RESEARCH ARTICLE

REVISED The impact of the National Heart, Lung, and Blood Institute data: analyzing published articles that used BioLINCC open access data [version 2; peer review: 1 approved, 1 approved with reservations, 1 not approved]

Saif Aldeen AlRyalat¹ , Osama El Khatib², Ola Al-qawasmi², Hadeel Alkasrawi², Raneem al Zu'bi², Maram Abu-Halaweh², Yara alkanash², Ibrahim Habash²

¹Department of Ophthalmology, University of Jordan Hospital, The University of Jordan, Amman, 11942, Jordan

²Department of Internal Medicine, University of Jordan Hospital, University of Jordan, Amman, 11942, Jordan

³Department of Forensic Medicine, University of Jordan Hospital, The University of Jordan, Amman, 11942, Jordan

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Abstract

Background: Data sharing is now a mandatory prerequisite for several major funders and journals, where researchers are obligated to deposit the data resulting from their studies in an openly accessible repository. Biomedical open data are now widely available in almost all disciplines, where researchers can freely access and reuse these data in new studies. We aim to study the BioLINCC datasets, number of publications that used BioLINCC open access data, and the impact of these publications through the citations they received. **Methods:** As of July 2019, there was a total of 194 datasets stored in BioLINCC repository and accessible through their portal. We requested the full list of publications that used these datasets from BioLINCC, and we also performed a supplementary PubMed search for other publications. We used Web of Science (WoS) to analyze the characteristics of publications and the citations they received. **Results:** 1,086 published articles used data from BioLINCC repository for 79 (40.72%) datasets, where 115 (59.28%) datasets didn't have any publications associated with it. Of the total publications, 987 (90.88%) articles were WoS indexed. The number of publications has steadily increased since 2002 and peaked in 2018 with a total number of 138 publications on that year. The 987 open data publications received a total of 34,181 citations up to 1st October 2019. The average citation per item for the open data publications was 34.63. The total number

Open Peer Review

Approval Status ? ✓ ✗ ✓

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(revision)			✗	✓
18 Aug 2021			view	view
version 3				
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version 2				
(revision)		✓		
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version 1	?	✗	✗	
20 Jan 2020	view	view	view	

1. **Christian Ohmann** , ECRIN, Düsseldorf, Germany
2. **Lisa Federer** , National Institutes of Health, Bethesda, USA
3. **Andrew Brown** , Indiana University School of Public Health-Bloomington,

of citations received by open data publications per year has increased from only 2 citations in 2002, peaking in 2018 with 2361 citations.

Conclusion: Majority of BioLINCC datasets were not used in secondary publications. Despite that, the datasets used for secondary publications yielded publications in WoS indexed journals and are receiving an increasing number of citations.

Keywords

Open Data, Publications, National Institute of Health, Bibliometrics

This article is included in the **Research on Research, Policy & Culture** gateway.

Bloomington, USA

Colby Vorland , Indiana University School of Public Health-Bloomington, Bloomington, USA

4. **Heyam Fawaz Dalky** , Indiana University School of Public Health-Bloomington, Bloomington, USA

Any reports and responses or comments on the article can be found at the end of the article.

Corresponding author: Saif Aldeen AlRyalat (saifryalat@yahoo.com)

Author roles: **AlRyalat SA:** Conceptualization, Data Curation, Methodology, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing; **El Khatib O:** Methodology, Project Administration, Supervision, Writing – Original Draft Preparation; **Al-qawasmi O:** Methodology, Validation, Writing – Original Draft Preparation; **Alkasrawi H:** Resources, Writing – Original Draft Preparation, Writing – Review & Editing; **al Zu'bi R:** Resources, Writing – Original Draft Preparation, Writing – Review & Editing; **Abu-Halaweh M:** Resources, Writing – Original Draft Preparation, Writing – Review & Editing; **alkanash Y:** Resources, Writing – Original Draft Preparation, Writing – Review & Editing; **Habash I:** Resources, Writing – Original Draft Preparation, Writing – Review & Editing

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REVISED Amendments from Version 1

The new version further specified that the scope of the current article is to analyze BioLINCC datasets, publications that used BioLINCC datasets, and citations received by these publications. The new version provided more details about the datasets themselves, the percentage of datasets used in secondary publications, the datasets that have the highest number of publications, and so on. The discussion of the importance of open data for early career researchers has also been expanded. [Table 1](#) and [Figure 1](#) have been added to reflect these changes.

Any further responses from the reviewers can be found at the end of the article

Introduction

Recent years have seen an increased call for data sharing in clinical studies, especially for research funded by international and governmental agencies¹. The call originally aimed to maximize transparency for clinical trial results¹, but the benefits of data sharing extended beyond its original aim. Open access data is frequently cited as a boon for researchers, where researchers can re-analyze already collected data to answer a new research question^{2,3}. To organize and maximize the scientific use of open access data, researchers and funders store their data in open access data repositories⁴. The Biologic Specimen and Data Repository Information Coordinating Center (BioLINCC), is a National Heart, Lung, and Blood Institute is one such data repository, initiated in 2000 with the aim of sharing data from observational and interventional studies supported by the institute⁵. The impact of open access data, in terms of number of datasets used from a repository, publications generated from these datasets, and citations received by these publications are still unknown. In this study, we aim to study the BioLINCC datasets, number of publications that used BioLINCC open access data, and the impact of these publications through the citations they received.

