BMJ

BMJ 2011;343:d6128 doi: 10.1136/bmj.d6128

RESEARCH

Honorary and ghost authorship in high impact biomedical journals: a cross sectional survey


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Abstract

Objectives To assess the prevalence of honorary and ghost authors in six leading general medical journals in 2008 and compare this with the prevalence reported by authors of articles published in 1996.

Design Cross sectional survey using a web based questionnaire.

Setting International survey of journal authors.

Participants Sample of corresponding authors of 896 research articles, review articles, and editorial/opinion articles published in six general medical journals with high impact factors in 2008: *Annals of Internal Medicine*, *JAMA*, *Lancet*, *Nature Medicine*, *New England Journal of Medicine*, and *PLoS Medicine*.

Main outcome measures Self reported compliance with International Committee of Medical Journal Editors (ICMJE) criteria for authorship for all authors on the selected articles.

Results A total of 630/896 (70.3%) corresponding authors responded to the survey. The prevalence of articles with honorary authorship or ghost authorship, or both, was 21.0% (95% CI 18.0% to 24.3%), a decrease from 29.2% reported in 1996 (P=0.004). Based on 545 responses on honorary authorship, 96 articles (17.6% (95% CI 14.6% to 21.0%)) had honorary authors (range by journal 12.2% to 29.3%), a non-significant change from 1996 (19.3%; P=0.439). Based on 622 responses on ghost authorship, 49 articles (7.9% (6.0% to 10.3%)) had ghost authors (range by journal 2.1% to 11.0%), a significant decline from 1996 (11.5%; P=0.023). The prevalence of honorary authorship was 25.0% in original research reports, 15.0% in reviews, and 11.2% in editorials, whereas the prevalence of ghost authorship was 11.9% in research articles, 6.0% in reviews, and 5.3% in editorials.

Conclusions Evidence of honorary and ghost authorship in 21% of articles published in major medical journals in 2008 suggests that increased efforts by scientific journals, individual authors, and academic institutions are essential to promote responsibility, accountability, and transparency in authorship, and to maintain integrity in scientific publication.

Introduction

Inappropriate authorship (honorary and ghost authorship) and the resulting lack of transparency and accountability have been substantial concerns for the academic community for decades.[1-5] The importance of integrity in authorship has concerned scientific journals,[4-6] and recent reports of inappropriate authorship[7 8] have captured the attention of the news media and government officials.[9 10]

Inappropriate authorship may involve honorary authors, individuals who are named as authors but who have not met authorship criteria[11] and have not contributed substantially to be able to take public responsibility for the work,[5 12 13] and ghost authors, individuals who have made substantial contributions to the work reported in an article but who are not named as authors.[5 12 13] Previous research has documented prevalences of honorary and ghost authors of 19% and 11%, respectively, in articles published in biomedical journals in 1996,[14] and of 39% and 9%, respectively, in review articles published by the *Cochrane Library* in 1999.[15]

In the 1980s, the International Committee of Medical Journal Editors (ICMJE) developed guidelines for responsible and accountable authorship.[11] These criteria have been updated regularly and have been adopted by more than 600 biomedical journals. The ICMJE guidelines include specific requirements for authorship, and stipulate that all authors should participate sufficiently in the work reported in an article to be able to take public responsibility for the content or an important part of the content (see web extra table 1 on bmj.com).

In this study, we surveyed corresponding authors of articles published in 2008 in six general medical journals to determine the prevalence of articles with honorary authors and ghost authors and to compare this with the prevalence reported in 1996.[14] We hypothesised that the prevalence of articles with honorary and ghost authorship would decline, that the prevalence

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Extra figure and tables
Copy of study questionnaire sent to participants

of honorary and ghost authors would vary by article type, and that inappropriate authorship would be more prevalent in the two journals in our study that do not publicly require and report author contributions than in the four journals that do.

Methods

The study included the six general biomedical journals with the highest impact factors in 2008 according to the Institute for Scientific Information's *Journal Citation Report*: *Annals of Internal Medicine*, *JAMA*, *Lancet*, *Nature Medicine*, *New England Journal of Medicine*, and *PLoS Medicine*.[16] In 2008 these journals followed ICMJE guidelines for authorship (see web extra table 1).

