

Institut Santé Publique Relations Internationales (ISPRI) / International Studies Public Health Institute (ISPHI)  
Rue E. Pons 69004 Lyon – France poreau\_brice@yahoo.fr Fax : +33 45 65 20 75 2 Tel: +33 45 65 20 753

Abstract

**Background:** Since the genocide occurred in 1994, Rwanda has faced up to the challenge of rebuilding. Public health is a main field to understand this rebuilding.

**Objectives:** In this paper, the aim was to map the scientific research on public health in Rwanda after the genocide and to present the links between different financing systems.

**Methods:** We used bibliographic analyses with Web of Science of papers published during the period 1975-2014. We performed analyses on journals, most cited articles, authors, publication years, organizations, funding companies, countries, and keywords.

**Results:** We obtained 86 articles between 1975 and 2014. Most articles were published after 2007. The main countries of research laboratories were the United States of America, Rwanda, England and Belgium and represented the main network collaboration. The relevant keywords were: HIV, woman, child, program, rural and violence.

**Conclusions:** Public health research on Rwanda appeared 14 years after the genocide. A main field was emerging: the spread of HIV with mother-child transmission, and the policies to take this subject into account in rural zones. The network of institutions developing these studies was USA-Rwanda.

**Keywords:** Rwanda; Public health; HIV; woman; social network analysis; bibliometrics

**DOI:** <http://dx.doi.org/10.4314/ahs.v14i4.41>

Introduction

Twenty years ago, between 800000 and 1200000 people perished according to historical references<sup>1</sup>. In few months, ethnic mass slaughters occurred in all parts of the country. The rebuilding has remained incomplete because of the gigantic tasks in different areas. One of the major areas is public health. In fact, public health represented the needs and demands about population<sup>2</sup>. In low-income countries, public health systems were not suitable to population need; therefore, after genocide and the efforts to rebuild the healthcare structures, the task seemed a major one<sup>3</sup>. Public health covered different fields such as infectiology<sup>4</sup>, parasitology<sup>5</sup>, mental health<sup>6</sup>, organization of the centers and financing movements<sup>7</sup>.

**Corresponding author:**  
Brice Poreau  
Institut Santé Publique Relations  
Internationales (ISPRI)/International  
Studies Public Health Institute (ISPHI)  
Rue E. Pons 69004 Lyon–France  
poreau\_brice@yahoo.fr  
Fax : +33 45 65 20 75 2 Tel: +33 45 65 20 753

After 2008, the World Health Organization presented several programs on public health in Rwanda<sup>8</sup>. After 2010, the main objectives were the fight against HIV, tuberculosis and malaria, the fight against the transmission mother-child<sup>8</sup>, corresponding to the Millennium Development Goals<sup>4-6</sup>.

The aim of this article was to analyze the advancement of scientific publications on public health in Rwanda during the period 1975-2014, and to present the knowledge structures of public health researchers in the world compared to the social situation of Rwanda.

Methods

We used the Science Citation Index-Expanded (SCIE) database, accessed through the Web of Science (WOS) platform from Thomson Reuters. In the advanced search, we obtained the articles by this formula: TS=(public health AND Rwanda). We verified each record to ensure their relevance. The period was 1975-2014. The aim was to see any differences before and after genocide (occurred in 1994). Moreover, no restrictions were performed concerning the document types. Then, we performed the “analysis results” function of WOS. We extracted: journals, most cited articles, au-

thors, countries, funding agencies, organizations, publication years.

In order to evaluate the research networks between countries, after the analysis by country, we reviewed records of each country and then performed the analysis a second time in order to know the links between the chosen country and the other countries. We then established the diagram.

Finally, we performed several keyword (KW) researches to get the main relevant topics. These analyses are to compare with former bibliometric studies in other fields<sup>9-11</sup>.

Results

We obtained 86 records. Only one publication was before 1994 (table1). 62/86 (72%) were after 2007 (table1).

Table 1: records per year from 1991 (first publication) to 2014. 72% of publications were after 2007.