Methods

Data collection

There are a total of 205 studies listed on BioLINCC data repository, where four studies have their data stored in other repositories, and seven studies have only specimens available at the BioLINCC institution available upon request, but no datasets associated with them. We only included datasets stored in BioLINCC repository and can be accessed through their [portal](#), which comprises 194 dataset ([Figure 1](#)).

We also contacted BioLINCC support to obtain an up to date list of published articles that used BioLINCC dataset, where we received a list of all publications up to 24th July 2019. Researchers accessing the BioLINCC datasets are requested to disclose any publication resulted from the use of the BioLINCC datasets. The BioLINCC also list published articles that used BioLINCC datasets on their website (<https://biolincc.nhlbi.nih.gov/publications/>). A manual search of PubMed was also carried out to confirm an updated full list of publications. We

used the basic search of PubMed by inputting the title of the dataset in the search field. Any study that reported the use of the searched dataset as part of its results was included in our analysis, where authors either detail the name and acronym of dataset used in the methods section, usually with specific citation to relevant study, or in the acknowledgment section in their articles. The included articles either used data stored in the BioLINCC repository alone, or used these datasets along with other datasets from other repositories. We analyzed the number of studies published using each dataset (supplementary material).

Bibliometric analysis

We used [Web of Science](#) (WoS) database to analyze the characteristics of included publications. We prepared a list of digital object identifiers (DOIs) for the included articles. We inputted the DOI list into the WoS advanced search field, where only WoS indexed publications from the total included articles were analyzed further. The WoS database has a built-in analysis to provide data regarding the number of publications using the included dataset per year (yearly publications), topic of publication, affiliation of authors, and number of citations received⁶.

Results

1,086 published articles used data from BioLINCC repository for 79 (40.72%) datasets, where 115 (59.28%) datasets didn't have any publications associated with it. Dataset for the Atherosclerosis Risk in Communities Study (ARIC) had the highest number of publications associated with it 162 (15%), followed by Framingham Heart Study-Cohort (FHS-Cohort) with 94 (8.7%), and Cardiovascular Health Study (CHS) with 82 (7.6%). 162 (14.9%) of publications used more than one dataset ([Table 1](#)). Out of the 1,086 published articles, only 987 (90.88%) articles were WoS indexed. All articles published were English language (see underlying data⁷). The first publication using BioLINCC open data was from 2002. Since then, the number of publications has steadily increased since 2002, as shown in [Figure 2](#), and peaked in 2018 with a total number of 138 publications.

The 987 open data publications received a total of 34,181 citations from 27,904 published articles up to 1st October 2019. The average citation per item for the publications using BioLINCC data was 34.63. The total number of citations received by publications using BioLINCC data per year has increased from only 2 citations in 2002, to a peak of 2361 citations in 2018 ([Figure 3](#)).

A total of 352 (35.66%) of the published articles related to cardiac and cardiovascular systems, 106 (10.74%) articles related to general internal medicine, and 92 (9.32%) related to public and occupational health. [Figure 4](#) shows the 10 most common fields the studied publications using BioLINCC data published in. The American Journal of Cardiology had the highest number of publications using BioLINCC data (60; 6.08%), followed by the International Journal of Cardiology with 47 (4.76%), and American Journal of Medicine 25 (2.53%). [Table 2](#) shows the

Figure 1. The initial datasets and the final datasets included after applying exclusion criteria.

Table 1. Top 10 datasets in the Biologic Specimen and Data Repository Information Coordinating Center (BioLINCC) with highest number of publications.

Dataset	Count	%
Atherosclerosis Risk in Communities Study	162	15.0%
Framingham Heart Study-Cohort	94	8.7%
Cardiovascular Health Study (CHS)	82	7.6%
Digitalis Investigation Group	76	7.0%
Framingham Heart Study (FHS) Offspring (OS) and OMNI 1 Cohorts	53	4.9%
Action to Control Cardiovascular Risk in Diabetes	46	4.3%
Systolic Blood Pressure Intervention Trial	44	4.1%
Evaluation Study of Congestive Heart Failure and Pulmonary Artery Catheterization Effectiveness	39	3.6%
Coronary Artery Risk Development in Young Adults	38	3.5%
Atrial Fibrillation Follow-Up Investigation of Rhythm Management	33	3.1%

Figure 2. Number of publications that used Biologic Specimen and Data Repository Information Coordinating Center (BioLINCC) open data since 2002.

Figure 3. The total number of citations received by open data publications per year.

top 10 journals that publications using BioLINCC data were published in. US authors participated in 842 (85.31%) of the publications using BioLINCC data, followed by Canadian and England authors, with 121 (12.26%), and 81 (8.21%), respectively (Figure 5). The top three affiliations in terms of publications using BioLINCC data were University of Alabama system, University of Alabama at Birmingham, and University of California system as shown in Table 3.

Discussion

Tremendous effort has been made by BioLINCC in preparing dataset to be used as open data since its establishment, where hundreds of studies have been published using BioLINCC open data⁶. Despite the finding that majority of datasets didn't yield further publications from the re-use of the dataset, many of the datasets had high number of publications. The impact of these publications can be measured in

Figure 4. The 10 most common fields the studied open data articles published in.

