Improving the reporting of research impact assessments: a systematic review of biomedical funder research impact assessments

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Abstract

The field of research impact assessment (RIA) has seen remarkable growth over the past three decades. Increasing numbers of RIA frameworks have been developed and applied by research funders and new technologies can capture some research impacts automatically. However, RIAs are too different to draw comparable conclusions about what type of methods, data or processes are best suited to assess research impacts of different kinds, or how funders should most efficiently implement RIAs. To usher in the next era of RIA and mature the field, future RIA methodologies should become more transparent, standardized and easily implementable. Key to these efforts is an improved understanding of how to practically implement and report on RIA at the funder-level. Our aim is to address this gap through two major contributions. First, we identify common items across existing best practice guidelines for RIA, creating a preliminary reporting checklist for standardized RIA reporting. Next, we systematically reviewed studies examining funders' assessment of biomedical grant portfolios to examine how funders reported the results of their RIAs across the checklist, as well as the operational steps funders took to perform their RIA and the variation in how funders implemented the same RIA frameworks. We compare evidence on current RIA practices with the reporting checklist to identify good practice for RIA reporting, gaps in the evidence base for future research, and recommendations for future effective RIA.

1. Background

Research impact assessments (RIAs) measure the research outputs, outcomes, and impacts of research projects, portfolios, or programs. RIAs typically include three key components: (1) *activities* undertaken (e.g. reviewing publications stemming from funded research or collating researcher's reports of impacts); (2) *methods and data* used to capture impacts (e.g. bibliometric analysis, surveys or interviews); and (3) *frameworks* used to guide these activities such as the Payback Framework (Buxton and Hanney 1996) or the Canadian Academy of Health Sciences (CAHS) Framework (Panel on Return on Investment in Health Research 2009). RIAs constitute a major tool in the research culture landscape, yet there is little consensus about how best to implement or report them.

There has been a growing culture of research impact, particularly in the United Kingdom, Australia, Canada, and the United States (Cruz Rivera et al. 2017; Razmgir et al. 2021; Reed et al. 2021), with interest and practice in the field of RIA increasing substantially over the past 30 years (Adam et al. 2018; Reed et al. 2021). This growth has spurred new conversations around how governments, funders, and researchers can best articulate the value of performing clinical research (Smith 2022), the obligations funders may have to demonstrate return on research investment (Lai et al. 2022; Wood and Wilner 2024) and relative alignment of such research to patient priorities and funder missions (Ward et al. 2023), and the roles and responsibilities universities and researchers may have in demonstrating research impact. New databases and technology from Dimensions.ai, Researchfish, and Clarivate help researchers, universities, and funders streamline and automate the data they need to demonstrate research impact during these assessments. Although RIA has been pursued in a variety of fields such as the agricultural, environmental, and social sciences (Razmgir et al. 2021; Pfeifer and Helming 2024), most RIA application and development has happened within the field of biomedical research (Razmgir et al. 2021).

Alongside this growth in practice, there has been an evolving body of scholarship about RIA: describing RIA (Hinrichs-Krapels and Grant 2016), guiding RIA (Adam et al. 2018; Sreenan et al. 2023), and critiquing RIA (Smith et al. 2020). While RIAs have traditionally emphasized indicators such as publications and ability to secure follow-on funding (Dworkin, Reffey and Wojtanik 2022), most researchers agree that assessing impacts meaningful to patients and their families is a worthwhile, if complex, endeavor (Gerke, Uude and Kliewe 2023).

Recent reviews (Greenhalgh et al. 2016; Cruz Rivera et al. 2017; Hanney et al. 2017; Newson et al. 2018; Razmgir et al. 2021; Abudu, Oliver and Boaz 2022) have identified over 60 frameworks found within the literature for use in RIA and there have been numerous applications of RIAs by a variety of actors—research groups (Rollins et al. 2021), universities (Ovseiko, Oancea and Buchan 2012), funders (Curran and Barrett 2014; Donovan et al. 2014; Kamenetzky et al. 2016), specific funding programs (Guthrie et al. 2015; Bowden et al.

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2018; Anderson et al. 2021), and national research portfolios (Glover et al. 2014; Glover et al. 2018). These frameworks demonstrate considerable heterogeneity in terms of purpose, timing of intended use (i.e. whether prospective or retrospective), by type of impact metric collected, and by who developed the framework (i.e. academic researchers or funders). While useful contributions to the landscape, this proliferation of RIA frameworks can complicate choices for actors wishing to measure the impact of research portfolios. Indeed, these different approaches to RIA mean that the activities and methods that funders utilize to measure research impact can vary greatly—even where the same frameworks are ostensibly being employed (Abudu, Oliver and Boaz 2022), leading to difficulty interpreting results, and even greater difficulty comparing across RIAs.

Beyond the selection of a framework, funders face many additional choices such as deciding on a portfolio of projects or grants to include in their assessment, selecting a timeframe for the assessment, considering which impact indicators fit their purpose, and determining appropriate methodologies for collecting and analyzing impact data. In 2022, we systematically reviewed the literature on RIAs of biomedical funding portfolios to explore how funders were approaching their RIAs and observed that methodological and reporting challenges were common (Abudu, Oliver and Boaz 2022). These included: a lack of a RIA framework, which may have impacted the methodological and theoretical rigor of the assessment; a lack of information about project completion status of included projects, which left readers unable to fully discern if the assessment was capturing impacts from projects still in progress or completed; a lack of information about lag time included in the analysis, which meant that readers were unaware how much time had elapsed since projects were completed and thus, how long projects had to accrue impacts that could be captured by the impact assessment; and an overall lack of detail about methods and data sets used in the analysis (Abudu, Oliver and Boaz 2022).

The methodological challenges we observed in our systematic review are well-documented in the broader RIA literature (Milat, Bauman and Redman 2015; Hanney et al. 2017; Adam et al. 2018; Jernroth 2024). Because of their pervasiveness, some critics argue RIA methodological challenges outweigh any potential usefulness and validity RIA may have as a means of demonstrating research impact (Budtz Pedersen and Hvidtfeldt 2023; Peruginelli and Pölönen 2023), particularly when used in high-stakes scenarios such as evidence for future funding decisions (Kamenetzky and Hinrichs-Krapels 2020). Others feel that the heavy skills, capacity, and technology burden often needed for RIA provides further evidence that RIA is not ready for wide-scale adoption by universities, funders, and governments around the world (Wood and Wilner 2024).

