thus increasing scientific publications (15).

We found a majority of publications published in journals ranked in the Q1 category of the journal classification system. With a view to improving the quality of research in the DR, the Ministry for Public Health established a national council for bioethics in health (Consejo Nacional de Bioética en Salud) in 2004, which is responsible for evaluating research to be carried out in human subjects throughout the country. The ultimate aim of this body is to standardize the quality of research and defend the quality criteria and ethical principles underpinning high-quality research (16). The high quality of the scientific output of the DR deserves to be highlighted, given that the country is considered to be an upper-middle-income one in terms of

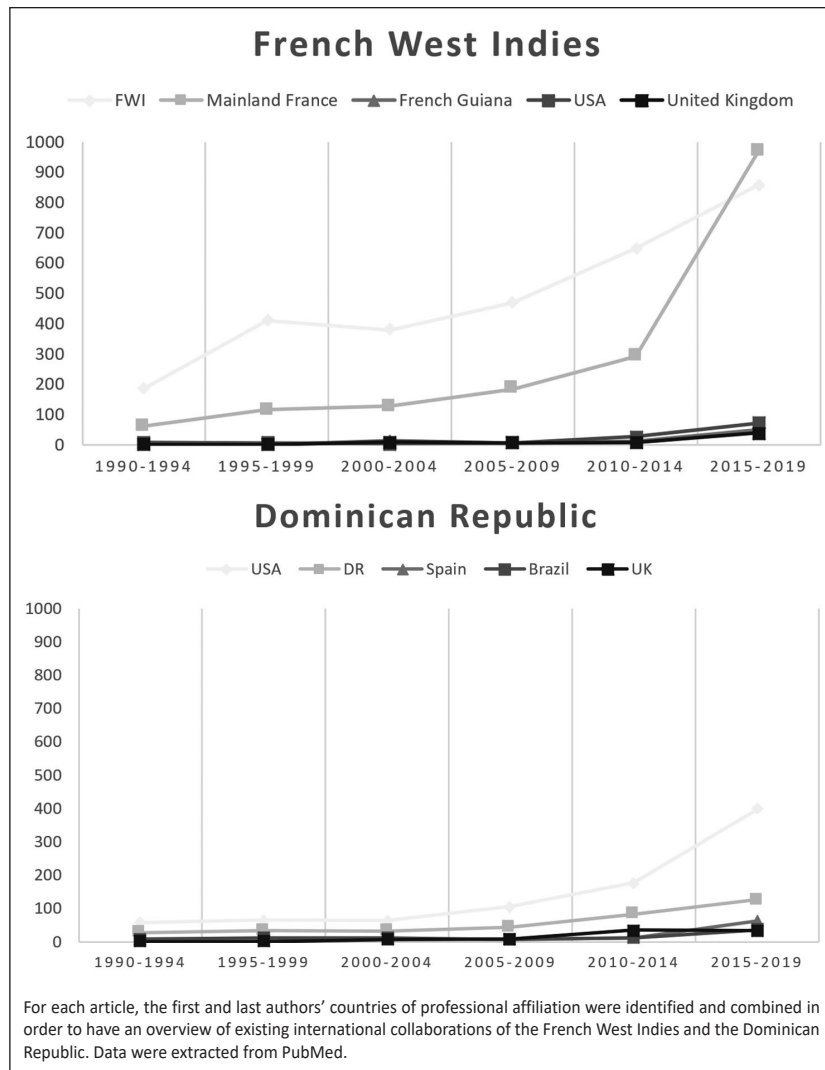


Figure 3. Trends in the number of articles from the French West Indies and the Dominican Republic according to first and last authors' country/region of professional affiliation, 1990-2019.

resources and is in competition with higher-resource countries. In addition, the increasing percentage of Q1 publications over time underlines the upward dynamic of research there. The various research policies leading to the certification and specialization of research teams have strongly contributed to this growth.

