

Mapping South African public health research (1975 - 2014)

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Background. Since 1994, South Africa (SA) has faced up to the challenge of building a strong economy, to which public health provides an important underpinning.

Objectives. To map the scientific research in public health in SA after the end of apartheid and to present the links between the different financing/funding systems.

Methods. Bibliographic analyses utilising the Web of Science of papers published during the period 1975 - 2014, analyses of journals, most cited articles, authors, publication years, organisations, funding agencies, countries and keywords, and mapping of the relations between countries involved in public health research and of the Web of Science Categories using VOSviewer.

Results. I accessed 2 246 articles published between 1975 and 2014, the majority of which were published after 2007. The main countries of research were the USA, SA, Switzerland and the UK, representing the main network collaborations. The relevant keywords were HIV, woman, child, program/programme, rural, tuberculosis, district and sex.

Conclusions. Public health research in SA reached a high level 16 years after the end of apartheid. The chief field that emerged was the spread of HIV, including mother-to-child transmission, and the policies applied to all districts of SA, through a network of institutions between the USA and SA.

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Since 1994 and the dawn of democracy in South Africa (SA), the country has made significant efforts to build one of the strongest economies in Africa. Development of the national health system, the foundation of which is the primary healthcare approach, has been a major goal^[1] aimed at the needs of the population.^[2] Public health covers the fields of infectious disease, parasitology, mental health, and organisation and financing of health facilities.

After 2007, the World Health Organization (WHO) presented several programmes on public health in SA.^[1] The main objectives of the 2008 - 2013 co-operation strategy were the fight against HIV, tuberculosis (TB) and malaria, the fight against mother-to-child transmission (MTCT) of HIV,^[1] corresponding to Millennium Development Goals (MDGs) 4 - 6, the need to strengthen health policies and to prevent and reduce disease, disability and premature death from non-communicable diseases, and the strengthening of surveillance systems.

The aim of this article is to analyse scientific publications on public health from SA during the period 1975 - 2014, in the context of the social situation in the country.

Methods

The Science Citation Index-Expanded (SCIE) database, accessed through the Web of Science platform from Thomson Reuters, was used. In the advanced search,

the articles were obtained using this formula: TS=(public health AND South Africa) for the period 1975 - 2014. Each record was verified to ensure its relevance. This aim was to analyse differences before and after 1994. There were no restrictions regarding the document types.

The 'analysis results' function of the Web of Science was then performed. Journals, most cited articles, authors, countries, funding agencies, organisations, publication years and Web of Science Categories were extracted.

To evaluate the research networks between countries, after analysis by country, the records of each country were viewed and then the analysis was performed a second time in order to understand the links between the chosen country and the other countries. The mapping diagram was then developed.

To analyse the Web of Science Categories, the data were exported into a file 'analyze.txt'. This file can be read by the programme wc10.exe. It generated map-files for VOSviewer.^[3]

Finally, several keyword (KW) researches were performed to find the main relevant topics. These analyses were to compare with former bibliometric studies in other fields.^[3-5]

Results

I obtained 2 246 records. There were 30 publications before 1994, but 1 686/2 246 (72%) after 2007 (Table 1).

The three authors with most records were Karl Peltzer, Alan Flisher and Diane

Table 1. Records per year from 1987 to 2014 (72% of publications were after 2007)

Publication years	Records, n
1987	1
1991	6
1992	12
1993	11
1994	11
1995	14
1996	16
1997	28
1998	40
1999	34
2000	35
2001	43
2002	48
2003	39
2004	63
2005	75
2006	84
2007	131
2008	154
2009	177
2010	225
2011	263
2012	297
2013	315
2014	124

McIntyre, all three of whom were attached to SA academic institutions. The main journals were the *South African Medical Journal* (146/2 246), *AIDS* (89/2 246), *BMC Public Health* (64/2 246), *PLoS One* (50/2 246), *Tropical Medicine and International Health* (37/2 246) and the *Bulletin of the World Health Organization* (36/2 246).

