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LITERATURE REVIEW ARTICLE

Do Open Access Mandates Work? A Systematized Review of the Literature on Open Access Publishing Rates

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ABSTRACT

To encourage the sharing of research, various entities—including public and private funders, universities, and academic journals—have enacted open access (OA) mandates or data sharing policies. It is unclear, however, whether these OA mandates and policies increase the rate of OA publishing and data sharing within the research communities impacted by them. A team of librarians conducted a systematized review of the literature to answer this question. A comprehensive search of several scholarly databases and grey literature sources resulted in 4,689 unique citations. However, only five articles met the inclusion criteria and were deemed as having an acceptable risk of bias. This sample showed that although the majority of the mandates described in the literature were correlated with a subsequent increase in OA publishing or data sharing, the presence of various confounders and the differing methods of collecting and analyzing the data used by the studies' authors made it impossible to establish a causative relationship.

Keywords: open access mandates, data sharing policies, systematized reviews, effectiveness

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INTRODUCTION

Advocates of the open access (OA) movement seek an increase in freely available scholarship, especially if that scholarship relies—directly or indirectly—on public sources of funding and support. As a means of achieving this goal, advocates have promoted a culture of openness and sharing among the producers of research and have looked to various entities and institutions, including prominent public and private funders of research, for assistance. These entities, in turn, have enacted mandates or developed policies that either outright require or strongly encourage the widespread sharing of various research outputs. The details of OA mandates vary, such as who institutes the mandate, what research output is covered (e.g., journal articles or research data), whether compliance is truly mandatory or just strongly recommended, and to what extent compliance is tracked. The reasoning behind mandates and policies of this kind is that they will compel researchers—who might otherwise fail to do so—to make their work open. Although several studies have tried to assess compliance with such measures and determine whether they have had an impact on the rate of OA publishing within the individual research communities subject to a mandate or policy, as of yet no one has examined the evidence as a whole.

We initially attempted to determine whether, and to what extent, OA mandates increase the rate of OA participation within the research communities they target by conducting a systematic review. (We define “research community” here as any identifiable institution, organization, or group engaged in research that produces tangible outputs of some kind, such as journal articles, books, data sets, or theses and dissertations. And by “OA participation,” we mean the number of open research products, such as articles or data sets, or the amount of evidence pointing to such products, such as data availability statements.) Authors of systematic reviews aim to find, code, appraise, and synthesize all of the previous research surrounding a specific, focused question in an unbiased and transparent manner (Foster & Jewell, 2017). However, the existing literature on OA mandates, which consists primarily of case studies that employ a variety of methods, presented many challenges to conducting a true systematic review, as did our stringent inclusion and exclusion criteria, so we ultimately followed a systematized approach instead (Grant & Booth, 2009). Risk of bias was high—only five articles made it past the critical appraisal stage—and numerous confounding factors in the included studies rendered a straightforward answer to our research question moot. Instead, the current study highlights the need for more robust research on OA initiatives, especially mandates and policies designed to encourage or increase sharing.

We also want to acknowledge the arguments made by others against measuring OA success only through such quantitative means of how many articles are made OA (Rigling et al., 2018;

Maron et al., 2019; Roh et al., 2020). As noted by Selman (2022), this often misses other important values and ideologies, such as working to create a more equitable publishing ecosystem. We see this research project, then, as one of many needed evaluations of OA mandates; whereas this project looks at the numbers, a broader holistic view should incorporate how mandates work toward shared values.

BACKGROUND

History of mandates

Since OA was first proposed, proponents have struggled to get researchers to take part. Björk et al. (2010) found that by 2009, just 20.4% of articles were freely available in some way. Severin et al. (2020) found that some disciplines increased their OA share to 66% of articles, but others fell below 30%. The need for solutions to address these issues has been apparent since the early 2000s. Although other issues exist, Xia et al. noted that “academic authors lacking sufficient motivation to self-archive in OA repositories created the need for mandate policy” (2012, p. 88). Harnad (2015) and Renfro (2011) have both argued that institutions and funders need to enact mandates to improve OA rates.

A school at the University of Southampton enacted what is believed to be the first mandate in 2003, and the United Kingdom recommended the first funder-based mandate shortly after (Xia et al., 2012). The Faculty of Arts and Sciences at Harvard University became the first group of faculty to vote in favor of a mandate in 2008, the same year that the National Institutes of Health (NIH) changed its policy from recommending that NIH-funded research be made open to mandating it (Xia et al., 2012). By 2010, mandates became common in Western Europe and existed on every continent (Xia et al., 2012).

