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Gemma E. Derrick

*The University of Sydney*, [gemma.derrick@cchs.csic.es](mailto:gemma.derrick@cchs.csic.es)

Andrew Hayen

*The University of Sydney*

Simon Chapman

*The University of Sydney*

Abby S. Haynes

*The University of Sydney*

Berenika M. Webster

*Thomson Reuters*

*See next page for additional authors*

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**Authors**

Gemma E. Derrick, Andrew Hayen, Simon Chapman, Abby S. Haynes, Berenika M. Webster, and Ian Anderson

# A bibliometric analysis of research on Indigenous health in Australia, 1972-2008

**Gemma E. Derrick**

*Sydney School of Public Health, The University of Sydney, New South Wales and CSIC Institute of Public Goods and Policies (IPP), Madrid, Spain*

**Andrew Hayen, Simon Chapman, Abby S. Haynes**

*Sydney School of Public Health, The University of Sydney, New South Wales*

**Berenika M. Webster**

*Thomson Reuters, New South Wales*

**Ian Anderson**

*Onemda VicHealth Koori Health Unit, The University of Melbourne, Victoria*

Significant health disparities remain between Indigenous and non-Indigenous populations in Australia. Life expectancy at birth for Indigenous Australians is 59 and 65 years for males and females respectively, 23% and 20% lower than the 77 and 82 years for non-Indigenous Australians.<sup>1</sup> Indigenous Australians are hospitalised five times more than non-Indigenous Australians for potentially preventable conditions. Despite this unacceptable gap, only \$1.17 was spent on Indigenous health for every \$1 that was spent on non-Indigenous health.<sup>1</sup> Research, and the publicity flowing from it, can play vital roles in heightening public and political awareness of health problems and their solutions, and can make the case for health service and policy reform. Research concentration in different fields of health research can be an important index of how seriously a nation considers a health problem.

With 2.5% of the Australian population self-identifying as Aboriginal and/or Torres Strait Islander in 2003,<sup>2</sup> the National Health and Medical Research Council (NHMRC)

has committed to reach a target of 5% of its funding to include research on Indigenous health.<sup>3,4</sup> It has also pledged to increase Indigenous representation on both its Council and principal committees, and outlined the roles and priorities for research in relation to Indigenous health as part of the 2002 NHMRC Roadmap report.<sup>3</sup> Little is known about the success of such programs in increasing the amount, visibility and impact of research on Indigenous health published in Australia. This is despite substantial growth in government and media attention to Indigenous health issues, particularly to the gap between the state of Indigenous and non-Indigenous health.

This paper investigates the rate of growth of Indigenous-related health research in Australia from 1972 to 2008, and the volume of citations of that research, and compares it to that of selected other fields of Australian health and medical research. It was hypothesised that Indigenous-related health research would grow at the same rate and have the same level of 'citedness' as other fields of health research.

## Abstract

**Objective:** To determine the growth patterns and citation volume of research publications referring to Indigenous health in Australia from 1972 to 2008 compared to seven selected health fields.

**Methods:** Web of Science was used to identify all publications (n=820) referring to the health of Indigenous Australians authored by Australian researchers, 1972 to 2008. Citations for each publication were also captured. Growth was compared with selected health fields as well as with overall Australian research publications.

**Results:** Research publications referring to Indigenous health, while remaining relatively small in number, grew at an average annual rate of 14.1%, compared with 8.2% across all fields of Australian research. The growth rate shown was equal second highest in our seven categories of health and medical research. However, Indigenous publications were cited significantly less than the Australian average.

**Conclusions:** While there has been positive growth in publications referring to Indigenous health, the attention paid to this research through citations remains disappointingly low.

**Implications:** Given that research concentration and impact can be an index of how seriously a nation considers a health problem, the low visibility of Australian research examining Indigenous health does not demonstrate a level of concern commensurate with the gravity of Indigenous health problems. Further investigation for the reasons for lower citations may identify potential intervention strategies.

**Key words:** Indigenous health, Australia, bibliometrics, research evaluation

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**Correspondence to:** Dr Gemma E. Derrick, Institute of Public Goods and Policies, Consejo Superior de Investigaciones Cientificas, Madrid, Spain, 28037; e-mail: gemma.derrick@cchs.csic.es

## Methods

We used Web of Science (WoS) to locate publications and their citations, and indexed journals, concerning the health of Australian Indigenous populations, which were published by Thomson Reuters and authored by researchers from Australian institutions from 1 January 1972 to 31 December 2008. (Thomson Reuters was known formerly as the Institute of Scientific Information (ISI). ISI commenced tracking in 1966, but very few medical journals appeared to be included until 1972.)