The main research funding agencies were Wellcome Trust (UK, 55 records), the National Institutes of Health (USA, 37 records) and the National Research Foundation of South Africa (SA, 28 records) (Table 2). The UK, the USA and the European Union, as well as SA, are involved in financing public health research in SA.

The three most represented institutions in SA were the University of Cape Town (362/2 246), the University of the Witwatersrand (264/2 246) and the University of KwaZulu-Natal (152/2 246).

The ten main countries involved were SA (1 246/2 246), the USA (669/2 246), the UK (395/2 246), Switzerland (130/2 246), Australia (101/2 246), Canada (94/2 246), France (93/2 246), Belgium (81/2 246), the Netherlands (69/2 246) and Kenya (55/2 246).

The networks between the main countries were mapped (Fig. 1). The scientific network concerning SA public health research, with the main countries involved, is described. The main arrow/link is between SA and the USA (with 236 records of 1 246 linked to SA) as the most important collaboration. The second most important collaboration is between SA and the UK (186/1 246). Finally, the diagram illustrates three other important networks: SA-Switzerland (51/1 246), SA-Australia (48/1 246) and SA-Belgium (50/1 246).

Keyword analysis revealed the terms HIV (907/2 246 records), programme(s) and program(s) (638/2 246 records), woman (women) (466/2 246), child(ren) (438/2 246), rural (360/2 246), tuberculosis (269/2 246), district (209/2 246), sex (187/2 246), environment (131/2 246), malaria (121/2 246), mental health (118/2 246 records) and violence (102/2 246).

Finally, VOSviewer was used to map the Web of Science Categories (Fig. 2). The most important categories were Public, Environmental and Occupational Health, Infectious Diseases and Social Sciences Biomedical.

Discussion

According to my analysis, the majority of public health studies were undertaken in the post-apartheid era,^[6-7] very few having been published before 1994. At the end of the 1990s and in the first years of the 2000s, the themes were those found in this survey.

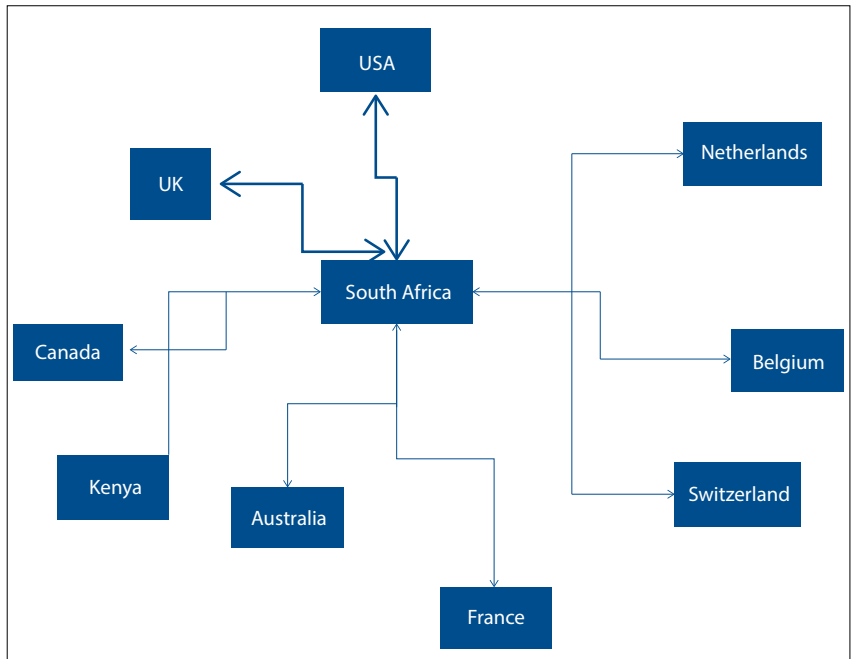


Fig. 1. Scientific networks in South African public health research and the main countries involved.

