

## Introduction

An increasing number of publishers are considering moving towards *open access publishing* where everyone has lawful free access to research articles on the Internet.<sup>1</sup> Advocates of open access publishing criticize the traditional publishing model whereby publishers can make profits through subscriptions whilst restricting access to important scientific information that should be in the public domain. The *author-pays model* has been proposed as an alternative method of raising revenue to fund publishing. It is based on the idea of shifting costs from readers to authors; subscriptions are replaced by author charges for publication. The author contribution is usually referred to as an 'author charge' but the assumption is that it will be paid by research funders or the author's institution. BioMedCentral, which currently publishes more than 100 journals, operates on such a model. The author-pays model has attracted much attention and several publishers are currently experimenting with author publication charges in exchange for open access to research papers,<sup>2,3</sup> including the BMJ Publishing Group.<sup>4</sup> However, little is known about the long-term feasibility of such a model, the implications on research published, and authors' attitudes to such a model.<sup>5–7</sup>

The success of open access publishing funded through author charges is dependent on authors having access to financial support at the time of submission or acceptance of their research papers. The Wellcome Trust<sup>8</sup> made a conservative estimate of the cost of publishing an open access article to be between \$500 and \$2,500, with the cost relating to the journal's level of selectivity. Several major funding agencies, such as the National Institutes of Health, the National Science Foundation, the Howard Hughes Medical Institute, the Medical Research

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# Financial support at the time of paper acceptance: a survey of three medical journals

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**ABSTRACT:** *The author-pays model (open access publishing funded through author charges) is dependent on authors having access to financial support at the time their research papers are accepted. We conducted an author survey to determine the availability of external funding for publication charges at different points in the research process. Of the 377/524 (72%) who responded, 62% (233/377) received external funding to support their study, but with notable differences between journals. Only 25% (95/377) could withdraw funds from a grant at the time of paper acceptance. The grant was closed at this time for almost half (105/233, 45%) of those who were externally funded. Non-externally funded research was largely supported through departmental resources (56%, 80/144) or carrying out research in own time (63%, 91/144). To conclude, a large proportion of published research is not externally funded, and many funded researchers do not have access to financial support at the time their paper is accepted for publication.*

Council, the Wellcome Trust, and Research Councils UK, have indicated that they are willing to support the open access initiative by ring-fencing money for publication charges in grants in exchange for free open access to research they have funded. However, our previous study with authors submitting papers to the *BMJ* found that there were concerns about the implications of an author-pays model for non-externally funded researchers.<sup>6</sup> Authors suggested that the proportion of non-externally funded research may be substantial and that the type of research that is not funded is often important methodological research.

There have been a few previous studies evaluating the volume of non-funded medical research in a range of medical specialties (pathology, internal medicine and surgery;<sup>9</sup> internal medicine and neurology;<sup>10</sup> psychiatry;<sup>11</sup> emergency medicine;<sup>12</sup> and medical education<sup>13</sup>). These studies found a substantial proportion of research is not funded, but most were conducted several years ago.<sup>9-12</sup>

The objective of our study was to determine the proportion of research published in three biomedical journals (in paediatrics, genetics, and general medicine) that was externally funded and the accessibility of funds for author publication charges at different points in the research process.

## Methods

### *Author survey*

We emailed an invitation to participate in an electronic survey about research funding to the corresponding authors of papers published in *Archives of Disease in Childhood* (ADC), *BMJ*, and the *Journal of Medical Genetics* (JMG) in 2003. These journals were selected to represent different specialties, namely paediatrics, genetics, and general medicine.

Authors of case reports/series were excluded because they are not generally considered to be original research and one would not expect to receive research funding for such studies. The questionnaire asked participants to respond in relation to the study/research described in their published paper. As a reminder, the authors' paper title was mail-merged into the survey

at relevant points. The questionnaire included questions about how the specific research study was funded, whether the authors received external funding, the length of funding, access to funds at different stages in the research process, and how non-externally funded research was supported. Authors who had published more than one paper describing more than one study in 2003 were sent a questionnaire for each study reported. To increase response rates, email reminders were sent to non-responders one and two weeks after the initial mailing.

We did not receive ethical approval for this specific survey, but we did receive general approval from the *BMJ*'s ethics committee to conduct research with authors of the *BMJ* Publishing Group's journals about this topic.

### *Analysis of published funding statements*

For the sample of authors who responded to the survey, we analysed the content of the declarations of funding support printed in the papers in the three journals. We recorded the presence of a statement about funding for the study presented, the type of funding (project-specific or personal, e.g. a research fellowship, or both); and the name of the funder.