The 2 sites collaborated primarily with 2 large countries (the USA and France). In the DR, one of the influential factors in increasing the number of publications was the strong collaboration between the DR and the USA (thanks to longstanding diplomatic and cultural relations as well as affiliations between institutions and academies). This link between the 2 countries has intensified in recent years, resulting in an increase in direct funding to Dominican scientific research and the increased funding of scholarship programs, which provide study and research opportunities to Dominican students and professionals (5). For researchers operating

within the Guadeloupe and Martinique university hospitals, collaborators have come primarily (in the last 30 years) from mainland France. This type of collaborative partnership ensures increased visibility and provides researchers from Guadeloupe and Martinique with opportunities to get experience in performing and overseeing innovative, large-scale projects, which is an asset in terms of promoting *future* partnership potential. The growing association of senior researchers from the USA and France with our sites of interest could engender valuable experiences and become a springboard for developing teams of local and independent researchers within the Caribbean.

At both sites, one of the most common subjects for publications was, and remains, the field of infectious diseases (Figure 4). The proportion of publications in this category from 1990 through 2019 was 55% for authors from the FWI and 27% for those from the DR. For both the FWI and the DR, the field of infectious diseases represents a collaborative therapeutic area that, when explored, promotes the development of scientific research in terms of publication and visibility. Indeed, the inhabitants of Caribbean countries share sociodemographic features that may contribute to the emergence of infectious diseases; these diseases present a major challenge for the economic development of these countries, presumably sufficient to justify focusing their resources on this health problem.

In the DR, the growing number of publications in the disciplines of public health and infectious diseases has resulted from the increase of HIV and outbreaks of malaria, tuberculosis, and arbovirus in recent years, prompting increases in funding for scientific research. Conversely, the DR has not seen any rise in basic science publications, probably due to limited staff resources and technological limitations (5).

As shown in Figure 5, the contribution of the DR to scientific knowledge over time has been mainly related to HIV treatment and prevention, due to near-exclusive funding, with a consequent reduction in the number of publications in other health disciplines (Figure 4). It is noteworthy that more than 90% of HIV/AIDS research projects were funded by international organizations 16, with the National Council for HIV and AIDS (Consejo Nacional para el HIV y SIDA) highlighted as a local agency responsible for the management and allocation of financial resources, notably loans and

