

# The status and challenges of preprint adoption in Africa

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## Abstract

Low- and middle-income countries face obstacles in sharing scientific research globally due to costly publishing fees and biases. Preprints—manuscripts shared before formal journal-organised peer review—offer a potential remedy. However, their uptake, mainly in the USA, UK, and Western Europe, contrasts sharply with limited adoption in Africa. Understanding African researchers' views on preprints remains scant, hindering acceptance. Our survey reveals widespread unawareness regarding preprints and reliance on traditional publishers among African researchers. Of 182 respondents from Nigeria, South Africa, and Tanzania, 41.9% posted preprints, yet 77% were unaware of Africa-specific repositories. While non-posters read preprints, fewer cited or shared them. Social media served as the primary platform for preprint sharing, with concerns over sharing before peer review. Although recognized for accessibility and career enhancement, concerns persisted regarding recognition and co-author unfamiliarity. Encouragement from publishers was vital, but opinions varied on institutional and funder involvement, highlighting differing perceptions in promoting preprints. Additionally, our data suggests that traditional publishers dominate the preprint landscape for Africa-based researchers. This study provides important preliminary information relating to perceptions of preprints across African scholars and highlights the need for urgent further work to increase awareness and adoption of preprints across Africa.

## Introduction

The traditional model of scientific communication, primarily through journal publication, has faced increasing scrutiny due to its limitations in terms of cost, equity, and inclusion. While it has long been the established method for disseminating academic and scientific work in the life sciences, this approach has created a system where authors are often distanced from their research, with limited control over its visibility and impact <sup>1</sup>. The decision-making power within this system often rests with a select few gatekeepers, such as journal editors, who may introduce biases or prejudices into the evaluation process <sup>2</sup>. This can lead to the exclusion of valuable research that may challenge existing paradigms or originate from underrepresented voices. Furthermore, the traditional and current publishing models often impose financial barriers such as subscription fees for institutions and high article processing charges (APCs) for authors, creating financial burdens for researchers, particularly those from low-middle income countries and regions, such as Africa <sup>3-5</sup>. Researchers within these regions are often unable to pay APCs and their institutions may struggle to pay subscription fees <sup>6</sup>.

A potential solution to the financial and equity challenges has been in the form of the open access movement. However, this is the movement that has resulted in APCs and a potentially confusing array of different OA routes. One potential solution to this publishing and OA problem are preprints; scholarly manuscripts published by the authors on an online platform with immediate free access prior to journal-organized peer review <sup>7,8</sup>. Preprints offer open, rapid, and equitable dissemination of research findings, empowering authors to share their work promptly and widely without the constraints of traditional publishing <sup>9,10</sup>. An important merit of depositing preprints is that they offer a timestamp for novel research findings, thus bolstering claims to the priority of discovery <sup>11</sup>. Furthermore, preprints could aid in improving the quality of the final findings by facilitating early feedback from the scientific community. This, in turn, greatly aids in advancing scientific knowledge, promotes collaboration among researchers and acts as a potential source of novel ideas and breakthroughs <sup>12</sup>.

These advantages are especially beneficial to African scholars, to whom traditional scientific communication platforms are often inaccessible, expensive, and exclusionary <sup>13</sup>. Furthermore, the adoption of preprints presents a key advantage for African researchers by offering a solution to the widespread issue of publishing in predatory journals, a major challenge in the African academic landscape <sup>14</sup>. Nevertheless, uptake of preprints has been slow in Africa compared to the rest of the world <sup>15</sup>. This might be attributed to a myriad of reasons, including technical issues such as lack of quality assurance and lack of technological infrastructure <sup>13</sup>. Further, social issues such as low awareness about preprints, fear of scooping as well as the nature of curation and evaluation of preprints have been the main challenges globally, especially in the life and health science domains <sup>9,16,17</sup>.

The status of preprint utilization in Africa is not clear, with data missing and often presented as an approximation based on findings presented from other continents <sup>15</sup>. Furthermore, to date, little is known about the position and perspectives of African researchers towards preprints.

Thus, this study investigates the perspective and challenges of preprint adoption in Africa and presents preliminary findings on the perceptions of preprints by African researchers.

## Methods

### Study design

This was a cross-sectional study aimed at assessing African researchers' knowledge and perspectives on preprints alongside their challenges. The study targeted a population of researchers based on the African continent. Both preprint users and those who hadn't posted nor used preprints before were allowed to answer the survey. Researchers not based in Africa were excluded from the data analysis.

