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Embracing Open Science in Bioinformatics: A perspective from the Global South

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1. INTRODUCTION

In the realm of modern scientific research, open science has emerged as a transformative paradigm that promotes transparency, collaboration, and accessibility in all stages of the scientific process. This approach stands at the core of scientific advancement, enabling researchers to share data, methods, and findings freely, ultimately fostering innovation and accelerating discoveries. While open science has gained widespread recognition and adoption in many parts of the world, its implementation and impact in the Global South, particularly in the field of bioinformatics, presents a unique set of challenges and opportunities. Bioinformatics, the interdisciplinary field at the intersection of biology, computer science, and data analysis, has witnessed remarkable growth in recent years, revolutionizing our understanding of genomics, proteomics, and systems biology. Its applications span from drug discovery to evolutionary biology, with far-reaching implications for human health and the environment. As bioinformatics becomes increasingly central to scientific research, the principles of open science must be embraced by all, including researchers in regions with distinct socio-economic and infrastructural contexts. The Global South, encompassing countries in Latin America, Africa, Asia, and Oceania, is a region characterized by diverse cultures, rich biodiversity, and unique research challenges. It is also a region that stands to benefit immensely from the adoption of open science principles, given the potential for increased collaboration, resource sharing, and access to global knowledge. Nevertheless, the path to embracing open science in bioinformatics within the Global South is multifaceted and requires careful consideration of local dynamics, resources, and limitations. This poster explores the landscape of open science in the field of bioinformatics from a Global South perspective. It delves into the motivations, challenges, and opportunities faced by scientists in these regions as they navigate the open science ecosystem. We examine the ways in which open science practices can empower researchers, improve research quality, and address global issues such as infectious diseases, food security, and biodiversity conservation. Additionally, we discuss strategies for building local and international collaborations, bridging the digital divide, and enhancing scientific capacity. By shedding light on the experiences and efforts of bioinformaticians from the Global South, we aim to inspire a broader dialogue and provide insights for policy-makers, institutions, and the international scientific community on how to foster a more inclusive and equitable global research landscape. Embracing open science in bioinformatics is not only an imperative for addressing local challenges but also a key step in advancing global scientific knowledge.

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2. MATERIALS AND METHODS

Data Collection and Sources

Data for this study were collected from a combination of primary and secondary sources. We focused on literature within the Global South region, including countries in Latin America, Africa, Asia, and Oceania. The study literature was selected through a stratified sampling approach, ensuring representation across different geographical and socio-economic contexts within the Global South. Secondary data were gathered from publicly available reports, publications, and institutional websites related to open science, bioinformatics, and research practices in the Global South. These sources provided valuable context and background information for the analysis.

Data Analysis

Qualitative and quantitative data analysis methods were employed to derive meaningful insights from the collected data. Themes were identified through a process of coding and categorization, allowing us to understand the experiences, challenges, and opportunities related to open science in bioinformatics from the Global South perspective. Literature Review and Reference Management: Literature review and citation management were facilitated using reference management software (e.g., EndNote or Zotero) to organize and cite relevant publications and reports.

Limitations

It's important to note that while the methods employed in this study aimed to provide a comprehensive perspective on open science in bioinformatics in the Global South, there may still be limitations in terms of representativeness and generalizability of the findings. The experiences and practices of bioinformaticians and institutions may vary widely within the diverse Global South region. Results should be considered preliminary, biased and dynamic.

3. RESULTS AND DISCUSSION

Open Science Practices in the Global South

The assessed data provided valuable insights into the adoption of open science practices within the Global South. Notably, most literature indicated that open science principles play a significant role in research practice. However, the degree to which these principles are embraced varies across countries and institutions, reflecting the diverse research landscape within the region.

Challenges and Barriers

•Digital Divide: One of the most significant challenges identified is the digital divide, which impacts both access to information and the capacity to engage in open science practices. In low-resource settings, limited access to high-speed internet, computational resources, and up-to-date software hampers effective participation in bioinformatics research.

•Funding and Resources: A common challenge faced by research institutions in the Global South is the inadequate funding and infrastructure to support open science initiatives and practices. Many reports emphasized the need for increased financial resources to procure advanced computing infrastructure and to provide training in open science methodologies.

•Data Management: Effective data management remains a challenge. The lack of standardized data management protocols and practices hinders data sharing and integration within and between institutions. This issue is exacerbated by concerns over data security and privacy.

•Policy and Institutional Support: Several reports pointed to concerns about the absence of clear policies and institutional support for open science. The lack of incentives for researchers to share their data, as well as limited recognition of open science in tenure and promotion processes, hinder widespread adoption.

Opportunities and Initiatives

Despite these challenges, there are notable initiatives and opportunities for the promotion of open science within the Global South:

•Regional Collaborations: Bioinformaticians and research institutions have increasingly recognized the value of regional collaborations. These partnerships enable resource sharing, knowledge exchange, and collaborative research projects, mitigating some of the challenges posed by limited individual resources.

•Training and Capacity Building: Respondents expressed a strong desire for training programs focused on open science practices. Initiatives aimed at building capacity in bioinformatics and open science are emerging, with international organizations and institutions offering online courses and workshops (Figure 1).

•Open Access Journals: Open access journals, some of which are regionally based, provide a platform for researchers from the Global South to disseminate their work. They offer opportunities for visibility and recognition, which is particularly important in the context of open science. Issues regarding paywalls (close access in terms of readership) and publish walls (the advent of Article Publishing Charges) affect asymmetrically researchers from the Global South.

Global South and Global Research Challenges

Many bioinformaticians in the Global South are actively engaged in research that addresses regional and global challenges, including infectious diseases, biodiversity conservation, and agricultural sustainability. Open science is seen as a means to amplify the impact of this research and to collaborate with the global scientific community. The bridge between mainstream hegemonic research and local agendas generates a tension between the practices and objectives of researchers from the South in terms of career advancement and publicly funding Science oriented to the common good of the local communities.