Publications	Records
2014	1
2013	15
2012	13
2011	13
2010	8
2009	9
2008	3
2007	5
2006	4
2004	2
2003	1
2002	1
2000	2
1999	1
1998	4
1997	2
1995	1
1991	1

The three authors with most records were Binagwaho, Karema and Ngabo with only Binagwaho first author of articles. He was attached to Rwanda Institutions. The main journals were The Bulletin of WHO (7/86), AIDS (5/86), BMC Health services research (3/86) and BMC public Health (3/86). The three most

cited records were from Leroy et al., Mann et al. and Otten et al.<sup>4,12-13</sup>.

The funding agencies were numerous and very few from Africa (table 2). We noted 4/70 (5,7%) fundings from Rwanda.

Table 2: funding agencies (68) from European, US or Asian regions, a small part were form Rwanda with the Ministry of Health and the National Rwanda University and the United States of America with Harvard University

Table 2: funding agencies (68) from European, US or Asian regions, a small part were form Rwandan institutions.

Funding Agencies	records
NIMH	2
WELCOME TRUST	1
AGENCE NATIONALE DE RECHERCHES SUR LE SIDA ET LES HEPATITES VIRALES ANRS	1
AIDS INTERNATIONAL TRAINING AND RESEARCH PROGRAM AITRP	1
AUSAID AUSTRALIAN LEADERSHIP AWARD	1
BELGIAN TECHNICAL COOPERATION IN RWANDA	1
BILL AND MELINDA GATES INSTITUTE FOR POPULATION AND REPRODUCTIVE HEALTH	1
CANADIAN INSTITUTES OF HEALTH RESEARCH CIHR	1
CENTERS FOR DISEASE CONTROL AND PREVENTION	1
CHR MICHELSEN INSTITUTE CMI	1
CIHR SOCIAL RESEARCH CENTRE IN HIV PREVENTION	1
CONNAUGHT START UP AWARD	1
DEPARTMENT OF HEALTH PROMOTION AND DEVELOPMENT HEMIL	1
DORIS DUKE CHARITABLE FOUNDATION S AFRICAN HEALTH INITIATIVE	1
EFFICIENCE CI ANRS	1
EMORY CENTER FOR AIDS RESEARCH	1
EUROPEAN AND DEVELOPING COUNTRIES CLINICAL TRIALS PARTNERSHIP EDCTP	1
FLEMISCH RESEARCH FOUNDATION FWO BELGIUM	1
FLEMISH INTERUNIVERSITY COUNCIL VLIR UOS	1
FOGARTY FOUNDATION	1
GENEVA GLOBAL WITH SCHISTOSOMIASIS CONTROL INITIATIVE SCI	1
GLOBAL ALLIANCE FOR IMPROVED NUTRITION GAIN	1
GLOBAL BENEFIT CANADA	1
GLOBAL FUND	1
GLOBAL NETWORK FOR NEGLECTED TROPICAL DISEASES GNNTD	1
GOVERNMENT OF TAIWAN	1
HENRY M JACKSON FOUNDATION	1
HIV SECTION UNICEF NEW YORK	1
IMPACT UNIVERSITY OF ABERDEEN UK	1
INTERNATIONAL AIDS VACCINE INITIATIVE	1
IRANIAN MINISTRY OF HEALTH AND MEDICAL EDUCATION	1
JOHN SIMON GUGGENHEIM FOUNDATION	1
MICHAEL AND SUSAN DELL FOUNDATION	1
MICRONUTRIENT INITIATIVE UNICEF	1
MINISTRY OF FOREIGN AFFAIRS OF GRAND DUCHE OF LUXEMBOURG	1
MINISTRY OF HEALTH OF THE REPUBLIC OF RWANDA	1
NACCAP	1
NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES OF THE	1
NATIONAL INSTITUTES OF HEALTH	1
NATIONAL INSTITUTE OF CHILD HEALTH AND HUMAN DEVELOPMENT	1
NICHD	1
NORWEGIAN KNOWLEDGE CENTRE FOR THE HEALTH SERVICES NORWAY	1
NORWEGIAN RESEARCH COUNCIL	1
NOSSAL INSTITUTE FOR GLOBAL HEALTH AT THE UNIVERSITY OF MELBOURNE	1
OFFICE OF HIV AIDS AT THE UNITED STATES AGENCY FOR	1
INTERNATIONAL DEVELOPMENT	1
ORC MACRO INC	1
PEPFAR	1
PEPFAR S UNIVERSITY	1
PRESIDENT S EMERGENCY PLAN FOR AIDS RELIEF	1
PUBLIC HEALTH AGENCY OF CANADA	1