Table 2. Top 10 journals publishing articles that used Biologic Specimen and Data Repository Information Coordinating Center (BioLINCC) open data with their respective impact factor according to 2018 Journal Citation report.

JOURNAL	Impact factor	Articles (%)
AMERICAN JOURNAL OF CARDIOLOGY	2.843	60 (6.08%)
INTERNATIONAL JOURNAL OF CARDIOLOGY	3.471	47 (4.76%)
AMERICAN JOURNAL OF MEDICINE	4.760	25 (2.53%)
EUROPEAN JOURNAL OF HEART FAILURE	12.129	22 (2.23%)
HYPERTENSION	7.017	22 (2.23%)
PLOS ONE	2.776	21 (2.13%)
CIRCULATION	23.054	18 (1.82%)
JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY	18.639	18 (1.82%)
JOURNAL OF CARDIAC FAILURE	3.967	16 (1.62%)
EUROPEAN HEART JOURNAL	24.889	15 (1.52%)

terms of citations received, where citations of publications using BioLINCC data have exponentially increased. They received a total of 2361 citations in the year 2018. Cardiology is the main field, with more than third of publications are cardiology related, and the top two journals publishing articles using BioLINCC data are also cardiology journals.

In an analysis done in 2017, Coady and his colleagues analyzed the administrative records of investigator requests for BioLINCC data, they found that 35% of clinical trial data were associated with at least one publication within five years from data public release⁸. Our findings also showed that majority of data-sets deposited in the BioLINCC repository were not associated

Figure 5. The top countries published using Biologic Specimen and Data Repository Information Coordinating Center (BioLINCC) open data.

Table 3. The top affiliations in terms of open data publications using Biologic Specimen and Data Repository Information Coordinating Center (BioLINCC) open data.

Organization	Articles	Percentage
UNIVERSITY OF ALABAMA BIRMINGHAM	120	12.158%
UNIVERSITY OF ALABAMA SYSTEM	120	12.158%
UNIVERSITY OF CALIFORNIA SYSTEM	109	11.044%
HARVARD UNIVERSITY	105	10.638%
UNIVERSITY OF CALIFORNIA SAN FRANCISCO	57	5.775%
CASE WESTERN RESERVE UNIVERSITY	55	5.572%
VETERANS HEALTH ADMINISTRATION VHA	54	5.471%
UNIVERSITY OF CALIFORNIA LOS ANGELES	53	5.370%
UNIVERSITY OF TEXAS SYSTEM	52	5.268%
PENNSYLVANIA COMMONWEALTH SYSTEM OF HIGHER EDUCATION PCSHE	51	5.167%

with secondary publications. In a previous survey conducted on researchers who requested datasets from BioLINCC showed that the majority of researchers requested the data to conduct an independent research project⁸. Moreover, Ross et al. in their survey also found that majority of requests to the BioLINCC repository were made by early career researchers. Where we previously pointed to the importance of open access data for underfunded and early career researchers², our results showed that the top three countries using open access data are USA, UK, and Canada. Researchers new to open data might be skeptical about the publishing opportunity of studies performed using open data. In our analysis the top 10 journals publishing open data studies, which also comprised around 27% of the total studied publications, had an impact factor of more than two. Regarding the clinical impact of publications using open data, an example would be the post-hoc analysis of the Digitalis Investigation Group trial using the open data of the original trial⁹, which showed that digoxin therapy is associated with an increased risk of death from any cause among women, but not men, a finding that the original study failed to find. The digitalis trial is an example of how cardiology researchers are using open data, with efforts of cardiology initiatives encouraging data sharing and use by cardiology researchers¹⁰. Clinical trial data sharing in cardiology has also been used to validate the reproducibility of published results¹¹. In our study, we found a higher number of cardiology related publications using open access data compared to other specialties.

Since 2003, the National Institute of Health mandated that data collected by studies receiving more than \$500,000 be stored in a publicly available repository, with BioLINCC being the main

repository for NIH-NHLB institute funded research¹². This might explain the high impact of studies resulting from the BioLINCC stored data. On the other hand, data shared by platforms other than BioLINCC may lack sufficient description about the shared data, which will hamper its use by other researchers¹³. Moreover, repositories should focus on facilitating access to data and increasing awareness about it, so that more researchers can use the data from these repositories^{10,11}. Our results are based on BioLINCC repository, where data of well-funded research projects undergo extensive processing before being publicly shared, resulting in well-curated, high quality data. Other studies should be done to validate our results, by evaluating data repositories that do not have the pre-sharing processing. Moreover, we didn't compare citations received by open data publications and primary data publications, which should be carried out in future projects.

