A Survey and Analysis of Data Policies of Overseas Research Funding Agencies: A Case Study of UK and US Research Councils

Authors: Zhang Yao, Gu Liping, Yang Yunxiu, Zhang Duo, Gu Liping

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Abstract

[Purpose/Significance] Effective research data management plays a crucial role in supporting open science and open academic exchange systems. The practical experiences from foreign research data policies can serve as valuable references for China' s research funding agencies and information service institutions. [Method/Process] This study employs literature review and survey methods to analyze the key elements of research data policies from major international research funding agencies. [Results/Conclusion]The research data storage policies of funding agencies encompass: data types, standards, repository locations, and retention periods. Their research data quality supervision policies include: management plans, rights and responsibilities mechanisms, oversight mechanisms, and reward-penalty mechanisms. Their research data dissemination policies cover: privacy protection, intellectual property delineation, degree of openness, among others.

Full Text

Preamble

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Authors:
Zhang Yao[1],[2], Gu Liping[3], Yang Yunxiu[1], , Zhang Duo[1],
[1]University of Chinese Academy of Sciences, Beijing 100049
[2]Lanzhou Library of Chinese Academy of Sciences, Lanzhou 730000
[3]National Science Library, Chinese Academy of Sciences, Beijing 100190
Chengdu Library of Chinese Academy of Sciences, Chengdu 610041
Wuhan Library of Chinese Academy of Sciences, Wuhan 430071

Abstract

[**Purpose/Significance**] Effective research data management plays a crucial role in supporting open science and scholarly communication systems. Practical experiences from foreign research data policies can provide valuable references for China' s research funding agencies and information service institutions. [**Method/Process**] Through literature review and desk research, this paper analyzes the key policy elements of major international research funding agencies. [**Result/Conclusion**] Research funding agencies' data storage policies include: type, standard, location, and retention period. Quality supervision policies encompass: management plans, accountability mechanisms, monitoring mechanisms, and reward-penalty systems. Dissemination policies comprise: privacy protection, intellectual property definition, and openness levels.

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1. Good Data Policy as the Foundation of Research Data Management Practice

Research data constitutes a vital component of scientific development. The advancement of science requires the mutual enhancement and verification of ideas and evidence, with "scientific ideas" primarily published in academic journals and "scientific evidence" referring mainly to the preservation and utilization of research data [1-2]. In the era of digital research, research data has become a critical strategic resource. Open sharing of research data is essential for digital research development, and good data management practices yield numerous benefits [3]: (1) facilitating data discovery and understanding; (2) ensuring work continuity when team members leave or join; (3) avoiding unnecessary duplication of data collection and reconstruction; (4) supporting literature preservation and enabling result verification; (5) fostering collaboration and scientific research; (6) increasing research visibility and impact; and (7) allowing other researchers to cite data, thereby granting proper credit to data owners.

In recent years, many countries and research management departments have emphasized systematic research data management, while foreign scholars have conducted related studies. For example, S. Jones reviewed data management policies of major UK research funding agencies, proposing that policy implementation requires infrastructure development, enhanced research evaluation, improved professional recognition of data management, and promotion of international data-driven innovation and discovery [4]. Shen Yi et al. investigated a new data management service model at Johns Hopkins University—Data Management Services (DMS) to Data Archive (DA)—examining policy impact on practice and suggesting that institutional context is the key factor constraining successful implementation [5]. China has long engaged in research project

outcome management and sharing. The Ministry of Science and Technology launched the "National Scientific Data Sharing Project" [7] and "National Science and Technology Infrastructure Platform Construction" [8] in 2002. Chinese scholars have also focused on research data management. Si Li et al. analyzed characteristics of foreign data open sharing policies and their implications for China [9]. Ding Pei interpreted features of foreign university institutional research data policies and proposed that libraries should become catalysts for policy development [10]. Xie Yanqiu et al. investigated foreign scientific database policy construction [11]. Chen Daqing surveyed UK research funding agencies' data management and sharing policies from temporal and content perspectives, recommending policy development, institutional data submission requirements, funding support, and clarification of responsibilities [12]. Wang Qiaoling et al. introduced the legal foundation, guiding ideology, and principles of UK scientific data sharing, analyzing policies from research councils, foundations, universities, and government departments [13]. Liu Feng et al. analyzed data repositories by country, establishment date, discipline, institutional affiliation, and openness level, concluding that repositories have a solid foundation and require strengthened research on standardized management and open application mechanisms [14].

