Evidence Based Library and Information Practice

Research Article

Making Job Postings More Equitable: Evidence Based Recommendations from an Analysis of Data Professionals Job Postings Between 2013-2018

Joanna Thielen
Biomedical Engineering Librarian
Art, Architecture & Engineering Library
University of Michigan
Ann Arbor, Michigan, United States of America
Email: jethiele@umich.edu

Amy Neeser
Consulting & Outreach Lead
Research IT
University of California Berkeley
Berkeley, California, United States of America
Email: aneeser@berkeley.edu

Received: 1 Mar. 2020 **Accepted**: 18 June 2020

Data Availability: Neeser, A., & Thielen, J. (2020). Making job postings more equitable: evidence-based recommendations from an analysis of data professionals job postings between 2013-2018 (V2) [dataset]. UC Berkeley. https://doi.org/10.6078/D1K419

DOI: 10.18438/eblip29674

Abstract

Objective - Over the last decade, many academic libraries have hired data professionals to offer research data services. As these positions often require different types of experience than traditional librarian positions, there is an increased interest in hiring professionals from outside the typical library and information science (LIS) pipeline. More broadly, there has also been an increased interest in academic libraries and higher education to incorporate the principles and practices of diversity,

equity, inclusion, and accessibility (DEI&A) into their work. These phenomena allow an opportunity to examine the growing area of data professionals and library hiring practices through the lens of DEI&A. Data was collected from 180 data professional job positions, including education, experiences, and skills, to better understand the evolving and complex landscape of data professionals and to provide evidence based recommendations regarding how the profession can enact meaningful and lasting change in the areas of DEI&A.

Methods - The qualifications and responsibilities listed in data professional job postings from 2013 to 2018 were examined. Prior to analyzing the job postings, a codebook of 43 variables was developed. The 177 data professional job postings (corresponding to 180 positions) were independently analyzed, noting the presence of each variable, including the locations and the degrees of complexity sought. After coding, discrepancies were mutually resolved. Overall, the coding process had 94% intercoder agreement, which indicates a high level of agreement.

Results - Over one-third of postings (n = 63, 35%) did not use the word "librarian" in the job title. Eighty-eight percent (n = 159) required a Master's in LIS degree, but 67% (n = 119) also accepted an equivalent degree. Over half of the positions (n = 108, 60%) were also looking for an additional degree, most frequently a graduate degree. The median salary of the positions listing a quantitative value was $57,000; however, this value may not be accurate because only 26% of job positions (n = 47) gave a quantitative salary. From the research data management skills mentioned, general data management (n = 155, 86%), data repositories (n = 122, 68%), and data curation (n = 101, 56%) appeared most frequently. Libraries were also looking for traditional LIS skills and experiences, including instruction (n = 138, 77%), consultation (n = 121, 67%), and a public services perspective (n = 69, 38%).

Conclusion - The results show that academic libraries are trying to recruit candidates from outside the traditional academic library pipeline. Research data activities (a non-traditional area for LIS) and traditional LIS areas were both frequently mentioned. Overall, these job positions should be written through a more intentional lens of DEI&A. This would help to make data professional positions more diverse and inclusive, while also helping academic libraries to reach their goal of recruiting outside of LIS. A set of concrete DEI&A recommendations are provided that are applicable for writing all library positions, so that readers can put these results into action and enact meaningful change within the profession.

Introduction

Over the last decade, an increasing number of academic libraries have hired data professionals to offer research data services (RDS) to facilitate the advancement of research. Data professionals help researchers to "address the full data lifecycle, including the data management plan, digital curation (selection, preservation, maintenance, and archiving), and metadata creation and conversion" (Tenopir, Sandusky, Allard, & Birch, 2013, p. 70). These positions often require different types of experience than traditional librarian positions, which can create an interest in hiring professionals from outside of the typical library and information science (LIS) pipeline. Accepting a variety of academic backgrounds and professional experiences naturally increases other forms of diversity because more types of people will apply. Furthermore, there is an increased interest in academic libraries and higher education more broadly to incorporate principles and practices of diversity, equity, inclusion, and accessibility