### Data collection

The survey was created with Google Forms and disseminated via social media platforms and institutional mailing lists for 2 months between September and November 2023. We also worked with partners, including AfricArXiv and eLife, to disseminate the survey across their networks. To incentivise completion of the survey, a gift card/merchandise was offered to randomly selected participants at the end of the survey. The full list of questions can be found in Supplemental Material 1.

### Data analysis

Data was collected in Google Forms prior to manual cleaning for consistency and grammar. Data was then downloaded to Excel and transferred and analyzed in R (version 4.1.2 for MacOS 14.0) using the tidyverse (version 2.0)<sup>18</sup> and patchwork (version 1.1.2)<sup>19</sup> packages. The full R code used for analysis is available from Zenodo (doi:10.5281/zenodo.10285619).

### Ethical considerations

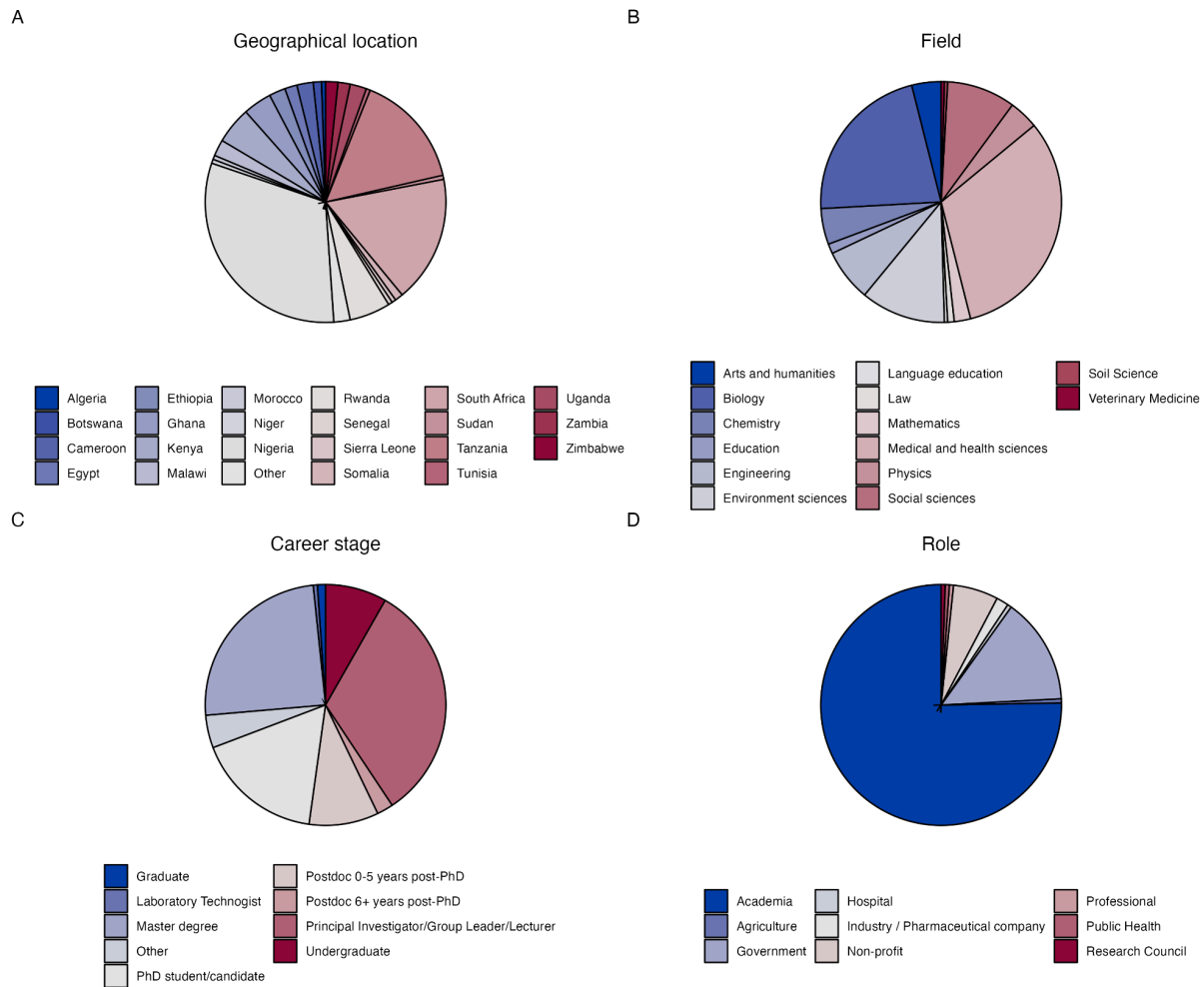
This study was deemed not to require ethical approval by the authors due to being a low-risk survey. All participants provided consent prior to completing the survey. No names or identifying information was retained unless participants opted to provide their email addresses to be entered into a raffle to win some merchandise.