were the most two represented with 24/86 for Rwanda institutions and more than 30 for the USA (table 3). The ten main countries were the United States of America (41/86), Rwanda (33/86), England (15/10), Belgium (10/86), Switzerland (9/86), France (7/86), Australia (5/86), Canada (5/86), Kenya (5/86) and the Netherlands (5/86).

We developed the networks between the main countries (diagram 1). The scientific network on Rwanda public health research with the main countries involved is described. The main arrow is between the USA and Rwanda (with 41 records on 86). This is the most important cooperation. The second most important collaboration is between Rwanda and Belgium (8/86 articles). Finally,

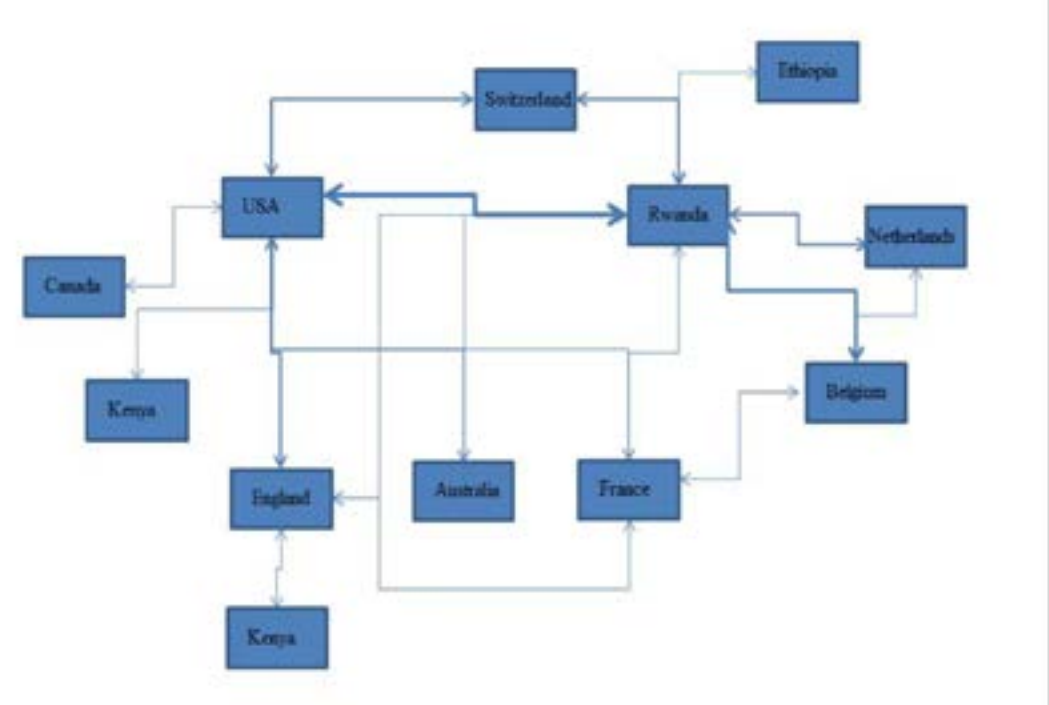
Table 3: Main institutions, references from Rwandan institutions were a large part and US institutions were well represented.