While there is mounting pressure for research funders to demonstrate returns of research investment, and emerging consensus that endeavors to measure impact are in the public good, there is a noticeable lack of literature about *how* funders perform RIA (Brown et al. 2022), and even less information about *how best* to perform funder-led RIA (Esterhuyse and Boshoff 2022; Wood and Wilner 2024). Understanding best practices in a landscape saturated with frameworks and diverse methodologies is complex. One important voice of guidance in this space has been the now-closed International School of Research Impact Assessment (active 2013 to 2018), founded by Jonathan Grant, Paula Adam, and Kathryn Graham (The International School on Research Impact Assessment). ISRIA held week-long intensive courses annually from 2013 to 2017 to train evaluation practitioners seeking to perform and optimize RIA. ISRIA's most prominent contribution has been its Ten-point guidelines for an effective process of research impact assessment, which was published in 2018 and disseminated broadly within the academic community. These guidelines provide high-level considerations for designing and conducting a RIA, communicating results, and developing a community of practice (Adam et al. 2018). Other guidance in this space has arisen from a handful of academic papers and blog posts about funder experiences with RIA. Taken together, this guidance represents an important contribution to the field, but implementation challenges persist. In their 2020 review looking at the processes organizations use to implement RIA, Kamenetzky and Hinrichs-Krapels find this practical know-do gap continues: 'Thus, our concern is that research organizations, in spite of having a crucial role to play in setting expectations and procedures around impact, are under-served by much of the 'science of science' literature, insomuch as it does not extend to practical application or application within a complex research funding landscape' (Kamenetzky and Hinrichs-Krapels 2020).

The current limitations in RIA data, methods and implementation do not, in our view, constitute a reason to abandon the attempt to understand the effects of research and research funding. Rather, we believe that ushering in the next phase of RIA guidance is dependent on clear guidelines for reporting RIAs to improve the RIA evidence base. Several attempts to improve the practice and use of research have focused on improving reporting, with a view to changing research practices [e.g. Equator network (EQUATOR Network), Consolidated Standards of Reporting Trials 2010 (CONSORT 2022) (Moher et al. 2010) or Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) (Husereau et al. 2022)]. It has not escaped our notice that these guidelines, if synthesized, may provide not just a route to better RIA practice as their aim, but a potential reporting checklist for the field of RIA. In the same way that the CONSORT statement has improved the reporting for randomized controlled trials published in journals that have endorsed CONSORT (Turner et al. 2012), a similar statement for RIAs could improve the quality and reproducibility of impact assessments among funders, creating greater assurances that demonstrated impacts were sourced adequately, and provide useful empirical evidence to begin conversations around guidance on how best to perform funder-led RIAs. In this paper we have used this approach by identifying reported activities, data and frameworks within RIAs, and analyzed these against best practice guidelines.

Our aim in this paper is to trial a proposed checklist for enhancing RIA reporting against current examples of published RIAs. First, we examine existing guidelines and identify common stages for effective RIAs, identifying key steps for RIA implementation that can be transformed into an essential reporting checklist for RIAs. Second, we systematically identify and review biomedical funder grant-based RIAs, identifying how well funders already report on these proposed checklist items within their assessments. We close with recommendations about how to practically report on RIA at the funder-level, aiming to increase uptake of systematic RIA reporting among funders and improve the methodological quality of assessments conducted.

2. Methods

2.1 Building a checklist for effective RIA reporting from existing guidelines

As the aim of the paper is to produce useable, practical guidance, we identified common themes across existing best practice guidelines that should be included in a write-up of RIA to maximize clarity, quality, and reproducibility. We performed an informal review of the literature to identify best practice guidelines for conducting research impact assessments using a Google Search and literature available to us from our 2022 review (Abudu, Oliver and Boaz 2022). Adam et al.'s 2018 ISRIA Statement: Ten-point guidelines for an effective process of research impact assessment (Adam et al. 2018) and its' early predecessor the Six Block Protocol of Research Impact Assessment served as our starting point. We reviewed all citations of the ISRIA paper to capture additional relevant papers. Our final sample of best practice guidance included: Adam et al. (Adam et al. 2018), Graham et al. (Graham et al. 2018), ISRIA 2014 (The International School on Research Impact Assessment 2014), Reed et al. (Reed et al. 2021), and Collado (Collado 2019), as well as technical guidance supplied with the CAHS framework (Panel on Return on Investment in Health Research 2009). Although other recent best practice guidance exists, this literature focuses on how researchers or universities can maximize their research impact, rather than how funders can evaluate their research impact (Sreenan et al. 2023).

To build upon current literature, we reorganized the 10 ISRIA principles and the ISRIA six-block protocol into a reporting checklist designed to follow the format of an academic paper (i.e. introduction, methods, results, and discussion). This format follows the structure of existing reporting guidelines such as CONSORT 2010 (Moher et al. 2010) or Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) (Husereau et al. 2022), and although the checklist is most relevant to an academic paper, it is applicable to funder white-papers as well. For each checklist item, we added a brief explanation/rationale of the item along with detailed coding instructions. As part of our work to transform current best practice guidelines into a reporting checklist, we also clarified a few areas that we felt needed better guidance. We created a new essential step of data analysis to clarify for funders that a thorough RIA should include a reporting of activities that are designed to collect impact data and activities that are designed to analyze impact data. These activities have been reported together in the past, and we believe separating these tasks provides greater methodological clarity for funders and reviewers. Informal conversations with A. Kamenetzky, an experienced RIA implementer previously at NIHR, encouraged us to include a checklist item about reflecting on best practices and building capacity within the discussion section, after learning about NIHR's work in developing capacity and best practices for RIA within their organization. The abbreviated version of the checklist can be found in Table 1, and the full version can be found in the Supplementary Materials. This checklist represents a minimum set of reporting items, that if applied by authors, funders, and journal editors could improve the standardization, transparency, and reproducibility of RIAs and

promote a culture of mutual learning among the wider RIA community.

2.2 Identifying examples of funder-conducted research impact assessment

We undertook a broad, global systematic review to identify: (1) framework-informed research impact assessments of a grant or project-based portfolio conducted by biomedical research funders; between 2014 and 2024 and (2) the data and methods used by funders to structure and carry out their analyses. These criteria and dates were selected to build on previous reviews published in 2017 (Hanney et al. 2017) and 2022 (Abudu, Oliver and Boaz 2022).

2.3 Search strategy

We searched for relevant literature using both electronic database searches, and a grey literature search. We developed an electronic database search strategy with support from a professional librarian combining index and free-text terms in a Boolean search to accurately and sensitively identify relevant publications. Broad search concepts included: assessing impact, science of science research, and research evaluation. Searches were adapted across five databases: Ovid MEDLINE, Ovid Embase, Ovid Global Health, Scopus, and Web of Science. Article searching was performed iteratively between April 2021 and February 2022 and updated in June 2024. Article review, coding, and analysis occurred between May 2021 and March 2022, and again in June 2024. The second part of the review strategy involved searching grey literature derived from Google Scholar, LSHTM Theses, ProQuest Dissertations & Theses Global, and the United States National Library of Medicine Bookshelf; identifying papers from key contacts; and hand-searching articles from Health Research Policy and Systems, Research Evaluation, and Implementation Science as key journals. The published database articles and grey literature papers were reviewed separately in Rayyan and then combined for data extraction.

