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Health needs and public health functions addressed in scientific publications in Francophone sub-Saharan Africa

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SUMMARY

Objective: To describe the reporting of public health research in Francophone sub-Saharan Africa (FSA).
Study design: A bibliometric research study of scientific public health publications in FSA, which includes 24 countries and approximately 260 million people.
Methods: Two researchers analysed original articles published in 2007 in the medical or social sciences fields and indexed in *Scopus*. At least one co-author of articles had to be based in FSA. The analysis focused on research field, public health function (WHO classification), FSA country author's affiliation, language, journal type and global burden of disease (WHO classification).
Results: Of 1047 articles retrieved by the search, 212 were from the public health field. The number of articles per country varied from 0 to 36. Public health functions examined were health service research (24.5%), health monitoring (27.4%), prevention (15%) and legislation (0.5%). The distribution of health needs described in the articles was close to that of the WHO data for Africa for 2004: infectious and parasitic diseases (70% vs 54%), maternal and perinatal conditions (15% vs 17%), non-communicable diseases (15.6% vs 21%), and injuries (0.5% vs 8%).
Conclusion: The areas reported in published articles from sub-Saharan Africa reflect the health needs distribution in Africa; however, the number of publications is low, particularly for prevention. In light of the current focus on evidence-based public health, this study questions whether the international scientific community adequately considers the expertise and perspectives of African researchers and professionals.

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Introduction

Public health research contributes to a better comprehension of health determinants and to the development of preventive or curative interventions. Scientific publication in a peer-reviewed journal is the natural outcome of all research activity, promoting dissemination of scientific and professional knowledge.

In 2006, 90% of the world's scientific production came from three main areas:[1] the European Union (EU), 33% of publications; North America, 30% and Asia, 22%. Only 1.2% of world publications came from Africa, whose population is approximately twice that of the EU, with 0.3% from sub-Saharan Africa, excluding South-Africa. In 1997, Francophone sub-Saharan Africa produced only 12% of the scientific publications from Africa.[2]

Such statistics illustrate the gap between Europe or North America and Africa in terms of scientific research. It was wondered whether the situation was similar in the public health field. The state of public health research in Europe is well known, thanks to a bibliometric overview within the collaborative study SPHERE (*Strengthening Public Health Research in Europe*).[3]

The scientific public health publications from Francophone sub-Saharan Africa (FSA), a cultural zone including 24 countries and covering an estimated 260 million people, was analyzed by bibliometric study.

Methods

Identification of articles

Public health publications published in 2007 in the *Scopus* database (http://www.scopus.com/home.url) were identified. *Scopus* was chosen because this database covers a wider journal range (more than 18,000 journals indexed) than other internationally recognized databases (http://www.fasebj.org/content/22/2/338.long) and because of its multidisciplinary nature (articles of public health can be published in fields other than biomedical, especially social sciences). All original articles (excluding literature reviews, letters and editorials) that were published in the health sciences, human and social sciences or life sciences fields; in any language; with at least one of the co-authors from FSA (search strategy described in Table 1) were included. Articles without abstracts were excluded.

Selection of articles

Selected articles needed to concern one of the public health functions defined by the World Health Organization (WHO) and used in the SPHERE study.[4] Each article was classified as concerning health monitoring (subdivided into monitoring health and disease or health determinants), health services research, prevention, or legislation. The health services research category was wide-ranging and included analysis of health care systems, planning, quality, costs, health policy and access to health care. Prevention covered health education, health promotion, health communication, health policy, health program, action on the environment, chemical prevention, screening, immunization and treatment of addictions. Legislation involved analysis of public health law and regulation. As compared with laboratory or clinical (patient-related) health research, public health research is undertaken at the population level, so articles related to clinical research were excluded (Fig. 1).

Content analysis

Two of the authors (JB, FA) read the titles and abstracts of articles to determine whether they were related to public health, then assigned the categories of the research to the selected articles. In case of disagreement in the classification, a common third reading was made to establish consensus. The number of public health research publications for each FSA country was estimated. Data were collected on public health functions, health needs, authors' affiliation, and publication language.