Data availability

Underlying data

Harvard Dataverse: Publications that used Biologic Specimen and Data Repository Information Coordinating Center (BioLINCC) datasets. <https://doi.org/10.7910/DVN/1TXA3C>⁷

This project contains the following underlying data:

- BioLINCC Dataset.tab (Spreadsheet containing details of publications using BioLINCC datasets)

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

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Open Peer Review

Current Peer Review Status: ? ✓ ✗

Version 2

Reviewer Report 19 October 2020

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Lisa Federer

National Library of Medicine, National Institutes of Health, Bethesda, MD, USA

I appreciate the authors' revisions.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: data science, data sharing and reuse

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 25 September 2020

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Colby Vorland

¹ Department of Applied Health Science, Indiana University School of Public Health-Bloomington, Bloomington, IN, USA

² Department of Applied Health Science, Indiana University School of Public Health-Bloomington,

Bloomington, IN, USA

Andrew Brown

¹ Department of Applied Health Science, Indiana University School of Public Health-Bloomington, Bloomington, IN, USA

² Department of Applied Health Science, Indiana University School of Public Health-Bloomington, Bloomington, IN, USA

Summary:

The authors ask an interesting question as to what the impact of BioLINCC has been on the use of open data. However, the assessments of impact do not seem to appropriately contextualize the use of BioLINCC datasets as compared to growth of scientific publishing overall. Further, the authors include data in their analyses before the existence of BioLINCC, and the methods used to sample are unclear.

Abstract

It is unclear why WoS indexing is in the conclusions, unless it is being used as a proxy for 'impact.' If so, the article does not make clear that WoS indexing is being used as a sign of impact.

The choice of 'citations' as a metric for 'impact' is questionable. Citations may best be considered a metric of 'attention'.

Introduction

BioLINCC was not initiated in 2000 as stated- it was 2008:

<https://www.nhlbi.nih.gov/science/biologic-specimen-and-data-repository-information-coordinating-center-biolincc>

The NHLBI had a different repository since 2000. However, since the authors focus on BioLINCC, this raises the question why the authors start their survey in 2002, and how this data came to be included in their sampling.

Methods

The methods as currently stated are not reproducible. For example, on what date were BioLINCC and PubMed sampled? What was the search string for PubMed?

It is not clear whether PubMed entries necessarily indicate that they use BioLINCC datasets. The authors mention "any study that reported the use of the searched dataset as part of its results was included". Does that mean full texts were reviewed? If so, by what process and by which of the authors?

It is not clear what is meant by "title of the dataset in the search field". Does this mean the study name? The study acronym? It seems likely that many publications would not use the exact dataset name in the title or abstract and this approach would therefore potentially miss papers. Were any new papers found beyond the BioLINCC list from the PubMed search? How many articles from the BioLINCC list were not confirmed in the PubMed search? This information is missing from the methods.

Results

It is indicated that over 9% of the articles using data from BioLINCC are not WoS indexed. If these

articles are not evenly distributed over time, then it will skew the results of the trends. For example – were the papers not indexed more recent papers that WoS has not yet picked up? At minimum, the authors can manually extract the year, journal, and country of publication from these papers to include the in assessments.

The utility of the analyses as currently presented seem questionable. How does the increase in articles published and citations by year compare to trends in overall metrics of these measures? i.e. do these trends outpace or just reflect the growth of scientific publishing overall? The authors may also consider limiting such comparison to the specific fields that use BioLINCC data.

The authors note the values ‘peaked in 2018’, but that was the most recent year of full data, given their partial year in 2019. Thus, 2019 is likely artificially small by virtue of it being a partial year.

The University of Alabama at Birmingham is part of the University of Alabama System, and thus counting them separately does not seem to make sense.

It is unclear how fields of study were determined. Were these just extracted from WoS (is this “topic of publication” per methods or a separate extraction), or did the authors classify them? Regardless, the finding that cardiology is the top field is not surprising, given that BioLINCC is from the National Heart, Lung, and Blood Institute. This should be made clear.

One key point that may undermine the idea of ‘impact’ of the open datasets is that the study investigators appear to be included in these counts. For example, the University of Alabama at Birmingham is a key site for some studies (e.g., CARDIA), and thus they would be publishing from their datasets whether they were open in BioLINCC or not. So, what is the incremental contribution to investigators who are not part of the cohort? What difference is it making for how many papers would be published if the data were open or not?

Discussion

In general, the discussion does not seem to flow logically. For example, in one paragraph, the authors discuss the percent of publications after data release, the top countries from which BioLINCC data are used and top journals, and then a single example of clinical impact from using BioLINCC data. The points in the discussion should be separated and connected to the purpose of the study. New results (e.g., impact factor) should not be introduced in the discussion. Further, have there been other studies that have examined these or related questions about BioLINCC or other repositories?

“The impact of these publications can be measured in terms of citations received, where citations of publications using BioLINCC data have exponentially increased”

- Exponential growth is a specific mathematical term whereas the growth in the figures appears to be roughly linear.

“Researchers new to open data might be skeptical about the publishing opportunity of studies performed using open data.”

- This statement does not seem relevant to the analysis nor supported by any citations.

Finally, a limitations section is needed noting the sole focus on WoS and whether the inclusion of other indexes might alter conclusions. For example – to our knowledge, F1000Research is not indexed in WoS; would relevant studies published here be included in a different index?

Data

We downloaded and inspected the data:

- There is no data dictionary to interpret the dataset.
- 'Recid' starts at 4 and not 1. Some 'Recid's are missing (for example, #5, #7). Were these entries those that were not indexed by WoS? Those DOIs would still be useful to include in the dataset so future researchers can use them.
- Were theses and other article types included in all analyses (include this information in the methods)?
- There are missing data (e.g., funding; MESH terms; article types; study type; one publication was missing 'study list').
- The authors state that they searched WoS by DOI, and yet DOIs are missing from some entries. How was this accounted for in the analysis? Are the missing DOIs counted as part of 'not indexed in WoS'?