## Results

### Demographics

A total of 182 respondents took the survey. The majority of the respondents were from Nigeria, South Africa and Tanzania, representing 31.3%, 17.03% and 15.3% of all respondents, respectively (Fig 1A, supplementary table 1). Respondents belonged to diverse disciplines ranging from arts and humanities, biological science, and natural sciences to health and medical sciences. A large proportion of the respondents, however, belonged to medical and health

sciences (32%), Biology (21.9%) and Environmental sciences (11.2%). Social scientists composed approximately 9% of the respondents (Fig 1B, supplementary table 2). Respondents who were PhD students (17%), masters students (24.7%) and lecturer/principal investigators (32.4%) constituted a significant portion of the career stages (Fig 1C), with roles mostly in academia (75%; Fig 1D).



**Fig 1. Demographics of respondents.** A) Pie chart of the geographical distribution of survey respondents, B) Pie chart showing the field of respondents, C) Pie chart showing the career stages of respondents and D) Pie chart showing the career role of respondents. N=182 respondents.

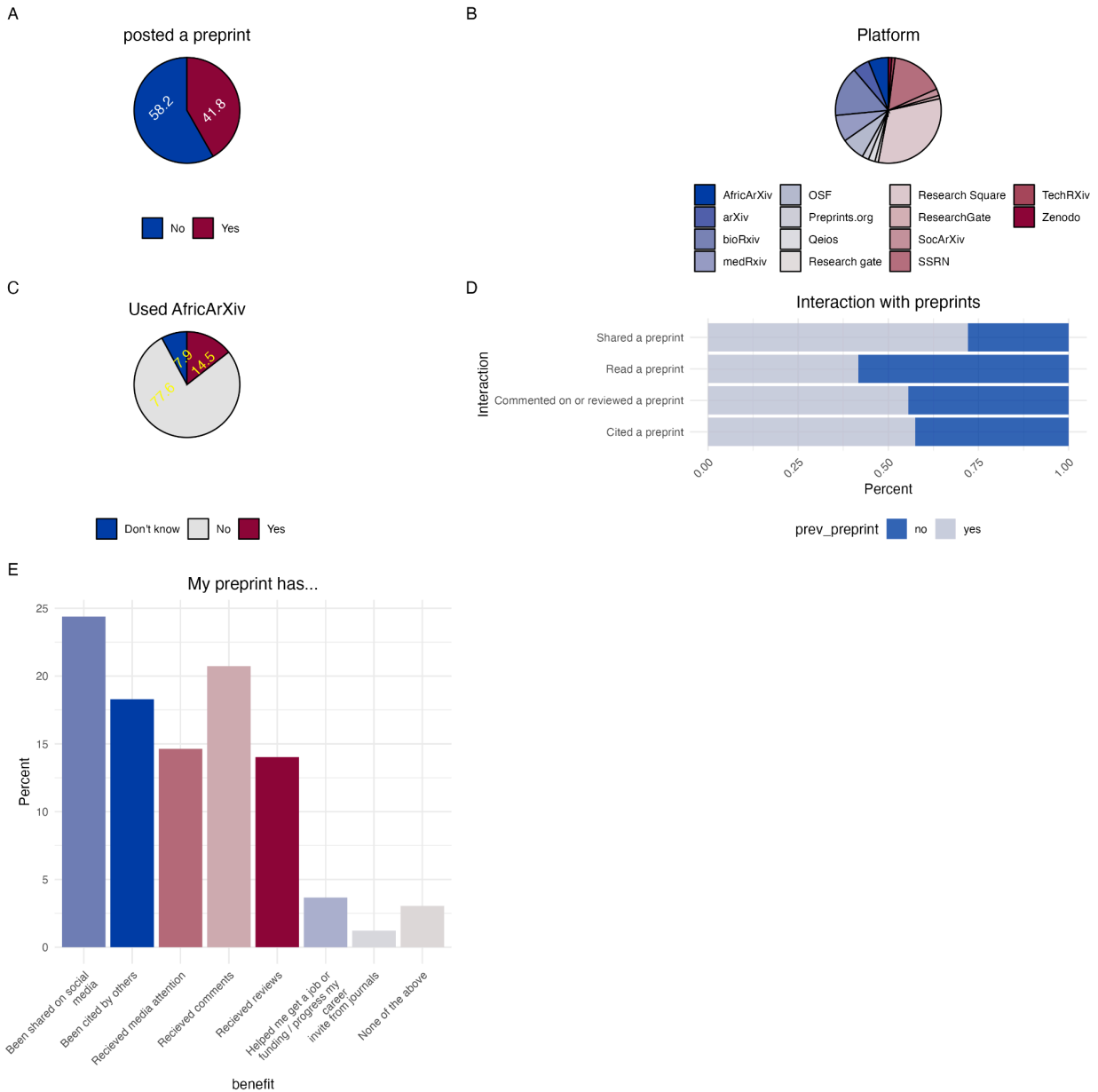
## Experience with preprints

The findings from our survey shed light on the diverse landscape of preprint engagement within our respondent pool in Africa. A minority (41.9%) of respondents reported having posted a

preprint at some point (Fig 2A), with most using Research Square (31.6%) to post their preprints, followed by SSRN (16.3%) and bioRxiv (15.3%) (Fig 2B). Across this preprint posting, 77% had never used AfricaArXiv (Fig 2C). About 8% of the respondents were uncertain about their usage of AfricArXiv, suggesting a lack of awareness.