By 2015, a report from the European Union found a total of 663 mandates, with about 60% of them coming from Europe and 22% coming from North America (Swan et al., 2015). That number increased to more than 1,000 mandates by 2020 (Mering, 2020). A majority of the mandates come from institutions, and about 10% of them come from grant funders (Swan et al., 2015; Mering, 2020).

Xia et al. (2012) found that policies could be classified in other ways, including what material the mandate covered, such as articles or theses and dissertations. Swan et al. (2015) noted that they could also be classified by whether the policy was a true mandate or just a recommendation or suggestion for OA; their report found that about half of the policies were a true mandate.

Benefits and drawbacks

Detractors to OA mandates are many, with journal editorials often decrying them as hurting academic freedom and the ability of journals and publishers to properly function (Johnston, 2017). Others have reported on the difficulty in managing mandates, especially as researchers often fall under multiple mandates from their institutions, various grant funders, and more (Baldwin & Pinfield, 2018). Still other studies have found that a mandate on its own is often not enough; faculty, for various reasons, do not always comply, meaning that other people—often librarians—must do work to ensure their faculty members' research is deposited into an appropriate repository (Xia et al., 2012; Zhang et al., 2015).

However, various studies have found evidence showing that mandates are connected to some increased participation in OA. For instance, Kennan (2011) compared two Australian universities—one with a policy, and one without—and found not only that the one with a policy had better rates but that their faculty were also more knowledgeable about OA. Larivière and Sugimoto (2018) studied the compliance rates for various funder mandates and found that, although the rate for NIH-funded research was around 90%, for others less than half of funded research complied with a policy. The study found that the funders with the best compliance rates threatened to withhold funding if researchers did not comply, although it was unclear whether the funders ever followed through on this. Swan et al. (2015) also found evidence that mandates help to increase OA rates, although they noted that factors that gave a mandate strength, such as not allowing opt-out waivers and connecting participation in the mandate to research evaluation, seemed to provide the biggest boost.

Meanwhile, a number of funders, primarily national research groups in Europe, have moved forward with Plan S, a strengthened mandate proposal that would prohibit embargoes, require authors to retain copyright, and forbid hybrid OA (Rabesandratana, 2019). Supporters of the plan, which went into effect in 2021, are trying to get buy-in from funders across the globe, with some private funders in the United States and Africa joining Coalition S, the group supporting Plan S (Rabesandratana, 2019). More recently, the White House Office of Science and Technology Policy (2022) announced updates to its own mandate that also look to strengthen OA participation, including removing the embargo for sharing research articles and data, as well as requiring all federal departments to develop an OA mandate, not just those that provide more than \$100 million in grant funding a year.

As of yet, no large-scale review has been conducted on the various studies looking into the effectiveness of OA mandates.

METHODS

Although this study drew upon evidence synthesis reporting best practices (i.e., a comprehensive search of the literature, two rounds of screening, a risk of bias assessment, etc.) and was initially undertaken with the goal of reporting any findings in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses and the Methodological Expectations of Cochrane Intervention Reviews, it is not—and should not be considered—a systematic review (Page et al., 2021; Higgins et al., 2022). Reviews of this kind are often referred to as “systematized” reviews (Grant & Booth, 2009). Our team consisted of five librarians during the searching phase of the project but only involved four during its latter stages.

We developed fairly strict inclusion and exclusion criteria, namely, we included studies from all over the world with a variety of different entities (e.g., government, grant funder, research institution, journal, etc.) instituting any kind of mandate or policy type (i.e., those focused on research data as well as those focused on text-based documents). However, we excluded qualitative studies as well as those with missing data. More specifically, we excluded studies that failed to provide calculated deposit rates or figures from both prior to and after a mandate or policy went into effect. We also excluded any studies with self-reported data from individual faculty or researchers (e.g., surveys of members of the community to which a given mandate applies) as well as works that predicted the future effects of OA mandates. And, finally, we only kept articles written in English, despite the limitation that this practice places on the generalizability of our results.

Next, we identified relevant databases, casting a wide net due to the interdisciplinary nature of our research question. The databases searched were as follows:

- LISTA (EBSCO)
- Academic Search Complete (EBSCO)
- PubMed, MEDLINE (Ovid)
- Web of Science (Clarivate)
- Education Source (EBSCO)
- ERIC (EBSCO)

We then developed search strings using keywords and controlled vocabulary relating to the concept of “open,” such as the following:

- open access
- open science

- open data
- open research
- open scholarship

We combined these with terms relating to the intervention in question, like “mandate” and “policy,” and outcome-related words, like “compliance” and “adherence.” Additionally, the team searched several grey literature sources including ProQuest Dissertations & Theses, The Grey Literature Report, OpenGrey, arXiv, and Google Scholar using simpler search strings (e.g., the phrase “open access” alongside “mandate” or “policy”). These searches were conducted between June 2020 and the end of September 2020. Our search strings for each database as well as our review protocol are available on the Open Science Framework site ([Azadbakht et al., 2022](#)).