The search string in the topic field '(indigenous OR aborig\*) AND Australia AND health' together with 'Australia' in the address field was used after trialling various searches to determine which would return the most relevant results. Papers dealing exclusively with any aspect of Indigenous health, as well as papers that included data and/or commentary on Indigenous health within a wider focus (for example, studies of the distribution of disease or risk factors in the Australian population) were included. In this paper we refer to all such papers as 'Indigenous-related health research'. All papers thus returned (n=820) were downloaded and stored on the same day in order to accurately capture the number of citations. Only original articles were included in the analysis.

Joinpoint regression models were fitted to the data using the Joinpoint Regression Program v3.4.0.<sup>5</sup> Joinpoint regression models accommodate the rate of change in publications changing with time.<sup>6</sup> A maximum of four joinpoints, chosen by the software to achieve the most significant model, were allowed in each model, and the data were assumed to follow a Poisson distribution. From the joinpoint regression models, the average annualised percentage change and 95% confidence intervals were calculated.

Seven areas were selected for comparison, as we judged them as fields where Indigenous-related health research was most likely to be published, thus providing relevant comparison growth rates. We compared the growth of Indigenous-related health publications with the growth in the following seven selected health and medical fields as defined by WoS: cardio and cardiovascular research; public, environmental and occupational health; healthcare sciences and services; medicine: general and internal; ophthalmology; nutrition

and dietetics; and substance abuse. We also compared our sample with the overall Australian publication output in all research fields (medical and non-medical) combined. These areas were selected for comparison as we judged them as the areas in which Indigenous-related health research was most likely to be published, thus providing relevant comparison growth rates. We applied to Thomson Reuters for the total number of Australian publications and their relative citation counts in each of our fields of interest and data were provided for the period 1981-2008. The following variables were recorded for each publication: journal; year and number of years since publication; number of citations; and citations per year.

In order to compare growth rates of Indigenous-related health research and seven related health fields, the average annual growth was used. To fairly compare growth rates from different fields, joinpoint models with the same number of joinpoints in the same position would need to be fitted. As the data for each of the seven fields are not necessarily amenable to the same number and position of joinpoints as well as the small number of overall Indigenous-related health research publications, we determined that using average annual change was more suitable.

The numbers of citations for the 820 Indigenous health related publications were also captured. Each Indigenous-related publication was then categorised according to its WoS field classification. Of our sample of 820 Indigenous health research articles, 811 were classified as being in at least one of the JCR-ISI health and medical fields of interest. Publications from each of the seven comparison health fields of interest were then subject to citation counts. Citations of Indigenous health publications were then compared to those for all Australian publications within that field using the Mann-Whitney *U* test. For these analyses, citations were restricted to publications that were published between 1981 and 2008, because this was the range able to be supplied by Thomson-Reuters.

Finally, the 20 highest-cited Indigenous health-related publications were identified and the total and average annual citation rate calculated. Publications were then ranked by annual citation rate and the top 20 publications were identified.

**Table 1: Growth rates for Indigenous health-related publications, seven comparison health fields and all Australian research output, 1972-2008.**

Category (number of papers)	Average annual percentage increase (95% CI)	% all Indigenous publications in each field
(a) Indigenous Health-related Research (820)	14.7 (2.7-28.2)	
(b) Selected health and medical:		
Cardiac and Cardiovascular Research (8024)	9.3 (4.6-14.2)	0.3
Healthcare Science and Services (3286)	21.0 (14.3-28.1)	4.4
Medicine: General and Internal (41013)	1.0 (-0.5-2.5)	21.1
Ophthalmology (7108)	9.0 (7.8-10.2)	0.9
Nutrition and Dietetics (4424)	11.2 (8.0-14.5)	3.2
Public, Environmental & Occupational Health (13786)	11.2 (7.7-14.8)	29.0
Substance Abuse (2868)	14.7 (12.0-17.5)	4.7
(c) All Australian publications (745595)	8.2 (6.3-10.1)	