2.4 Inclusion/exclusion

Literature was included if it was:

- 1) published between 2014 and 2024;
- 2) English-language;
- 3) available as a full-text primary research article or report;
- focused on a biomedical health funding portfolio (two or more funded grants/projects);
- 5) focused on assessing the impact of the biomedical health funding portfolio;
- 6) included an assessment of downstream research impact such as assessing the impact of research on policy, practice, or society; and
- used a named research 'assessment or evaluation' framework to guide the assessment.

For clarity these articles and reports will henceforth be referred to together as 'impact studies'. Following Razmgir et al. (2021) we defined 'frameworks' as using a transparent a priori approach which seek to demonstrate general impacts of a research portfolio, often using indicators to measure impact categories such as: knowledge production, capacity building, informing decision making, health and health systems, and economical and social impacts. The framework Table 1. RIA reporting checklist—items to include when reporting research impact assessments of funder research portfolios.

Section/item	Item no.	Recommendation	Reported on page no
Title and abstract			
Title	1	The title should clearly identify the paper as a research impact assessment (RIA).	-
Abstract	2	Structured summary of assessment framework, methods, results, and conclusions.	-
Introduction			
Objectives	3	State the purpose or goal of the assessment.	-
Methods			
Framework	4	State the framework chosen for the assessment.	-
Sample	5	Clearly identify the sample of projects included in the analysis.	-
Time lag	6	Clearly identify the time lag included in the analysis.	-
Impact categories	7	Identify the impact categories to be measured.	-
Impact indicators	8	Identify the impact indicators that will be used to measure impact.	-
Data sources	9	Identify the data sources used to complete the assessment.	-
Data collection	10	Specify methods used to collect impact data.	-
Data analysis	11	Specify methods used to synthesize data across different data	-
·		sources, perform data verification, or prepare case studies.	
Non-academic partners	12	Describe ways non-academic partners will be included in the assessment.	-
Results			
Portfolio description	13	Describe the portfolio of research being addressed, including how the portfolio is determined and the kinds of research in the portfolio.	-
Evidence of impacts	14	Provide evidence of impacts organized by impact categories.	-
Discussion			
Target audience and dissemination	15	State the target audience(s) of the study and identify how the report will be disseminated.	-
Building capacity	16	Share how future RIA could be improved, efforts to build future capacity, at the funder-level.	-
Limitations	17	State the limitations of the analysis.	_
Other		······	
Ethics	18	Ethical statement, if applicable.	_
Materials	19	Materials provided, if applicable.	-
Resources	20	Resources utilized and staffing needed for RIA implementation.	-
Source of funding	21	Relationship of evaluator to funder, if applicable.	-

Note: For consistency, the format of this statement has been modeled after CONSORT and CHEERS.

could have been previously published or newly created within the study itself.

These criteria meant that we removed many studies that had some similar goals of impact assessment, performed in different research settings. For example, we did not focus on RIAs of translational research centers (Grazier et al. 2013), institutional or platform funding (Zakaria, Grant and Luff 2021), groups of physicians, medical students, or trainees, if the unit of the assessment was not an individual grant or project. We excluded these different but important topic areas because we felt that the goals and methodology for performing RIAs of these groups were too different from funder RIAs of project-based portfolios.

All studies were reviewed by title first, and abstract and full text by R.A. and K.O., and included studies were screened jointly to ensure that both reviewers agreed on the final selection of studies. Figure 1 provides an overview of the article screening process.

2.5 Data extraction

For each study included in our review, we coded data on the aims of the framework or model used by the funder; the justification for the choice of this framework; the data collected by the funder to assess the research portfolio; steps authors took to report on their assessment; and information the funder provided about staffing needs or requirements, resources used, and lessons learned during the assessment.

2.6 Data analysis

We used the reporting checklist listed above to organize the extracted data and examine how funder RIAs are routinely reporting the results of their assessments. We did this to enable easier comparison across RIAs and to identify potential best practices, and gaps in the evidence base. All data was collected and analyzed in Microsoft Excel. All studies were coded by R. A. with a subset coded by K.O. for quality assessment.

3. Results

27 346 citations from the database search were imported into Rayyan for deduplication and coding, with 22 995 unique studies remaining after de-duplication. 104 citations from the grey literature search were imported into Rayyan; 99 unique records remained after de-duplication. After screening, 19 studies remained after the database search and 7 studies remained after the grey literature search. In total, 26 impact studies were found to meet the criteria for inclusion in this analysis.

Included impact studies came from authors in nine countries or regions (see Table 2). Most studies were from public funders (n = 20); three studies were from nonprofit funders,

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources



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Figure 1. PRISMA diagram of included studies.

two from mixed funding sources (i.e. public, academic, and/ or nonprofit); and one study had a funder type that could not be identified. The funding portfolios spanned a wide range of topics, including AIDS, cancer, cardiology, environmental health, health technology assessment, general health, global health, malaria, maternal and child health, and universal healthcare access. Additionally, some studies looked at the impact of funding arising from specific funding mechanisms such as federal contracts, small grants, or the Clinical and Translational Science Awards.

Below, we present results on the 26 included studies and how they present their activities, data and methods against each of the reporting categories and corresponding checklist items.

3.1 Title

3.1.1 The title should clearly identify the study as a RIA

To identify RIAs within the database and grey literature, studies should utilize keywords that include variations on 'assessing/assessment' or 'analysis/analyzing' or 'evaluating/evaluation' and 'impact' and include the name of the funding portfolio being evaluated. Twelve studies (46.2%) utilized the standard terminology, as defined above, in their titles. Two studies with easyto-index titles include 'Assessing the impact of small-research grants supported by WHO in the Eastern Mediterranean Region 2010–18' by Yazdizadeh et al. (2022) and 'Evaluation of the impact of National Breast Cancer Foundation-funded research' by Donovan et al. (2014).

3.2 Abstract

3.2.1 Structured summary of assessment framework, methods, results, and conclusions

The abstract should provide an overview of the RIA and include the following key components: (1) a description of the funding portfolio being analyzed; (2) the framework and methods used to conduct the analysis; and (3) a summary of the results/conclusions found. Thirteen studies (50.0%) reported this step. Three studies from the grey literature did not have an abstract that could be evaluated. The most common reason an abstract did not meet this reporting criteria was because it failed to include the word 'framework'. Among included studies, six did not meet the criteria for items 1 or 2, 15 met the criteria for item 1 or 2 but not both, and five met the criteria for both items 1 and 2.

3.3 Introduction

3.3.1 Stated purpose or goal of the assessment

Articulating the aim(s) of an assessment at the beginning of a study helps the reader to clearly evaluate the goals of the RIA. Twenty-five out of 26 (96.2%) studies reported this step. One study did not to meet this criterion because this information was instead contained within the methods. Funders reported a range of goals for their RIAs which included: demonstrating impacts or knowledge translation, comparing own funding with other funders, looking at funding in the context of the funders' strategic priorities, and demonstrating accountability to taxpayers (Abudu, Oliver and Boaz 2022). Additionally, studies sometimes used the

Table 2. Key metrics of included studies.