As in the 1996 study, we included three types of articles from these journals: original research reports (research); reviews, including meta-analyses (reviews); and editorials, commentaries, and other opinion articles (editorials). Before we established a sampling frame, two of us (JSW and AF) evaluated each article type by journal based on criteria established a priori. These authors reviewed three journals each, randomly checked each other's coding, discussed any uncertainties or discrepancies, and resolved these differences by consensus. After identifying all of these article types published in 2008 in the six journals, we used a random number generator to select a stratified random sample of articles from each journal reflecting the proportion of the three types of articles published in each journal and the proportion of the total number of articles published by all six journals.

The corresponding author of each selected article was identified. If an article designated more than one corresponding author, one of these authors was randomly selected. Articles (primarily editorials) written by journal editors and staff writers and high government officials (without publicly available personal email addresses) were not eligible for inclusion and, if selected, were replaced with a randomly selected article of the same type from the same journal. If a corresponding author appeared in more than one selected article, only one of these was randomly chosen and the other article replaced with a random selection (see web extra figure on bmj.com).

The corresponding authors of sampled articles were sent an email message in April 2009 inviting them to complete an online questionnaire and explaining that participation was voluntary and that their identities and responses would be kept confidential. Up to three reminder emails were sent to non-responders at about one week intervals. No incentive or compensation was offered for participation.

We developed an online questionnaire based on the mail questionnaire used in the 1996 survey.[14] The questionnaire consisted of 30 questions about the corresponding author, the contributions and functions of all authors, and writing and editing assistance and other contributions from unnamed authors and other individuals (see web extra questionnaire on bmj.com). The questionnaire was pretested among a sample of 15 authors and editors who were not included in the final study.

Using the same base definition as that used in the 1996 survey[14] (based on the ICMJE authorship criteria[11]), we defined an article as having an honorary author if the corresponding author reported any of the following:

1) An author did not meet these three criteria:

(*a*) "conceiving and designing the work," "analysing and interpreting the data," or "collecting data or other material" (we included data collection as an acceptable criterion for authorship because the ICMJE had added this to their guidelines before we conducted this study)

(*b*) "writing the manuscript or part of the manuscript" or "revising the manuscript to make important changes in content"

(*c*) "approving the final version of the manuscript"

2) An author did not "feel comfortable explaining the major conclusions" of the article

3) An author performed "only one function, and nothing else" from a list of 17 activities: supervising the work of any of the coauthors; recruiting coauthors; recruiting study subjects; analysing or interpreting data; conducting literature search; analysing or interpreting literature; reviewing the manuscript; communicating with journal editor(s); signing the statement of copyright transfer to the journal; conceiving and designing the work; collecting data and other material; obtaining funding or material support; performing statistical analysis; writing the manuscript or part of the manuscript; approving the manuscript before submission to a journal; revising the manuscript or making important changes in content; reviewing page proofs or the journal's edited version of the manuscript (see questions 8, 9, and revised question 11 in the study questionnaire on bmj.com).

Using the same definition as that used in the 1996 survey,[14] we defined an article as having a ghost author if the corresponding author reported any of the following:

1) An individual who was not listed as an author made contributions that merited authorship

2) An unnamed individual participated in writing the article.

We also examined the acknowledgment and methods sections of articles meeting these criteria for indications of writing and editing assistance (see questions 13, 17, and 19 in the study questionnaire on bmj.com).

We determined the prevalences of articles with honorary authorship or ghost authorship, or both, in 2008 in these six high impact journals and compared these prevalences to those reported in the six journals in the 1996 study.[14] We also compared prevalences of inappropriate authorship between 2008 and 1996 by article type (research, review, editorial). Because the earlier study was limited to US based corresponding authors and included only three of the six journals in the current study, we also conducted a secondary analysis comparing the prevalence of honorary authors and ghost authors in the three journals included in both the 1996 study and in the present study (*Annals of Internal Medicine*, *JAMA*, and *New England Journal of Medicine*) using a subsample of the 2008 sample that only included US-based corresponding authors.

Four journals in this study (*Annals of Internal Medicine, JAMA, Lancet, and PLoS Medicine*), publicly require (that is, in their instructions for authors) authors to report their individual contributions and publish these contributions in the article. Two journals (*New England Journal of Medicine* and *Nature Medicine*) do not publicly require reporting of individual author contributions and do not routinely publish these contributions in the article. In a subanalysis we compared the prevalence of honorary and guest authors in the journals that required reporting of author contributions versus those without such requirements.