### Results

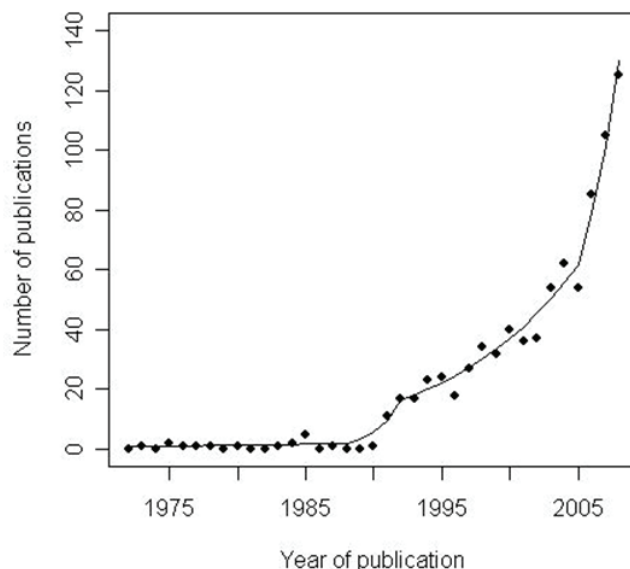
Of the 820 papers returned, 595 (72.6%) had the words Aboriginal or Indigenous in the title, indicating that the primary focus of the paper was Indigenous health research. The remainder contained references to Indigenous health, but were not focused primarily on Indigenous populations. Figure 1 show the joinpoint regression model fitted to the data to show the growth of the number of Indigenous health-related publications over time, from 1972 to 2008. For Indigenous health research, the average percentage change (APC) for the period 1972-1988 was 5.1%. This changed for the period 1988 to 1992 to 68.1%; then fell to 10.8% from 1992-2005. From 2005-2008, however, the APC was calculated to be 28.0%

The average annual growth in the number of Indigenous-related health research publications was 14.7% (95% CI 2.7% to 28.2%). The number of publications in the seven comparison fields of interest is shown in Figure 2, and the average annual percentage changes are shown in Table 1.

Overall, all Australian publications showed an annual average percentage change of 8.2%. The field with the highest annual average percentage change in the number of publications was healthcare science and services at 21.0%. Public, environmental and occupational health, the category with the highest proportion (29%) of Indigenous health-related publications, had an annual average percentage increase of 11.2%. The rate of change in publications is displayed in Table 1.

Table 2 shows the distribution of citations across five bands for Indigenous health-related publications as well as for the seven comparison fields for 1981-2008. Indigenous health-related publications within these seven fields are also shown. Of particular interest is the proportion of Indigenous health-related publications that are currently uncited, compared with the proportion of all uncited Australian publications. Although Indigenous health

**Figure 1: The number of Indigenous-related health research publications listed in WoS by year, 1972-2008 and estimated joinpoint regression.**



publications made up a small proportion of total papers in all fields, a few interesting results emerged. For the public, environmental and occupational health field, a significant difference was seen between the (lower) 'citedness' of the Indigenous health-related publications and that of the Australian average ( $p < 0.001$ ). This was also seen for the healthcare science and services field ( $p = 0.014$ ), nutrition and dietetics ( $p < 0.001$ ) and for substance abuse ( $p = 0.02$ ). In contrast, for the field, medicine: general and internal, the proportion of Indigenous papers remaining uncited was not significantly different from that of the Australian average ( $p = 0.18$ ).

The total number of Indigenous health-related publications in both the cardiac and cardiovascular and the ophthalmology fields

**Table 2: Proportion of Indigenous health-related publications in each citedness category compared to all Australian publications in related field for the period 1981-2008.**