Metrics	Total (n)	Total (%)
Included studies	26	100
Article type		
Journal Article	21	80.8%
White Paper	5	19.2%
Country or region of authors		
Australia	6	23.1%
United States	6	23.1%
United Kingdom	5	19.2%
Brazil	2	7.7%
Canada	2	7.7%
Malaysia	2	7.7%
Ireland	1	3.8%
Mexico	1	3.8%
WHO Eastern Mediterranean Region	1	3.8%
Funder type of associated funding portfolio		
Public	20	76.9%
Nonprofit	3	11.5%
Mixed Funding (Academic/Public/Nonprofit)	2	7.7%
Undetermined	1	3.8%
Year of publication		
2014	3	11.5%
2015	3	11.5%
2016	1	3.8%
2017	3	11.5%
2018	1	3.8%
2019	6	23.1%
2020	3	11.5%
2021	1	3.8%
2022	4	15.4%
2023	0	0.0%
2024	1	3.8%

introduction to report activities that they undertook to better inform their assessments such as: preparing a logic model (n = 3), conducting a background portfolio analysis to better understand the types of projects included in the assessment (n = 7), conducting a literature review (n = 1), and preparing a research program overview (n = 1).

3.4 Methods

3.4.1 State the framework chosen for the assessment

The literature and existing principles are clear that grounding a RIA within a framework is key to preparing a high-quality, structured, and methodologically rigorous assessment (Cruz Rivera et al. 2017; Adam et al. 2018; Graham et al. 2018), however practical advice about how to choose either a legacy RIA framework or develop a novel framework is limited (Reed et al. 2021). To follow RIA best practices, a study should clearly identify the framework used to guide the assessment within the methods. Nineteen out of 26 studies (73.1%) reported this item. The remaining seven studies did not meet this criterion because the framework was contained within the introduction section and was not repeated in the methods.

Included studies cited seven named frameworks from the literature [Payback framework (Curran and Barrett 2014; Donovan et al. 2014; Guthrie et al. 2015; Bowden et al. 2018; Castor et al. 2019; Fun et al. 2019; Mulligan 2019; Boulding et al. 2020; Rollins et al. 2021; Lai et al. 2022; Yazdizadeh et al. 2022; Medellin-Lacedelli et al. 2024), CAHS framework (Angulo-Tuesta and Santos 2015; Angulo-Tuesta, Santos and Natalizi 2016; Mosedale et al. 2022), Alberta Innovates framework (Alberta Innovates 2020), Agency for Healthcare Research Quality (AHRQ) Impact framework (Isetts et al. 2017), Achieving Public Health Impact through Research (APHIR) Evaluation framework (Avenew et al. 2021), Framework to Assess the Impact from Translational Health Research (FAIT) framework (Dodd et al. 2019), and Australian Research Council Pilot Impact Assessment framework (Tsey et al. 2019)] and six previously unnamed frameworks (Bunn et al. 2015; Cohen et al. 2015; European Commission: Directorate-General for Research and Innovation et al. 2017; National Academies of Sciences, Engineering, and Medicine et al. 2017; Waterhouse et al. 2019; Creager et al. 2022). Only five studies cited frameworks that did not appear to be linked to the Payback or CAHS frameworks (European Commission: Directorate-General for Research and Innovation et al. 2017; Isetts et al. 2017; National Academies of Sciences, Engineering, and Medicine et al. 2017; Tsey et al. 2019; Creager et al. 2022).

Some studies offered a justification about why their framework was chosen, and those that chose a legacy framework (Payback or CAHS) frequently cited the framework's longstanding place within the RIA community (Donovan et al. 2014; Mulligan 2019; Mosedale et al. 2022). Studies that created new frameworks for their analysis mentioned a few reasons for doing so: they wanted to capture additional impact categories beyond what the Payback Framework offered, such as in the case of the APHIR Evaluation Framework, which seeks to also capture impacts from research projects on the funders' own research enterprise (Ayenew et al. 2021), they wanted to combine impact categories from multiple frameworks such as in the case of Bunn et al., Cohen et al. and Waterhouse et al. (Bunn et al. 2015; Cohen et al. 2015; Waterhouse et al. 2019). The FAIT framework was the only framework selected for its specific cost-benefit analysis approach to understanding research impact; but it should be noted that this framework arises from the Payback Framework as well (Dodd et al. 2019). All included studies applied the RIA framework to retrospectively analyze research impacts after the original research projects were completed.

3.4.2 Clearly identify the sample of projects included in the analysis

A RIA should include a clear definition of the projects/grants included in the impact assessment. This should feature: (1) the funding program being analyzed; (2) the project funding dates of the projects being evaluated; and (3) the total number of projects included in the analysis within the methods. Thirteen studies (50.0%) reported this item. The most common reason papers did not meet this criterion was because they did not report the total projects being evaluated in the analysis until the results section. Some studies also identified how they planned to select a subset of projects that would be used for case studies (i.e. case study sampling) or potential interviewees that would be contacted for interviews (i.e. interviewe sampling).

3.4.3 Clearly identify the time lag included in the analysis

A RIA should have a measure of lag time included in the assessment in order to clarify how much impact accrual time has been incorporated into the assessment. To do this, a RIA should specify the dates of project funding *and* the date the assessment was performed, so that the lag time can be calculated (by subtracting the date the assessment was performed from the date the project was completed). Fourteen studies (53.8%) reported this item. The most common reason that studies did not meet this criterion was because they did not report the date of the analysis and/or the date of impact data collection, thereby prohibiting a lag time calculation.

3.4.4 Identify impact categories to be measured

A RIA should articulate the broad categories in which it plans to measure impact within the methods. Twenty-two studies (84.6%) reported this item, and we used the impact categories from the Payback Framework to organize reported impacts. Included studies covered the following categories: advancing knowledge (n = 25); capacity building and future research (n = 24); influencing policy and informing decisionmaking (n = 25); health and health system impacts (n = 17); and economic and social impacts (n = 14).

3.4.5 Identify impact indicators that will be used to measure impact

In addition to specifying the broad impact categories to be addressed within the RIA, the methods section should also identify the specific impact indicators that will be used to measure impact. Twenty-three studies (88.5%) reported this item within the methods. We used the Researchfish indicator categories (Graham et al. 2018) as a way to group indicators used within studies. The most frequently reported impact indicators were influence on policies, practices, products, processes, and behaviors (n = 25) and citations/bibliometrics (n = 24). The full range of impact indicators observed within studies in our review is available in Fig. 2.

