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Multiple authorship: growth or inflationary bubble?

ABSTRACT

OBJECTIVE: To analyze the increase in number of authors per article in Brazilian scientific journals on public health.

METHODS: Articles published between 1999 and 2010 in six journals on public health and one medical journal (for comparison) from SciELO with Qualis (Capes) classification equal or superior to B-1, were searched on the LILACS database. The evolution of the median number of authors/article and the proportion of articles with more than four authors were evaluated. The association between the the triennium of publication and the presence of four or more authors per paper was estimated through the Mantel-Haenzel *odds ratio*, adjusted for the type of journal.

RESULTS: An increase of the median number of authors and the proportion of articles with more than four authors was observed in all journals, especially in the last triennium. The *odds ratio* for articles with four or more authors, adjusted for the type of journal, were: second triennium 1.3 (95% CI 1.1;1.4); third triennium 1.5 (95% CI 1.3;1.8), fourth triennium 2.39 (95% CI 2.1;2.8).

CONCLUSIONS: Scientific journals on public health have shown an increase in the number of authors per article over the years, regardless of editorial orientation.

DESCRIPTORS: Authorship. Journal Article. Public Health. Authorship and Co-Authorship in Scientific Publications. Scientific and Technical Publications. Scientific Publication Ethics.

INTRODUCTION

The number of authors per article has increased in scientific journals, a peculiar worldwide phenomenon in recent decades. Studies using different techniques, involving diverse journal groups and varied reference periods have unequivocally verified this fact.^{1, 8, 15, 18, 22} One of these studies²⁴ quantified the authorship of millions of articles in five decades and showed that such phenomenon occurs in all areas of knowledge, including the social sciences, albeit with less intensity.

Most of these studies merely identify and describe the phenomenon, but there are those that seek to understand its determinants.^{2, 5, 12, 17, 23} Analysis performed on a sample of authors of 896 articles published in leading medical journals (Annals of Internal Medicine, JAMA, Lancet, Nature Medicine, New England Journal of Medicine and PLoS Medicine) showed a reasonable proportion (17.6%) of cases in which individuals who were included as authors had not contributed sufficiently to merit this designation, characterizing the so-called “honorary authorship”. Considering only research articles, this proportion reached 25%.

One of the mentioned studies⁵ showed that the main contribution to the growing number of authors per article in the British Medical Journal (BMJ), over 20 years, was the relative increase in the number of senior authors. This finding becomes worrying in the view of the “white bull effect” (a reference to the myth

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of seduction of Europa by Zeus, disguised as a white bull), described by Kwok¹⁴ as the self-imposition of a given individual as “honorary author” to a researcher in a weaker position. For instance, the negotiation of senior researchers with students under their guidance. How much of the senior authors’ contribution in the study on the BMJ articles would be attributable to the “white bull” is something that must be questioned.

A frequent explanation for the increase in the average number of authors is that the greater complexity of studies would demand more and more cooperative work.^{1,7,8,17} While this is possible and even probable, Papatheodorou et al¹⁷ disagree that this fact explains all the situations in which such an increase is observed. Their research showed an increase in the number of authors over the years, in both randomized and non-randomized studies, with the effect of year of publication remaining significant after adjustment for other factors, such as the topic of study, multinational study and population size.

One reason for the growing number of authors would be the answer to the pressures on researchers to increasingly publish articles (the so-called “publish or perish”). However, in some situations a large number of authors is justified, including multicenter and/or multidisciplinary studies, and research involving complex and laborious designs. Therefore, the analyses presented are justified to protect and adequately characterize these situations.

Such considerations led to the question: Would this growth also be observed in Brazilian journals on public health?

Hence, the objective of this study is to analyze the increasing number of authors per article in Brazilian scientific journals on public health.

METHODS

A study was carried out in 2010 with Brazilian journals on public health included in the ScieLO collection, with classification Qualis/CAPES equal or superior than B1: *Revista de Saúde Pública* (RSP), *Cadernos de Saúde Pública* (CSP), *Ciência & Saúde Coletiva* (C&SC), *Revista Brasileira de Epidemiologia* (RBE), *Physis e Interface*. The *Brazilian Journal of Medical and Biological Research* (BJMBR), also holding a Qualis B1 classification in public health^a (2010) and found in ScieLO, was included for comparison. For each journal, all references in the LILACS database (1999 to 2010) were selected. The initial year of the period was chosen for the journals that were already being published for at least one year, and 2010 represented the last year with all issues published and present in the database at the time of the review.