Statistical analysis

Each article served as the unit of analysis for determining the prevalence of honorary or ghost authors. We hypothesised a 10% reduction in the prevalence of articles with honorary or

ghost authors from the 29% prevalence reported in the previous study of six journals in 1996.[14] We estimated that 149 articles would be required to detect this difference with β of 0.20 and a two tailed α of 0.05. Assuming a 67% response rate (based on recent *JAMA* author surveys), we estimated that we needed to sample at least 223 corresponding authors to ensure an adequate sample of 149 completed surveys. Using the same parameters, we estimated that 587 articles would be needed for the subanalyses comparing the four journals with and the two journals without requirements for reporting author contributions. Again assuming a 67% response rate, we estimated that we needed to sample at least 877 authors to achieve the minimum of 587. Corresponding author response rates were calculated according to American Association of Public Opinion Research (AAPOR) standard definitions.[17]

We used χ^2 tests to compare proportions between journals and groups of journals, and to compare prevalences between the two studies (1996 and 2008). Prevalence estimates and adjusted Wald 95% confidence intervals were also calculated. Statistical analyses were computed with SPSS 14.0.[18]

Results

Sample characteristics

In 2008, these six, high impact, general medical journals published 2297 research, review, and editorial articles. A randomly selected, stratified sample of 896 corresponding authors of these articles were invited to complete the survey online (see web extra figure on bmj.com). Usable questionnaires were completed by 630 authors, for an overall response rate of 70.3% (range 58.3% to 85.9% across journals; see web extra table 2 on bmj.com). There were no statistically significant differences in response rates by article type; 67.3% of corresponding authors of research articles, 76.0% of review article authors, and 70.4% of editorial authors responded (P=0.117). However, there were differences across journals (P<0.001; web extra table 2).

Thus, the final analytic dataset included 630 articles for the general analyses. For analyses of honorary authorship, 545 authors submitted complete usable surveys; and for analyses of ghost authorship, 622 authors submitted complete usable surveys (web extra figure). The ghost author analyses were limited to 622 because of missing data from eight surveys. One of the original questions on honorary authorship in the 1996 questionnaire was slightly modified for ease of use in our internet based survey. Some implausible responses were discovered to that question after the survey was completed. Therefore, corresponding authors of all multi-authored articles were re-surveyed (n=501) with a single question worded exactly like the question in the earlier survey.[14] Usable surveys were received from 426 of these corresponding authors for a response rate of 85.0%. Thus, for honorary authorship analyses, 545 articles were available after excluding authors of multi-authored articles who did not respond to the second survey and those from single authored articles with implausible data (web extra figure).

Corresponding authors who responded to the questionnaire were mostly men (75.2%), reported having an MD degree (72.7%), had academic appointments (88.4%), resided in the United States or Canada (63.0%) or Europe (28.7%), and reported having published more than 20 articles in the previous five years (62.7%; web extra table 3). The sampled articles closely reflected the proportions of articles published by the six journals, and included 230 (36.5%) research articles, 136 (21.6%) reviews, and 264 (41.9%) editorials (web extra table 4).

Inappropriate authorship

In the full sample (n=630) the prevalence of articles with honorary authorship, ghost authorship, or both was 21.0% (95% confidence interval 18.0% to 24.3%). Compared with the prevalence of inappropriate authorship reported in the 1996 study (29.2% (26.1% to 32.4%)),[14] there was a significant decline in the overall prevalence of articles with honorary or ghost authors in 2008 (P=0.0004).