General

The writing is generally clear, but it could benefit from a grammatical edit in some passages.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

No

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

No

Competing Interests: Drs. Vorland and Brown have received research funds from the Center for Open Science.

Reviewer Expertise: Meta-research

We confirm that we have read this submission and believe that we have an appropriate level of expertise to state that we do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 08 Apr 2021

Saif Aldeen AlRyalat

I went through the manuscript and amended and responded to all comments. Here are the responses.

Reviewer Colby Vorland and Andrew Brown

It is an honor to receive a feedback from Drs Colby and Brown from Indiana university, we performed almost all the changes suggested, and we hope the current version satisfy the quality required. Here are the detailed responses.

Summary:

The authors ask an interesting question as to what the impact of BioLINCC has been on the use of open data. However, the assessments of impact do not seem to appropriately contextualize the use of BioLINCC datasets as compared to growth of scientific publishing overall. Further, the authors include data in their analyses before the existence of BioLINCC, and the methods used to sample are unclear.

Response: Thank you. The study is mostly descriptive of the studies published using datasets stored at the BioLINCC repository, with a bibliometric analysis of these studies. We believe that such analysis will show the impact of open data and will encourage authors to further share their data publicly. So we agree with the reviewer that the current analysis lacks the comparison with the growth of overall scientific literature, but we will consider such analysis in the near future.

The BioLINCC is basically a repository to store and facilitate the share of data collected by National Heart, Lung, and Blood Institute funded studies, where these studies and their data might have been done before the existence of the BioLINCC, but were stored in the BioLINCC repository afterward.

Abstract

It is unclear why WoS indexing is in the conclusions, unless it is being used as a proxy for 'impact.' If so, the article does not make clear that WoS indexing is being used as a sign of impact.

Response: We used the WoS database as they have strict and high bar criteria to index publication, so it was used as a proxy for impact as the authors stated. We clarified this point in the abstract as suggested.

The choice of 'citations' as a metric for 'impact' is questionable. Citations may best be considered a metric of 'attention'.

Response: we agree with the author that the issue of considering citation as the sole metric for impact is debatable, so we made this point clear in the limitation section.

Introduction

BioLINCC was not initiated in 2000 as stated- it was 2008:

<https://www.nhlbi.nih.gov/science/biologic-specimen-and-data-repository-information-coordinating-center-biolincc>

The NHLBI had a different repository since 2000. However, since the authors focus on BioLINCC, this raises the question why the authors start their survey in 2002, and how this data came to be included in their sampling.

Response: Whereas the BioLINCC repository itself was made in 2008, the datasets deposited in it were developed before that, since 2000*, so the publications may date back to as early as 2002.

* Coady SA, Wagner E. Sharing individual level data from observational studies and clinical trials: a perspective from NHLBI. *Trials*. 2013 Dec;14(1):1-3.

Methods

The methods as currently stated are not reproducible. For example, on what date were BioLINCC and PubMed sampled? What was the search string for PubMed?

It is not clear whether PubMed entries necessarily indicate that they use BioLINCC datasets. The authors mention “any study that reported the use of the searched dataset as part of its results was included”. Does that mean full texts were reviewed? If so, by what process and by which of the authors?

Response: The original dataset was extracted by contacting the BioLINCC personnel and asking them for the up to date list of publications that used repository’s datasets. Our supplementary PubMed search was carried out as follows, which we further elaborated in the methods section:

“A manual search of PubMed was also carried out to confirm an updated full list of publications as follows:

- We used the basic search of PubMed by inputting the title of the dataset in the search field (e.g., Cooperative Study of Sickle Cell Disease or CSSCD), in order to retrieve results that mention the dataset in the title, abstract, or keywords.
- The searched articles were manually screened by one of the authors (SAA) to check if the dataset was used in the study to generate results, where authors either detail the name and acronym of dataset used in the methods section, usually with specific citation to relevant study, or in the acknowledgment section in their articles. The included articles either used data stored in the BioLINCC repository alone or used these datasets along with other datasets from other repositories
- We added the searched articles to the original dataset provided by the BioLINCC.
- We analyzed the number of studies published using each dataset (supplementary material).”

It is not clear what is meant by “title of the dataset in the search field”. Does this mean the study name? The study acronym? It seems likely that many publications would not use the exact dataset name in the title or abstract and this approach would therefore potentially miss papers. Were any new papers found beyond the BioLINCC list from the PubMed search? How many articles from the BioLINCC list were not confirmed in the PubMed

search? This information is missing from the methods.

Response: Inputting the title and the acronym of the dataset in the PubMed search will retrieve all articles that mentioned the dataset in the title, abstract, keywords. The guidelines for reporting secondary analysis articles require the mention of the dataset used in the title or abstract*. Despite that, we agree with the reviewers that our search might miss few articles that did not mention the dataset there. We tried to limit the words for the methods and results, which is why these details are not provided the full manuscript. We directly added the results searched by the supplementary search directly on the original dataset provided by the BioLINCC, which is provided as supplementary material.

* Swart E, Schmitt J. STandardized Reporting Of Secondary data Analyses (STROSA)-Vorschlag für ein Berichtsformat für Sekundärdatenanalysen. Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen. 2014 Jan 1;108(8-9):511-6.