Effective data policies provide guidance for research data management and facilitate open sharing practices. International organizations such as the Research Data Alliance (RDA) are advancing data-driven innovation globally [4]. While existing studies often consider policy from an information infrastructure perspective, examining the entire workflow of research data storage, management, and dissemination from research management and information service viewpoints offers alternative insights. This paper employs literature review and desk research to analyze recent policies from foreign research funding agencies and identify key policy elements.

2. Overview of Research Funding Agency Data Policies

2.1 Research Framework

As primary funders of research projects, funding agencies' recommendations and mandates significantly impact researchers and data management practices [1]: they require researchers to submit and store data through standardized policies while incentivizing attention to data preservation through reformed evaluation systems that reward data contributors. A common question regarding funding agencies' requirements for host institutions is: "What to store? How to store? How to manage after storage? What to note when using?" Systematic policy analysis of these questions yields three research questions:

Question 1: What storage specifications should host institutions follow when submitting data?
Question 2: What supervision should funding agencies implement to ensure data quality?

Question 3: Whose rights should be protected during data dissemination?

Drawing from *Introduction to Foresight*' s approach from "policy content collection" to "policy recommendation," this study adopts policy observation to establish research foci [15], as shown in .

Research Framework for Research Funding Agency Data Management Policies

Policy Observation Focus	Research Questions
Research Data Storage	Are host institutions required to store research data? What storage specifications should be followed? How long should data be stored after submission? What constitutes data quality? What are the storage standards? Where should data be stored? Any specific requirements?
Research Data Quality Supervision	Are grantees required to submit data management plans? What details should plans include? Are guidance/services provided for plan development? Are plans monitored? Is funding provided for data management? How are roles and responsibilities allocated? Any clear accountability mechanisms?
Research Data Dissemination	Is submitted research data required to be openly shared? Timeline for sharing? How is intellectual property regulated? How are confidentiality and security ensured? What are the ethical requirements? How are data submitters' contributions recognized?

2.2 Research Subjects

Referencing nine research funding agencies listed under "Funders' Data Policies" in the DCC website' s "Resources for Digital Curators" [16-17] and ten agencies covered in D. Dietrich et al.' s survey of US funding agencies [18], this study selected twelve major UK and US research funding agencies as subjects, as shown in .

Overview of Data Management Policies from Major International Research Funding Agencies

Funding Agency	Policy Release Date
UK Research Councils (RCUK)	
RCUK Position Statement on Open Access to Research Outputs [19]	June 2005
RCUK Updated Position Statement on Access to Research Outputs [20]	June 2006
RCUK Common Principles on Data Policy [21]	April 2011
Arts and Humanities Research Council (AHRC)	
Research Funding Guide [22]	Version 2.5 released August 2013, updated to v2.7 August 2014
Biotechnology and Biological Sciences Research Council (BBSRC)	
Data Sharing Policy [23]	Implemented April 2007, updated June 2010
Engineering and Physical Sciences Research Council (EPSRC)	
Research Data Policy Framework [24]	Officially released May 2011
Economic and Social Research Council (ESRC)	
Scientific Data Policy [25]	Released 2000, updated September 2010
Medical Research Council (MRC)	
Research Data Sharing Policy [26]	Released January 2006, updated 2011
Natural Environment Research Council (NERC)	
Data Policy [27]	Officially released January 2011
Science and Technology Facilities Council (STFC)	
Scientific Data Policy [28]	Released September 2011
Wellcome Trust (WT)	
Data Management and Sharing Policy [29]	Updated August 2010

Funding Agency	Policy Release Date
Cancer Research UK (CRUK)	
Data Sharing and Preservation Policy [30]	Released January 2009
US National Institutes of Health (NIH)	
Data Sharing Policy and Implementation Guidance [31]	Updated March 2003
US National Science Foundation (NSF)	
Dissemination and Sharing of Research Results [32]	Updated January 2013

The survey was conducted from February 2 to August 16, 2014, with multiple discussions and revisions from September to December 2014. The final manuscript was completed on January 14, 2015.