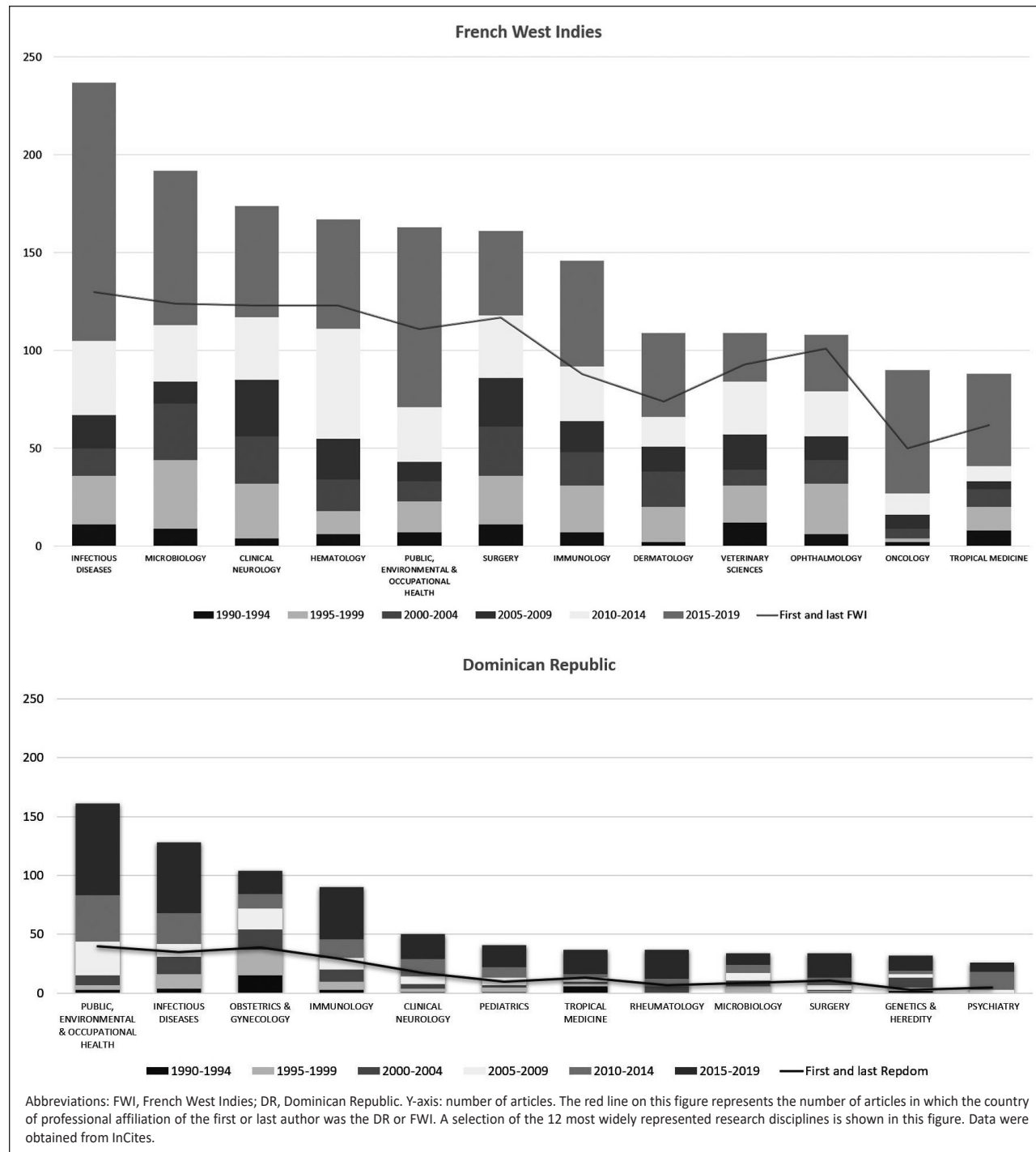


Figure 4. Distribution of articles published in the French West Indies and the Dominican Republic by research area, from 1990 to 2019.

grants from the Global Fund, WHO, Centers for Disease Control and Prevention, Pan American Health Organization (PAHO), National Institutes of Health, United States Agency for International Development, European Union, and United Nations Children’s Fund (17).

The DR has a population that is approximately 14 times greater than that of the FWI. Although there is a higher number of cases per year of arbovirus diseases, the trend in publications

in this research area is not as pronounced as expected. The chikungunya epidemic in the DR began in February 2014, with almost 430,000 cases in the first 6 months, representing 65% of all the cases reported to PAHO by 33 countries and territories of the Americas (18). In 2016, 5575 cases of Zika were detected in the DR, representing 13% of all the cases reported to PAHO in the Latin Caribbean region, and attributed to the early onset of epidemiological surveillance in the DR (19).

Close collaboration on arboviruses would enable both the FWI and the DR to broaden their knowledge of these pathologies, which present a real public health problem. Studies conducted in the French overseas territories of Guadeloupe and Martinique are usually associated and/or compared with those of mainland France; it would be interesting to make similar associations/comparisons with studies from the Caribbean neighbors of these 2 islands. Scientific cooperation in the countries exposed to arboviruses would give greater visibility to the scientific publications focusing on these diseases and could easily show that together we can make greater progress towards the ultimate goal of improving the prevention and treatment of these diseases. Furthermore, climate change is intensifying the interest in this therapeutic area. The FWI could produce important knowledge in this area and thus enable the implementation of prospective projects. For example, creating a bank of blood samples for research on arboviruses and that would be shared by the 2 sites would be a constructive and productive first step. The certified biobank of the FWI, which is already involved in several national and international studies, would be a partner of choice for scientific cooperation (20).

The researchers from the FWI published mainly on arboviruses, whereas those from the DR published mainly on HIV (Figure 5). This is because the HIV situation in the Caribbean, with almost 330,000 new cases and with 70% of people living with HIV accessing antiretroviral therapy, remains very worrisome (21). In addition, in France and majority of other developed countries, research in the field of HIV was center stage for several decades. Today, however, outstanding advances in therapy coupled with increased awareness about prevention have transformed HIV into a chronic disease that is well known and characterized. In terms of research in the FWI, emerging diseases that develop in epidemic form remain a major area of concern (e.g., arboviruses). This is a health issue that is shared by several neighboring countries in the Caribbean, including the DR, and is thus an area in which scientific cooperation would benefit all parties.