(DEI&A) into their work. Examining the landscape of data professionals working in academic libraries and formulating recommendations for action can help increase diversity in these positions, reducing disparities within the profession and its institutions. The consequence of perpetuating the status quo is to worsen the disparities amongst underprivileged and underrepresented groups. As hiring managers, search committee members, tenure review committee members, advocates, and conversation starters, everyone has a role to play in making our profession more equitable and inclusive for a more diverse groups of professionals. DEI&A is much more than simply having a library or institutional statement at the bottom of a job posting. DEI&A principles and practices should inform every aspect of a job posting. This evidence based research study presents the data collected from a deductive thematic analysis of 177 data professional job postings, including education, experiences, and skills, to better understand the complex landscape of data professionals. The findings are used to create a set of recommendations for how DEI&A principles can be incorporated into any academic library job posting so that the profession can enact meaningful and lasting change.

Literature Review

Research Data Services in Academic Libraries

The need for academic libraries to provide RDS due to the emergence of more data intensive research, data management mandates from funding agencies, and other factors, has been well-established in the literature (Tenopir et al., 2013). Further, RDS is listed as a top trend in academic libraries in both 2016 and 2018 by the Association of College and Research Libraries (ACRL) (ACRL Research Planning and Review Committee, 2016; ACRL Research Planning and Review Committee, 2018). As RDS is an emerging area within academic librarianship, the literature consists mostly of case studies, focused primarily on assessing the needs of campus researchers and implementing these services, as summarized by Tenopir, Kaufman, Sandusky, and Pollock (2019). While this literature provides valuable information about researcher needs and the implementation of RDS services, it provides little information on the emerging sub-discipline of data professionals. There is a need to capture data about the responsibilities, qualifications, and other information about data professional positions, such as education, experiences, and skills.

DEI&A in Academic Libraries and Higher Education

Academic libraries have a long history of valuing DEI&A. Examples include research on accessibility and diversity of library websites (Yoon, Hulscher, & Dols, 2016) and LIS student groups advocating for DEI&A inclusion in LIS curriculum (Jardine & Zerhusen, 2015). There are several examples of conferences and events on this topic, such as the Conference on Inclusion and Diversity in Library & Information Science (https://cidlis.umd.edu/). Other national LIS conferences, such as the Digital Library Federation and Research Data Access and Preservation Association, have tracks or specific foci on these topics. Further, national groups such as the American Library Association and ACRL have offices and committees to ensure the prioritization of DEI&A.

Similarly, higher education institutions have also been incorporating DEI&A into their values and work, as seen throughout professional publications such as *Inside Higher Ed* (Willis, 2017) and the *Chronicle of Higher Education* (Brown, 2019). Professional associations such as Educause (n.d.) have identified DEI&A as a critical priority and higher education conferences such as the Leadership in Higher Education (https://www.magnapubs.com/leadership-in-higher-education-conference/) are likewise focusing on these themes. Additionally,

individual universities have incorporated these principles into many facets of the institution, such as the University of Michigan's Diversity, Equity, and Inclusion Certificate (n.d.) for graduate students and the University of California Berkeley's (2018) strategic plan. However, one area that has received less attention from the DEI&A perspective is the job search process in academia, which is opaque and favors those on the inside (Fernandes et al., 2020).

Job Posting Analyses to Create a Landscape of Data Professionals

Job postings describe "the duties and responsibilities ... experience, education, skills, knowledge, or other attributes required for the job; and the hiring organization, salary range, and other benefits" (Kim & Angnakoon, 2016, p. 327). Academic libraries can also use job postings to articulate their needs and priorities, especially for areas of expansion such as RDS.

Subsets of RDS job postings have been examined via content analysis. Si, Zhuang, Xing, and Guo (2013) compared the core competencies and duties of scientific data specialists in 46 job postings to the current curricula in 38 LIS programs. They found that most LIS curricula train students in the basics of data curation, but more specialized areas were limited. Kim, Warga, and Moen (2013) studied job postings for digital curation positions and developed a set of competencies for digital curation responsibilities, which were used to create curricula in digital curation and data management. Xia and Wang (2014) visualized keyword and phrase occurrences of 167 job postings for social science data librarians from 2005-2012. Chen and Zhang (2017) analyzed 70 data management professionals' positions, from January to April 2015 using word frequency analysis, finding that 27% of postings mentioned a Master's degree in Library and Information Science (MLIS).