Running searches in each of the aforementioned databases yielded a total 6,115 items. We moved these into Zotero, a citation management tool, to catch as many duplicate records as possible using that tool’s deduplication feature. After deduplication, there were a total of 4,629 citations. We also accumulated an additional 60 records from various grey literature search platforms, amounting to a combined total of 4,689 items. Next, we exported the citations into a CSV file, where each record was assigned a unique identifier. We then imported these into Rayyan, a free, web-based screening tool ([Ouzzani et al., 2016](#)).

We performed the title and abstract screening in Rayyan. The records were blinded for the duration of the screening period, and each study was independently reviewed and voted upon by at least two of the librarians on the team. Ultimately, we eliminated 4,590 items during this stage of the review. The majority of these were simply irrelevant and had nothing to do with OA deposit mandates or policies. At the same time, we engaged in targeted citation searching and hand searching. Specifically, we looked at the reference lists of and tracked down cited references for any included articles. We also examined the bibliographies of excluded articles that we thought might have relevant citations in their reference lists. This yielded a total of 20 additional records.

We entered the full-text screening phase of the review with a total of 99 records and then assessed the additional 20 records discovered during citation and hand searching separately. Whereas we encountered a few truly irrelevant articles, most of the studies excluded during this second round of screening were qualitative/opinion pieces, engaged in forecasting, or failed to include deposit data or calculated deposit rate from prior to the mandate or policy’s effective start date. After unblinding, we resolved any conflicts by having a third team member cast a tie-breaking vote.

After this stage of screening, we were left with 11 articles:

- Colavizza et al., 2020
- Daoutis & Rodriguez-Marquez, 2018
- Eriksen & Alstad, 2014
- Gilbert et al., 2011
- Hardwicke et al., 2018
- Herrmannova et al., 2019
- Smart, 2019
- Soper, 2017
- Staudt, 2020
- Xia et al., 2012
- Zhang et al., 2015

These were divided among the team members and coded using a shared Excel spreadsheet, in which we recorded key information about each study, such as the institution(s) and mandator(s) it featured, specific details about the mandate or policy itself, and the deposit rates or raw numbers pre and post mandate. We then used Glynn's (2006) critical appraisal tool for libraries to further evaluate the articles. Two members (not the same team members who coded the articles) each independently used Glynn's checklist to appraise each article for bias. Answers were then compared. If the reviewers disagreed on an article, a third reviewer was brought in.

RESULTS

Five studies scored 75% or higher on the critical appraisal assessment, meaning that they are considered to have a low risk of bias; however, six studies scored less than 75% (see Table 1), meaning that they have a high risk of bias. It should be noted that the nature of most OA mandate studies can weigh against some of the criteria on the tool. For example, many studies the team looked at were case studies of specific institutions, which will preclude having external validity. Also, a number of the studies were conducted by institutional repository managers or other people who helped oversee the mandate, which means that another criterion—"Were those involved in data collection not involved in delivering a service to the target population?"—will be a No, which counts against low risk of bias. Although it does not appear that these affected the overall results, further research should take note of it. Other specific areas in which studies did poorly were failing to include areas for future study (six articles), not

Article	Population	Data Collection	Study Design	Results	Total
Colavizza et al., 2020	75%	67%	100%	100%	86%
Daoutis & Rodriguez-Marquez, 2018	83%	50%	50%	40%	58%
Eriksen & Alstad, 2014	83%	20%	0%	20%	35%
Gilbert et al., 2011	67%	75%	75%	40%	63%
Hardwicke et al., 2018	100%	83%	100%	60%	85%
Herrmannova et al., 2019	83%	100%	100%	67%	86%
Smart, 2019	75%	50%	100%	50%	67%
Soper, 2017	67%	50%	33%	40%	50%
Staudt, 2020	83%	100%	100%	50%	76%
Xia et al., 2012	67%	100%	50%	67%	70%
Zhang et al., 2015	83%	100%	100%	100%	94%

75% or higher indicates a low risk of bias, whereas below 75% indicates a high risk of bias.

Table 1. Critical bias results for the 11 remaining articles for each section of the critical bias tool as well as the overall result

accounting for confounding variables (six), not clearly stating the research methodology (four), and not clearly stating the data collection methods (four).