The following sections discuss foreign funding agencies' research data storage, quality supervision, and dissemination policies based on this research framework.

3. Research Data Storage Policies of Funding Agencies

3.1 Mandatory Requirements for Research Data Storage

To ensure data authenticity and integrity, mandatory storage requirements are essential. RCUK and its seven councils have developed individual data management policies based on the *RCUK Common Principles on Data Policy* [18]. NIH established its *Data Sharing Policy and Implementation Guidance* in March 2003 [31], and NSF released its data management policy in 2010 [32]. These agencies universally require long-term preservation of research data from funded projects.

Research data is generated throughout the project lifecycle, and much of it is unique and irrecoverable if damaged. Mandatory storage policies not only strengthen protection and oversight of research outcomes but also facilitate reuse of data with lasting value.

3.2 Data Submission Within 6 Months Post-Project Completion

Funding agencies require prompt data preservation after project completion, with specific timelines varying by discipline. AHRC [22] and ESRC [25] require data to be available for storage within 3 months of project completion, while CRUK [30] and WT [29] mandate data storage within 6 months post-completion.

3.3 Long-Term Preservation Requirements: 3 Years to Permanent

Preservation requirements range from 3 years to permanent. AHRC [22] and NIH [31] require data preservation for 3 years post-project completion. CRUK [30] requires at least 5 years, while BBSRC [23], EPSRC [24], MRC [26], STFC [28], and WT [29] require secure storage for at least 10 years. STFC [28] further recommends permanent preservation for data that cannot be remeasured (e.g., early observational experimental data).

Research data represents the fruits of researchers' labor. Long-term preservation of valuable data enables reuse and improves utilization efficiency. However, data must be screened, with quality requirements and retention periods varying by discipline. Considering current technological capabilities and costs, humanities and social sciences require secure preservation for at least 3 years, while medical and scientific-technical fields require at least 10 years, with systems designed for permanent preservation capacity.

3.4 High-Quality Metadata Submission

Metadata explains data information, ensuring readability despite hardware technological changes [11]. RCUK [21] stipulates that sufficient metadata should be recorded and made publicly available, with published results always including information on how to access supporting data. EPSRC [24] requires online publication of structured metadata including data restrictions, access rationale, and condition summaries, with digital data assigned unique identifiers. AHRC [22], BBSRC [23], and ESRC [25] require creation of accessible, retrievable, and sustainably usable research data according to established standards.

3.5 Adoption of Domain-Specific Standards

Domain-established standards should be adopted. CRUK [30] and BBSRC [23] mandate using domain standards to create accessible data, while WT [29] recommends formats enabling citation, analysis, and linking. Implementation guidelines can also be developed: NERC [27] advises consulting relevant data centers; MRC [26] suggests referring to UK Data Archive (UKDA), Inter-university Consortium for Political and Social Research (ICPSR), Australian National Data Service, and national statistical practice guidelines; EPSRC provides guidance from JISC, Digital Curation Centre, and Information Commissioner' s Office; ESRC [15] recommends referencing Extended Safety Data Sheet (ESDS) and UKDA guidelines.

Establishing storage standards unifies preservation formats, enables selection of high-value data, and improves management efficiency. Specific disciplines should adopt domain-established standards: medicine may reference UKDA, ICPSR, Australian National Data Service, and national statistical standards; engineering and physical sciences may reference JISC, DCC, and Information Commissioner' s Office guidance; economics and social sciences may reference ESDS and UKDA specifications.