For each article, only one function of the WHO classification was identified and used by the SPHERE study.[4] Health needs were classified in terms of Disability Adjusted Life Years (DALYs) as established by the WHO.[5] Mortality, morbidity and disability data are combined into a single measure of disease burden known as DALYs. The Global Burden of Disease (GBD) project provides estimates of the burden of disease worldwide and at the country level. The GBD conditions are organized into four levels. The articles were classified by the first level, which contains four categories: 1) communicable diseases, maternal

Table 1 – Literature search filters for public health articles.

Connector	Field	Parameter
	Subject of research	('MEDI') OR ('SOCI') OR 'PHAR') OR ('IMMU') OR ('MULT') OR ('NEUR') OR ('NURS') OR ('HEAL') OR ('PSYC') OR ('MULT')
And	Affiliation	(comores) OR (comoros) OR (maurice) OR (mauritius) OR (seychelles) OR ('cap vert') OR ('cape verde') OR (mauritanie) OR (mauritania) OR (mali) OR (niger) OR (tchad) OR (chad) OR (senegal) OR ('burkina faso') OR (benin) OR (guinée) OR (guinea) OR ('cote d'ivoire') OR ('ivory coast') OR ('republique centrafricaine') OR ('central african republic') OR (togo) OR (cameroun) OR (cameroon) OR ('guinée equatoriale') OR ('equatorial guinea') OR ('republique democratique du congo') OR ('democratic republic congo') OR (gabon) OR (congo) OR (rwanda) OR (burundi) OR (djibouti) OR (madagascar))
And	Publication year	2007
And	Publication type	Article
And Not	Publication type	Review, letters, editorials
And	Language	All

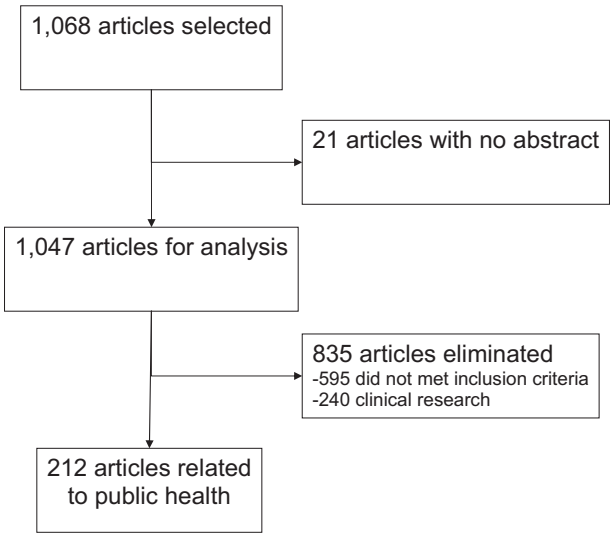

Fig. 1 – Flowchart of public health articles in the study.

and perinatal conditions (also nutrition deficiencies); 2) non-communicable diseases (including cancer, cardiovascular diseases, neuropsychiatric conditions); 3) injuries (intentional and non-intentional); 4) other, not related to any disease but concerned with a health determinant (such as a behaviour or an environmental exposure) or a methodological issue.

If possible a GBD category to each article was assigned. Two categories were assigned to a few articles that did not focus on a single disease. Then the distribution of categories (calculated proportion) was compared to that of DALYs for Africa in 2004 (reference proportion) by chi-squared test (single proportion vs standard). When the ratio of publications to DALY was >1, the topic was considered to receive a high level of attention relative to its share of disease burden. A $P < 0.05$ was considered statistically significant. Statistical analysis involved use of SAS 9.1 (SAS Inst., Cary, NC).

Results

1047 articles for the study were identified; 212 were related to public health and selected (Fig. 1). These 212 articles were published in 115 journals (93 in English, 21 in French and one in German). The annual mean of articles by journal was 1.8 (max = 11 for Cahiers Sante).