The included studies (see Table 2) were published between 2015 and 2020 and were conducted on mandate compliance activity occurring in the United States and the United Kingdom (Hardwicke et al., 2018; Herrmannova et al., 2019). Mandate types included institutional, journal publisher, and funder (Zhang et al., 2015; Hardwicke et al., 2018; Herrmannova et al., 2019; Colavizza et al., 2020; Staudt, 2020). Specifics on mandate requirements varied and were not always available. One study looked at mandates that stated accepted versions of publication must be deposited in a campus institutional repository with differing or unclear policies on embargos, waivers, and timeframes (Zhang et al., 2015). The journal publisher mandates examined required that data availability statements be included with publications or that research data be made publicly available prior to publication (Hardwicke et al., 2018; Colavizza et al., 2020). Funder mandates required that publications be made open either within 3 months of publication or at the time of acceptance (Herrmannova et al., 2019; Staudt, 2020).

The included articles also varied in their scope, approach, and methods. One study measured the effectiveness of an institutional mandate aimed at increasing the rate of freely available published research articles (Zhang et al., 2015). The researchers utilized pre- and post-mandate repository data as well as the subscription-based citation index Web of Science to track adherence and calculate deposit rates. Another study estimated the impact of the

ID	Reference	Mandator	Mandate Specifics	Timeframe of Included Studies (based on deposit or publication date)	Outcome
1	Herrmannova et al., 2019	Funder	REF 2021 OA Policy: Grant recipients must deposit resulting research articles into an OA platform within 3 months of acceptance of the publication.	Approximately 3 years pre mandate and 2 years post mandate	UK deposit rate within required timeframe increased by over 30 percentage points, from less than 50 percent to 80 percent.
2	Zhang et al., 2015	Institutional	Accepted versions of any institutional-authored publication must be deposited into the campus IR. Exception waivers are available on a case-by-case consideration.	1 year pre mandate and 1 year post mandate	Deposit rate decreased by 1.54 percentage points.
3	Staudt, 2020	Funder	All NIH-funded research must be deposited in PubMed Central in final peer-reviewed form at time of acceptance.	Approximately 5 years pre mandate and 3 years post mandate	Deposits to PMC increased by 50 percentage points, from ~40% in 2007 to ~90% in 2011.
4	Hardwicke et al., 2018	Publisher	Relevant research data must be made publicly available prior to publication of an accepted article in the journal.	1 year pre mandate and 2 years post mandate	Increase in data availability statements by 53 percentage points (25% to 78%) and increase in reusable data by 40 percentage points (22% to 62%).
5	Colavizza et al., 2020	Publisher	Data availability statements must be included with all publications, and all authors must share their research data.	Approximately 15 years pre mandate and 3 years post mandate	Increase of available data by 49.1 percentage points (determined via analysis of original data).

(table continues)

Timeframe of Included Studies (based on deposit or publication date)

ID	Reference	Mandator	Mandate Specifics	Timeframe of Included Studies (based on deposit or publication date)	Outcome
Failed CA	Gilbert et al., 2011	Institutional	Research must be made available in campus IR within 6 months of publication. Exception waivers are available on a case-by-case consideration.	1 year pre mandate and 1 year post mandate	Increase in OA availability by 6.2 percentage points.
Failed CA	Eriksen & Alstad, 2014	Institutional	UjB researchers are encouraged (not mandated) to publish in OA or hybrid journals. NTNU researchers are encouraged (not mandated) to publish in OA journals or include items in IR. UjO mandates researchers deposit post-print into IR.	1-2 years pre mandate and 0-1 year post mandate	UjB: decrease in deposits by 75%. NTNU: did not provide pre-policy data for comparison. UjO: decrease in deposits by 82.4%. Data noted as unreliable due to collection tool flaw.
Failed CA	Xia et al., 2012	Institutional, multi-institutional, program, funder, thesis, and unspecified	349 mandates of which 122 were institutional, 6 were multi-institutional, 35 were program, 55 were funder, 78 were thesis, and 53 were unspecified in who the mandator was. Mandate specifics varied widely.	Varied based on individual mandate	Approximately 54% of repositories included increased deposits post mandate. Approximately 29% reported a decrease. The remaining repositories saw little change or were otherwise inconclusive.
Failed CA	Smart, 2019	Institutional	Accepted version of research must be deposited into campus IR.	1 year pre mandate and 2 years post mandate	Deposit rate increased by 324% from 2015 to 2018.