3.6 Storage in Institutional Repositories with Specific Links

Funding agencies ensure data storage by designating specific repositories and data centers. Storage locations include: (1) **Funder-operated repositories**: ESRC [25] operates a research catalogue recording awards and outputs, providing storage space for publications; NERC [27] established the centralized e-print repository NORA (NERC Open Research Archive). (2) **National repositories**: BBSRC [23], CRUK [30], MRC [26], and WT [29] support storage in UK PubMed Central. (3) **No designated repository**: AHRC [22] and EPSRC [24] do not provide publication repositories, expecting researchers to utilize available institutional and disciplinary repositories.

Regarding funder support for data centers or institutional repositories, three approaches exist: (1) **Operating data centers**: STFC [28] operates multiple data centers, services, and portals (e.g., UK Solar System Data Centre, Chemical Database Service, Diamond Data Portal); NERC [27] operates data centers supporting long-term management of valuable environmental data. (2) **Supporting storage without operating centers**: AHRC [22] previously provided support through Archaeology Data Service (ADS) for archaeology researchers, but after 2012 charges fees to all AHRC project applicants, expecting non-archaeology researchers to use other data centers; BBSRC [23] provides examples of public repositories supported by existing databases and policies; WT [29] supports construction of key databases at the European Bioinformatics Institute without operating its own center. (3) **No operation or provisions**: CRUK [30], EPSRC [24], and MRC [26] neither operate data centers nor specify how researchers should process, preserve, or share data.

Specifying storage locations enables continuous maintenance of specific data objects, facilitates centralized management, and provides user access while giving researchers clear guidelines. In China, with relatively mature institutional repositories, these could directly serve as platforms for research data storage.

4. Research Data Quality Supervision Policies

4.1 Requiring Grantees to Develop Data Management Plans

Data management plans (DMPs) enable host institutions to manage and preserve data systematically, clarify management details, and allow funding agencies to assess feasibility. NIH [31] requires all applicants requesting over $500,000 (starting October 1, 2003) to submit a data sharing plan or justification for not sharing. NSF [32] requires all proposals (starting January 18, 2011) to include a two-page "Data Management Plan" detailing dissemination and sharing.

UK funding agencies (except EPSRC [24]) require DMPs in funding applications. ESRC [25] provides nine recommended elements: data source explanation; gap analysis between available and required data; data value, type (qualitative/quantitative), quality, format, standards, metadata, and collection methods; quality assurance and backup procedures; management and archiv-

ing plans; anticipated difficulties and solutions; confidentiality, anonymity, and ethical considerations; data ownership; and responsibilities of all participating institutions.

DMPs ensure continuous maintenance throughout the project lifecycle, supporting data generation, management, and sharing. They should universally be required in proposals, covering: data sources, domain and type, standards, relationships with other data, release timing, retention period, sharing methods, access restrictions, and ownership.

4.2 Providing Guidance and Services for DMP Development

Major foreign funding agencies provide guidance through: (1) **Policy guides and FAQs**: NERC [27] offers DMP templates; WT [29] provides DMP guidelines; CRUK [30] and BBSRC [23] offer FAQ compilations; NIH [31] provides DMP examples. (2) **Specific services**: AHRC [22] allows archaeology researchers to obtain guidance through ADS; ESRC [25] data center staff assist researchers in developing DMPs.

Given the specialized nature of data management, providing best practices, policy guides, or online services enables grantees to develop compliant, high-quality DMPs.

4.3 Monitoring DMP Implementation

DMPs typically cover data collection, processing, and analysis, serving as a quality assurance mechanism. Funding agencies can supervise accountability systems through DMP implementation. ESRC [25] indicates that final funding payments may be withheld if institutions fail to provide storage standards (unless waived in advance). NIH [31] mandates project staff to oversee data sharing policies and evaluate plan adequacy. DMP implementation should be assessed at project completion and used as an evaluation criterion for future funding eligibility.

4.4 Providing Financial Support for Data Management

Data preservation and management are integral to research. Funding conditions may include resources for data handling. RCUK [21], BBSRC [23], EPSRC [24], and MRC [26] allow reasonable data management and sharing costs to be covered by project funds. ESRC [25] reviews costs related to DMP implementation and provides dedicated funding. WT [29] offers additional grants to cover open access fees. NIH [31] permits applicants to request data management funding in proposals.