Results

It is indicated that over 9% of the articles using data from BioLINCC are not WoS indexed. If these articles are not evenly distributed over time, then it will skew the results of the trends. For example – were the papers not indexed more recent papers that WoS has not yet picked up? At minimum, the authors can manually extract the year, journal, and country of publication from these papers to include the in assessments.

Response: We analyzed the non-indexed articles manually to check if they were published in 2019, which if so might reflect a delay in the indexing. We found that they were distributed over the years with the majority were published in the year 2018. We could not perform detailed analysis as they could not be analyzed using the WoS database, so clarified this in the results: “For the 99 (9.12%) articles that were not indexed, they were distributed over the years with the majority (i.e. 42 articles) were published in 2018.”

The utility of the analyses as currently presented seem questionable. How does the increase in articles published and citations by year compare to trends in overall metrics of these measures? i.e. do these trends outpace or just reflect the growth of scientific publishing overall? The authors may also consider limiting such comparison to the specific fields that use BioLINCC data.

Response: Thank you for the important point. While we did not compare with the overall publishing trend in the field, we tried to show the increase in the number of publication using open access data in each field. The use of specific dataset might not be restricted to the field of the dataset itself, as a dataset that was originally a cardiovascular dataset might be used by researchers from other fields for other ideas. As an example, Radiological images in ACCESS datasets were used several times for Radiology publications.

The authors note the values ‘peaked in 2018’, but that was the most recent year of full data, given their partial year in 2019. Thus, 2019 is likely artificially small by virtue of it being a partial year.

Response: We agree with the reviewer, so we made this point clear in the methods.

The University of Alabama at Birmingham is part of the University of Alabama System, and thus counting them separately does not seem to make sense.

Response: We corrected according to reviewer suggestion, the WoS database have both as separate affiliation, which led to this confusion.

It is unclear how fields of study were determined. Were these just extracted from WoS (is this “topic of publication” per methods or a separate extraction), or did the authors classify them? Regardless, the finding that cardiology is the top field is not surprising, given that BioLINCC is from the National Heart, Lung, and Blood Institute. This should be made clear.

Response: These are WoS based classification, we changed in the text accordingly.

One key point that may undermine the idea of ‘impact’ of the open datasets is that the study investigators appear to be included in these counts. For example, the University of Alabama at Birmingham is a key site for some studies (e.g., CARDIA), and thus they would be publishing from their datasets whether they were open in BioLINCC or not. So, what is the incremental contribution to investigators who are not part of the cohort? What difference is it making for how many papers would be published if the data were open or not?

Response: We thank the reviewers for the important remarks, as it is difficult to performed such discrimination in the current study, we made this point clear in the limitation part, so that readers would consider this point upon interpreting the results.

Discussion

In general, the discussion does not seem to flow logically. For example, in one paragraph, the authors discuss the percent of publications after data release, the top countries from which BioLINCC data are used and top journals, and then a single example of clinical impact from using BioLINCC data. The points in the discussion should be separated and connected to the purpose of the study. New results (e.g., impact factor) should not be introduced in the discussion. Further, have there been other studies that have examined these or related questions about BioLINCC or other repositories?

Response: We made several changes on the discussion to improve its flow. We removed some of the unrelated discussion part. We also removed the part related to impact factor.

“The impact of these publications can be measured in terms of citations received, where citations of publications using BioLINCC data have exponentially increased”

Exponential growth is a specific mathematical term whereas the growth in the figures appears to be roughly linear.

Response: We changed accordingly, thank you.

“Researchers new to open data might be skeptical about the publishing opportunity of studies performed using open data.”

This statement does not seem relevant to the analysis nor supported by any citations.

Response: We removed it through our effort to improve the discussion part, thank you.

Finally, a limitations section is needed noting the sole focus on WoS and whether the inclusion of other indexes might alter conclusions. For example – to our knowledge, F1000Research is not indexed in WoS; would relevant studies published here be included in a different index?

Response: We agree with the reviewer, we made clear that WoS database might not include all studies published using open access data from BioLINCC repository.

Data

We downloaded and inspected the data:

There is no data dictionary to interpret the dataset.

Response: We added a description at the dataset website:

<https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi%3A10.7910%2FDVN%2F1TXA3C&version=DR>

'Recid' starts at 4 and not 1. Some 'Recid's are missing (for example, #5, #7). Were these entries those that were not indexed by WoS? Those DOIs would still be useful to include in the dataset so future researchers can use them.

Response: The entries did not use the BioLINCC data, so were not included in the dataset.

Were theses and other article types included in all analyses (include this information in the methods)?

Response: Thesis were not included, we added this to the methods.

There are missing data (e.g., funding; MESH terms; article types; study type; one publication was missing 'study list'). The authors state that they searched WoS by DOI, and yet DOIs are missing from some entries. How was this accounted for in the analysis? Are the missing DOIs counted as part of 'not indexed in WoS'?

Response: Missing doi were added to the manually to the WoS search for data analysis. They were not counted as part of the "not indexed in WoS". After inputting doi to the database, information about the study will automatically be retrieved from the WoS database, so missing data in the excel sheet won't affect the analyzed data.

Thank you for your consideration!

Sincerely,

Saif Aldeen AlRyalat, M.D.

Corresponding author.