The references were exported in RIS format and the number of authors per paper was calculated by an application developed for this purpose. Analyses were performed according to the four triennia of the studied period to ensure a greater stability in the estimates. The median number of authors per article (interquartile range) and the proportion of the number of articles with four or more authors were calculated for each triennium. The association between the triennium of publication and the presence of four or more authors per paper was estimated through the Mantel-Haenzel odds ratio, adjusted for the type of journal. The journals were grouped into four categories³: 1) clinical journal (BJMBR); 2) journals with a higher proportion of epidemiological articles (RBE, CSC, RSP); 3) journal without a clear predominance of a specific study field (C&SC); 4) journals with a higher proportion of articles on the humanities (Physis and Interface). The analyses were performed with the Stata program (version 9.0).

RESULTS

A higher median of authors for the BJMBR, followed by group 2 journals (RBE, CSC, RSP), was observed in all periods (Table 1). Group 4 (Physis and Interface) and group 3 (C&SC) journals had the lowest medians. An increase in the median number of authors in the last triennium was observed for all journals, when compared to the first triennium. The proportion of articles with four or more authors had a roughly similar distribution to the median of authors related to journal category, although C&SC has shown higher proportions than the group 4 journals for this indicator (Figure 1). The growth of this proportion was observed for all journals analyzed. Taking the first triennium as a reference, the odds ratios are presented for articles with four or more authors, adjusted according to journal group (Table 2). This analysis also reveals growth. The chance of having four or more authors was 2.39 higher for articles published in the last three years compared to those published in the first three years (Table 2).

DISCUSSION

An increase in the number of authors per paper was observed, particularly in the last triennium, based on two indicators: median number of articles and proportion of articles with four or more authors.

As this phenomenon is confirmed in the analyzed journals, a question remains: Is it the result of an increased cooperation between Brazilian authors or “honorary authorship”?

^a For purposes of evaluation of postgraduate programs, the Brazilian Ministry of Education created a ranking of journals based on different criteria and specific to each area of knowledge. Further information at <http://www.capes.gov.br/avaliacao/qualis>

Table 1. Distribution of the number of authors published according to triennium, 1999 to 2010

Journal	Triennium			
	1999-2001	2002-2004	2005-2007	2008-2010
Brazilian Journal of Medical and Biological Research				
Number of articles	544	644	618	527
Median number of authors(interquartile range)	4 (3;6)	4 (3;6)	5 (4;7)	5 (4;7)
Revista de Saúde Pública				
Number of articles	296	399	534	491
Median number of authors (interquartile range)	3 (2;4)	3 (2;5)	3 (2;4)	4 (2;5)
Cadernos de Saúde Pública				
Number of articles	407	689	936	939
Median number of authors (interquartile range)	2 (1;4)	3 (2;4)	3 (2;5)	4 (2;5)
Revista Brasileira de Epidemiologia				
Number of articles	29	110	158	216
Median number of authors (interquartile range)	2 (2;3)	3 (2;4)	3 (2;4)	4 (2;5)
Ciência & Saúde Coletiva				
Number of articles	92	255	501	899
Median number of authors (interquartile range)	1 (1;2)	2 (1;3)	2 (1;3)	2 (2;4)
Interface				
Number of articles	77	63	135	266
Median number of authors (interquartile range)	1 (1;2)	1 (1;2)	2 (1;3)	2 (1;3)
Physis				
Number of articles	30	58	70	165
Median number of authors (interquartile range)	1 (1;1)	1 (1;2)	1 (1;2)	2 (1;3)

Table 2. Association between triennium of publication and occurrence of four or more authors, 1999 to 2010.