Discussion and Implications

The findings from this study underscore the complex landscape of open science in bioinformatics within the Global South. While challenges related to resources and infrastructure persist, opportunities for regional collaborations, capacity building, and international partnerships offer promising avenues for overcoming these barriers.

The geographical distribution of research institutions highlights the need for targeted interventions in underserved areas to ensure equitable access to bioinformatics resources and expertise. Open science, when integrated into research on regional and global challenges, has the potential to enhance the visibility and impact of bioinformatics research from the Global South.

4. CONCLUSIONS

Embracing Open Science: A Necessity and Opportunity

The findings of this study underscore the critical importance of embracing open science in the field of bioinformatics within the Global South. While the challenges are formidable, the potential benefits for researchers, institutions, and society at large are equally significant. Open science offers a pathway to address local research challenges, amplify the impact of bioinformatics research, and enhance collaboration on a global scale.

Addressing Challenges and Barriers

The challenges identified in this study, including the digital divide, limited funding, data management issues, and policy gaps, must be acknowledged and addressed. To bridge the digital divide, concerted efforts are needed to expand access to high-speed internet, computational resources, and updated software and repositories. Investment in research infrastructure, coupled with international collaborations, can provide much-needed resources to research institutions in the Global South. Developing clear policies and providing institutional support for open science practices are essential steps toward its widespread adoption.

Fostering Regional Collaborations

Regional collaborations represent a promising opportunity to overcome many of the challenges associated with open science. Researchers and institutions in the Global South can leverage their collective strengths through resource sharing, knowledge exchange, and collaborative research projects. Initiatives aimed at building capacity in bioinformatics and open science, particularly in under-resourced areas, can be pivotal in promoting equitable participation.

International Engagement and Partnerships

International engagement is essential for the Global South to fully benefit from open science. The global scientific community should actively support and facilitate collaborations, mentorship, and resource-sharing initiatives with researchers and institutions in this region. Initiatives to connect scientists and foster knowledge exchange across borders can empower the Global South to contribute to global research challenges effectively. Collaborations should be in page with local research agendas, avoid asymmetries and prevent parachute science.

Policy and Institutional Change

To ensure the sustainability of open science practices, there is a need for clear policies at both institutional and national levels. Incentives for researchers to share data and engage in open science should be established, and recognition of open science contributions in academic promotions and evaluations should be emphasized. Bioinformatics and open science curricula should be integrated into educational programs to ensure the next generation of scientists is well-equipped to embrace these principles.

Open Science and Global Challenges

Bioinformaticians in the Global South are uniquely positioned to address regional and global challenges, from infectious diseases to biodiversity conservation. Open science can play a pivotal role in amplifying the impact of their research. By sharing data, collaborating across borders, and engaging with international partners, bioinformaticians can contribute to the solutions of pressing global issues.

The Road Ahead

Embracing open science in bioinformatics within the Global South is not just an aspiration but an imperative. It is a collective journey that requires the commitment of researchers, institutions, governments, and international organizations. By addressing the challenges, fostering collaborations, and aligning policies with open science principles, the Global South can actively participate in the global scientific community, making meaningful contributions to research and innovation.

This study provides a snapshot of the current state of open science in bioinformatics within the Global South and sets the foundation for future research and initiatives. The road ahead may be challenging, but it is illuminated by the promise of greater inclusivity, collaboration, and scientific advancement.

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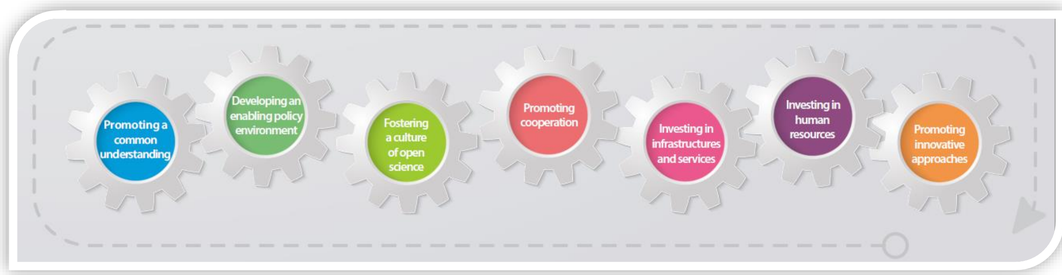

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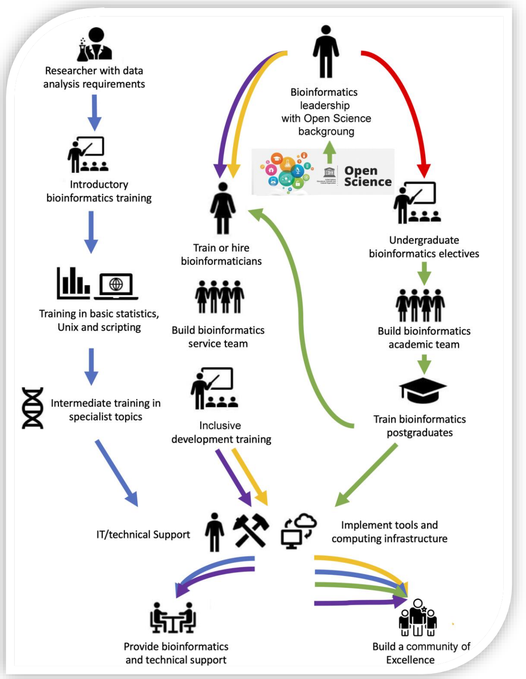

Figure 1. adapted from 10.1371/journal.pcbi.1009592