ID	Reference	Mandator	Mandate Specifics	Timeframe of Included Studies (based on deposit or publication date)	Outcome
Failed CA	Daoutis & Rodriguez-Marquez, 2018	Institutional	Published articles must be deposited into campus IR and other research outputs encouraged.	2 years pre mandate and 1 year post mandate	Deposit rate increased by 28 percentage points.
Failed CA	Soper, 2017	Institutional	Accepted versions must be deposited into campus IR	Time pre mandate unknown and 1 year post mandate	Annual deposit rate increased by 364%.

Because there were so few remaining articles, we have also included the results and details for the six excluded by the critical bias. CA = critical appraisal; IR = institutional repository; NIH = National Institutes of Health; NTNU = Norwegian University of Science and Technology; OA = open access; PMC = PubMed Central; UiB = University of Bergen; UiO = University of Oslo.

Table 2. Results and details from the five included articles

NIH's 2008 Public Access Policy by examining citations associated with a set of PubMed Central articles and a comparison sample over time (Staudt, 2020). Two studies measured the impact of data-related journal policies and accordingly determined adherence via the presence of a data availability statement and the accessibility of the associated research data itself within published research articles (Hardwicke et al., 2018; Colavizza et al., 2020). One study analyzed data from Crossref, the digital object identifier registry, and CORE (COncnecting REpositories), an OA content aggregator, to determine whether the UK REF 2021 OA policy reduced the time lag between an article's publication and its deposit into a repository (Herrmannova et al., 2019). In all but one of these studies, enacting a mandate or policy resulted in an increase in the rate of OA publishing, data sharing, or the prevalence of data availability statements.

DISCUSSION

Reports on OA mandates have been published often, as shown in this article. Although there is a trend in the results showing that, in most of the cases assessed, mandates increase the availability of OA publishing, the high variation in the reported rate speaks to the complexity of the situations being compared and the lack of homogeneity in methods and measures across the included studies. Many of the problematic issues observed were also present in Langhan-Putrow et al.'s (2021) recent systematic review of OA citation advantage articles—such as lack of clear information around data totals and how data were collected—and together speak to larger research problems that need to be addressed in order to move the assessment and validation of OA work forward.

Overall, this study found critical issues with many of the articles that attempted to look at the effects of OA mandates on actual OA participation. Of the articles eliminated during the second round of screening, 39 were excluded because they did not include data of OA rates prior to and/or after the mandate went into effect. Of the 11 that did make it through the second screening round, just over half failed the critical appraisal, leaving five studies, which we decided was not enough to reach any consensus or conclusions.

The focus of several articles in the final round did not appear to be on the results of the mandate but instead on some related aspect, such as case studies looking at how an institution or library worked to implement an OA mandate (Gilbert et al., 2011; Xia et al., 2012; Zhang et al., 2015; Soper, 2017; Daoutis & Rodriguez-Marquez, 2018; Smart, 2019). However, in order to properly assess the implementation, having clear data to show the results is important. Too often authors of these studies did not provide this, instead offering vague statements such as that OA rates “increased” or “decreased.” Echoing Larivière & Sugimoto (2018), future research in this area would greatly benefit from having an accepted standard for what data

and other information to include in reporting to help further the overall knowledge of OA mandates and their effectiveness. Any such standard or best practice should also include what confounding variables to look at or at least consider when evaluating mandate effectiveness. For instance, researchers should provide mandate details, such as whether it was opt in/opt out, and include whether OA is actually required or just recommended, and what material is covered by the mandate. Other confounding variables include whether an institution provided support in meeting the mandate, such as by the library working to collect and deposit articles into the local institutional repository. Too many of the studies we looked at lacked these details, making it harder to determine the overall efficacy of the mandate.

Possibly contributing to the dearth of reported confounding variables and mandate details could be a lack of specifics in the mandates themselves. The Open Research Funders Group recently recognized the challenges that face those who wish to create strong OA mandates, citing that “gathering information on the wide range of sharing practices, crafting clear language, and finding examples of good practices to pull from takes time, energy, and can be a significant barrier” (Tananbaum, 2022, para. 1). Their newly created Policy Clause Bank and Policy Generator, in addition to other aids such as the Institutional Open Access Policy Toolkit from the Canadian Association of Research Libraries (2020), can help entities craft strong OA mandates that align with their mission and values while including the enforcement that others have found help make mandates successful (Swan et al., 2015; Larivière & Sugimoto, 2018).

Other issues that arose through the critical appraisal included a failure of some studies to properly detail their overall methodology and, more specifically, their data collection methods, both of which would be addressed by researchers providing more details in general in their reports. Questions about the appropriateness of the time period covered in the studies also arose. It would help future researchers to have an idea of what is an acceptable minimum time period to study—one year after a mandate? Two years?