3.4.6 Identify data sources used to complete the assessment

The methods section should include mention of the data sources used to complete the assessment, such as 'final reports from included projects' or data gathered from Dimensions. Ai. This information can be presented along with the

of Impact Studies Reporting Indicators

methods used to collect impact data so that it is clear where and how data will be generated for each activity. Twenty-two studies (84.6%) reported this item.

3.4.7 Specify methods used to collect impact data

Next, the methods section should include mention of the methods used to collect impact data. Twenty-three studies (88.5%) reported this item within their methods. All studies reported at least one data collection activity (across any section of the paper). These activities included: documentary review (n=20); bibliometric analysis (which could include data on Altmetrics too, n=14); surveys (n=12); semi-structured interviews or key informant interviews (n=10); Researchfish data collection (n=3); co-authorship/social network analysis (n=2); return-on-investment analysis (n=2); analysis of personnel supported by grants (n=1); costbenefit analysis (n=1); field visit (n=1); focus group (n=1); and pilot testing of an impact scoring tool (n=1).

3.4.8 Specify methods used to synthesize data across different data sources, perform data verification, or prepare case studies

This item is designed to capture all activities that evaluators may take between primary data collection and the reporting of results, and to specifically distinguish between methods used for primary data collection and methods used to triangulate, analyze, and synthesize data collected under reporting item 10. Funders should consider how data will be triangulated/analyzed across the various data sources utilized, if case studies or impact narratives would be useful for a subset of projects in the analysis, and how non-academic partner input could help score impact or contextualize results. Twenty-two studies (84.6%) reported this item, seen in Fig. 3.



Five impact categories and their associated impact indicators as observed within the review

Figure 2. Frequency of impact indicators reported within included impact studies, by impact category.

Frequency of Data Synthesis Activities Reported within Included Impact Studies



Figure 3. Frequency of data synthesis activities reported within included impact studies, by activity category.

3.4.9 Describe ways non-academic partners will be included in the assessment

The last item we have proposed for a minimum set of reporting criteria for RIA methods sections is to describe ways that non-academic partners will be included in the assessment. Although RIA best practices dictate the use of non-academic partners to qualify and contextualize impact data collected, they are not frequently used in practice. In our review we found only three studies (11.5%) that mentioned the use of non-academic partners being consulted or identified during the RIA development process (Cohen et al. 2015; Guthrie et al. 2015; European Commission: Directorate-General for Research and Innovation et al. 2017), and in only one study did the non-academic partners include patients or members of the public.

Looking in total at the nine suggested reporting guidelines for the methods section of a RIA, 19 out of 26 studies (73.1%) satisfied at least six of the nine methods-focused reporting guidelines.

3.5 Results

3.5.1 Describe the portfolio of research being addressed, including how the portfolio is determined and the kinds of research in the portfolio

To begin the RIA results section, studies should include a description of the type of research being evaluated to enable comparisons between different portfolio types. To meet this criterion, studies should describe the types of research contained within the portfolio (i.e. disease site and research approach) and the portfolio boundaries (i.e. funding announcement numbers and program dates). In our review, 12 studies (46.2%) reported this portfolio overview in the results section as the reporting checklist suggests. Six studies (23.1%) provided a portfolio overview of the research included in the assessment in other areas of the study, such as the introduction, methods, or appendix, and eight studies (30.8%) did not provide any description of the types of research contained within the assessment portfolio.

3.5.2 Provide evidence of impacts organized by impact categories

The second reporting item for RIA results is to provide evidence of portfolio impacts, organized by impact categories. As a best practice, the results should be organized by the impact categories and indicators previously listed in the methods section. For the purposes of our analysis, we coded studies as meeting this reporting criteria if the results were organized by impact categories (even when these categories were not specified in the methods section previously). 23 papers (88.5%) met this reporting criterion.

3.6 Discussion

3.6.1 State the target audience(s) of the study and identify how the report will be disseminated

To improve dissemination of RIA results, studies should specify who are the intended target audience(s) of the study and describe ways in which the results will be disseminated. Four studies (15.4%) reported this item. One example of this work is Isetts et al., who offer this reflection of their plans for dissemination:

'An important aspect of this program evaluation is the impact on the funding organization itself... Based on the findings of this program evaluation analysis, the CPF Board of Directors is exploring a number of quality improvement initiatives designed to enhance collaborations with the academic community nationwide' (Isetts et al. 2017).

3.6.2 Reflect on how future RIA could be improved and efforts to build future capacity at the funder level

This reporting item is designed to capture either specific actions already taken by the funder to reflect on RIA best practices and build future institutional capacity for additional RIAs, or a funder's recommendations on how these actions might be taken in the future.

We took an inclusive stance about what counted as relevant reporting for this step and identified six studies (23.1%) as

meeting this reporting criteria, such as indicating that impact data collection would continue after the assessment was completed. However, discussions about building capacity for RIA at the funder-level remained limited, and we did not consider that general discussion of study limitations was enough to satisfy this criterion (Kamenetzky and Hinrichs-Krapels 2020).

3.6.3 State the limitations of the analysis

A RIA following best practices should include a brief discussion of the analysis limitations within the discussion. 24 out of 26 studies (92.3%) included a brief section on limitations in the discussion section of their RIA write-ups.

We examined studies in our review to determine the completeness of reporting for the first 17 suggested guidelines covering the title, abstract, introduction, methods, results, and discussion. Fifteen out of 26 studies (57.7%) satisfied at least 11 out of 17 reporting criteria (representing >60% adherence to the reporting criteria). No studies in our review reported all 17 criteria; only one study received the highest reporting score (15 out of 17, 88.2% of reporting criteria satisfied).

3.7 Other

The final four reporting criteria are suggested as optional but encouraged, and concern information about ethics, shareable materials, resources used, and author relationships to the funder. These criteria, if adopted, can improve transparency about how the RIA was implemented.

3.7.1 Ethical statement, if applicable

We have suggested item 18 to provide an opportunity to report if ethical approval was required for the RIA. Across the studies in our review, 10 mentioned seeking ethical approval in the methods section (the most common place for reporting), the discussion section, or via a standalone ethics statement at the end of the study. Including a reporting item on ethical approval may be valuable as RIAs begin to incorporate more patient and public involvement into impact assessment.

3.7.2 Materials provided, if applicable

One way to build a community of practice for RIA is to share original materials from an analysis that could help other funders with their own work. We examined included studies and their appendices to determine if they provided any original materials such as logic models or frameworks, interview guides, or data coding sheets. Of the 26 included studies, 12 (46.2%) provided some original materials within their study or in the associated supplemental materials.

3.7.3 Resources utilized and staffing needed for RIA implementation

Within the introduction, methods, or discussion sections of RIA reports, authors sometimes mentioned that data availability, resource availability, staffing availability, and/or timeline constraints played a role in the design of their RIA. We encourage reporting of these considerations in a resourcing section of the RIA report write-up.

Resources required: Twenty-four out of 26 studies mentioned software, equipment, or external staffing resources that they used to complete their analysis. Figure 4 provides an overview of the resources observed within included studies.