Of the 545 articles with usable data on the honorary authorship questions, 96 (17.6%) met criteria for honorary authorship (table⇓). Nearly all of these (93) were articles in which the corresponding author reported that one or more co-authors performed only one function, thus not meeting ICMJE authorship criteria (see web extra table 5). Prevalence ranged from 12.2% to 29.3% by journal (P=0.134), and was 25.0% for research articles, 11.2% for editorials, and 15.0% for reviews (P=0.0007). The prevalence of honorary authorship in 2008 (17.6% (14.6% to 21.0%)) was not significantly different from the prevalence in 1996 (19.3% (16.7% to 22.2%))[14] (P=0.439). The 2008 prevalence of honorary authors for research articles was significantly higher than in 1996 (25.0% (19.7% to 31.1%) *v* 16.3% (13.3% to 19.9%), P=0.006), but was significantly lower for review articles (15.0% (9.6% to 22.6%) *v* 25.5% (20.4% to 31.4%), P=0.023) and editorials (11.2% (7.5% to 16.3%) *v* 20.8% (13.1% to 31.2%), P=0.038).

A total of 49 (7.9%) of 622 articles met the criteria for ghost authorship (table⇓). Prevalence ranged from 2.1% to 11.0% across the six journals, and was 11.9% for research articles, 6.0% for reviews, and 5.3% for editorials (P=0.017). Compared with the results for 1996,[14] ghost author prevalence in 2008 was significantly lower (11.5% (9.5% to 13.9%) *v* 7.9% (6.0% to 10.3%), P=0.023). The prevalence of ghost authors was not significantly different by article type between 2008 and 1996.

In addition, because of the potential for non-response bias, we calculated a conservative prevalence estimate by assuming that all articles for which corresponding authors were non-respondents had no honorary or ghost authors. Under these assumptions and based on a denominator of 896 corresponding authors, the prevalence of articles with honorary authorship or ghost authorship would be 14.7% (132/896), the prevalence of articles with honorary authorship would be 10.7% (96/896), and the prevalence of articles with ghost authorship would be 5.6% (49/896).

In a secondary analysis of the three journals included in both the 2008 and 1996 surveys (*Annals of Internal Medicine, JAMA*, and *New England Journal of Medicine*), and including only corresponding authors from the US (as in the 1996 study), the overall prevalence of articles with honorary authorship was 21.7% (18.0% to 25.8%) in 1996[14] and 11.4% (8.0% to 16.0%) in 2008 (P=0.0008), and the overall prevalence of articles with ghost authorship was 12.0% (9.2% to 15.4%) in 1996[14] and 7.4% (4.8% to 11.2%) in 2008 (P=0.0497).

Comparison of the four journals that indicate a requirement for authors to report their individual contributions (*Annals of Internal Medicine, JAMA, Lancet*, and *PLoS Medicine)* with the two journals that do not have such public requirements (*New England Journal of Medicine* and *Nature Medicine)* showed no statistically significant differences in the prevalence of articles with honorary authors (18.5% *v* 16.0%, P=0.461) or ghost authors (7.3% *v* 9.0%, P=0.455). However, the journals without public requirements for reporting individual contributions (such as in instructions for authors) may have had private guidance for authors about appropriate authorship (such as in letters requesting revision).

Among the 630 articles in this study, 121 (19.2%) included acknowledgment sections that identified contributions to the manuscript such as review, advice, comments, analysis, and various forms of assistance. Of these, 40 (6.3%) specifically identified writing, editing, editorial assistance or writing, or manuscript preparation. Among the 49 articles that met criteria for ghost authorship, seven (14%) included an acknowledgment of writing or editorial contributions from non-authors in the acknowledgment section. No acknowledgment of writing or editorial assistance was noted in the methods section of any of these articles.

Discussion

Principal findings

Inappropriate authorship (honorary and ghost authorship is an important issue for the academic and research community and is a threat to the integrity of scientific publication. Our findings suggest that 21% of articles published in 2008 in the general medical journals with the highest impact factors had an inappropriate honorary author, and that nearly 8% of articles published in these journals may have had an unnamed important contributor. The highest prevalence of both types of inappropriate authorship occurred in original research articles, compared with editorials and review articles. When looking at temporal trends from 1996 to 2008, we found a decline in the overall prevalence of inappropriate authorship (29.1% in 1996 *v* 21.0% in 2008), no significant change in the prevalence of honorary authorship (19.3% *v* 17.6%), and a decline in the prevalence of ghost authors (11.5% *v* 7.9%).

Comparison with other studies

This study directly updates our previous study that looked only at US based authors who published in three general medical journals and three specialty journals.[14] Our current study selected articles published in six general medical journals with the highest impact factors regardless of the corresponding author's location.

