Use of *h*-like indicators based on Journal Impact Factors for evaluating scientific performance: Australian cancer research case study

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Theme: Disciplinary relevance of bibliometric indicators: Science and Technology, Social Sciences and Humanities (primary), Quantitative and qualitative approaches: a special focus in evaluation of the academic performance (secondary).

Keywords: Journal Impact Factor, IF^2-Index, *h*-index, *g*-index, research evaluation, Australian cancer research.

Background

Since the introduction of the *h* index [HIRSCH, 2005] a number of studies have shown the practical use of this measure to evaluate scientists within specific disciplines. Consequently it was rapidly incorporated into e-resources such as the Web of Science and Scopus to measure an author's comparative 'standing' in a particular research community. Likewise, the informetric community quickly adapted the *h* index and developed various modifications of this indicator like the *g* index [EGGHE, 2006], h^2 index [KOSMULSKI, 2007] and others [BORNMANN et. al., 2008], extending it from micro-level evaluation of individuals to macro-level evaluation of journals [BRAUN et al. 2006] and institutions [MOLINARI & MOLINARI, 2008].

Citation-based evaluation of research is disadvantaged by requiring some years for papers to be cited; hence, studies have used Journal Impact Factors (JIFs) to measure the quality of research publications [WILSON, 2005] as well as to measure the quality of journals by correlating JIFs with the results of a peer assessment survey [YUE et al, 2007]. In a project commissioned by the NSW Cancer Institute, cancer research in Australia from 1999 to 2006 was assessed through the quantity and quality of journal publications in the Thomson Scientific ISI database and Medline [WELBERRY et al., 2008]. Our paper expands this project and uses the JIFs of cancer-related publications to compare performance of top-level cancer research in Australia and in each of its eight states/territories.

Problem/Application

The aim of this paper is to show how JIFs can be used similarly to h-like indexes for evaluating the performance of research units. It will introduce a 'new' measure similar to the h index, but one based on JIFs rather than on the numbers of papers and citations to them. This measure provides comparison of performance in prolific research areas (e.g.,

cancer) by giving a single measure for the performance of top-level research among, for example, geographical regions within a country or between/among countries. An advantage of this measure is the provision of a stable figure over a fixed timeframe for research performance that does not depend on years for research papers to accrue 'prestige' through citations.

Methodology

Keywords/keyphrases were used to retrieve all cancer-related publications from the Science and Social Science Citation Indexes containing at least one author with an Australian affiliation. The corporate source/address field allowed distribution of all publications to individual Australian states (Publications with multiple authors from more than one state were distributed to each state; however publications with multiple authors all from the same state were distributed only once). The ISSN and year of each journal publication were used to obtain the appropriate JIFs. After ranking all publications year-by-year their JIFs the *h*-like indicators were calculated.

Outcome/Findings/Results

The results for four *h*-like indicators show a clear trend (and improvement over the results in earlier studies [WILSON, 2005; WELBERRY, 2008]) for the increasing performance of the status of top-level cancer research in Australia over 1999-2006 (Table 1). The results also provide a comparison of the standing of each Australian state/territory led by two states: New South Wales (NSW) and Victoria (VIC). Comparing the four different *h*-like indicators suggests that the h^2 index lacks the power to differentiate substantially between the different states (or time periods) when applied to JIF's. Giving increased weight to publications with higher impact factors (IFs) makes the g index preferable to the *h* index. The IF^2 index would seem to provide the greatest discriminatory capability.

Conclusion

The informetric measure introduced in this paper provides guidance for future analysis and evaluation of research performance in all disciplines where research is published in journals with high IFs. It could prove useful in evaluating and comparing research performance of large research units such as laboratories, institutions, states, countries or geographical regions (e.g., the European Union). Our study shows that JIFs can be used to establish a measure similar to the h-index which provides timely and robust comparison of research performance at the macro-level. Using an *h*-like measure based on the square of the journal impact factor (IF^2) can overcome the contrast between the numeric ranges of JIFs (lower) to that of citations (higher). This 'new' measure allows finer granularity when comparing large research units and better comparison of (or discrimination among) disciplines with lower impact factors.

Table 1. Comparison of the 'h', 'g' , 'h²', and IF² Indexes for 1999-2006 based on JIFs for Australia and two of its most productive states: New South Wales and Victoria

		1999	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
Australia	'*h*' index	18	18	17	21	18	22	24	25
	'*g*' index	24	24	22	26	27	30	32	33
	'h²' index	5	5	5	5	5	6	6	7
	IF² index	95	93	101	97	111	108	139	179
New South Wales	'*h*' index	12	12	13	15	14	17	15	15
	'*g*' index	16	19	14	20	21	23	22	26
	'h²' index	4	5	3	5	5	5	4	6
	IF² index	58	61	69	69	79	95	102	100
Victoria	'*h*' index	13	15	14	15	16	16	23	22
	'*g*' index	20	20	18	22	21	24	28	27
	'h²' index	5	5	4	5	5	5	5	5
	IF² index	66	73	69	92	90	95	104	107

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