Staffing needs: While no study provided a full accounting of the staff needed to complete the entire RIA from start to finish, 12 papers mentioned, at least minimally, project staff and their roles. These needs were often reported in the methods sections, where authors noted examples such as 'two staff members coded project data' or 'three staff members completed telephone interviews'. A complete assessment of person-days required was not available in any study. Three studies were conducted, at least in part, by staff at RAND Europe—an organization with specialized expertise in impact assessment and evaluation.



Frequency of Resources Used by Included Studies

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3.7.4 Relationship of evaluator to funder

This reporting item serves as an opportunity to clarify if the RIA was conducted by the funder itself, a commissioned third party who was hired to conduct the assessment, or an independent group who has chosen to assess the funding portfolio for independent research. If authors did not directly mention their affiliation with the funder in the report text, we looked to the author affiliations and acknowledgements to determine if there was a funder affiliation. Among the studies in our review, four studies (15.4%) were authored by the funder themselves, six studies (23.1%) were authored by independent authors not affiliated with the funder, and the remaining 16 studies (61.5%) were commissioned by or supported by the funder that was the subject of their assessment.

3.7.5 Operational pathways

Following the application of the reporting checklist to studies in our review, we then wanted to look more broadly at the 'operational pathways', or combinations of activities that studies took across their analysis, to see if papers using the same framework reported using the same types of activities to complete their RIAs. Among the 12 studies that used the Payback Framework, each reported a different 'operational pathway' of data sources, metrics and indicators, primary data collection activities, and data synthesis activities to complete their analysis. The three studies using the CAHS framework utilized similar data collection methods but differed in their selection of impact indicators in item 8. The remaining 11 studies each used a different RIA framework to structure their analysis and different activities to collect and analyze data.

4. Discussion

In this paper, we propose a preliminary minimum checklist for effective RIA report writing which incorporates guidance from best practice guidelines, including ISRIA and the Six Block Protocol (Adam et al. 2018). We compare this guidance with existing practice by funders, which we identify through a systematic review of the literature. Overall, we find a huge variety in both the ways that funders conduct their RIAs and report on their assessments.

Our review shows that research funders report using a wide range of frameworks, and different data sources, data collection and analysis methods, and resourcing to implement these frameworks. This is consistent with a 2020 literature review by Pedersen et al. finding that there is 'considerable methodological diversity' among the many different RIA frameworks and methodologies employed within social sciences and humanities literature (Pedersen, Grønvad and Hvidtfeldt 2020). They argue 'this finding indicates that different frameworks are focusing on different aspects of impact rather than on universal assessment.' These observations align with our own findings and underscore that variations between frameworks and methodological approaches can make it challenging to compare different RIAs and feel confident that they are measuring similar impacts in similar ways. Clear reporting on frameworks, data, and methods is key to improving the evidence base about how to optimize RIA effectiveness.

The heterogeneity we found in terms of methods, data and implementation of RIA approaches means that drawing convincing conclusions about how to best assess research impact is still challenging. Even when the same framework was implemented, studies varied greatly in how they carried out their assessments. For example, our review found 12 examples of funders using the Payback Framework-each using a different combination of indicators to measure impact and methods to collect and analyze data. There is much discussion within the literature about RIA not being a 'one size fits all' process, and encouragement for funders/researchers to consider how their own goals for RIA align with the assessment process. In our view, this flexibility should be balanced with an empirical evidence base about which approaches and activities work best for different goals. Flexibility when designing an impact assessment is an important principle of the ISRIA Statement, but more guidance may be needed for funders who want to optimize their time required for planning for, setting up, and performing an impact assessment (Crane, Blatch-Jones and Fackrell 2023). At present, this 'hands-off' approach to RIA implementation and reporting leaves funders with a surprising lack of information about how to practically design and implement such an assessment.

In this paper, therefore, we present a preliminary set of reporting criteria to bridge the gap between understanding guiding principles for evaluating research impact and applying practical steps to design and implement an effective RIA that incorporates these principles. This checklist represents a minimum set of reporting items, that if applied by funders could improve the standardization, transparency, and reproducibility of RIAs and promote a culture of mutual learning among the wider RIA community.

4.1 Title, abstract, and introduction

The first three proposed reporting items provide guidance for funders around how to begin a RIA paper. Item 1, use a title with clear RIA terminology, is important for clearly identifying RIA papers within the literature. Since there are many funders embarking on so many different types of RIA, it is valuable to have all of these examples readily indexed in a standard way to support the growing community. Item 2 follows with suggestions for a structured abstract to aid in this indexing. In our review, approximately half of studies are already meeting these standardized reporting criteria.

Item 3 recommends that funders state the purpose of the RIA to contextualize why the assessment is being conducted and what it hopes to achieve. Helpfully, most studies in our review (25 out of 26) are already incorporating a statement of purpose into their report introductions. Understanding a funders' mindset when performing a RIA helps readers better understand the context of the assessment (Reed et al. 2021), and what the reasonable next steps of the report might be (i. e. demonstrate to program officials impacts of funding, enact program change, or improve impact data collection) (Pfeifer and Helming 2024).

4.2 Methods

Our proposed reporting checklist recommends nine items to improve methodological clarity and reproducibility, and it represents the area in need of most improvement among funders. This section begins with item 4, state the framework used for the analysis. Utilizing a framework is a fundamental element of successful RIAs. All studies in our review did cite the framework used for the assessment, and 19 (73.1%) did this as recommended in the methods section. While all studies in our sample reported the framework they used to guide their analysis, the heterogeneity mitigates against a common definition and measurement of impact. When possible, it would be valuable to ensure methodological continuity across funder-led RIAs was prioritized, to reduce the proliferation of duplicative RIA frameworks. The dominance of the Payback and CAHS frameworks within both previous (Hanney et al. 2017) and more recent literature reviews (Abudu, Oliver and Boaz 2022) suggest that research funders are likely familiar with these frameworks, and perhaps more importantly, that they may be working satisfactorily to assess research impact. One consideration that may still need input from the larger RIA community is whether a new or modified framework is necessary if a funder wishes to capture both potential and actualized research impacts. Giving frameworks the flexibility to capture both potential and actualized impacts could improve standardization of frameworks within the field.