In total, 156 articles were published in English, 55 were in French and one was in German. The number of articles varied from 0 to 36 per country (Fig. 2). Most articles were co-authored by at least one non-African collaborator: 106 [50%] were from Europe; 41 [19.3%] were from the United States and 33 [15.5%] were from other areas. For almost one-third of the articles, authors were from two different African countries: 24 [11.3%] were from another FSA country; 36 [17%] were from another African country.

Public health functions

More than half of the articles (157 [59.9%]) concerned health monitoring, mainly behavioural and environmental factors. Health service research was described in one-quarter (52 [24.5%]) of the publications, prevention in 32 (15%) and legislation in 1 (0.5%) (Table 2).

Health needs

Most articles discussed health needs. Indeed, 52 articles concerned health determinants not specifically related to a disease, methods or health monitoring.

Table 3 presents the health needs discussed in articles: the topics in decreasing order of frequency were infections and parasitic diseases (70%), non-communicable diseases and maternal and perinatal health (15.6% and 15%, respectively), and injuries (0.6%). The proportion of articles devoted to communicable diseases, involving the greatest burden of disease and engendering the highest proportion of research, was higher than the DALY proportion (70% vs 53.9%). However, the proportion of articles describing maternal and perinatal conditions was similar to the DALY proportion (15% and 17.2%). Injuries received less research attention as compared with their share of the disease burden (0.6% vs 7.8%).

Discussion

Production of scientific public health publications in FSA

The production of scientific publications related to public health as reflected by this bibliometric study is weak in Africa as compared with that in Europe (7000 annual publications) and the United States (9400 publications).[1] This trend is reflected in the volume of publications from sub-Saharan Africa, which contributed to only 1% of the worldwide publications in 2000 as compared with EU and North America, which contributed 40.2% and 36.8% respectively.[6] This trend is confirmed by the Tijssen study[7] which revealed that the contribution of Africa to global research production was low between 1980 and 2004. These results can probably be explained by the combination of two factors. On the one hand, less research is conducted in Africa, and on the other, the work is less visible because it is not published or is published in local journals, not indexed in international databases.

Several factors may explain the low research activity. In particular, funding for this activity is low. According to UNESCO, Office of Economic Cooperation and Development (OECD) countries dedicated 2.2% of their gross domestic product (GDP) to research and development, and sub-Saharan Africa dedicated only 0.2%.[8] Moreover, the profession of researcher has been decreasingly valued, and teachers and researchers were frequently unsatisfied with their salaries.[9] This situation leads to the development of research outside public institutions, researchers' emigration to wealthier countries or professional conversion.[10]

The study results reflect the difficulties FSA authors have in publishing in indexed journals. Several reasons can explain this phenomenon. Firstly many African researchers have scientific writing training problem. Zofou et al. identified lack of training as a major need raised by young scientists and postgraduate students from English and French-speaking Africa.[11] Secondly, because of the specific health problems in

