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.


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. One of these studies 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. Analysis performed on a sample 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 studies 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
Hence, the objective of this study is to analyze the proportion of articles with four or more authors for each triennium. The association between the number of authors and the presence of four or more authors per paper was estimated through the Mantel-Haenszel odds ratio, adjusted for the type of journal. The journals were grouped into four categories: 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 across 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"?
The possibility of undue authorship has taken various editors to express their views over time. An editorial published in Nature reports the difficulty of finding mechanisms to control the situation. Another 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 (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 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 editorial 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 make revisions of proposed solutions, trying to offer control models to limit the possibility of undue authorship. Such solutions are divided

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

<table>
<thead>
<tr>
<th>Journal</th>
<th>Triennium</th>
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</thead>
<tbody>
<tr>
<td>Brazilian Journal of Medical and Biological Research</td>
<td>544</td>
</tr>
<tr>
<td>Median number of authors (interquartile range)</td>
<td>4 (3;6)</td>
</tr>
<tr>
<td>Revista de Saúde Pública</td>
<td>296</td>
</tr>
<tr>
<td>Number of articles</td>
<td>407</td>
</tr>
<tr>
<td>Median number of authors (interquartile range)</td>
<td>3 (2;4)</td>
</tr>
<tr>
<td>Cadernos de Saúde Pública</td>
<td>21</td>
</tr>
<tr>
<td>Number of articles</td>
<td>2 (2;3)</td>
</tr>
<tr>
<td>Median number of authors (interquartile range)</td>
<td>1 (1;4)</td>
</tr>
<tr>
<td>Ciência &amp; Saúde Coletiva</td>
<td>92</td>
</tr>
<tr>
<td>Number of articles</td>
<td>77</td>
</tr>
<tr>
<td>Median number of authors (interquartile range)</td>
<td>1 (1;2)</td>
</tr>
<tr>
<td>Interface</td>
<td>30</td>
</tr>
<tr>
<td>Number of articles</td>
<td>1 (1;1)</td>
</tr>
<tr>
<td>Median number of authors (interquartile range)</td>
<td>1 (1;2)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Triennia</th>
<th>Number of articles</th>
<th>Articles with four or more authors</th>
<th>Odds ratio*</th>
<th>Confidence interval of 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2001</td>
<td>1475</td>
<td>594</td>
<td>40.3</td>
<td>1</td>
</tr>
<tr>
<td>2002-2004</td>
<td>2218</td>
<td>932</td>
<td>42.0</td>
<td>1.25</td>
</tr>
<tr>
<td>2005-2007</td>
<td>2952</td>
<td>1228</td>
<td>41.6</td>
<td>1.54</td>
</tr>
<tr>
<td>2008-2010</td>
<td>3503</td>
<td>1632</td>
<td>43.2</td>
<td>2.39</td>
</tr>
</tbody>
</table>

*adjusted according to journal group; tendency chi-square p < 0.001
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 papers 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), 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.”

One review article analyzed 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.

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\[\text{BJMBR: Brazilian Journal of Medical and Biological Research; C&SC: Ciência & Saúde Coletiva; CSP: Cadernos de Saúde Pública; RBE: Revista Brasileira de Epidemiologia; RSP: Revista de Saúde Pública}\]

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

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The authors declare that there are no conflicts of interest.