4.5 Establishing Rights and Responsibilities Mechanisms

Research data management involves multiple stakeholders. ESRC [25] specifies: (1) **Funder responsibilities**: Provide clear DMP development guidance,

ensure effective implementation throughout the research lifecycle, and evaluate DMPs through peer review. (2) **Applicant responsibilities**: Prepare and submit DMPs. (3) **Grantee responsibilities**: Address confidentiality, ethics, legal constraints, and other issues at project initiation; continuously report DMP progress; archive data within 3 months of project completion. (4) **Data service provider responsibilities**: Ensure long-term data access. (5) **Sensitive data accountability**: For confidential or sensitive personal data, holders must seek consent, comply with regulations, protect participant anonymity, restrict access, and share within ethical constraints.

Effective data management requires collaboration among all parties to ensure data readability, reliability, integrity, and reusability [33].

5. Research Data Dissemination Policies

5.1 Open Sharing Within 6 Months of Publication

Funding agencies require timely, responsible data sharing. CRUK [30], MRC [26], and STFC [28] mandate data openness within 6 months of relevant publication. Despite disciplinary differences, data should generally be openly shared within 6 months of formal research output publication.

Note that storage time refers to when outputs are deposited in repositories, while open sharing time refers to when deposited data becomes publicly accessible after an embargo period.

Data storage enables funding agencies to verify outcomes and maximize academic exchange among researchers while ensuring funding transparency. However, open sharing requires conditional restrictions. Once scientific ideas (papers) and evidence (data) are shared, others can rapidly learn and replicate them. Policies must protect researchers' "competitive advantage" for a certain period and respect the editorial efforts and "time-limited exclusivity" of academic journals, data journals, and repositories in quality control and dissemination. Without such protections, well-intentioned policies promoting high-quality exchange may devolve into low-level publication.

5.2 Intellectual Property Rights Primarily Granted to Grantees

IP regulations recognize data producers' contributions and ensure proper utilization. NSF [32] typically allows grantees to retain primary legal rights while requiring compliance with government policies and international agreements. ESRC [25] encourages research outcome development, expecting grantees to comply with the UK' s Copyright, Designs and Patents Act 1988. IP provisions include: (1) For funded research, IP rights and responsibilities belong to the research institution (unless otherwise specified), though ESRC may retain IP rights under specific circumstances. (2) For collaborative research, institutions should formally recognize all participants' contributions and rights through agreements negotiated at project initiation.

5.3 Special Handling of Data Involving Human Subjects

Confidential and privacy-sensitive data require sharing restrictions. NIH [31] protects confidential data through data modification, anonymization, re-identification, and identifier suppression, removing direct identifiers (names, addresses, phone numbers) and considering removal of indirect identifiers. NSF [32] requires privacy protection for subjects in confidential data, negotiating data cleaning, storage, and dissemination strategies during application review. ESRC [25] mandates compliance with the UK Data Protection Act [34] and Freedom of Information Act [35], establishing data security services enabling remote secure access for sensitive, detailed, confidential, or potentially disclosive data under standard licenses. CRUK [20] emphasizes that while data should be shared, patient privacy and confidentiality must be maintained, with any confidentiality issues fully addressed in the DMP.

5.4 High Ethical Standards

Innovation and high-quality research require strong ethical standards. ESRC [25] expects grantees to adhere to key principles in the ESRC Research Ethics Framework, obtaining consent through agreements with subjects, anonymizing personal/confidential data, and setting access restrictions before open sharing. NIH [31] requires constraints on public disclosure for privately funded projects, with limitations specified in data sharing plans. RCUK [21] acknowledges legal, ethical, and commercial constraints when publishing research data.

Overall, research data should be accessed as widely and freely as possible while protecting sensitive data through special handling.

5.5 Citation Norms

RCUK [21] policies require users to attribute data sources and comply with citation terms and conditions. Citation provisions recognize researchers' contributions and standardize data usage, promoting reuse.