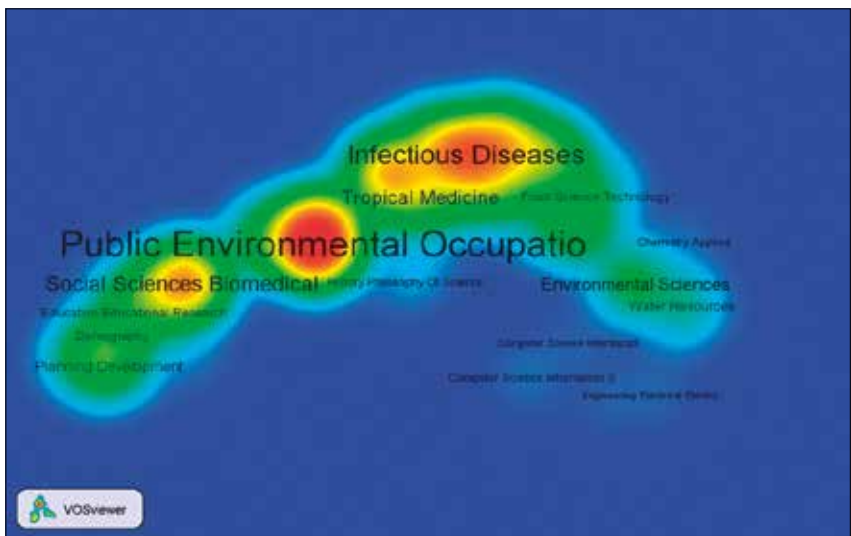


Fig. 2. Web of Science Categories mapped with VOSviewer. The most important categories are Public Environmental Occupational, Infectious Diseases and Social Sciences Biomedical.

Table 2. Funding agencies*	
Funding agencies	Records, n
Wellcome Trust	55
National Institutes of Health	37
National Research Foundation	28
Bill and Melinda Gates Foundation	28
Medical Research Council of South Africa	15
European Commission	11
Department of Health in South Africa	10
European Union	10
National Institute of Mental Health	10
	Continued ...

Table 2. (continued) Funding agencies*

Funding agencies	Records, <i>n</i>
National Research Foundation South Africa	10
World Health Organization	10
WHO	9
Canadian Institutes of Health Research	8
National Institute of Allergy and Infectious Diseases	8
USAID	8
Atlantic Philanthropies	7
GlaxoSmithKline	7
Medical Research Council South Africa	7
South African Department of Health	7
United States Agency for International Development	7
United States Agency for International Development USAID	7
University of the Witwatersrand	7
US National Institutes of Health	7
Water Research Commission WRC of South Africa	7
Doris Duke Charitable Foundation	6
Fogarty International Center	6
Fogarty International Center National Institutes of Health	6
Irish Aid	6
National Institutes of Health NIH	6
National Research Foundation NRF	6
National Research Foundation NRF of South Africa	6
United States National Institute on Aging	6
Bristol Myers Squibb	5
CDC	5
Centers for Disease Control and Prevention	5
Education Trust Fund of Nigeria	5
FAS	5
National Department of Health	5
Stellenbosch University	5
Swedish Council for Working Life and Social Research	5
Swiss National Science Foundation	5
UK Medical Research Council	5
University of Fort Hare	5
Wellcome Trust London UK	5
Andrew W Mellon Foundation	4
AUSAID	4
CNPQ	4
Department for International Development	4
Human Sciences Research Council South Africa	4
International Development and Research Centre	4
International Development Research Centre	4
John D and Catherine T MacArthur Foundation	4
National Institute of Allergy and Infectious Diseases NIAID	4
National Institute of Mental Health NIMH	4
	Continued ...

HIV was prevalent in SA public health policy,^[8] and furthermore corresponded to MDG 6 (combat HIV/AIDS, malaria and other diseases).