Respondents who had previously posted a preprint reported more interactions with preprints than respondents who had never posted a preprint (Fig 2D). Of those who reported sharing preprints, 72% had previously posted a preprint. Similarly, more respondents who reported commenting on or reviewing a preprint (55% vs 44%) or citing a preprint (57% vs 43%) had previously posted a preprint compared to not having posted a preprint. However, more respondents who reported having read a preprint had previously not posted a preprint themselves (42% vs 58%). This potentially suggests that although scholars are reading preprints, they are either not utilizing the advances in scientific knowledge or they are not appropriately attributing credit.

We also inquired about the kind of attention posted preprints had received. Most preprints had been shared on social media (40, 24%), with many receiving comments (34, 20.7%) or being cited (30, 18.2%). A smaller number also received media attention (24, 14.6%) or peer reviews (23, 14%) (Fig 2F).



**Fig 2. Respondents' experience with preprints.** A) Percentage of respondents who have previously posted a preprint, B) Pie chart of the platforms used to post preprints, C) Percentages of respondents who have used AfricaArXiv before, D) Bar chart showing the interaction with preprints for respondents based on if they have previously posted a preprint or not, and E) Benefits experienced by respondents who have previously posted preprints. N=182 respondents.

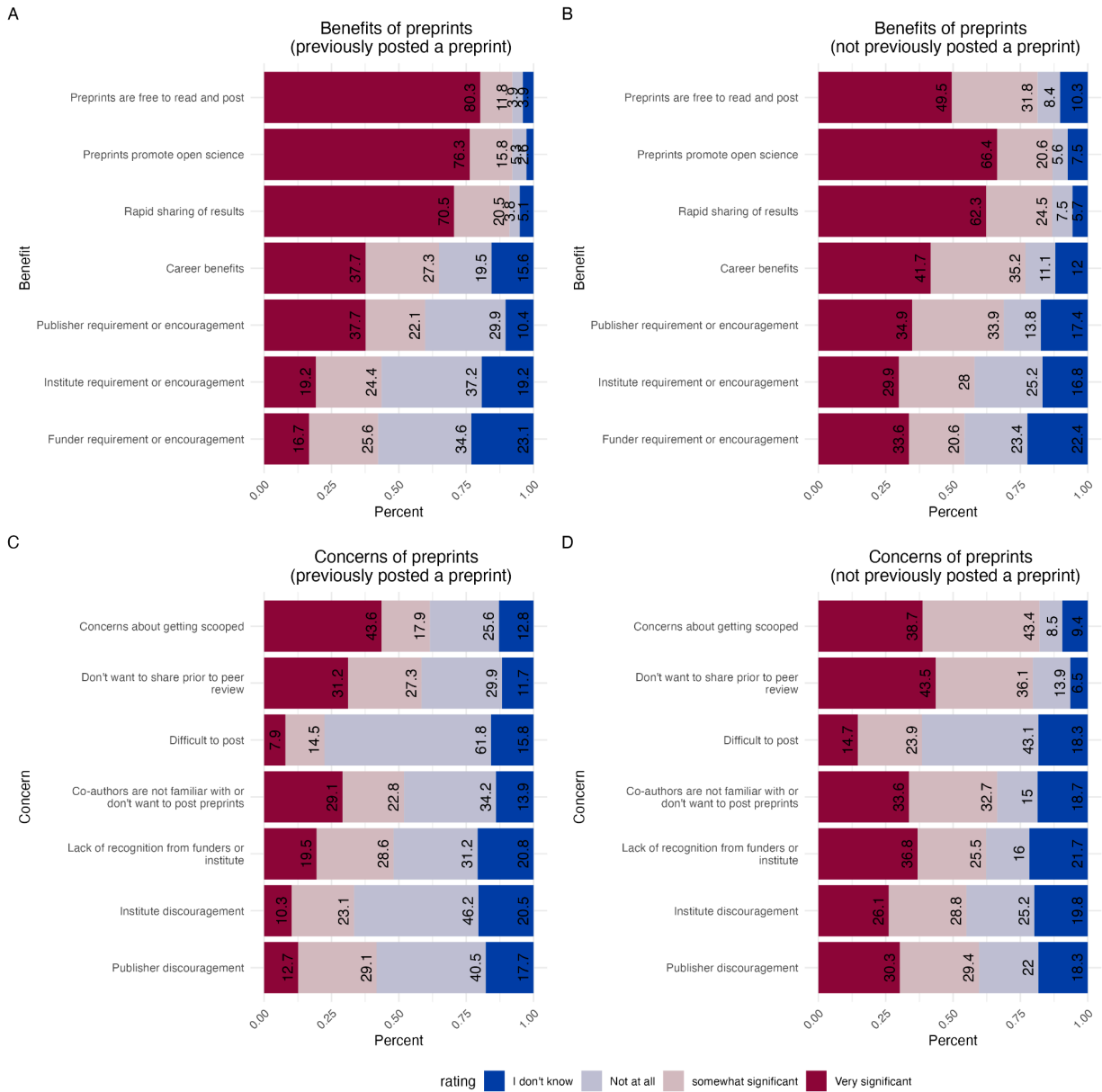
## Benefits and concerns around preprints