Competing Interests: None

Reviewer Report 08 September 2020

<https://doi.org/10.5256/f1000research.24126.r70339>

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Lisa Federer ¹ National Library of Medicine, National Institutes of Health, Bethesda, MD, USA² National Library of Medicine, National Institutes of Health, Bethesda, MD, USA

The authors have addressed an interesting question - what are the impacts of open data, specifically considering citations received by publications using open data sets. This question is very timely given the increasing number of funder and journal requirements that datasets be made open. However, my primary concern with this paper is that it doesn't really provide much context for understanding impact.

The authors have tracked citations to articles that reuse datasets over time. However, with nothing to compare these counts to, it's hard to contextualize what these citations really mean. Are these papers being cited more/less than similar articles that aren't reusing datasets? How do citations to these articles describing secondary reuse compare to the number of citations received by the articles describing the dataset originally and its primary use? It's evident that citations to these articles are going up over time, but that's to be expected to an extent. So I'm not really sure what to make of these numbers and how to use them to understand impact. While this article provides an overview of the state of citations to articles reusing BioLINCC data, it is unclear to me what conclusions can be reasonably drawn from this analysis about impact.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.**Reviewer Expertise:** data science, data sharing and reuse

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 18 Sep 2020

Saif Aldeen AlRyalat

We would like to thank Dr. Frederer, who is an expert in the field of data science, for the insight and thoughts she shared through her revision. While we agree with her comments on the gap between our study and the big aim of “studying the impact of open data”. Our study tried to answer a certain aspect of this aim, which we further specified in the current version, and added more data that will provide better insight on BioLINCC datasets, publications, and their impact. Here are our detailed responses:

Comment: The authors have addressed an interesting question - what are the impacts of open data, specifically considering citations received by publications using open data sets. This question is very timely given the increasing number of funder and journal requirements that datasets be made open. However, my primary concern with this paper is that it doesn't really provide much context for understanding impact.

Response: We totally agree with Dr. Federer, that the analysis of open data is most relevant during this time. One of the most important data repository in the biomedical field containing high quality datasets for well conducted studies is the BioLINCC repository. The interest to study the characteristics of this data repository is not new, as we pointed in the publications by Coady et al., Ross et al., and Giffen et al. While none of these papers alone provide the full picture of the impact of the BioLINCC repository and open data, they each provide knowledge on certain aspects. We chose to study the number of datasets that were used out of the total datasets in the BioLINCC repository, the number of publications generated (considering that this is the main reason for data requests as found by Ross et al), and number of citations these publications received. While this aim will cover a small aspect of the big question of “the impact of open data”, it will provide an important insight for better understanding of the characteristics of open data at the BioLINCC repository, what are the main datasets used, their fields, and the assurance that using an open dataset won't compromise publishing potential of studies, if important findings found. We tried to stress further on this point.

Comment: The authors have tracked citations to articles that reuse datasets over time. However, with nothing to compare these counts to, it's hard to contextualize what these citations really mean. Are these papers being cited more/less than similar articles that aren't reusing datasets? How do citations to these articles describing secondary reuse compare to the number of citations received by the articles describing the dataset originally and its primary use? It's evident that citations to these articles are going up over time, but that's to be expected to an extent. So I'm not really sure what to make of these numbers and how to use them to understand impact. While this article provides an overview of the state of citations to articles reusing BioLINCC data, it is unclear to me what conclusions can be reasonably drawn from this analysis about impact.

Response: We agree with the author that comparing the number of citations received by publications that used open data with primary data articles would provide a better insight into the impact of open data compared to other articles. We amended the aim to narrow its scope so that it accommodates the aspects covered by our study:

“The impact of open access data, in terms of the number of datasets used from a repository, publications generated from these datasets, and citations received by these publications are still unknown. In this study, we aim to study the BioLINCC datasets, the number of publications that used BioLINCC open access data, and the impact of these publications through the citations they received.”

We added the point mentioned by the esteemed reviewer to the study limitations and as a suggestion for future studies. We further discussed the aspects regarding the BioLINCC use of datasets and the characteristics of its publications.

Competing Interests: None.

Reviewer Report 10 August 2020

<https://doi.org/10.5256/f1000research.24126.r68865>

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Christian Ohmann

¹ European Clinical Research Infrastructure Network, ECRIN, Düsseldorf, Nordrhein-Westfalia, Germany

² European Clinical Research Infrastructure Network, ECRIN, Düsseldorf, Nordrhein-Westfalia, Germany

This is an interesting paper about the impact of data sharing for a non-commercial repository (BioLINCC). From the viewpoint of the reviewer, the manuscript should be improved:

In the section “data collection” the authors describe different data search methods for publications:

1. Updated list of publications received from BioLINCC directly.
2. List of published articles on the BioLINCC website.
3. Manual search of Pubmed with the title of the dataset.

The authors should describe the overlap/differences between the results of the different search strategies, preferably in a figure. The authors could use the PRISMA flow diagram as an example (<https://www.equator-network.org/reporting-guidelines/prisma/>).

The authors state in the “bibliometric analysis” section that “Any study that reported the use of the searched data set as part of its results was included in our analysis”. It is not clear, how the datasets were identified in the publication. Was this performed via the registration number of the underlying study in a registry (e.g. NCT-number) or by the title/acronym of the data set from the

BioLINCC database? The authors should clarify how this was performed.