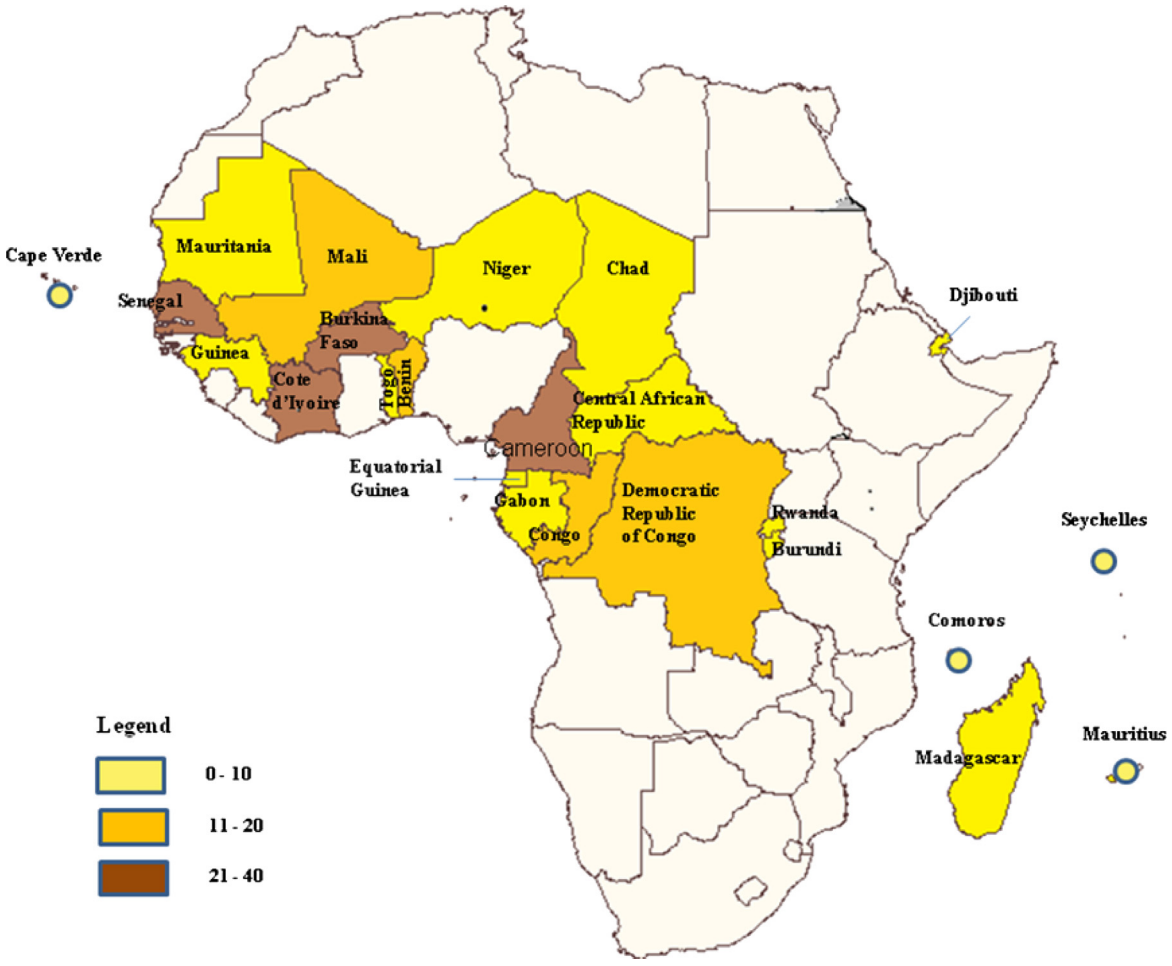

Fig. 2 – Number of publications by stated or country of author affiliation in 2007.

Table 2 – Public health articles by function.

Domain	No. of articles	%
Health monitoring	**127**	**59.9**
Measurement of health/disease	58	27.4
Determinants	69	32.5
- Environmental	23	10.8
- Behavioural	46	21.7
Heath services research	**52**	**24.5**
- Health care system	11	5.2
- Planning	2	0.9
- Quality	16	7.5
- Costs	12	5.7
- Health policy	7	3.3
- Access to health care	4	1.9
Prevention	**32**	**15.1**
- Health education and promotion	17	8.0
- Screening	2	0.9
- Immunization	9	4.2
- Chemical prevention	3	1.4
- Treatment of addictions	1	0.5
Legislation	**1**	**0.5**
Total	**212**	**100**

Africa, international journals may hesitate to accept for publication reports that may have limited application in developed countries, and even when they are published, these articles are less cited than others.[12] As well, African journals, which publish much of the work of African researchers, are rarely indexed in major international databases and thus not visible, not cited, and not valued. For example, only 31 of the 4900 journals indexed by MEDLINE are from Africa.[13] Senegal was represented by two journals, Madagascar and Mali a single journal each.[14] Thus, an estimated 65% of African research papers are published in local journals that are not listed in the international citation databases.[15]

However, because of the particularity of health contexts, systems and situations in FSA, a better international visibility and recognition of African research in public health is essential. With the current focus on evidence-based public health, this situation questions the consideration by the international scientific community of African professionals and researchers' perspectives and expertise. To improve the situation, firstly, the diffusion of African publications should be promoted. Initiatives such as the African Index Medicus[16] or African Journals Online[17] contribute to this goal. On the other hand, improving the rate of publications in indexed journals need to be worked.