Thematic Analysis as a Research Method

Thematic analyses "move beyond counting explicit words or phrases and focus on identifying and describing both implicit and explicit ideas within the data" (Guest, MacQueen, & Namey, 2012, p. 10). This method yields richer results than word frequency analysis because it can "captur[e] the complexities of meaning within a textual data set" (Guest et al., 2012, p. 11). This methodology has been previously applied to the analysis of job postings within academic libraries. Hall-Ellis (2005; 2006) used this confirmatory method to track changing expectations and requirements for entry-level cataloguer positions and managerial cataloguer positions. In addition to coding the appearance of predetermined variables in the job postings, Hall-Ellis (2005; 2006) also coded for the complexity of each variable, which cannot be done with word frequency analysis. A more rigorous analysis of job postings within RDS using thematic analysis is lacking from the literature, with Chen and Zhang (2017, p. 22) noting that the results of their study shows "a need for a follow-up study to monitor the development of th[is] emerging job area."

Aims

This research project aims to answer the following research questions:

1. What are the most frequently occurring qualifications (required and preferred) and responsibilities for data professional positions?
    a. Specifically, what education and experiences occur most frequently?
    b. What research data activities occur most frequently?
    c. What other responsibilities and skills occur most frequently?
2. What is the median salary and salary range of data professional positions?

Methods

This research study uses deductive thematic analysis to examine data professional job postings that were posted from January 1, 2013 to June 30, 2018. These job postings were gathered from the following electronic mailing lists: 1) ACRL Science & Technology Section (n.d), 2) *Code4Lib* jobs list (n.d.), 3) Digital Library Federation Job Board (n.d.), 4) International Association of Social Science Information Services & Technology jobs portal (n.d.) and 5) Research Data Access and Preservation Association (n.d.). In addition, DataCure (an electronic mailing list on Google Groups) was analyzed for job postings; note that the viewer must be a member before accessing the list but anyone is allowed to join. These data sources were chosen because they are known nationally, attract job postings from a diverse pool of academic libraries, and provide access to job postings during the chosen time frame.

In some cases, the job announcement did not contain the complete job posting. In these cases, links to external websites (usually the university jobs portal), the Internet Archive WayBack Machine (n.d.), Google searches, and personal communications were used to locate the complete job posting. Seven job postings were excluded from this study because the full posting could not be located.

Job postings were first evaluated based on the job title. If a job title referenced data or RDS, the job posting was downloaded for further analysis. Postings were then reviewed to determine if they met the following four inclusion criteria:

1. Full-time, permanent positions
2. Located in an academic library
3. Located within the US
4. Primarily focused on providing RDS, which was defined as 50% or more of job responsibilities devoted to these services. The following description of RDS from Cox and Pinfield (2014) was used to determine if the job position fulfilled this criterion and positions that focused on library or administrative data were excluded:

   > [RDS] consists of a number of different activities and processes associated with the data lifecycle, involving the design and creation of data, storage, security, preservation, retrieval, sharing, and reuse, all taking into account technical capabilities, ethical considerations, legal issues and governance frameworks. (Cox & Pinfield, 2014, p. 300)

Once it was concluded that a job met the four inclusion criteria, metadata about the job posting was recorded, including the university name, job title, and posting date (see Appendix A for metadata on the job postings). In total, 236 full data professional job postings were gathered. However, this corpus contained duplicates. Job postings from the same university posted within 12 months of each other were targeted as possible duplicates. Several factors were scrutinized to determine if the postings were duplicates of the same position, including posting date, job title, responsibilities, and qualifications. If the postings had 25% or more difference in their responsibilities or qualifications, they were not considered duplicates and each posting was kept in the corpus. Potential duplicate postings were reviewed individually to determine if the posting should be included or excluded. Determinations were then discussed and agreement was reached on the inclusion or exclusion for each posting. If postings were duplicated, the posting with the most recent posting date was kept. In total, 59 postings were removed as duplicates, leaving 177 job postings corresponding to 180 job positions (3 job postings were for 2 positions).