Citedness category	0 Cites		1-10 Cites		11-50 Cites		51-100 Cites		101+ Cites		Median (Q1-Q3)	p-value		
	Count	%	Count	%	Count	%	Count	%	Count	%				
All Indigenous health-related publications (811)	181	22.4	464	57.2	153	18.7	11	1.4	2	0.2	3	1-9	N/A	
Public, Environmental & Occupational Health	Indigenous	236	52	22.0	140	59.3	44	18.6	0	0	3	1-7	0.0001	
	All	8,777	1,211	13.8	4,714	53.7	2,498	28.4	273	3.1	81	0.9		6
Cardiac & Cardiovascular Research <sup>a</sup>	Indigenous	3	1	33.0	2	67.0	0	0	0	0	-	-	-	
	All	4,336	455	10.5	1,855	43.5	1,532	35.3	311	7.2	153	3.5	9	3-24
Healthcare Sciences and Services	Indigenous	36	16	44.4	19	52.8	1	2.8	0	0	1	0-4	0.014	
	All	3,916	1,176	30.0	2,040	52.1	658	16.8	29	0.7	13	0.3		2
Medicine: General & Internal	Indigenous	171	24	14.0	97	56.7	46	26.9	4	2.3	0	0	5	1-12
	All	13,723	1,967	14.3	6,946	50.6	3,620	26.4	603	4.4	587	4.3	6	2-16
Ophthalmology <sup>b</sup>	Indigenous	8	2	25.0	6	75.0	0	0	0	0	-	-	-	
	All	4,833	631	13.1	2,589	53.6	1,388	28.7	176	2.6	49	1.0	6	2-14
Nutrition & Dietetics	Indigenous	26	7	26.9	13	50.0	6	23.1	0	0	1.5	0-9	<0.001	
	All	3,512	474	13.5	1,594	45.4	1,200	34.2	182	5.2	62	1.8		8
Substance Abuse	Indigenous	39	5	12.8	26	66.7	8	20.5	0	0	3	1-9	0.02	
	All	1,896	13.94	51.26	29.89	4.03	0.88	6	2-16					

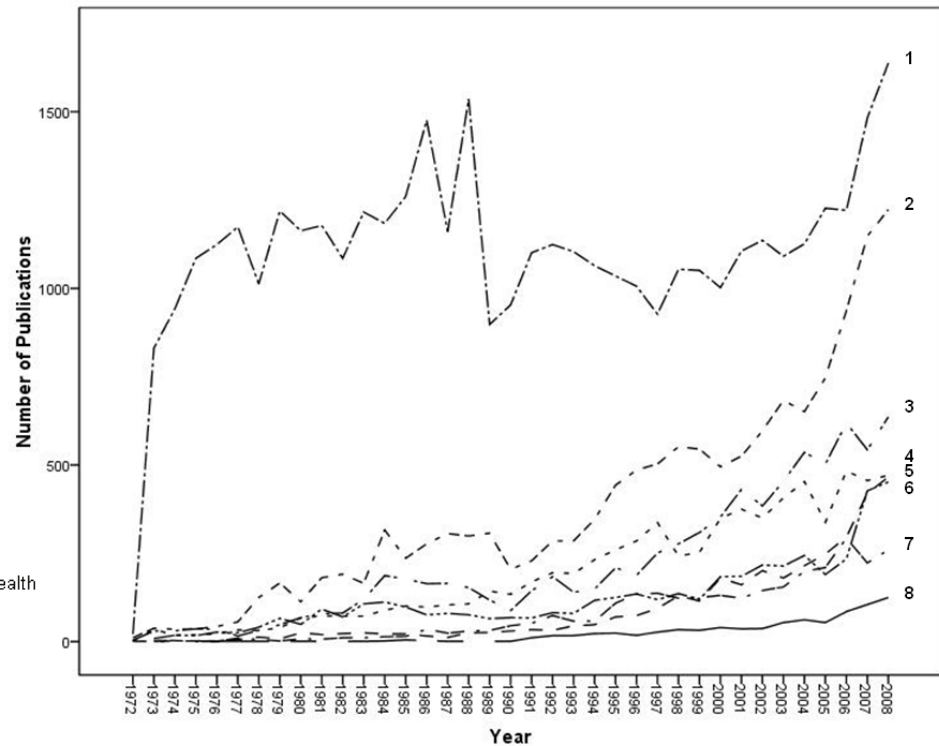
<sup>a</sup> Median, quartiles and Mann-Whitney statistic not reported due to the small number of Indigenous health-related publications.

<sup>b</sup> Not all Indigenous health-related publications within our sample were included in one of the 7 fields of interest. Similarly, a number of publications had multiple classifications. The total number of publications shown in this table will therefore differ from the total shown in Table 1

**Figure 2: Growth in the number of Indigenous health-related research publications compared with the seven selected comparison health fields, 1972-2008.**

**KEY**

- 1 Medicine: General and Internal
- 2 Public, Environmental and Occupational Health
- 3 Cardio and Cardiovascular Research
- 4 Ophthalmology
- 5 Healthcare Sciences and Services
- 6 Nutrition and Dietetics
- 7 Substance Abuse
- 8 Indigenous health publications\*



was too small to calculate significance using the Mann-Witney test. In addition, median, quartiles and Mann-Whitney statistic were not reported due to the small number of Indigenous health-related publications in each field of interest.