Table 3 – Comparison of ratios of articles (percentage) to Disability Adjusted Life Years (DALYs; percentage) (2004 World Health Organization [WHO]) according to four main categories of disease burden.

Diseases	Articles (%)	DALYs (WHO)	Ratio articles/DALYs	P
Infectious and parasitic diseases	70.00	53.88	1.30	0.0003
Tuberculosis	2.50	2.88	0.87	**0.85**
Sexually transmitted disease	4.40	0.92	4.78	<0.0001
HIV	15.00	12.39	1.21	**0.66**
Diarrhoea	1.25	8.55	0.14	**0.001**
Childhood cluster diseases	3.12	3.33	0.94	**0.88**
Malaria	14.37	8.21	1.75	0.0045
Other infectious and parasitic diseases	29.37	3.74	7.85	<0.0001
Maternal, perinatal and nutritional conditions	**15.00**	**17.22**	**0.87**	**0.59**
Maternal conditions	6.25	3.96	1.58	0.14
Perinatal conditions	3.75	10.14	0.37	0.0074
Nutritional deficiencies	5.00	3.12	1.60	0.07
Non-communicable diseases	**15.62**	**21.02**	**0.74**	**0.09**
Malignant neoplasms	0.60	1.64	0.36	0.31
Neuropsychiatric conditions	2.50	5.15	0.48	0.12
Sense organ diseases	0.60	2.50	0.24	0.13
Cardiovascular diseases	5.00	3.78	1.32	0.42
Other non-communicable diseases	6.87	5.35	1.28	0.39
Injuries	**0.60**	**7.88**	**0.076**	**0.0078**
Unintentional injuries	0.60	5.37	0.11	0.0079

Unequal production

The production of publications varied considerably among regions and countries of Africa. Indeed, West Africa alone produced nearly two-thirds of the articles, which confirms that this region was the third producer of articles after Southern Africa and Northern Africa.[18]

Moreover, four countries of FSA (Cameroon, Burkina Faso, Senegal and Cote d'Ivoire) jointly accounted for almost 50% of all publications. These countries were the first four Francophone producers of biomedical publications from sub-Saharan Africa according to previous studies.[7,19] These findings are consistent with those of Gaillard and Waast[20] who found two decades ago that Cameroun, Senegal, and Côte d'Ivoire were among the main French-language producers of scientific publications. In addition, Uthman reported that Senegal produced at least 75 biomedical publications per year, followed by Cameroon, Burkina Faso and Benin, with 31–75 publications per year from 1996 to 2005.[18] The structure of the research fields in these countries could explain this situation. For example, Burkina Faso has developed a research culture with support for dedicated institutions such as the Muraz centre. This centre is among the oldest and most active centres of the *Organisation de Coordination et de Coopération pour la Lutte Contre les Grandes Endémies*. Cameroon has one of the 10 national academies of Africa,[2] as does Senegal, and it is bilingual (French and English).