The dynamic of scientific collaboration within the Caribbean is a real challenge for the FWI. Indeed, language barriers, sociocultural differences, and disparate healthcare and demographic contexts exist throughout the Caribbean, and in fact, are potential impediments to this kind of collaboration (22). It is noteworthy that cooperation between the FWI and its Caribbean neighbors has already been initiated with the

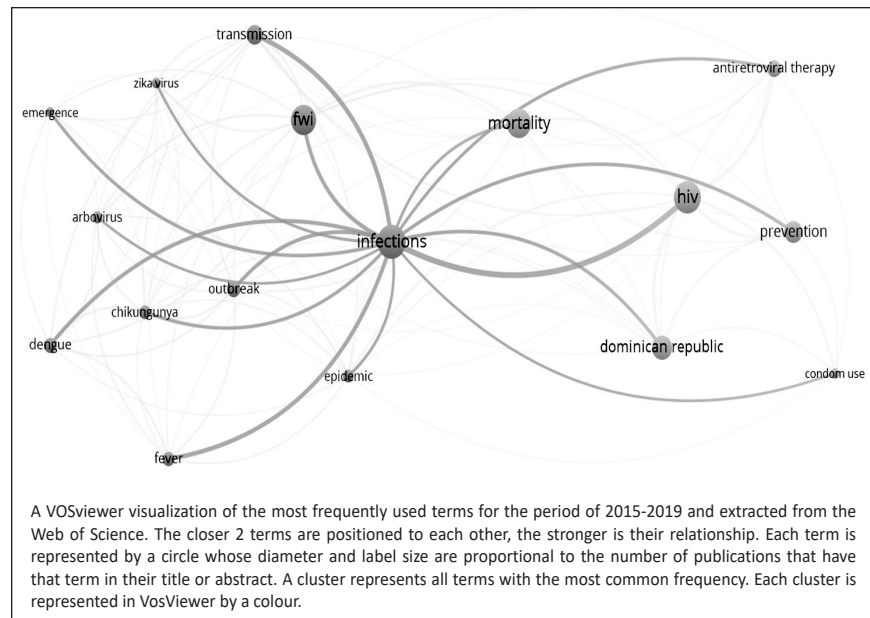


Figure 5. Network visualization of keywords related to infectious disease used in publications from the French West Indies and the Dominican Republic.

recent integration of Martinique and Guadeloupe into the Organization of Eastern Caribbean States in 2015 and 2019, respectively (23).

The Minister for Health of the DR paid an official visit to Martinique in 2019, during which visit prospects for scientific and medical cooperation, particularly in oncology, were discussed.

Other, similar, exchanges aimed at promoting scientific and medical cooperation are currently being undertaken and will continue throughout the next 5-year period.

One of the limitations of this article is the lack of exhaustiveness of the results obtained from the research conducted on the WOS website. Because we focused on Medline-indexed publications, none of the other publications from the 2 sites were analyzed. Upon exploring the affiliations, we found that several authors had multiple institutional affiliations, and we took into account each author's country of affiliation. We focused our analysis on the first and last authors rather than on all the co-authors, though including all the authors in the analysis could have provided us with more detailed information about the existing international cooperation at each site.

Conclusion

This study is one of the first to perform a bibliometric analysis of the scientific output (over a period of 30 years) of the FWI and the DR. This quantitative and qualitative analysis underlines the development of medical and scientific research in the FWI and the DR over the last 3 decades and highlights the predominance of the field of infectious diseases in that research. This therapeutic area, which gave rise to infectious diseases

publications at both sites, could be well-suited to partnerships and scientific cooperation. Creating research consortia that comprise researchers from different research institutes could help all who participate to mutually contribute to advancing scientific knowledge that is specific to their geographical areas. In the long term, integrating bibliometric indicators into routine practice would make it possible to closely monitor research and innovation strategies in these 2 regions.

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