Participants were asked to rate the importance of different benefits that may be obtained from posting preprints. For respondents who had previously posted a preprint, preprints being free to

read and post (80.3%), promoting open science (76.3%) and rapid sharing of results (70.5%) were highly ranked as very significant benefits (Fig 3A). However, respondents who had not previously posted a preprint ranked these top three benefits as less “very significant” than the group with preprint posting experience (49.5%, 66.4% and 62.3% respectively) (Fig 3B). The career benefits of preprints were more ranked as somewhat (35.2%) or very significant (41.7%) by those who had not previously posted a preprint compared to those who had. When ranking the requirement or encouragement of institutions, funders or publishers, respondents ranked publisher encouragement as being the most “very significant” (37.7% and 34.9% for those who had posted a preprint or had not previously posted a preprint). However, respondents were mixed on the ranking of the other stakeholders. It is interesting that both the requirement or encouragement of institutions or funders received high responses of “not at all” from respondents who previously posted preprints (19.2% and 23.1% respectively) and those who had not (16.8% and 22.4% respectively).

In addition to the benefits, participants were asked to rank common concerns about preprints. For respondents who had previously posted a preprint, not wanting to share before peer review and concerns over scooping were both highly ranked as somewhat (27.3% and 17.9% respectively) or very significant (31.2% and 43.6% respectively) (Fig 3C). Co-authors not being familiar with preprints received more mixed responses (51.9% “significant or very significant, 34.2% “not at all”), whereas preprints being difficult to post was largely ranked as not a concern (61.8% “not at all”). Lack of recognition from funders or institutions was ranked as somewhat (28.6%) or very significant (19.5%), although a large number of responses also rated this as not at all (31.2%) or not sure (20.8%). Publisher discouragement was generally seen as less of a concern, being more highly scored as not at all (40.5%) or somewhat significant (29.1%). Institute discouragement was further seen as less of a concern, with most respondents ranking this as not important (46.2%). Again, the same trend was observed in responses from participants who had not previously posted a preprint (Fig 3D). However, lack of recognition, institute discouragement and publisher discouragement were more highly scored as very significant (36.8%, 26.1% and 30.3% respectively) compared to those who had previously posted a preprint. Additionally, the number 1 concern for those who had not posted a preprint was sharing prior to peer review (43.5% rated as “very significant”) whereas for those who had posted a preprint it was concerns over scooping (43.6% rated as “very significant”).





**Fig 3. Ranking of the perceived benefits and concerns of preprints.** A) Ranked benefits of preprints from respondents who had previously posted a preprint, B) Ranked benefits of preprints from respondents who had not previously posted a preprint, C) Ranked concerns of preprints from respondents who had previously posted a preprint and D) Ranked concerns of preprints from respondents who had not previously posted a preprint. Data was processed to remove any “na”, missing or inappropriate values prior to plotting.