We acknowledge the difficulties of tracking OA participation, which in turn can make it difficult to report out more concrete data. Improvements in platforms, analytics, and reporting will hopefully ease this and make it possible for future researchers to more reliably collect these data (Robinson-Garcia et al., 2019; Huang et al., 2020). It might not ever be possible to truly assess all types of OA mandates together. The differences between institutional versus funder versus journal mandates might instead need to be studied separately. As some articles also pointed out, OA in general has become more widely accepted across academia, and researchers may be impacted by more than one mandate in a given project, i.e., both a funder and an institution mandate, which can make it harder to separate out the effects of each individual one (Swan et al., 2015).

Finally, as noted in the results, we found problems with the critical appraisal tool used for this area of study. Part of this could be solved by broader studies that go beyond one case study at a time, but researchers interested in future systematic reviews of OA topics will have to grapple with the issue that current critical appraisal tools are not always best suited for OA research.

Plan S and the new White House memo show that mandates are not going away, at least anytime soon, and research into them will need to continue. Follow-up studies to those already published could not only help provide more specific data but also help OA researchers better understand the overall and long-term effects of these mandates. Future researchers also should ensure they are providing enough information about the mandate and confounding factors to ensure that others can properly understand them, and they should consider how Plan S and other initiatives change the topic areas requiring further study.

This study has several limitations that may impact the interpretation and applicability of the results. First, as noted earlier, we only included English-language studies, which meant excluding three studies during the full-text screening phase. Secondly, the wording of our research question also excluded studies that compared comparable institutions or groups of institutions where the only differing variable was whether they had an OA mandate, which could also have provided valuable information. Some institutional repositories were only created and promoted at the same time their parent organization instituted a mandate.

CONCLUSION

This review showed that, although OA mandates and policies of various kinds seem to be associated with an increase in the amount of data sharing or freely available research products, it is difficult to directly compare the included studies because they differed so much in their methods, the scope and force of their mandate or policy, and their duration. Likewise, the number of potential confounders across studies (e.g., supportive services, other inducements to share, etc.) suggests that a causative relationship cannot be formally established. Given these challenges, an altogether different approach to reviewing and evaluating the literature surrounding OA mandates is needed.

Future reviews, systematic or otherwise, might use looser inclusion criteria—allowing, say, for studies that do *not* contain data from before the mandate or policy in question went into effect—and thereby enable a broader, more holistic understanding of these mandates' or policies' influence on researcher behavior. Alternatively, subsequent studies could compare similar groups with and without mandates to determine effectiveness or focus on just one, narrowly defined type of mandate or policy (such as data sharing policies) or just one kind

of entity (such as government agencies). Authors of future case studies also have a part to play as well. They should think carefully about how potential readers might use their work to make the case for OA mandates at their own institutions and provide data and details accordingly. Researchers in this area would also benefit from increased communication and collaboration. Working together, they might identify ways of standardizing how research on OA mandates and policies is conducted and of ensuring that such studies are rigorous and more directly comparable. Moreover, the entire OA community will need to consider Plan S going forward, as it is likely to have a considerable impact on any future research on OA uptake. And finally, as mentioned previously, research into OA mandates should consider them holistically, including how they affect other values and goals beyond just the percentage of articles being made OA. Future research in this area can look toward frameworks such as the FOREST Framework and the Ethical Framework for Library Publishing to guide their work (Boczar et al., 2018; Lippincott & Skinner, 2022).

REFERENCES

- Azadbakht, E., Schultz, T., Radniecki, T., & Shannon, A. (2022, November 14). *Assessing the effectiveness of open access (OA) mandates*. Open Science Framework. https://osf.io/cdz8y/?view_only=a821898de69b4384ae33da54a4d937ee
- Baldwin, J., & Pinfield, S. (2018). The UK scholarly communication licence: attempting to cut through the Gordian Knot of the complexities of funder mandates, publisher embargoes and researcher caution in achieving open access. *Publications*, 6(3), 31. <https://doi.org/10.3390/publications6030031>
- Björk, B.-C., Welling, P., Laakso, M., Majlender, P., Hedlund, T., & Guðnason, G. (2010). Open access to the scientific journal literature: situation 2009. *PLoS ONE*, 5(6), e11273. <https://doi.org/10.1371/journal.pone.0011273>
- Boczar, J., Collins, N., Cummings-Sauls, R., Fishel, T., Horton, V., Inefuku, H., Melton, S., Neds-Fox, J., Robertson, W., Roh, C., Schlosser, M., Sipovic, J., Thomas, C., & Westin, M. (2018). An ethical framework for library publishing. *Library Publishing Coalition (LPC) Publications*. <https://docs.lib.purdue.edu/libpubtaskforce/1>
- Canadian Association of Research Libraries. (2020, May). *CARL Institutional Open Access Policy Template and Toolkit*. Retrieved June 14, 2022, from <https://www.carl-abrc.ca/oa-policy-template-and-toolkit/>
- Colavizza, G., Hrynaszkiewicz, I., Staden, I., Whitaker, K., & McGillivray, B. (2020). The citation advantage of linking publications to research data. *PLoS ONE*, 15(4), e0230416. <https://doi.org/10.1371/journal.pone.0230416>
- Daoutis, C., & Rodriguez-Marquez, M. (2018). Library-mediated deposit: a gift to researchers or a curse on open access? Reflections from the case of Surrey. *Publications*, 6(2), 20. <https://doi.org/10.3390/publications6020020>