Shapiro et al examined authorship in a sample of articles published in 10 leading biomedical journals in 1989, limited to articles with four or more authors with US addresses.[19] Based on the first author's responses, Shapiro et al reported a prevalence of honorary authorship of 26%.[19] Our current study broadened the scope of this early work by including international authors and focused on biomedical journals with high impact factors. Although our study included articles published 19 years after the study by Shaprio et al, we found only a small decline in honorary authorship (17.6%). Shapiro et al did not report findings for ghost authorship.

Goodman surveyed the first authors of all research papers published in five consecutive issues of a general medical journal in 1993.[20] This small study (12 of 14 first authors responded) found that 64% of 84 authors and coauthors reportedly satisfied authorship criteria.

Similar to the current study, Mowatt et al used ICMJE authorship criteria to define honorary and ghost authors in a sample of reviews published by the *Cochrane Library* in 1999.[15] They found a high prevalence of honorary authors (39%) and a lower prevalence of ghost authors (9%). This study was not limited by the author's geographical location, but was limited to a single publication (*Cochrane Library*) and type of article (review). Our current study included more publications and updates the prevalence rates by another nine years.

Strengths and limitations

This evaluation of inappropriate authorship has several limitations. Firstly, because only six general biomedical journals with high impact factors were included, these results may not be generalisable to other medical journals, such as biomedical specialty journals, journals with lower impact factors, or scientific journals in other disciplines. However, these six journals are considered among the most influential journals in medicine, and all have rigorous guidelines for authors. We suspect that the prevalence of inappropriate authorship could be even higher in journals with less rigorous standards.

Secondly, the analyses are based on self reported data from corresponding authors. Shapiro et al had asked corresponding authors to report the level of confidence they had in identifying the contributions of their co-authors[19]; we did not include this assessment. Some under-reporting of honorary and ghost authors may be expected, based on social desirability bias, even though respondents were assured of the confidentiality of their survey responses. Moreover, if under-reporting did occur, it would mean that our results are underestimates of the extent of inappropriate authorship. However, the sample included in our study was representative of the article types from each of the selected journals, and the high response rate suggests that the participating authors were representative of authors who publish in these journals.

Thirdly, we cannot rule out the possibility of recall bias. Corresponding authors may not have accurately recalled their or their co-authors' activities and contributions to a particular publication. However, the articles selected for inclusion in our study were all published in 2008, and corresponding authors were surveyed in April 2009. Furthermore, the journals included in our study are all major journals, and have relatively short intervals from manuscript submission to publication. This interval from manuscript preparation to the administration of our survey would probably not have been a major factor in inaccurate reporting of the contributions of co-authors or recall bias. Although it is possible that the corresponding author of an article might not be the person most closely involved with manuscript preparation, in most cases the corresponding author coordinates the activities of other authors, represents the interests of other authors during interactions with journal editors, and often serves as the "guarantor" for the manuscript. Thus, the corresponding author would be the person most likely to have knowledge of the roles and contributions of other authors.

Fourthly, as in previous research on authorship,[14 15] we used ICMJE authorship criteria to define honorary and ghost authors. The ICMJE authorship criteria might not have been widely known or followed by the authors who participated in our study. However, these authorship criteria are readily available and are generally accepted and followed by hundreds of biomedical journals, including the six journals included in this study. Furthermore, we specifically included "data collection" as an acceptable contribution for authorship for the first set of criteria (ICMJE added this to the criteria before this study was conducted). The number of honorary authors, however, did not change when this criterion was removed in a post hoc reanalysis. In addition, we included a list of 17 common contributions to help elicit who contributed what to the published articles.

Policy implications

Our findings suggest that additional measures are necessary by scientific journals, individual authors, and academic institutions to prevent a practice that might lead to loss of public confidence. Scientific journals have taken steps to strengthen authorship

policies, such as requiring that each author report his or her contributions to the published work.[6 12 13 21 22] However, in our study, the secondary analyses comparing journals that have and those that do not have public requirements for reporting authorship contributions did not show a statistically significant difference in prevalence of inappropriate authorship. This may have been a result of the two journals without public requirements having private guidance on appropriate authorship, or this observation might reflect a "herd" effect.