## Discussion

The emergence of open-access publishing initially promised unrestricted access to research publications for scholars in low- and middle-income nations. However, the imposition of steep Article Processing Charges (APCs) by journals poses a formidable barrier, hindering African researchers from openly disseminating their work. This obstacle is notably magnified by the financial limitations faced by African researchers, characterized by lower incomes and a historical lack of equitable research funding allocation<sup>4</sup>. This challenge has visibly slowed the adoption of open-access publishing in Africa. Notably, a study by Ifeanyi J. Ezema et al.<sup>20</sup> revealed that twenty-seven African countries lacked any presence in open-access publishing, leading to diminished contributions to the global open-access publications landscape. Preprints have the capability of providing equitable opportunities for researchers in Africa to publish their work in a global and timely manner. Thus in this study, we aimed to investigate the perspectives and challenges of preprint adoption in Africa and present preliminary findings on the perceptions of preprints by African researchers. Like elsewhere in the world, preprint adoption is usually slow however with different levels of adoption; affected by different factors. Thus we discuss these perspectives and challenges in terms of experience with preprints, perceptions of preprints by Africa-based researchers, and recommendations.

### Preprint engagement among African researchers

There's a noticeable variation in how widely preprinting is adopted worldwide. This could stem from varying levels of awareness about preprinting across countries or differences in how they adopt and implement open science policies. Our findings highlight a modest (41%) prevalence of preprint posting among African researchers, underscoring the growing trend of researchers worldwide opting to share their work before formal peer review as preprints<sup>21,22</sup>. However, our data is likely a reflection of our limited sample size and biased responses with other studies demonstrating that African countries have generally low levels of preprinting with the highest number of preprints coming from South Africa and Ethiopia<sup>23</sup>.

### Preference of preprint servers among African researchers

Preprint servers could generally be classified according to their scope into general, field-specific, and regional preprint servers. While general preprint servers boast a wide reach, regional platforms, such as AfricArXiv for Africa, offer distinct advantages for geographically focused research. They amplify discoverability by a culturally attuned audience, enabling nuanced communication and collaboration amongst local experts. By showcasing regional expertise and priorities, these servers nurture vibrant research communities. For researchers seeking local impact, regional preprint servers provide a powerful platform to cultivate research with deep roots and far-reaching potential<sup>11</sup>. Surprisingly, a significant proportion (78%) of the respondents in this study had never used AfricaArXiv. Meanwhile, a study revealed that ChinaXiv, a preprint server based in China, was well-known and used by Chinese researchers<sup>17</sup>. This indicates that more efforts should be put toward emphasizing the importance of African regional servers to African researchers to aid them in better understanding the importance of such servers in fostering local research communities, promoting underrepresented research,

and addressing regional challenges which are essential to the development of the African content.

Our survey revealed that African researchers had more preference towards utilizing general preprint servers, such as arXiv (5.1%) and bioRxiv (15.3%). These results are similar to previous studies, which showed that 39% of researchers in Europe and the USA had a preference for using arXiv followed by 24% for the use of bioRxiv<sup>17</sup>. These global preprint servers offer significant benefits in visibility for researchers compared to regional servers and may be one reason why AfricaArXiv is underutilized in our sample. We also revealed the relatively high popularity of ResearchSquare (31.6%) and SSRN (16.3%) among the respondents. This might partially be explained by the fact that these preprint servers are owned and operated by Springer Nature and Elsevier, respectively, both of which are major academic publishers. This may represent the dominance of traditional publishers in Africa and their increasing co-option of “open science”. Alternatively, this could indicate the importance of closely implementing preprint posting with manuscript submission systems. However, this does suggest that preprints are being posted at the time of submission, which negates many of the benefits of preprinting. Our data highlights the limited awareness of preprint servers amongst Africa-based scholars and is an area for further exploration.

## Perceptions and Attitudes around preprints by Africa-based researchers

### Benefits of preprinting

Our findings demonstrate that the benefits associated with preprints, such as open access and rapid dissemination of results, were highly regarded, emphasizing the perceived advantages of advancing open science. This aligns with the attitudes of respondents in different regions and the growing global recognition of preprints as catalysts for open access and accelerating the pace of scientific discovery<sup>9,17,24–26</sup>. Additionally, this reflects other studies that demonstrate authors are most strongly motivated to increase awareness of their work and the speed of its dissemination<sup>25</sup>. Moreover, since 75% of our respondents were academics, it comes as no surprise that respondents also perceived potential career benefits as well as providing a free platform for sharing research as strong benefits offered by preprint posting. These findings suggest that recognition of preprints as a viable alternative to traditional peer-reviewed publications may increase among researchers in Africa due to the benefits associated with the practice. This may be particularly relevant for early-career researchers who greatly rely on timely publication of their work for career advancement and to establish their academic reputation<sup>24</sup>.