Eriksen, R. T., & Alstad, J. (2014). The stick or the carrot? An approach to open access. *Proceedings of the IATUL Conferences*. <https://docs.lib.purdue.edu/iatul/2014/openaccess/2/>

Foster, M. J., & Jewell, S. T. (Eds.). (2017). *Assembling the pieces of a systematic review: A guide for librarians* (Illustrated edition). Rowman & Littlefield Publishers.

Gilbert, J., Kinger, M., & Kullman, L. (2011). Implementing an open access policy at Chalmers University of Technology. *Proceedings of the IATUL Conferences*. <https://docs.lib.purdue.edu/iatul/2011/papers/10/>

Glynn, L. (2006). A critical appraisal tool for library and information research. *Library Hi Tech*, 24(3), 387–399. <https://doi.org/10.1108/07378830610692154>

Grant, M. J., & Booth, A. (2009). A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, 26(2), 91–108. <https://doi.org/10.1111/j.1471-1842.2009.00848.x>

Hardwicke, T. E., Mathur, M. B., MacDonald, K., Nilsonne, G., Banks G. C., Kidwell, M. C., Hofelich Mohr, A., Clayton, E., Yoon, E. J., Henry Tessler, M., Lenne, R. L., Altman, S., Long B., & Frank, M. C. (2018). Data availability, reusability, and analytic reproducibility: evaluating the impact of a mandatory open data policy at the journal *Cognition*. *Royal Society Open Science*, 5(8), 180448. <https://doi.org/10.1098/rsos.180448>

Harnad, S. (2015). Optimizing open access policy. *The Serials Librarian*, 69(2), 133–141. <https://doi.org/10.1080/0361526X.2015.1076368>

Herrmannova, D., Pontika, N., & Knoth, P. (2019). Do authors deposit on time? Tracking open access policy compliance. *2019 ACM/IEEE Joint Conference on Digital Libraries (JCDL)*, 206–216. <https://doi.org/10.1109/JCDL.2019.00037>

Higgins, J. P. T., Lasserson, T., Chandler, J., Tovey, D., Thomas, J., Flemyng, E., & Churchill, R. (2022, February). *Methodological expectations of Cochrane Intervention Reviews [MECIR Manual]*. The Cochrane Collaboration. <https://community.cochrane.org/sites/default/files/uploads/MECIR%20Version%20February%202022.pdf>

Huang, C.-K., Neylon, C., Hosking, R., Montgomery, L., Wilson, K. S., Ozaygen, A., & Brookes-Kenworthy, C. (2020). Meta-research: evaluating the impact of open access policies on research institutions. *eLife*, 9, e57067. <https://doi.org/10.7554/eLife.57067>

Johnston, D. J. (2017). Open access policies and academic freedom: understanding and addressing conflicts. *Journal of Librarianship & Scholarly Communication*, 5, 1–17. <https://doi.org/10.7710/2162-3309.2104>

Kennan, A. M. (2011). Learning to share: mandates and open access. *Library Management*, 32(4/5), 302–318. <https://doi.org/10.1108/01435121111132301>

Langhan-Putrow, A., Bakker, C., & Riegelman, A. (2021). Is the open access citation advantage real? A systematic review of the citation of open access and subscription-based articles. *PLoS ONE* 16(6). <https://doi.org/10.1371/journal.pone.0253129>