The next reporting item (item 5) in the methods is to identify the sample of projects included in the assessment. This is a fundamental element of an evaluation, however only half of studies (n = 13) in our review spelled out the total number of projects to be followed in the assessment in the methods. Without a clear definition of the project sample for a RIA, it is difficult for actors to feel confident that common RIA issues of latency, attribution, and data quality have been adequately addressed. Similarly, only half of studies (n = 13, although these were not necessarily the same 13 studies who met the previous reporting item) included enough information to determine a lag-time calculation for the number of years of impact data accrual that was built into the assessment (item 6). These steps are critical because best practice dictates that factoring lag time into an assessment is necessary to allow for impacts to accrue [as it can often take 17 or more years for a research project to produce a meaningful policy change (Morris, Wooding and Grant 2011)], and to determine if the assessment is being conducted on projects that have already been completed or projects that are still ongoing. Although we counted 13 studies as providing enough details to make a lag time calculation ourselves, no studies used the terminology 'lag time' to describe this concept. A successful example we did see within the review was from Donovan et al., who described different time periods used for capturing publications and citations ... 'The publication window was the 5-year period 2006 to 2010 ... The citation window was 1 January 2006 to 1 May 2011'. We believe this is a critical area for RIA report improvement and suggest that funders incorporate a statement like 'Projects were funded between 2010 and 2015, and we collected impact data beginning in December 2018. This allowed all projects in our review to have a minimum of 3 years of impact accrual lag time built into the assessment'.

Items 7 and 8 ask funders to specify both the broad impact categories they plan to assess (item 7) and the specific impact indicators that they will use to measure impact (item 8). Carefully specifying planned impact categories and indicators within a RIA report is necessary to ensure that the assessment can be easily appraised and reproduced. The process of identifying indicators can be a helpful reminder to consider data availability challenges, select more than one indicator to measure per impact category [as is best practice (Panel on Return on Investment in Health Research 2009; Adam et al. 2018)], and minimize metric 'gaming' that can occur when analyses are overly reliant on quantitative indicators, particularly bibliometric indicators which may be easily swayed by problems such as 'self-citing' (Adam et al. 2018). Most papers in our impact indicators. Several studies noted within their limitations that it was difficult to find evidence of down-stream research impacts such as health and health sector benefits and broader economic benefits, mainly because this data was not yet available for their research projects (European Commission: Directorate-General for Research and Innovation et al. 2017; Bowden et al. 2018; Rollins et al. 2021) and/or corroborate investigator-reported impacts with supporting evidence (Castor et al. 2019). Generating data for return-on-investment calculations proved to be particularly difficult because cost-benefit data was hard to find, and because the calculations themselves were unexpectedly complex and resource-consuming (Angulo-Tuesta and Santos 2015; Angulo-Tuesta, Santos and Natalizi 2016; Dodd et al. 2019). As reporting in items 7 and 8 is enhanced, funders should have better information about how to optimize indicator selection.

We believe items 9 (data sources), 10 (data collection), and 11(data analysis and synthesis) offer an important point of focus because they illustrate the diversity of approaches to RIA. These items were generally well-reported among studies in our review in terms of a binary yes/no coding, with yes meaning that yes, some discussion of the item was present in the methods, and no meaning that no mention of the item was found. Twenty-two to twenty-three papers reported each of these items (though not necessarily the same studies reporting each item). However, we believe reporting of these items could be improved to provide better clarity around data sources used and methods taken. In our review, we found that funders were often trying to evaluate several metrics over the course of the analysis and that there was in some cases ambiguity about how impact data was collected and assessed for each impact indicator (i.e. the methods or data sources were clear for some indicators but not all indicators present). The literature is clear that methodologies that capture both quantitative and qualitative data offer the best opportunity to measure broader, patient-and-public relevant impacts of research (Donovan 2011). We encourage funders to report activities undertaken (such as documentary review and/or a survey) as well as the data source for the activity, the resources used to collect the data, and the planned methods and tools that will be used for analysis such as 'Microsoft Excel for analysis of survey data'. This level of granularity can be useful to other funders who wish to engage with RIA, and it can provide valuable methodological clarity for researchers. A few studies particularly successful in outlining their methodological steps, data sources, and resources were Angulo-Tuesta and Santos (2015) and Cohen et al. (2015).

In Fig. 5, we have listed some potential examples for each element of the data collection and analysis process: selecting data sources, identifying methods to collect data, determining which tools or resources will be used to collect data, identifying the specific methods or metrics used to analyze data, and determining the tools used to analyze data. In addition, funders should consider if the internal staffing they have is available and skilled in performing these tasks or if external staffing support is required. Our review shows that some funders may use the same data sources and analyze them with different methods, and alternatively they may use the same



Figure 5. Data sources, methods, and resources for RIA implementation.

methods to analyze data from different sources. This lack of consensus about how to best pair data sources, methods, and tools and resources leaves funders underprepared to adequately perform RIAs.

We are not alone in calling for improved clarity around data sources, methods, and resources for RIAs. In particular, routinizing (Bunn et al. 2015; Guthrie et al. 2015) and systematizing data collection (European Commission: Directorate-General for Research and Innovation et al. 2017; Avenew et al. 2021) are seen as obvious improvements to be made. These efforts would benefit studies in our review that wished they could have gathered additional data from stakeholders but found this data difficult to capture within the assessment timeframe (Castor et al. 2019; Tsey et al. 2019). Suggestions for improved impact data tracking included requiring reporting of all potential impacts of an award in a final report and in common databases, immediately and after 5-10 years (National Academies of Sciences, Engineering, and Medicine et al. 2017). Systematized and routine impact data tracking could alleviate concerns that impact reporting can be based on 'poor' quality final project reports or patchy reporting across projects or subject to a self-reporting bias influenced by high-performing PIs who potentially have more impacts to report or more willingness to report impacts (Mosedale et al. 2022). Future research will be important for uncovering which combinations of methods and data sources yield the highest quality impact data for RIAs, so that funders can feel confident that they are making informed choices about their assessment, rather than relying on 'pragmatism' to make methodological decisions (Kamenetzky and Hinrichs-Krapels 2020).

We have suggested separating out data analysis (item 11) as a novel reporting item, as it implies a set of activities which require different skills and resources to complete. Some funders reported activities taken to triangulate findings from different sources to verify impacts reported by investigators, however, these steps to corroborate impact findings were not uniformly reported across studies in the review. Better documentation of activities performed during this stage in the methods section will help other funders understand the important, but sometimes overlooked steps that need to be taken after data collection to turn raw data into meaningful results. Across study limitations we saw a variety of recommendations to improve data analysis for future RIAs, including: modifying a Payback scoring system to allow for a spectrum of impact to be recorded rather than a binary coding of impact present/absent (Castor et al. 2019) and calls for end users to be included in expert panels that perform Payback scoring(Cohen et al. 2015); additional practical advice for the implementation of the FAIT framework, and encouragement to apply the framework prospectively, as research projects are beginning (Dodd et al. 2019); and seeking opportunities to benchmark results of future RIA studies with other comparable funders (Curran and Barrett 2014).