Important to add would be a statistic describing the number of publications per data set (may be also dependent on the year of publication of the data set in BioLINCC). Are there many datasets without any or only very few publications? Is the majority of publications concentrated in a few datasets? This information is important because no requests for data sharing may not justify costs and resources for preparation of data sharing (e.g. de-identification, curation).

One of the factors that is relevant for the number of publications is the year when the data set was published in BioLINCC. A figure correlating the date of publication of the data set with the number of publications could illustrate that. This is similar with the relation between the year of publication and the number of citations. These relationships should be worked out in the paper.

Another aspect to be considered could be the role of outliers in the statistics. Are there datasets and/or publications with a very high number of citations (e.g. more than 100). Does the citation pattern mainly concentrate in a few outstanding datasets or is it more evenly distributed?

The authors should include and discuss a cross-sectional web-based survey about access to clinical research data from BioLINCC, covering the period from 2007 to 2014 (Ross JS et al. Data sharing through an NIH central database repository: a cross-sectional survey of BioLINCC users. *BMJ open* 2016;6(9):e012769)¹.

The authors think that it would be good style to thank BioLINCC for providing datasets after contact.

References

1. Ross JS, Ritchie JD, Finn E, Desai NR, et al.: Data sharing through an NIH central database repository: a cross-sectional survey of BioLINCC users. *BMJ Open*. 2016; **6** (9): e012769 [PubMed Abstract](#) | [Publisher Full Text](#)

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: clinical research, medical informatics

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 18 Sep 2020

Saif Aldeen AlRyalat

It is an honor to receive feedback from professor Ohmann, we performed almost all the changes suggested, and we hope the current version satisfies the quality required. Here are the detailed responses.

This is an interesting paper about the impact of data sharing on a non-commercial repository (BioLINCC). From the viewpoint of the reviewer, the manuscript should be improved:

Comment: In the section “data collection” the authors describe different data search methods for publications:

The updated list of publications received from BioLINCC directly.

List of published articles on the BioLINCC website.

Manual search of Pubmed with the title of the dataset.

The authors should describe the overlap/differences between the results of the different search strategies, preferably in a figure. The authors could use the PRISMA flow diagram as an example (<https://www.equator-network.org/reporting-guidelines/prisma/>).

Response: Thank you for suggesting the PRISMA flow chart. We added a new flow chart detailing the steps of including datasets and the criteria of inclusion, with the number of datasets resulted after each exclusion step. While the list of publications provided by the BioLINCC was almost complete, the manual and Pubmed searches didn't yield a significant addition, where only a few articles added only (we added this to the article). On the other hand, the detailed number of datasets included and excluded is of paramount importance, we used the flow chart for detailing its number.

Comment: The authors state in the “bibliometric analysis” section that “Any study that reported the use of the searched data set as part of its results was included in our analysis”. It is not clear, how the datasets were identified in the publication. Was this performed via the registration number of the underlying study in a registry (e.g. NCT-number) or by the title/acronym of the data set from the BioLINCC database? The authors should clarify how this was performed.

Response: Any author requested BioLINCC datasets for use in a study should explicitly

mention the dataset used in the methods (i.e. the name of the dataset and the acronym if available), in addition to acknowledging the BioLINCC in the acknowledgment section.

Comment: Important to add would be a statistic describing the number of publications per data set (may be also dependent on the year of publication of the data set in BioLINCC). Are there many datasets without any or only very few publications? Is the majority of publications concentrated in a few datasets? This information is important because no requests for data sharing may not justify costs and resources for preparation of data sharing (e.g. de-identification, curation).

Response: Thank you for this insight. We analyzed the number of publications associated with each dataset. As the reviewer expected, there are many datasets with no publications associated with them, as well as datasets with high number of publications. We added these results and relevant tables, and we further discussed them in the discussion.

Comment: One of the factors that is relevant for the number of publications is the year when the data set was published in BioLINCC. A figure correlating the date of publication of the data set with the number of publications could illustrate that. This is similar with the relation between the year of publication and the number of citations. These relationships should be worked out in the paper.

Response: The publication year of datasets may vary according to the datasets, and may change with time if the study got updated (i.e. more data released with time). So it was difficult to study it, considering the unavailability of specific dates provided in the dataset we received from the BioLINCC.

Comment: Another aspect to be considered could be the role of outliers in the statistics. Are there datasets and/or publications with a very high number of citations (e.g. more than 100). Does the citation pattern mainly concentrate in a few outstanding datasets or is it more evenly distributed?

Response: As the author mentioned, we found several “outlier” datasets and we mentioned them in the results. These datasets were associated with higher number of publications compared to other datasets.

Comment: The authors should include and discuss a cross-sectional web-based survey about access to clinical research data from BioLINCC, covering the period from 2007 to 2014 (Ross JS et al. Data sharing through an NIH central database repository: a cross-sectional survey of BioLINCC users. *BMJ open* 2016;6(9):e012769)¹.

Response: Thank you for suggesting the article. We made good use of it.

The authors think that it would be good style to thank BioLINCC for providing datasets after contact.

Competing Interests: None.

Author Response 31 Jan 2021

Saif Aldeen AlRyalat

Dear Professor Ohmann,

We hope our responses satisfy your comments, if so, we hope to receive your feedback.

Thank you for your time.

Sincerely,
Saif Aldeen AlRyalat, MD.
Corresponding author.

Competing Interests: None

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