To determine patterns in the qualifications and responsibilities for data professionals, a confirmatory approach was taken using a deductive thematic analysis methodology. A

codebook of variables and attributes for each variable was determined prior to analyzing the job positions. The codebook was based on Hall-Ellis' (2005; 2006) thematic analyses of cataloguing librarian job postings. Appendix B shows the complete codebook of 43 variables and corresponding attributes. Each variable in the codebook was operationally defined in order to avoid ambiguity. Descriptions of when each variable should be used and should not be used were included. Variables were grouped into three categories: 1) education, experience, and salary; 2) research data activities; and 3) other responsibilities and skills. For each of the 43 variables, the attribute of location in the job posting was coded (see Table 1 for list of attributes). If the variable was mentioned in multiple locations in the job positions, only one location was recorded, based on the following hierarchy: required qualifications > preferred qualifications > responsibilities > description. For example, if the variable "data management plan" appeared in the responsibilities and preferred qualifications sections, it was coded as preferred qualifications. For the variables in the research data activities category and most variables in the other responsibilities or skills category, an interval scale correlating to the stated degree of complexity sought was also coded (Table 1). The codebook was reviewed by two academic data professionals (who were not affiliated with the project) and their feedback was incorporated to ensure that the variables were an accurate and thorough representation of the responsibilities and qualifications sought for data professionals.

All job postings were coded independently to ensure consistency and reliability. Initially, a small corpus of 15 job postings was coded and the codebook was refined to define variables more clearly, add additional variables, eliminate unneeded variables, and revise attributes. After these revisions, the entire corpus of 177 job postings was coded. Coding discrepancies were resolved through discussion. Coding reflected a high level of intercoder agreement; percent agreement was 94%, which is higher than the threshold of 80% for good agreement (Guest et al., 2012).

Table 1
Attributes for the Variable "Data Storage" [a]

Variable =	Data Storage				
	Attributes				
Location in the job posting	Required qualifications (minimum requirements; basic requirements)	Preferred qualifications (Desired qualifications)	Responsibilities (Duties)	Description	Not applicable
Degree of complexity sought	Experience (ability; demonstrated ability; aptitude)	Knowledge (understanding; competent; competence)	Familiarity	Implied	Not applicable

[a] Synonyms for each attribute are shown in parenthesis. The full codebook is in Appendix B.

Table 2
The Carnegie Classification of Institutions of Higher Education for the Job Positions (n = 180) (Shown in Descending Order of Institutional Size)

Carnegie Classification	***n***
Doctoral Universities: Very High Research Activity	146
Doctoral Universities: High Research Activity	19
Doctoral/Professional Schools	1
Master's Colleges & Universities: Larger Programs	2
Baccalaureate Colleges: Arts & Sciences Focus	8
Special Focus Four-Year: Medical Schools & Centers	3
Special Focus Four-Year: Other Health Professions Schools	1

Results

Metadata about the Job Positions

The entire corpus contained 177 job postings, corresponding to 180 job positions. All of the following analyses were based on the number of job positions. The number of job positions posted each year over the 2013-2017 time frame remained relatively consistent, ranging from 25 to 38 positions. The positions were geographically dispersed across the US, spread out across 37 states and Washington D.C.

Most positions were located at doctoral-granting universities with very high research activity (n = 146, 81%), based on The Carnegie Classification of Institutions of Higher Education (Indiana University, 2017). The breakdown of job positions by the Carnegie Classification of the institutions is shown in Table 2.

From the 180 positions, there were 119 unique job titles (job titles were analyzed based on exactly how they appeared in the job posting). The four job titles occurring most frequently were:

- Data Services Librarian (n = 23, 13%)
- Data Curation Librarian (n = 7, 4%)
- Research Data Management Librarian (n = 6, 3%)
- Data Librarian (n = 6, 3%)

Further, over one-third (n = 63, 35%) of the job titles did not include the word "librarian", instead using terms such as specialist, consultant, informationist, curator, coordinator, and analyst.

Education and Experience

Of the 180 positions, almost 90% (n = 159) listed an MLIS degree as a qualification (Figure 1).