Organizations	records
HARVARD UNIV	11
MINIST HLTH	8
NATL UNIV RWANDA	8
INST TROP MED	6
COLUMBIA UNIV	5
BRIGHAM WOMENS HOSP	4
WORLD BANK	4
ACCESS PROJECT	3
DARTMOUTH CTR HLTH CARE DELIVERY SCI	3
LONDON SCH HYG TROP MED	3
PARTNERS HLTH	3
PARTNERS HLTH INSHUTI MU BUZIMA	3
RWANDA BIOMED CTR	3
UNIV AMSTERDAM	3
UNIV BORDEAUX 2	3
UNIV MARYLAND	3
UNIV N CAROLINA	3
UPPSALA UNIV	3
WHO	3
ABT ASSOCIATES INC	2
AUSTRALIAN NATL UNIV	2
CTR HOSP UNIV KIGALI	2
EMORY UNIV	2
GLOBAL HLTH DELIVERY PARTNERSHIP	2
HEALTHNET INT	2

the diagram illustrates four other networks: Rwanda-Switzerland (4/86), Switzerland-USA(5/86), England-

USA (4/86) and Netherlands-Rwanda (4/86). The last networks are less important (less than 4 records on 86).

Diagram 1: scientific networks about Rwanda public health research and the main countries involved.



There are three main groups: the first and most important is the USA (with 41 records on 86). Then, the second group is Belgium (8/86 articles). The third important group is between: Rwanda-Switzerland, Switzerland-USA, England-USA and Netherlands-Rwanda.

Keyword analysis revealed the terms woman (women) for 29/86 records, program(s) 30/86 records, HIV 24/86 records, child (children, childhood) 21/86 records, rural 17/86, violence 12/86, sex 12/86.

Discussion

According to our analysis, only one study was published before 1994<sup>14</sup>. It deals with the economic cost of malaria in Rwanda. Article on the same subject was published after 2007<sup>15</sup> and corresponded to the Millennium Developmental Goal 6 (combat HIV/AIDS, malaria and other diseases). Nevertheless, most of the records were after 2007. It has taken more than one decade after genocide to see interest in Rwandan public health. Moreover, the last few years (from 2010 up to now) are the most relevant for public health studies. The limitations on publishing and research cannot be only attributed to genocide. Because only one study was published before genocide, it means that structures concerning public health were not created before 1994. The genocide didn't allowed researches to create these structures until the end of the 2000's. It means that

most areas of public health and especially those related to Millenium development Goals 4 to 6 are showing an increasing dominance in publication.

On an international political point of view, this period of publications corresponds to the programs launched by the World Health Organization<sup>8</sup>. Moreover, it corresponds to a major involvement of the government. The year 2012 was significant with advertising on the need to prevent several diseases<sup>16</sup>. International financing system seems to be needed for public health research. In fact it seemed that Rwanda alone was not able to develop such research field without this international help.

Our analysis demonstrated that the main field of public health in the 86 records concerned Millenium Development Goal 4 (reduce child mortality), 5 (improve maternal health) and 6 (combat HIV/AIDS, malaria and other diseases) about HIV spread and mother-child transmission, so that new programs were developed to explain this transmission<sup>17</sup>. Moreover, the programs focused on rural provinces<sup>3</sup>. Within the HIV studies, violence and sexual abuse concerning women were putting forward (Millenium Development Goal 5).

Nevertheless, we thought that other subjects could be more represented, such as mental health diseases, after the genocide<sup>18</sup>. This area seems to be dormant and could benefit from renewed impetus and focus on re-

search and publishing. It could be that they do the work but do not publish. Research on areas of health systems and Ministry of Health and Family Welfare were not available in our study and could be a limitation. Mental health seemed relevant not only because of war-related trauma, but also of disease-related trauma such as AIDS or other diseases. It seems clear that the current policies are not involved in such a field. Only four records on 86 put forward mental health. Mental health is clearly a burning issue for researchers in neighboring countries as Uganda. The studies deal with the impact of war in psychiatric problems and also with the impact of disease<sup>19-20</sup>. It could be explained by an historical and political points of view. In fact, in order to rebuild the country, the most urgent was not the psychiatric concerns. For the neighboring countries where most victims fled to, such as Uganda, post-traumatic disorders have become an obvious problem to take into account.

Finally, the networks between countries and the funding companies demonstrated that the public health in Rwanda, focused on HIV and mother-child transmission, since 6 years, were funded by Western organization with a major collaboration between Rwanda and the United States of America. Then, Belgium played also a major role, showing that Belgium remains still a help for Rwanda. Asian countries were not really implicated in the studies onpublichealth. European countries such as England, Switzerland or France were involved in these records. Other African countries such as Kenya, Ivory Coast, and Ethiopia were also involved. In fact, a limit of our study was the only use of SCIE database. This study was performed on this data base because the analyses were possible with the system. Suchfunctionisnotavailable withother databases. That's why we thought that the participation of other African countries might be under estimated in the Rwandan public health research.