Policy development should consider China' s actual conditions and advantages: (1) **Institutional**: The government prioritizes scientific data management and sharing, issuing regulations like the *Scientific Data Sharing Regulations*, *Management Measures for Scientific Data Sharing Projects*, and *Scientific Data Classification and Graded Sharing and Release Strategies* [9]. (2) **Technical**: Research institutions actively develop data repositories, such as the Chinese Academy of Sciences Institutional Repository Grid (http://www.irgrid.ac.cn/). (3) **Individual**: Academics like Academician Sun Jiulin [36] actively advocate for data management and sharing.

Based on this analysis and China' s policy development status, summarizes potential policy options for research funding agencies.

Potential Schemes for Research Funding Agency Data Management Policies

Policy Element	Potential Implementation Scheme
Mandatory Storage	Establish mandatory research data storage requirements
Data Submission	Implement data submission and storage within 6-12 months of project completion
Preservation Period	Preserve data for at least 3 years for verification; securely preserve for 10 years for utilization; design systems with permanent preservation capability
Data Quality	Require high-quality metadata submission
Storage Standards	Adopt domain-established standards (see above)
Storage Location	Require storage in institutional repositories with specific links provided
Data Management Plans	Require grantees to develop DMPs including: data sources, domain/type, standards, relationships with other data, release timing, retention period, sharing methods, access restrictions, ownership
DMP Guidance	Provide guidance/services, best practices, policy guides, or online services for DMP development
DMP Supervision	Monitor DMP implementation and evaluate as funding criterion
Financial Support	Require grantees to indicate funding needs in proposals; review costs and provide dedicated data management funding
Accountability	Allocate responsibilities among key stakeholders: applicants, grantees, data service providers
Data Release	Require immediate data storage upon formal publication (e.g., papers, technical reports) with open sharing within 12 months
IP Rights	Recognize contributions of funders, institutions, researchers, and information managers; holistically address data rights and responsibilities
Confidentiality	Comply with data protection regulations; specially handle subject-involved data through modification, anonymization, re-identification, identifier suppression
Ethics	Establish high ethical standards
Citation	Remind users to follow disciplinary citation norms

Overall, foreign funding agencies' research data policies guide institutions and information services while summarizing implementation experience. NSF's March 15, 2015 *Today' s Data, Tomorrow' s Discoveries* [37] responded to the White House OSTP open data policy, requiring DMPs, data citation guidelines, technical reporting, and funding for data storage and management. The UK and US have extensive practical experience with multiple policy revisions. This study

examines their latest policy versions to inform China' s policy development. Future research will interview researchers, librarians, and information specialists, combined with other policy studies, to develop best practice guides such as *Data Management Plan Guidelines*.

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Author Contributions

Zhang Yao: Drafted manuscript, primary translator of foreign policy documents.
Gu Liping: Provided information, proposed research framework, organized and proofread policy content, revised final manuscript.
Yang Yunxiu: Compiled and proofread foreign policy documents.
Zhang Duo: Compiled and proofread foreign policy documents.

Research on Data Policies of Research Funding Agencies: Case Study of British and American Research Councils

Zhang Yao[1],[2], Gu Liping[3], Yang Yunxiu[1], , Zhang Duo[1],
[1]University of Chinese Academy of Sciences, Beijing 100049
[2]Lanzhou Library of Chinese Academy of Sciences, Lanzhou 730000
[3]National Science Library, Chinese Academy of Sciences, Beijing 100190
Chengdu Library of Chinese Academy of Sciences, Chengdu 610041
Wuhan Library of Chinese Academy of Sciences, Wuhan 430071

Abstract: [Purpose/significance] Research data management plays an important role in supporting open science and scholarly communication systems. Foreign research data management policy experience offers enlightenment to China' s research funding agencies and information service institutions. [Method/process] Using literature review and desk study, we analyze contents of data management policies from major international funding agencies. [Result/conclusion] Data storage specifications include type, standard, location, and period. Quality supervision involves management plans, accountability mechanisms, supervisory mechanisms, and reward-penalty systems. Dissemination policies comprise privacy protection, intellectual property limitation, and openness levels.

Keywords: research data, research data policy, research funding agencies, rights management