The WHO focused on five objectives in SA in order to promote the MDGs.^[1] In this context, the main topics in this analysis were HIV, malaria, TB and mental health. This WHO emphasis in 2008 - 2013 corresponded to an increase in relevant public health publications (Table 1). The major collaboration was between the USA and SA (Fig. 1), while national public health policies were also significant. The National Department of Health (NDoH) developed the Negotiated Service Delivery Agreement 2010 - 2014,^[2] with four main objectives: increased life expectancy; reduction in maternal and child mortality rates (corresponding to MDGs 4 and 5); combating HIV and AIDS and decreasing the burden of disease from TB (corresponding to MDG 6); and strengthening health system effectiveness. The involvement of the NDoH, and more generally the other government departments in the realm of public health, was greater than similar involvement in other African countries.^[9] This corresponds with the results of my analysis: the three most represented organisations, as well as the three authors most cited, were South African. Moreover, the National Research Foundation of South Africa was a major funding agency (Table 2).

This analysis demonstrated that the main field of public health concerned HIV spread and MTCT, so that new programmes were developed to address this transmission.^[8]

I suggest that other public health issues, such as those in the field of mental health, might have been better represented. I noticed that the Mental Health Care Act No. 17 of 2002^[2] aimed to provide a legal framework for mental health and in particular the management of patients in mental health institutions, with emphasis on human rights. This Act corresponded to an increase in publications on mental health and raised questions about the mental health structures in SA.^[10-11]

Finally, the Web of Science Category Public, Environmental and Occupational Health was dominant,^[11] with national policies correctly having had this focus (Fig. 2), reflecting the reality that SA remains an unequal society, with a Gini coefficient of 0.65 in 2011.^[2]

Study limitations

The SCIE database provided the means for me to undertake this study. I acknowledge the limitation that, as a consequence, only publications appearing in this

Table 2. (continued) Funding agencies*

Funding agencies	Records, <i>n</i>
National Science Foundation	
North West University	4
PEPFAR	4
Pfizer	4
Research Foundation Flanders	4
Rockefeller Foundation	4
SIDA	4
US National Institutes of Health	4
UK Department for International Development	4
University of Cape Town	4
University of Michigan	4
US Centers for Disease Control and Prevention	4
US Department of Health and Human Services DHHS	4
Andrew W Mellon Foundation USA	3
Bank Netherlands Program Partnership	3
Boehringer Ingelheim	3
Canadian International Development Agency	3
Department for International Development DFID	3
Directorate General for Development Cooperation DGDC through the Flemish Interuniversity Council VLIR UOS	3
European Developing Countries Clinical Trial Partnership Senior Fellowship Award	3
Ford Foundation	3
Gilead Sciences	3
GlaxoSmithKline Biologicals	3
Health Canada	3
Health Economics and AIDS Research Division Heard at the University of KwaZulu-Natal	3
Human Sciences Research Council	3
International Development Research Centre of Canada	3
Medical Research Council	3
Merck	3
MRC UK	3
National Health Laboratory Service Research Trust	3
National Institute of Allergy and Infectious Disease NIAID	3
National Institute on Drug Abuse	3
Pan American Health Organization	3
Pfizer Foundation	3
Poliomyelitis Research Foundation	3
President S Emergency Plan PEPFAR	3
Public Health Agency of Canada	3
Research Committee of The World Bank	3
SA National Research Foundation	3
Sanofi Pasteur	3

FAS = Forskningsrådet för arbetsliv och socialvetenskap (Swedish Council for Social and Work Life Research); AUSAID = Australian Agency for International Development; CNPQ = Conselho Nacional de Desenvolvimento Científico e Tecnológico (Brazilian Council for Scientific and Technological Development); PEPFAR = US President's Emergency Plan for AIDS Relief; SIDA = Swedish International Development Cooperation Agency; VLIR UOS = Vlaamse Interuniversitaire Raad - Universitaire Ontwikkelingssamenwerking (Flemish Inter-university Council - University Cooperation Development).
*Names of agencies are exactly as they appear in the records.

database were used. It is therefore possible that participation of other countries, especially African countries, may have been underestimated in SA public health research. Other national databases could be used to develop the public health research links between SA and other African countries.

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