Both honorary and ghost authorship are unacceptable in scientific publications, and each form of inappropriate authorship has important consequences. Honorary authorship has implications for scientific integrity, in that individuals who have not contributed to the work or manuscript sufficiently to merit authorship but who are named as authors are misrepresenting their contributions in the scientific literature. This may have implications for promotion and tenure committees that examine a faculty member's number of publications rather than that faculty member's substantive contributions to the work. Moreover, in cases of scientific misconduct involving published articles, honorary authors may be held accountable and responsible even though they may not have contributed to the work to even merit authorship. Likewise, ghost authorship has important implications and consequences. If un-identified authors are involved in the work and manuscript preparation, readers not only will be unaware of the contributions, perspectives, and affiliations of these individuals, but also may not appreciate the influence or potential underlying agenda these individuals may have on the reporting of material in the article (such as may occur with ghost authors employed by industry).

There has been increased attention to taking steps to help "flesh out" ghost authors by requesting that authors provide details about the contributions of others who are not named as authors. According to the ICMJE guidelines: "All contributors who do not meet the criteria for authorship should be listed in an acknowledgments section. Examples of those who might be acknowledged include a person who provided purely technical help, writing assistance, or a department chairperson who provided only general support. Editors should ask corresponding authors to declare whether they had assistance with study design, data collection, data analysis, or manuscript preparation. If such assistance was available, the authors should disclose the identity of the individuals who provided this assistance and the entity that supported it in the published article. Financial and material support should also be acknowledged."[11]

Making the requirement for reporting individual contributions more rigorous, such as by requiring signed statements from each author attesting to his or her contributions, by publishing those detailed contributions as part of the article (even if online only), and by asking the corresponding author to verify and vouch for the reported contributions of co-authors, may increase the effectiveness of this approach. Journals could also remind authors to identify all people who have contributed substantially to the work and specifically note writing of the manuscript in this regard. For example, the journal *Neurology* specifically requires identification of the person who wrote the first draft of the manuscript.[22]

As with the suggested approaches for addressing suspected scientific misconduct,[23 24] maintaining integrity in authorship requires the commitment of individual researchers and the oversight of academic institutions. These institutions should evaluate their policies and procedures governing authorship to ensure that individuals whose names appear on published articles qualify for authorship and that articles on which faculty members are named as authors do not also have ghost authors. Departmental research committees and institutional promotions committees should evaluate each article on which a faculty member is listed as an author, and require that the individual's contributions are clearly listed. Academic and research institutions should develop guidelines for reporting cases of potential inappropriate authorship, and establish clear policies and procedures for confidential reporting of these concerns, and mechanisms for objective investigation of allegations of potential inappropriate authorship.

Conclusions

Ensuring appropriate authorship remains an important issue for authors, academic and research institutions, and scientific journals. Full transparency in authorship is essential for maintaining integrity and accountability in scientific publication and ensuring public confidence in medical research. The results of this study should raise awareness among the scientific community about the importance of ensuring appropriate authorship credit and responsibility. Future research should continue to monitor inappropriate authorship and investigate ways that the scientific community could increase its effectiveness in addressing the problem.

We thank Angela Grayson, Jeni Reiling, and Reuben Rios, *JAMA* assistant editors, for research assistance.

An earlier version of this research was presented at the Sixth International Congress on Peer Review and Biomedical Publication, 10 September 2009, Vancouver BC, Canada.

Contributors: JW collected and analysed the data. All authors (CD, AF, PF, JW) participated in the design of the study, interpretation of the results, the writing of the manuscript, and review and approval of the final manuscript. All authors had full access to all the data, including statistical reports and tables, in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

Funding: The authors are employed as editors with *JAMA*, one of the journals included in this study. All costs of the study were met by *JAMA*.

Competing interests: All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that none of the authors, their spouses or families, have any financial or non-financial interests or relationships that may be relevant to the submitted work

Ethical approval: Not required. In the invitation letter and at the beginning of the survey, participants were assured of confidentiality and the voluntary nature of their participation if they chose to participate. Participation was voluntary.