Triennia	Number of articles	Articles with four authors or more		Odds ratio*	Confidence interval of 95%
		n	%		
1999-2001	1475	594	40.3	1	-
2002-2004	2218	932	42.0	1.25	1,08;1,45
2005-2007	2952	1228	41.6	1.54	1,33;1,78
2008-2010	3503	1632	43.2	2.39	2,06;2,78

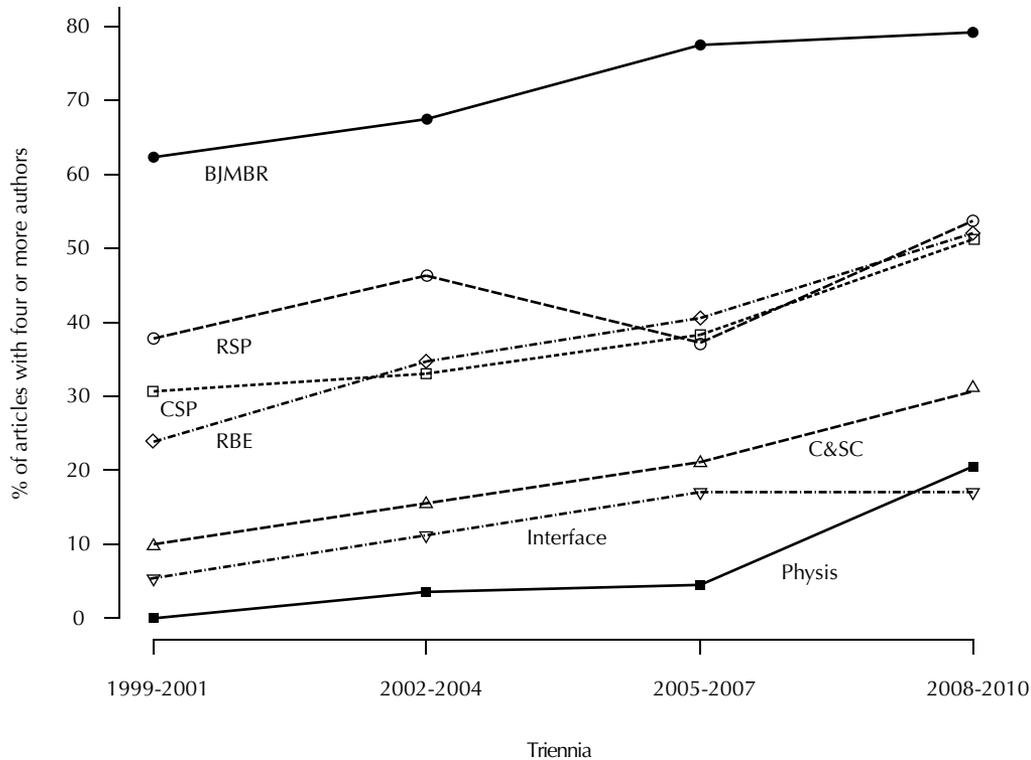
*adjusted according to journal group; tendency chi-square $p < 0.001$

The possibility of undue authorship has taken various editors to express their views over time.^{9-11,19,21} An editorial published in *Nature*⁹ reports the difficulty of finding mechanisms to control the situation. Another¹⁰ connects this problem with the use of quantitative indicators of scientific production, as the productivity incentive would lead to the proliferation of authors as a way to cheat the system, at least partially.

A particularly intense exchange began after a joint editorial by the then editors of *Lancet* and *BMJ*¹¹ (Richard Horton and Richard Smith, respectively), who analyzed their concerns regarding this problem, and announced a seminar to discuss proposals to address the situation. An editorial in the *BMJ*¹⁹ points to a radical strategy, based on the discussions from the

seminar previously mentioned: articles would have contributors instead of authors, who would be identified according to their participation, just as in the credits of a movie. To ensure ethical responsibility on the printed content, the articles would have a “guarantor”. These ideas prompted the then editor of the *American Journal of Public Health* (*AJPH*), Mervyn Susser, to publish an editorial²¹ that endorsed such proposal, asking the readers for their opinions. Responses were published in the May 1998 issue, occupying practically the entire letters section of the *AJPH*. The positions were varied, and no consensus was reached.