International partners

It was found that primary research partners for FSA authors were from Europe, particularly France, then North America. These results confirm data from *Observatoire des Science et des Techniques-OST*.[1] However, results for this north–south partnership were more prominent in this study than in the 2000 UNESCO study (69.3% vs 24.5%).[6] Indeed, international cooperation through the *Agence Universitaire Francophone* (AUF) plays an important role in terms of university support, including financial support. Moreover, the pairing of institutes and institute departments with French structures specialized in tropical sciences, such as the *Centre International de Recherche Agronomique et de Développement-(CIRAD)*, *Institut de Recherche et de Développement-(IRD)*, and the network of the *Institut Pasteur*[21] is also significant. Some topics such as HIV/AIDS are internationally oriented and tend to attract more international funds, partnerships, and opportunities to publish in international scientific literature. The United States provides funds for numerous projects related to HIV/AIDS in Africa through the US Agency for International Development (USAID) and President's Emergency Plan for AIDS Relief. The USAID is the first funding source for research in Africa, followed by the EU, French Cooperation and WHO.[9] Furthermore, a non-governmental organization, the Bill and Melinda Gates Foundation, is now a leading funder of research in tuberculosis and HIV/AIDS in sub-Saharan Africa. Moreover, 20% of active researchers practice their research activity on behalf of an outside interest (i.e. the research topics are based on the funder agendas and priorities).[22]

The south–south collaboration is also significant. This collaboration could lead to greater motivation by researchers and an improvement in number of publications, especially with teaching careers now linked to scientific publication and quality evaluated by an inter-state academic commission such as Conseil Africain et Malgache pour l'Enseignement Supérieur (CAMES).

Specific results for Africa in terms of public health functions

Most articles focused on monitoring, particularly monitoring health determinants, then health services research, prevention, and finally legislation, with a small proportion of articles. The findings for determinants and health services research were consistent with results for the SPHERE study, which analyzed research articles published in French in peer-

reviewed public health journals (32.5% vs 46% and 24.5% vs 27%, respectively).[23] The proportion devoted to prevention in this study was twice that found in the SPHERE study (15% vs 7%). However, given the potential impact of prevention on population health, the proportion of publications addressing such topics in tropical Africa is low.

Publication themes related to health needs and specific to Africa

In terms of health needs in Africa as determined by the WHO, a balance in publications was found, although those of infectious diseases seemed globally overrepresented (70% vs 53.9), with a 1.30 ratio, and an underrepresentation of injuries (0.6% vs 5.37). Malaria was the most explored need, which relates to the disease being the most common reason for seeking healthcare in sub-Saharan Africa. The results were consistent with Hofman et al., who found that 15% and 12% of publications were devoted to malaria in Cameroon and Senegal, respectively.[19] HIV/AIDS, the first cause of death among adults in Africa, was the second most-explored infectious disease. However, the HIV/AIDS-related publications produced by African English-speaking countries such as South-Africa, Uganda and Kenya were more numerous than those by Francophone countries.[23] Non-communicable diseases seem to be explored adequately (15.6% vs 21%). However, the projected epidemic of non-communicable diseases may not be given sufficient pro-active attention. In Europe, the imbalance between publications and needs was higher than what was found in FSA: 25% vs 5% and 71% vs 84% for infectious diseases and non-communicable diseases, respectively.[23]

Strengths and limitations

This study has some limitations. First, articles related to an African theme but written by a non-African author were not included, which could have brought complementary elements. Moreover, 'grey' literature was not included, which includes university theses and academic works[24] which could have added to the analysis of public health research in Africa, considering the difficulties described previously. Finally, this study was limited to articles published in indexed journals. In FSA, most of national and regional journals are not indexed or are indexed in regional databases. However, even if it can be considered that more than half of the articles are published in these journals, the total remains very low.

Despite these limitations, this study concerned a large sample of articles from one database, *Scopus*, which is renowned worldwide. Articles were analyzed by two independent researchers, which gave validity to the results. Furthermore, this study was an opportunity to present the situation of public health publications in one continent where such work is still rare. This study is the first bibliometric analysis of this field for FSA. Further studies could deepen this research, notably through a closer analysis of public health functions.

Conclusion

The exploration of public health themes and functions in articles written by African authors shows a better balance in terms of public health needs than in European publications. However, the number of publications is low as compared with the great health needs. The reasons for relative weak number of publications are multiple and must be further investigated to seek adapted support.

Author statements

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Competing interests

None declared.

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