Of the 20 Indigenous health-related papers with the highest citation volumes, only nine (45%) were papers devoted exclusively to Indigenous health matters and none of these were in the top five. The remainder all dealt with wider populations, but included data or perspectives on Indigenous health which meant they were classified as being Indigenous health-related research in our search. Thirteen of the top 20 cited papers were published between 2000 and 2008. Four authors had more than one paper in the 20 most-cited publications: Paul Zimmet (three papers), Ian Anderson (two papers), Wendy Hoy (three papers) and Zhiqiang Wang (three papers).

## Discussion

In this first extended bibliometric analysis of the Indigenous health field, we offer insights into the amount, growth and scientific impact of Indigenous health-related research in Australia. The paper complements that of Sanson-Fisher et al. (2006) who investigated Indigenous health-related research publications in Australia, Canada, New Zealand and the United States for the four years 1987-2000.<sup>7</sup> They observed an increase in Australian Indigenous health-related research from an identified sample of 200 such papers, noting the dominance of descriptive studies over intervention research.<sup>7</sup>

Our analysis of 820 papers examined the pattern of the growth of papers and citedness compared to the national average over a period of 36 years. The number of Indigenous health-related research

publications, while remaining relatively few, grew at an annual rate of 14.1%, compared to 8.2% across all fields of Australian research. This growth rate was equal second highest in our seven comparison categories of health and medical research. However, almost 25% of the Indigenous health related publications we included were not exclusively related to Indigenous health, but included data on Indigenous health as part of a wider population study. Had these papers been excluded, Indigenous health research would have had a poorer representation.

The proportional increase in the 1970s and 1980s reflects low publication numbers during the '60s but is also likely to reflect growing societal and policy interests in Indigenous health. The last decade has seen a constellation of factors influence the growth of Indigenous health-related research (See Table 3). In particular, the NHMRC increased investment in Indigenous health research, including a 2002 commitment to dedicate at least 5% of its total research funding to Indigenous health research.<sup>3,4,16</sup> This increased from 2.7% in 2001 and to 5.1% in 2008.<sup>17</sup>

The growth rates in Figure 2 show that for the category medicine: general and internal, there was a marked drop in the number of publications between 1981-1995, with the numbers returning to a normal growth pattern after 1991-1992. Repeated search experiments confirmed these results and they have been previously noted.<sup>18</sup> Our Thomson Reuters author advised that a similar effect during the same time period had been seen in many other countries for unknown reasons. Consequently, all results shown in this paper within the medicine: general and internal field should be regarded with caution.

The general low level of citations for Indigenous publications may reflect the relatively small size of the Indigenous health field.

**Table 3: Indigenous social movements potentially relevant to the growth of Indigenous health research.**

Year	Social movement	Description	Reference(s)
1967	The Aboriginal Tent Embassy	Vehicle for Indigenous political activism. Combined with interventions of researchers and health practitioners, this contributed to the increasing public interest in Indigenous health.	8-10
1986	NHMRC conference in Alice Springs	Identified priorities and ethical guidelines for Indigenous health research.	12-13
1989	The National Aboriginal Health Strategy	Developed through an agreement between the Australian government and Indigenous community representatives.	11
1990-2000	Increasing importance of evidence-based policy and service developments	In response to the broader policy interest in strengthening articulation between research and practice by developing priority driven research agendas.	14-15

Publications in smaller fields may have less potential to gain citations due to the smaller number of researchers contributing to the citations pool.<sup>19,20</sup> Another simple explanation could be that there is little interest in Australian Indigenous health research outside of Australia.

This paper shows that while there has been some success in boosting the number of publications concerned with Indigenous health, the visibility of Indigenous health-related research through citations is still disappointingly low. An encouraging result, however, was the number of Australian public health papers that included an Indigenous health sub-sample. A recognised limitation of this paper is that it concentrated solely on the appearance of Indigenous health-related research in the mainstream academic literature. Scientific impact measures such as publication and citation numbers are a limited determinant of wider research influence and do not necessarily reflect its social value. This paper did not address Indigenous health-related research represented in the grey literature which includes government and non-government organisation reports, books, and websites. These diverse reports would not appear in an ISI search but may have influenced the development of Indigenous health policies and programs. Further studies should investigate the use of Indigenous health research within this grey literature. Research concentration and impact can be seen as an index of the importance of a health problem to a nation. The low visibility of Australian Indigenous health-related research does not demonstrate a level of concern commensurate with the gravity of Indigenous health problems.

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