### Concerns about preprinting

Concerns regarding preprints were also notable among the respondents of this survey. Most respondents were particularly apprehensive about sharing their work before peer review and the risk of scooping, suggesting reservations about the timing and security of scientific outputs. These concerns are quite similar to researchers in other regions<sup>9,17,25,26</sup>. Additionally, a large number of respondents highlighted that sharing prior to peer review was a concern of preprints.

This could be alleviated by preprint peer review or a better understanding of the role and historical purpose of peer review. Moreover, concerns regarding lack of recognition and unfamiliarity among co-authors highlight potential challenges in acknowledging and navigating preprints within collaborative research environments. Addressing these concerns necessitates not only raising awareness but also fostering a conducive environment that balances the advantages of preprints with mitigating associated risks. By being informed about these concerns and actively engaging in their solutions, researchers can contribute to making preprints a valuable tool for accelerating scientific progress while upholding ethical and quality standards.

## Stakeholders' involvement in encouraging preprinting among African researchers

Stakeholders play crucial roles in encouraging the responsible and effective use of preprints<sup>27</sup>. Interestingly, our study revealed that institutional requirements and encouragement to publish preprints were not perceived as strong benefits compared to publisher requirements and encouragement amongst African researchers. This suggests that while institutions may play a role in promoting preprint adoption, researchers in Africa are more likely to be influenced by the expectations and practices of their respective fields and publishers. Alternatively, this may reflect the efforts of publishers in promoting preprints where institutions are failing to do so. In either case, this further highlights the dominance of traditional publishing on African research. Thus, encouraging wider stakeholder support and participation in the adoption and recognition of preprints within the African research community is important<sup>9</sup>. Furthermore, more effort must be allocated to acknowledging the value of preprints alongside traditional publications in the African academic reward systems. This might be done by helping these stakeholders to understand the tremendous benefits preprints could bring to them<sup>27</sup>.

## Recommendations

This study further highlights the ongoing need to enhance awareness of preprints across Africa, a known and persistent issue. Additionally, this preliminary study highlights a number of concerns around preprint use and reveals a focus on commercially-owned preprint servers. We give the following recommendations that we believe will promote the adoption of preprints in Africa based on the data presented in this survey, the literature and through wider private discussions with relevant academics:

1. Increase awareness of preprints in Africa and further work to dispel common and persistent myths through the use of tailored outreach initiatives
2. Improve institutional recognition by encouraging the development of policy frameworks that utilizes preprints as part of promotion and recruitment practices in addition to graduation requirements. Engaging with funders and institutions directly will be essential for this recommendation. As such, the establishment of a working group may be beneficial.

3. Increase awareness of the potential risks of commercial and for-profit, traditional, publishers in dominating the preprint landscape in Africa through discussions, workshops and evidence-led arguments
4. Include Africa-based proponents of preprints in global preprint and open access discussions

## Parameters and limitations of this study

Our study has several key limitations that future research could address and improve upon. A primary limitation is our reliance on a survey method, which depends on the self-reporting of participants regarding their use of preprints. This approach assumes that all responses are given truthfully and without any bias. One of the largest limitations of this study is the limited number of responses to the survey, which might be partially attributed to the short duration of which the survey was disseminated: our survey was conducted in September and November 2023. This constrains our discussion and interpretation of the responses. Moreover, due to the method of dissemination, many respondents are likely to be familiar with preprints or not fully based in Africa, potentially biasing their responses. The survey encompassed a diverse demographic of 182 respondents, primarily from Nigeria, South Africa, and Tanzania, reflecting a partial representation of the African research landscape. While the majority hailed from medical and health sciences, biology, and environmental sciences, social scientists accounted for a smaller proportion. This distribution highlights the dominance of certain disciplines within the respondent pool, potentially influencing the perspectives and experiences reflected in the survey findings. Furthermore, the significant presence of respondents in PhD, masters, and academic roles emphasizes academia's involvement, potentially sidelining insights from non-academic and early-career researchers or those who've subsequently left academia, hence limiting the comprehensive understanding of preprint engagement and concerns in broader African research spheres.