The final reporting item we propose for the methods section is to describe ways that non-academic partners will be incorporated into the RIA. Including non-academic partners and end-users in the design and conduct of a RIA can signify 'coproduction' of RIAs, and follows best practices in the impact field outlined by Bailey, Phipps, and others (Milat, Bauman and Redman 2015; Phipps et al. 2016; Graham et al. 2018; Bayley and Phipps 2019; Taylor et al. 2021; Reed and Rudman 2023; Woolley and Molas-Gallart 2023). To improve both methodological rigor of the analysis itself, as well as quality of the resulting paper or analysis write-up, we suggest that stakeholder involvement happen early and often (Graham et al. 2018), and that these activities formally be reported within item 12 of the methods. Our review demonstrated that studies are not yet thinking broadly about how to incorporate non-academic voices into their RIA methodology.

Kamenetzky et al. found in their review that 'Research teams' willingness to involve a suitably diverse group in these planning discussions was used as a heuristic for whether they were 'RIA ready' (i.e. whether it was yet appropriate for them to consider being part of more formal evaluations, requiring more than process and activity data collected by the organization as part of their standard portfolio monitoring)' (Kamenetzky and Hinrichs-Krapels 2020). Moving to include this heuristic as an indicator of RIA readiness and best practice could go a long way toward making RIA more inclusive and impactful at the patient and public level.

4.3 Discussion

Items 15 (state the target audience of the assessment) and 16 (identify ways to improve future RIA capacity) represent generally new areas of reporting within RIA papers for funders. These steps align with ISRIA guidelines 9: communicate results through multiple channels and 10: build a community of practice and share your learning with the RIA community. While it is reasonable to expect that funders may not be able to anticipate all the potential use-cases of their RIA at the time of report publishing, we think that two goals for this stage (determining who the target audience is of the report and determining how best to share the results) may help prompt useful reflection of how to best orient the results sections of RIAs. Determining the target audience of the RIA is something that should be considered during analysis set-up and as metrics are being planned for the analysis. After the analysis is completed, the target audience should be reconsidered, and specific and tailored dissemination activities should be planned. If the results of the report have not yet been widely disseminated at the time of the report publication, we would encourage authors to report planned dissemination activities within the discussion section.

In item 16 we encourage funders to report lessons learned during the assessment process more formally within the discussion section of their RIA report so that funders can learn from one another and build a culture of best practices. We think this is an area of great opportunity because funders' reflections on what steps and activities worked well and which ones were difficult to complete can provide valuable information as the RIA community seeks a better understanding of what an impactful RIA looks like. Some studies (Bowden et al. 2018; Waterhouse et al. 2019) noted plans to incorporate RIA in future assessments of the research program, while Castor et al. acknowledged that the RIA approach they utilized in their study was 'too intensive for routine and frequent use' but that some indicators could be incorporated into 'protocols, workplans, and monitoring and evaluation plans' of implementation science studies so that ongoing data gathering could continue (Castor et al. 2019). Best practices that we hope to see in the future include efforts to train staff to perform RIAs (Kamenetzky and Hinrichs-Krapels 2020), build up a culture of 'impact literacy' within the organization (Bayley and Phipps 2019), and/or work to build up organizational leadership to champion the role of RIAs within the funding agency (Kamenetzky and Hinrichs-Krapels 2020). We encourage these important reflections to take up a more formal place within published RIA reports so that they can be seen by a wider audience.

Item 17 represents a formal limitations section for the RIA. Generally, studies are already reporting a practical discussion about data challenges and opportunities for improved impact assessments, and we would encourage this practice to continue.

4.4 Other

Our preliminary reporting criteria ends with a section of reporting items that can enhance information sharing among funders about the resources used and procedural steps taken to produce a successful RIA. They include a variety of topic areas: inclusion of an ethics statement (item 18), provision of materials used such as survey instruments or impact scoring tools (item 19), resources and staffing utilized (item 20), and declaration of funding (item 21). The reporting item with the greatest potential to improve practice is likely to be item 20 (resources and staffing). Funders could benefit from more transparent information about the staff and resources needed to conduct a RIA to manage people, time, and risk associated with the project (Graham et al. 2018; Kieslinger et al. 2018). As Kamenetzky et al. found in their study of four organizations performing RIA, organizational skills-building to develop RIA skills takes considerable time and finances, and also plays an important role in an organization's selection of which methods they use when conducting their assessments (Kamenetzky and Hinrichs-Krapels 2020). This information about staffing/resources extends to organizational supports to develop automated data collection systems linking project records to end of grant reports and impact data—either as an in-house capability, or as member of Researchfish or Dimensions (Kamenetzky and Hinrichs-Krapels 2020). Authors in our review frequently noted that this was an area, that if in place, could have led to an improved experience performing the RIA. We would encourage future RIA reports to make note of these issues to support a community of learning around staffing and resource needs.

4.5 Strengths and limitations

We believe the strengths to our approach lie in our efforts to build upon valuable contributions to RIA field already, namely recent work by ISRIA, Adam et al. (Adam et al. 2018) and Reed et al. (Reed et al. 2021). The reporting criteria proposed here are likely to be a minimum set of criteria needed for successful and standardized RIA report writing. Future efforts to validate and expand these reporting criteria should incorporate consensus-building among RIA experts and non-academic stakeholders. There are some limitations to our work: first, efforts to capture methodological details of the included papers were difficult, particularly because we were interested in capturing a level of granularity that is not routinely reported on in RIA reports; and second, our proposed checklist of reporting items has not yet been discussed among impact experts for their opinions on applicability, validity, and usefulness in practice. We hope that our paper can encourage more conversation around what would be useful to include in a standardized RIA write-up. It is important to acknowledge that studies may have had relevant data that could have satisfied the reporting criteria if it had been included in the final reports. We encourage future RIA studies to include these items in their reports as we think there is much to be gained by the wider RIA community from learning how funders have shared results and sought to improve RIA implementation within their organizations.

5. Conclusions

We systematically assessed the evidence about how research funders are reporting and implementing their research impact assessments. We found that funders follow a wide range of frameworks, and even when the same framework is being used, report a diverse range of data, methods, and resources to implement their assessments. Future empirical research is needed to determine the optimal data sources and methods to best evaluate funders' research impact, and it is vital that this research include a consideration of the resources funders may need to adopt these data and methods. To increase transparency and improve methodological quality and reporting, we recommend that funders standardize reporting of RIAs. We believe that our reporting checklist can help bridge this gap within the literature and bring practical tools to funders. While we recognize that this checklist will likely not be exhaustive of all the elements that could provide a standardized RIA study, we believe we have highlighted some of the most critical and straightforward ways that RIA reporting can be improved. Future work to field-test the proposed reporting checklist directly with funding organizations will be important for ensuring that our recommendations are practical, effective, and align with funder goals. Implementing RIA at an organizational level is not a trivial task for funders and we hope that our work, alongside critical future research can inspire funders to feel more confident that their impact assessments are methodologically sound, meaningful to end users of their research, and providing valuable insights for their organizations.

Supplementary data

Supplementary data are available at *Research Evaluation Journal* online.

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Conflict of Interest

The authors do not have any conflicts of interest to report.

Data availability

Data for this manuscript is provided as a supplemental attachment.

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