Data sharing: A de-identified raw dataset and accompanying analytical files are available from Joseph Wislar at joseph.wislar@jama-archives.org

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What is already known on this topic

The presence of inappropriate (honorary and ghost) authors and the associated lack of transparency and accountability is an important problem for scientific journals, researchers, and academic institutions

Studies have found the prevalence of honorary authors to be as high as 39% and prevalence of ghost authors as high as 11% in a range of biomedical journals and types of articles

What this study adds

This study suggests that, among articles published in six high impact, general medical journals in 2008, the overall prevalence of articles with honorary authorship, ghost authorship, or both, was 21.0%, a decline from 29.1% in 1996

There was no change in the prevalence of honorary authors relative to 1996, but the prevalence of ghost authorship showed a significant decline

Inappropriate authorship remains a problem in high impact biomedical publications

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Accepted: 23 August 2011

Cite this as: *BMJ* 2011;343:d6128

Table

Table 1| Prevalence of honorary and ghost authors in a sample of 630 research, review, and editorial articles published in six general medical journals with high impact factors in 2008, by journal and article type

	Total*		Research		Reviews		Editorials	
Journal	No of articles	% (95% CI) of articles	No of articles	% (95% CI) of articles	No of articles	% (95% CI) of articles	No of articles	% (95% CI) of articles
Honorary author	**(n=545)**		**(n=220)**		**(n=120)**		**(n=205)**	
Ann Intern Med	9/58	15.5 (8.2 to 27.2)	6/26	23.1 (10.7 to 42.4)	2/23	8.7 (1.3 to 28.0)	1/9	11.1 (0 to 45.7)
JAMA	20/120	16.7 (11.0 to 24.4)	13/54	24.1 (14.5 to 37.1)	5/20	25.0 (10.8 to 47.3)	2/46	4.3 (0.4 to 15.3)
Lancet	24/122	19.7 (13.5 to 27.7)	5/30	16.7 (6.9 to 34.0)	4/24	16.7 (6.1 to 36.5)	15/68	22.1 (13.7 to 33.4)
Nature Med†	12/41	29.3 (17.5 to 44.6)	11/27	40.7 (24.5 to 59.3)		NA	1/14	7.1 (0 to 33.5)
N Engl J Med	18/147	12.2 7.8 to 18.6)	13/58	24.1 (13.5 to 34.8)	3/36	8.3 (2.1 to 22.6)	2/53	3.8 (0.3 to 13.5)
PLoS Med	13/57	22.8 (13.7 to 35.3)	7/25	32.0 (17.1 to 51.7)	4/17	23.5 (9.1 to 47.8)	2/15	13.3 (2.5 to 39.1)
Total	96/545	17.6 (14.6 to 21.0)	55/220	25.0 (19.7 to 31.1)	18/120	15.0 (9.6 to 22.6)	23/205	11.2 (7.5 to 16.3)
Ghost author	**(n=622)**		**(n=226)**		**(n=134)**		**(n=262)**	
Ann Intern Med	3/61	4.9 (1.1 to 14.0)	2/26	7.7 (1.0 to 25.3)	1/25	4.0 (0 to 21.1)	0/10	0 (0 to 24.9)
JAMA	11/140	7.9 (4.3 to 13.7)	8/56	14.3 (7.2 to 26.0)	1/24	4.2 (0 to 21.9)	2/60	3.3 (0.3 to 12.0)
Lancet	11/145	7.6 (4.2 to 13.2)	4/30	13.3 (4.7 to 30.3)	1/28	3.6 (0 to 19.2)	6/87	6.9 (2.9 to 14.5)
Nature Med	1/48	2.1 (0 to 11.9)	1/26	3.8 (0 to 20.5)	0/1	0	0/21	0 (0 to 13.5)
N Engl J Med	18/163	11.0 (7.0 to 16.9)	9/60	15.0 (7.9 to 26.3)	5/39	12.8 (5.1 to 27.2)	4/64	6.3 (2.0 to 15.4)
PLoS Med	5/65	7.7 (3.0 to 17.2)	3/28	10.7 (2.9 to 28.0)	0/17	0 (0 to 16.2)	2/20	10.0 (1.6 to 31.3)
Total	49/622	7.9 (6.0 to 10.3)	27/226	11.9 (8.3 to 16.9)	8/134	6.0 (2.9 to 11.5)	14/262	5.3 (3.1 to 8.8)

*Honorary author analyses are based on 545 articles with usable data; ghost author analyses are based on 622 articles with usable data.

†No review articles were eligible for honorary author analyses in *Nature Medicine*.