Publications^{4,6,7,16,20} make revisions of proposed solutions, trying to offer control models to limit the possibility of undue authorship. Such solutions are divided



BJMBR: *Brazilian Journal of Medical and Biological Research*; C&SC: *Ciência & Saúde Coletiva*; CSP: *Cadernos de Saúde Pública*; RBE: *Revista Brasileira de Epidemiologia*; RSP: *Revista de Saúde Pública*

Figure. Proportion of articles with four or more authors according to the analyzed journals and triennia of publication, 1999 to 2010.

into two major groups, both based on exhaustive lists of possible actions (contributions) in the making of an article. The first treats the list as a checklist, requiring minimum number of contributions (usually three) for the authorship to be considered. The other works with complex score systems assigned to each type of contribution, requiring a minimum total value, which varies according to the scheme adopted. One of the consulted papers¹³ sought to evaluate the operation of such schemes. The authors of 181 articles published in the *Croatian Medical Journal*, from January to July 2005, were consulted, by randomly using instruments based on the checklist or scoring system. It was concluded that the latter was more sensitive for determining authorship.

These proposals are attempts to implement the minimum requirements for authorship by the International Committee of Medical Journal Editors (ICMJE),^b which states that “authorship credit should be based on 1) substantial contributions towards the conception and design, data acquisition, or analysis and interpretation of data; 2) article writing or critical revision with important intellectual content; and 3) final approval of the version

to be published. Authors should meet conditions 1, 2 and 3.” This guidance resulted from the discovery of a fraud case (known as “Darsee affair”) in the 1980s, which exposed several cases of “honorary authorship”.¹⁹

One review article analyzed¹⁶ points out to usual and mistaken roles for attributing authorship, such as being administratively in charge of a research group or department, and raising funds for a project without being involved with it otherwise. In addition, there are other roles that could be acknowledged, but no authorship would be given to those revising or editing a manuscript, performing manual data collection (exceptional circumstances could change this), cleaning data, as well as providing resources (e.g. reagents or basic processes involved in the research that have not been specifically developed for it), basic maintenance and management of equipment/instruments (equipment/tools developed specifically for the considered project could, nonetheless, qualify for authorship). The studied journals adopt the ICMJE criteria with small systematic variations, demanding the authors a statement of authorship responsibility, without presenting any kind of checklist or score.

^b International Committee of Medical Journals Editors. Uniform requirements for manuscripts submitted to journals: updated April 2010. [cited 2011 Dec 28]. Available from: http://www.icmje.org/urm_main.html

The CNPq itself recently reported problems in the dissemination of scientific research under its funding. Considering that overcoming such problems would require the formulation of specific internal rules, nonexistent at that time, a committee responsible for their elaboration was created. Their publication on the organization's website followed.^c Several rules relate to the question of authorship (referring to the ICMJE criteria), indicating that, at least, there is some concern over this issue in our circles.

We emphasize that there are multiple authors per article, and even though the average number of authors is growing, it does not translate as an irregularity. The scientific work becomes more complex with the development of major projects. In health sciences, and particularly in public health, increasingly large databases are created, requiring more sophisticated strategies for extracting relevant information, or able to articulate diverse data and/or material sources (biobanks, collections of genetic profiles). Therefore, the appearance of larger research teams is inevitable, and this will tension the definition of what exactly qualifies for authorship. The growing complexity of research, with multiple insertion possibilities, even without undue manipulation, creates difficulties in

defining who can appear as an author in a given publication, and this is not adequately discussed by Brazilian authors and editors.

It is not possible to determine, due to the limitations of this study, whether or not the honorary authorship was occurring in the publications analyzed. The increasing number of authors per article, regardless of the journal's editorial orientation, indicates the need to further explore this issue through more extensive studies that include other variables, allow to qualify more precisely the type of study that originated the article and also assess authorship qualitatively.

Particularly in the absence of effective controls, the attribution of "honorary authorship" may be a considerable temptation in an environment which stimulates the production of increasing numbers of articles. It is a task for editors, authors and readers to ensure compliance with the ethical principles governing authorship, thus avoiding the situation when the basic currency of academic credibility will suffer from inflationary devaluation, as expressed by Papatheodorou et al.¹⁷ These authors made a clear allusion to what repeatedly occurred in recent decades with certain products under accelerated growth: the collapse of their markets, showing that their apparent value was unreal, an inflationary bubble.

^c Ministério da Ciência e Tecnologia, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Normas: ética e integridade na prática científica: relatório da Comissão de Integridade do CNPQ [cited 2012 Aug 11]. Available from: http://www.cnpq.br/normas/lei_po_085_11.htm#etica <http://www.cnpq.br/documents/10157/a8927840-2b8f-43b9-8962-5a2ccea74dda>

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