## Conclusions

This study presents essential preliminary insights into the perspectives of African researchers regarding preprints, highlighting avenues for future initiatives aimed at fostering their widespread adoption across the continent. Further research encompassing a broader spectrum of viewpoints from diverse regions within Africa is imperative. The findings underscore the existing scope for enhancing preprint utilization in Africa, thus advocating for a more inclusive presence within the open-access paradigm. Recognizing the transformative potential of preprints in democratizing knowledge access and expediting research processes, this study illuminates the need for strategic interventions to overcome identified challenges. Empowering the African research community through targeted measures stands poised to unlock the manifold benefits of preprints, fostering an equitable and dynamic global research landscape.

## Author contributions

Conceptualization: R.D.D., E.A., L.Y.M.E., J.K.P., J.A.C., and A.B.D. Data curation: J.A.C. Formal analysis: J.A.C. Investigation: R.D.D., E.A., L.Y.M.E., J.K.P., J.A.C., and A.B.D.

Methodology: R.D.D., E.A., J.K.P., J.A.C., and A.B.D. Project administration: J.K.P., and J.A.C. Supervision: J.K.P., J.A.C., and A.B.D. Visualization: J.A.C. Writing - original draft: R.D.D., L.Y.M.E., J.A.C., and A.B.D. Writing - review & editing: R.D.D., E.A., L.Y.M.E., J.K.P., J.A.C., and A.B.D.

## Data availability

Anonymised survey data and the R code used for analysis are available from Zenodo (doi: 10.5281/zenodo.10285619). Survey questions and data for Fig 1 are provided as additional supplemental files.

## Declaration of interests

JAC is the Associate Director of ASAPbio and all other authors are ASAPbio Fellows. ASAPbio is a non-profit organization promoting the productive use of preprints in the life sciences. The authors declare no other competing interests.

## Acknowledgements

We would like to thank Jo Havermann (AfricArXiv) and Susan Veldsman (Academy of Science of South Africa) for their help in disseminating our survey and Iratxe Puebla (DataCite) & Jessica Polka (ASAPbio) for feedback and comments. We thank Peleka Joseph (University of Dar es Salaam) for designing some of the artworks used in dissemination of the survey.

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## Supplemental materials

### Supplemental Materials 1. Survey questions



## Supplemental Materials 2. Tables for data from Fig 1

Supplemental Table 1. Data underlying Fig 1A

<b>Location</b>	<b>n</b>	<b>percentage</b>
Algeria	1	0.5494505
Botswana	2	1.0989011
Cameroon	4	2.1978022
Egypt	3	1.6483516
Ethiopia	4	2.1978022
Ghana	7	3.8461538
Kenya	9	4.9450549
Malawi	4	2.1978022
Morocco	1	0.5494505
Niger	1	0.5494505
Nigeria	57	31.3186813
Other	4	2.1978022
Rwanda	10	5.4945055
Senegal	1	0.5494505
Sierra Leone	1	0.5494505
Somalia	2	1.0989011
South Africa	31	17.0329670
Sudan	1	0.5494505
Tanzania	28	15.3846154
Tunisia	1	0.5494505
Uganda	4	2.1978022
Zambia	3	1.6483516

Zimbabwe	3	1.6483516
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Supplemental Table 2. Data underlying Fig 1B

<b>Field</b>	<b>n</b>	<b>percentage</b>
Arts and humanities	9	3.9473684
Biology	50	21.9298246
Chemistry	11	4.8245614
Education	3	1.3157895
Engineering	16	7.0175439
Environment sciences	26	11.4035088
Language education	1	0.4385965
Law	2	0.8771930
Mathematics	5	2.1929825
Medical and health sciences	73	32.0175439
Physics	9	3.9473684
Social sciences	21	9.2105263
Soil Science	1	0.4385965
Veterinary Medicine	1	0.4385965

Supplemental Table 3. Data underlying Fig 1C

<b>Career stage</b>	<b>n</b>	<b>percentage</b>
Graduate	2	1.0989011
Laboratory Technologist	1	0.5494505
Master degree	45	24.7252747
Other	8	4.3956044
PhD student/candidate	31	17.0329670

Postdoc 0-5 years post-PhD	17	9.3406593
Postdoc 6+ years post-PhD	4	2.1978022
Principal Investigator/Group Leader/Lecturer	59	32.4175824
Undergraduate	15	8.2417582

Supplemental Table 4. Data underlying Fig 1D

<b>Role</b>	<b>n</b>	<b>percentage</b>
Academia	137	75.2747253
Agriculture	1	0.5494505
Government	26	14.2857143
Hospital	1	0.5494505
Industry / Pharmaceutical company	3	1.6483516
Non-profit	11	6.0439560
Professional	1	0.5494505
Public Health	1	0.5494505
Research Council	1	0.5494505