## Results

### *Author survey*

#### *Sample*

A few of the questionnaires (59/583) bounced back because the email address of the corresponding author was inactive. Nearly three-quarters (72%, 377/524) of authors responded to the survey (ADC 89/152, 59%; *BMJ* 217/269, 81%; *JMG* 71/103, 69%). Overall, the mean age of participants was 45.3 (SD 8.8,  $n = 353$ ) years, 33% (123/377) were female and authors had been active researchers on average for 14.2 (SD 8.8,  $n = 362$ ) years. Authors had published between 1 and 500 papers (mean 58.6, SD 64.8,  $n = 360$ ).

#### *Externally funded research*

Overall, 62% (233/377) of authors reported

they received external funding (i.e. money from outside of their institution) for the research described in their paper, but the proportion varied by journal with a higher proportion of research funded in the genetics journal than the paediatric and general medical journals (40%, 36/89 ADC; 64%, 139/217 BMJ; 82%, 58/71 JMG). Of those who received external funding, the average duration of funding was 28.3 (SD 24) months, but 31% (72/233) received funding for one year or less (Table 1). Length of funding also varied by journal.

#### Sources of external funding

Across all journals, 64% (150/233) of research studies were funded with some public money, 36% (83/233) with some charity money, and 7% (16/233) with some industry money (Table 1). Many authors received money for a specific study from more than one source and there were differences between journals.

#### Access to external funds at time of submission and acceptance

Only 44% (102/233) of externally funded authors were still able to withdraw money from their funding source at the time of submitting their paper, dropping only slightly to 41% (95/233) at paper acceptance (Table 2). However, there were clear differences

between journals, with a much higher proportion of authors publishing in the genetics journal (JMG 66%, 38/58) able to withdraw money from their funding source at the time of acceptance than authors in the paediatric and general medical journals (ADC 25%, 9/36; BMJ 35%, 48/139).

At the time of paper acceptance, 45% (105/233) of externally funded authors' grants were closed, but there were clear differences between journals (47%, 17/36 for ADC; 53%, 74/139 for BMJ; 24%, 14/58 JMG). Only 13% (30/233) of funded authors said there was money available at this time that could have been used for author charges. A further 26% (60/233) could still access some money from their grant but were either not authorized or were reluctant to use funds for publication charges.

#### Non-externally funded research

Non-externally funded projects were largely supported through institutional departmental funds (56%, 80/144) and/or by the author carrying out the research in their own (unpaid) time (63%, 91/144), but there were journal differences (Table 3). Slush funds and 'other' sources were used to a lesser extent. Some of the free-text responses to this item illustrate the nature of how non-externally funded research gets supported (Box 1).

**Table 1** Length and source of external funding

	ADC (n = 36)	BMJ (n = 139)	JMG (n = 58)	Total (n = 233)
Duration of external funding				
Mean duration of funding in months (SD)	21.3 (15)	30.2 (29)	27.6 (15)	28.3 (24)
Received funding for one year or less (%)	15 (42)	44 (32)	13 (22)	72 (31)
Source of external funding <sup>a</sup>				
Public (%)	19 (53)	97 (70)	34 (59)	150 (64)
Charitable (%)	14 (39)	38 (27)	31 (53)	83 (36)
Industry (%)	3 (8)	10 (7)	3 (5)	16 (7)
Other (%)	1 (3)	15 (11)	4 (7)	20 (9)
Missing (%)	3 (8)	6 (4)	3 (5)	12 (5)

<sup>a</sup>Numbers do not sum to 100% as respondents could tick more than one source of funding (multiple response option).

**Table 2 Access to external research funds at time of submission and acceptance**

	ADC funded (n = 36)	BMJ funded (n = 139)	JMG funded (n = 58)	Total (n = 233)
Able to withdraw funds at time of submission? (%)				
Yes	11 (31)	52 (37)	39 (67)	102 (44)
No	22 (61)	81 (58)	16 (28)	119 (51)
Able to withdraw funds at time of acceptance? (%)				
Yes	9 (25)	48 (35)	38 (66)	95 (41)
No	24(67)	85 (61)	17 (29)	126 (54)
Financial status at acceptance (%)				
Grant closed	17 (47)	74 (53)	14 (24)	105 (45)
Grant open: money available that could have been used for author charges	1 (3)	14 (10)	15 (26)	30 (13)
Grant open: money left but not authorised to use it for this purpose	5 (14)	14 (10)	16 (28)	35 (15)
Grant open: money left but I would have been reluctant to use it for this purpose	2 (6)	16 (12)	7 (12)	25 (11)
Grant open: no money left	1 (3)	3 (2)	2 (3)	6 (3)
Don't know	6 (17)	4 (3)	1 (2)	11 (5)
Other	1 (3)	7 (5)	0 (0)	8 (3)

Note: Numbers do not sum to 100% due to missing data.