However, the link between the United States and Rwanda in this field, even if a bias of database choice could be seen, seems clearly relevant compared to other links.

Conflicts of interest

None

References

1. Poreau B. Extension de la théorie de la reconnaissance, l'exemple du génocide rwandais. Paris: L'Harmattan, 2011.

2. Meessen B, Kashala JPI, Musango L. Output-based payment to boost staff productivity in public health centres: contracting in Kabutare district, Rwanda. Bulletin of the World Health Organization. 2007 ;85 :198-115.

3. Meessen B, Kashala JPI, Musango L, Lemlin J. Reviewing institutions of rural health centres: The performance initiative in Butare, Rwanda. Tropical medicine and international health. 2006;11:1303-1317.

4. Leroy V, Newell ML, Dabis F, et al. International multicenter pooled analysis of late postnatal mother-to-child transmission of HIV-1 infection. The Lancet. 1998;352:597-600.

5. Zoli A, Shey-Njila, Assana E, et al. Regional status, epidemiology and impact of Taenia solium cysticercosis in Western and Central Africa. Acta Tropica. 2003;87:35-42.

6. Munyandamutsa N, Nkubamugisha PM, Gex-Fabry M, et al. Mental and physical health in Rwanda 14 years after the genocide. Social psychiatry and psychiatric epidemiology. 2012 ;47:1753-1761.

7. Meessen B, Soucat A, Sekabaraga C. Performance-based financing: just a donor fad or a catalyst towards comprehensive health-care reform? Bulletin of the World Health Organization. 2011 ;89 :153-156.

8. World Health Organization. Rapport annuel 2011. Kigali: World Health Organization, 2012.

9. Law J, Whittaker J. Mapping acidification research: a test of the co-word method. Scientometrics. 1992;23:417-461.

10. Chiu WT, Huang JS, Ho YS. Bibliometric analysis of severe acute respiratory syndrome related research in the beginning stage. Scientometrics 2004;61:69-77.

11. Jose L. Aleixandre JL, Aleixandre-Tudo JL, Bolanos-Pizzaro M, Aleixandre-Benavent R. Mapping the Scientific Research on Wine and Health (2001-2011). J. Agric. Food Chem.2013;61:11871-11880

12. Mann JM. Medicine and public health, ethics and human rights. Hastings Center report. 1997;27:6-13.

13. Otten M, Aregawi M, Were W et al. Initial evidence of reduction of malaria cases and deaths in Rwanda and Ethiopia due to rapid scale-up of malaria prevention and treatment. Malaria Journal. 2009;8.

14. Ettling MB, Shepard DS. Economic cost of malaria in Rwanda. Tropical medicine and parasitology. 1991;42:214-218.

15. Ruxin J, Negin J. Removing the neglect from neglected tropical diseases: Rwandan experience (2008-2010). Global public health. 2012;7:812-822.

16. Poreau B. Rwanda: une ère nouvelle. Paris: L'Harmattan, 2012.

17. Binagwaho A, Mugwaneza P, Irakoze A et al. Scaling up early infant diagnosis of HIV in Rwanda, 2008-2010. *Journal of Public Health Policy*. 2012;1-15.
18. Munyandamutsa N, Nkubamugisha P, Gex-Fabry M, Eytan A. Mental and physical health in Rwanda 14 years after the genocide. *Soc Psychiatry Psychiatr Epidemiol.*,2012;47:1753-1761.
19. Okello J, Nakimuli-Mpungu E, Musisi S, Broekaert E, Derluyn I. The association between mental health symptoms among school-going adolescents in Northern Uganda : the moderating role of war-related trauma. *Plos One*, 2014;9:e88494.
20. Han CH, Ssewamala FM, Wang J. Family economic empowerment and mental health among AIDS-affected children living in AIDS-impacted communities: evidence from a randomised evaluation in south-western Uganda, *J Epidemiol Community Health*, 2013;67:225-230.