- Larivière, V., & Sugimoto, C. R. (2018). Do authors comply when funders enforce open access to research? *Nature*, 562(7728), 483–486. <https://doi.org/10.1038/d41586-018-07101-w>
- Lippincott, S., & Skinner, K. (2022). *FOREST framework for values-driven scholarly communication*. Educopia Institute. <https://educopia.org/wp-content/uploads/2022/05/FOREST-Framework-2.0-Spring-2022.pdf>
- Maron, N., Kennison, R., Bracke, P., Hall, N., Gilman, I., Malenfant, K., Roh, C., & Shorish, Y. (2019). Open and equitable scholarly communications: creating a more inclusive future. *Association of College & Research Libraries*. <https://digitalcommons.unl.edu/scholcom/111>
- Mering, M. (2020). Open access mandates and policies: the basics. *Serials Review*, 46(2), 157–159. <https://doi.org/10.1080/00987913.2020.1760707>
- Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews*, 5(1), 210. <https://doi.org/10.1186/s13643-016-0384-4>
- Page, M. J., Moher, D., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., Stewart, L. A., Thomas, J., Tricco, A. C., Welch, V. A., Whiting, P., & McKenzie, J. E. (2021). PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. *BMJ*, 372, n160. <https://doi.org/10.1136/bmj.n160>
- Rabesandratana, T. (2019). The world debates open-access mandates. *Science*, 363(6422), 11–12. <https://doi.org/10.1126/science.363.6422.11>
- Renfro, P. (2011). Open access within reach: an agenda for action. *Journal of Library Administration*, 51(5–6), 464–475. <https://doi.org/10.1080/01930826.2011.589351>
- Rigling, L., Carlisle, E., & Waugh, C. (2018). In pursuit of equity: applying design thinking to develop a values-based open access statement. *In the Library with the Lead Pipe*. <https://www.inthelibrarywiththeleadpipe.org/2018/oa-statement/>
- Robinson-Garcia, N., Costas, R., & van Leeuwen, T. N. (2019). Indicators of open access for universities. *arXiv*. <https://doi.org/10.48550/arXiv.1906.03840>
- Roh, C., Inefuku, H., & Drabinski, E. (2020). Scholarly communications and social justice. In M. P. Eve & J. Gray (Eds.), *Reassembling scholarly communications: Histories, infrastructures, and global politics of open access* (pp. 41–51). MIT Press.
- Selman, B. (2022, May). “T”As and their discontents. Library Publishing Forum, Virtual. https://docs.google.com/presentation/d/1iD0lf6VvkvGiLLwwKdkWoPoPzgxtkP1h_azRNeV-Ffk
- Severin, A., Egger, M., Paul, E. M., & Hürlimann, D. (2020). Discipline-specific open access publishing practices and barriers to change: an evidence-based review. *F1000Research*, 7. <https://doi.org/10.12688/f1000research.17328.2>

- Smart, R. (2019). What is an institutional repository to do? Implementing open access harvesting workflows. *Publications*, 7(2), 37. <https://doi.org/10.3390/publications7020037>
- Soper, D. (2017). On passing an open access policy at Florida State University: from outreach to implementation. *College & Research Libraries News*, 78(8), 432. <https://doi.org/10.5860/crln.78.8.432>
- Staudt, J. (2020). Mandating access: assessing the NIH's public access policy. *Economic Policy*, 35(102), 269–304. <https://doi.org/10.1093/epolic/eiaa015>
- Swan, A., Gargouri, Y., Hunt, M., & Harnad, S. (2015). Open access policy: numbers, analysis, effectiveness. *arXiv*. <https://arxiv.org/abs/1504.02261>
- Tananbaum, G. (2022, June 8). *ORFG releases new resources to facilitate funders' open research policies*. Open Research Funders Group. <https://www.orfg.org/news/2022/6/8/orfg-releases-new-resource-to-facilitate-funders-open-research-policies>
- White House Office of Science and Technology Policy. (2022, August 25). *OSTP issues guidance to make federally funded research freely available without delay*. The White House. <https://www.whitehouse.gov/ostp/news-updates/2022/08/25/ostp-issues-guidance-to-make-federally-funded-research-freely-available-without-delay/>
- Xia, J., Gilchrist, S. B., Smith, N. X. P., Kingery, J. A., Radecki, J. R., Wilhelm, M. L., Harrison, K. C., Ashby, M. L., & Mahn, A. J. (2012). A review of open access self-archiving mandate policies. *Portal: Libraries and the Academy*, 12(1), 85–102. <https://doi.org/10.1353/pla.2012.0000>
- Zhang, H., Boock, M., & Wirth, A. A. (2015). It takes more than a mandate: Factors that contribute to increased rates of article deposit to an institutional repository. *Journal of Librarianship and Scholarly Communication*, 3(1). <https://doi.org/10.7710/2162-3309.1208>