**Table 3 Financial support for projects with no extramural support**

	ADC (n = 53)	BMJ (n = 78)	JMG (n = 13)	Total (n = 144)
Departmental funds (%)	25 (47)	49 (63)	6 (46)	80 (56)
Research in own time (%)	37 (70)	48 (62)	6 (46)	91 (63)
Slush fund (%)	4 (8)	7 (9)	1 (8)	12 (8)
Other (%)	8 (15)	8 (10)	2 (15)	18 (13)

Note: Numbers do not sum to 100% as respondents could tick more than one option (multiple response option).

### *Time spent on non-externally funded research*

Across all the journals, 55% (129/233) of externally funded and 85% (123/144) of non-externally funded authors reported that they work on this type of research at least 'some of the time' (Table 4). Forty per cent (94/233) of funded and 71% (102/144) non-externally funded authors reported that they submit their non-funded research to peer-reviewed journals 'all' or 'most of the time'.

### *Analysis of funding statements*

Seventy-one per cent (269/377) of published articles included a printed statement about financial support received including project grants, research fellowships, or both. As with the survey responses, there were notable differences between journals: 38% (34/89) of ADC studies, 81% (175/217) of BMJ studies, and 85% (60/71) of JMG studies contained statements describing funding (Table 5).

**Box 1**

- A student did the analysis under instruction and I repeated it and refined it with statistical advice from a friend and colleague.
- The data collection designed for another hypothesis was funded by X; I was partially supported by a grant for another study. In other words, there were no funds specifically designed to support this project. But I and my staff were supported by various funding sources for other projects during the period we completed the project.
- I used my own time – allocated analysis time from my analysts – and worked with a research fellow as well as other colleagues.
- My time in the department was funded as a training fellowship, which meant I had a lot of freedom to choose what I did, and this allowed time for research (but there was no specific funding for research).
- Part of my salary was covered by an (unrelated) career development award.
- Related research grant.
- Self-funded Ph.D.
- Baseline cohort recruited from previous study funded by MRC.
- Establishment Grant, fourth-year medical students.

**Discussion**

In these three journals a substantial proportion of published research was not supported by external funding agencies, but was largely carried out using institutional funds or in the researchers' own unpaid time. In addition, only two-fifths of funded authors would have been able to withdraw funds from the relevant research grant to pay for publication charges at the time their paper was accepted.

This study provides data from authors about access to funds at the time of paper acceptance, the tenet upon which the author-pays model is based. Our analysis of published statements about funding support printed with the papers suggested that 71% of authors received external funding for

their research. However, when the same authors of these papers responded to our survey, we found that only 62% of research studies received some external funding. We are not sure why there is a discrepancy between sources, but one reason might be that researchers are often encouraged or required to acknowledge their funders in all subsequent related publications and those written by authors on research fellowships. Thus relying on acknowledgements of funding to assess whether authors would have financial support at the time of publication could be misleading.

**Study limitations**

The extent to which the findings can be generalized to other journals is somewhat limited as we only sampled authors from three journals and found differences between them. Differences might be greater still for higher-impact journals in certain specialties. However, we did purposely select a general medical journal and two clinical journals in very different specialties to make the results more generalizable. Whilst the sample was quite small, it is likely to be representative of all research published in these journals as we achieved a good response rate and included publications across the whole calendar year. Our finding of a large proportion of unfunded research being published is in keeping with previous research in other specialties.<sup>9–13</sup>

Ten per cent of the initial sample pool had an inactive email address and we cannot rule out the possibility that these authors may have differed from the respondents as we did not attempt to trace them or their co-authors. However, we did receive a good response rate to the survey overall, in excess of the average for surveys of professionals (published surveys of physicians have a mean response rate of 54%).<sup>14</sup>

**Implications for funded research**

The funded research published in these three journals was supported by numerous funding bodies. Whilst some of these research funders have expressed support for the idea of open access publishing funded through author charges, many have not given details

**Table 4 Time spent on non-externally funded research**

	ADC		BMJ		JMG		Total	
	Funded (n = 36)	Non-funded (n = 53)	Funded (n = 139)	Non-funded (n = 78)	Funded (n = 58)	Non-funded (n = 13)	Funded (n = 233)	Non-funded (n = 144)
How often author works on non-funded research (%) <sup>a</sup>								
All or most of the time	11 (31)	28 (53)	29 (21)	29 (37)	6 (10)	6 (46)	46 (20)	63 (44)
Some of the time	11 (31)	18 (34)	49 (35)	38 (49)	23 (40)	4 (31)	83 (36)	60 (42)
A little of the time	8 (22)	7 (13)	38 (27)	11 (14)	21 (36)	3 (23)	67 (29)	21 (15)
None of the time	3 (8)	0 (0)	16 (12)	0 (0)	5 (9)	0 (0)	24 (10)	0 (0)
How often author submits non-funded research to peer-reviewed journals (%) <sup>b</sup>								
All or most of the time	21 (58)	41 (77)	57 (41)	54 (69)	16 (28)	7 (54)	94 (40)	102 (71)
Some of the time	5 (14)	6 (11)	26 (19)	16 (21)	16 (28)	4 (31)	47 (20)	26 (18)
A little of the time	3 (8)	6 (11)	27 (19)	8 (10)	16 (28)	1 (1)	46 (20)	15 (10)
None of the time	4 (11)	0 (0)	22 (16)	0 (0)	7 (12)	1 (1)	33 (14)	1 (1)

Note: Numbers do not sum to 100% due to missing data.

<sup>a</sup>How often do you work on research projects that are not externally funded (i.e. projects funded only through departmental or personal resources)? ('All of the time', 'Most of the time', 'Some of the time', 'A little of the time', 'None of the time').

<sup>b</sup>How often do you submit your unfunded research to peer-reviewed journals for publication? ('All of the time', 'Most of the time', 'Some of the time', 'A little of the time', 'None of the time').

**Table 5 Analysis of funding statements of research articles published in ADC, BMJ, JMG in 2003<sup>a</sup>**

	ADC (n = 89)	BMJ (n = 217)	JMG (n = 71)	Total (n = 377)
Received external funding (%)	34 (38)	175 (81)	60 (85)	269 (71)
Type of funding				
Project funding (%) <sup>b</sup>	26 (76)	109 (62)	31 (52)	166 (62)
Person(s) funding (%) <sup>c</sup>	4 (12)	36 (21)	17 (28)	57 (21)
Person(s) and project funding (%) <sup>d</sup>	4 (12)	30 (17)	12 (20)	46 (17)

Note: Only direct financial funding is included (funding for the provision of equipment etc. is not included).

<sup>a</sup>Only includes those authors who responded to the survey (n = 377). Results very similar when all published papers included (n = 583).

<sup>b</sup>At least one of the authors received financial support for the specific project for example a project grant.

<sup>c</sup>At least one of the researchers was funded through a fellowship, studentship or award.

<sup>d</sup>At least one of the authors received funding for the specific project and at least one of the researchers was personally funded through a fellowship, studentship or award.

on how they plan to finance and support authors. For example, most have not indicated whether they are going to increase the budget for the overall grant accordingly or give the same amount and allocate a sum for dissemination whilst expecting grantholders to reduce their expenses in other areas. As grants run for fixed periods and the acceptance of articles is the last stage in the research cycle it is possible that grants may be used up or closed at the time of publication, especially where there is a long delay

between publication submission and acceptance. Funding bodies in support of open access publishing need to assure authors that they will support them by paying publication charges after the fixed term of the grant. The National Institutes of Health (NIH) and the Wellcome Trust, staunch supporters of the open access publishing movement, now award additional funding to grantholders to cover publication charges levied by publishers supporting the open access model.<sup>15,16</sup> However, it is less clear how

other funders will support their grantholders, but the situation is changing rapidly as we are entering a transition period.

### Implications for non-funded research

This study found that a large proportion of research is not supported by external funding agencies and is carried out in researchers' own time or through departmental resources. The author-pays model could become an additional barrier for such researchers and some research may not be published due to limited resources. This would have important implications, because the types of research that are published could become skewed and important research may fail to get into the public domain.<sup>5,8</sup> Alternatively, non-funded research may be diverted to traditionally financed journals regardless of appropriate readership.

### Future research

Some publishers, for example BioMed Central and PLoS, have introduced waivers for authors unable to pay publication charges and argue that the author-pays model works. To determine the overall feasibility of an author-pays model detailed economic analysis is required, taking into consideration the volume of research that is not funded.

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