However, over 70% of positions (n = 132, 73%) accepted an equivalent degree in lieu of an MLIS degree and all mentions of an equivalent degree were located in the required qualifications. One position listed this qualification as "MLIS degree or equivalent advanced degree in the social sciences." Figures 2 and 3 show the level and disciplines mentioned for these equivalent degrees (note that a position could list multiple levels or disciplines). The most frequent equivalent degree level sought was an advanced

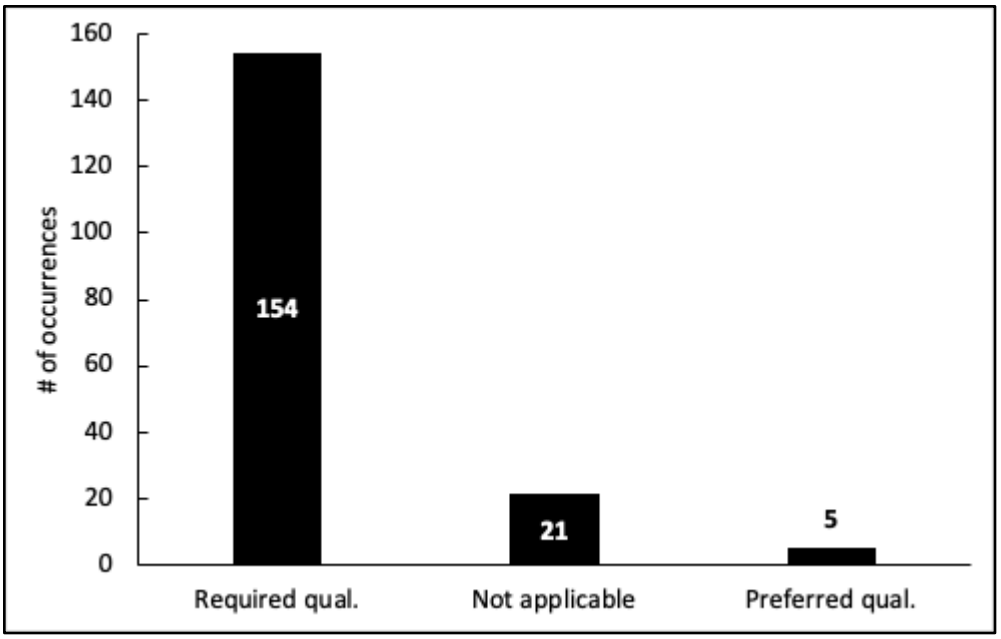

Figure 1
The location of an MLIS as a qualification for the job position (n = 180).

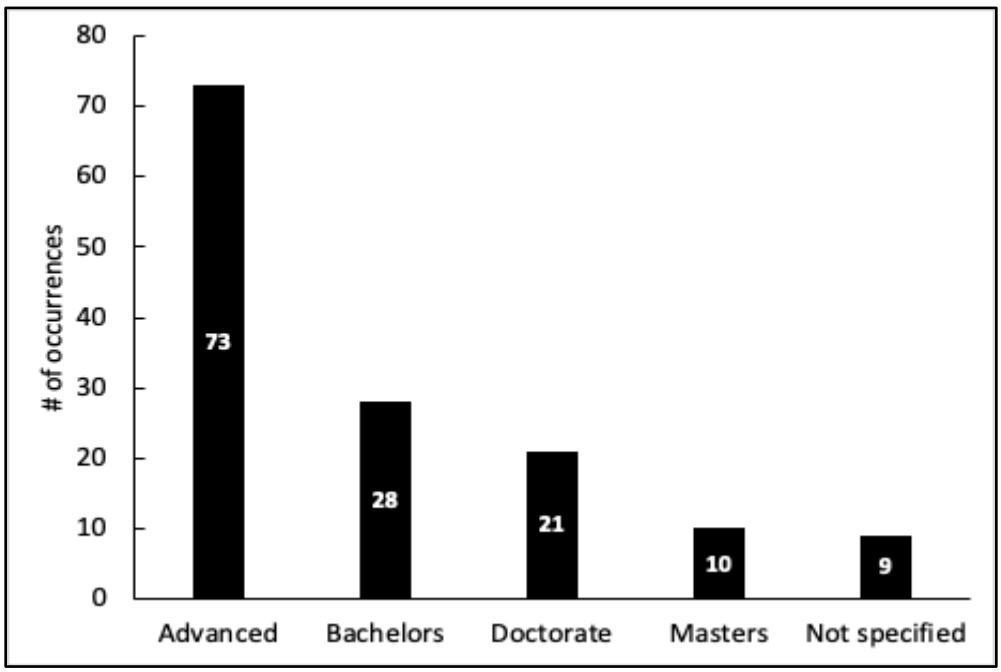

Figure 2
The levels of equivalent degrees mentioned. Synonyms for advanced were graduate and professional; a synonym for doctorate was terminal. Note that a position could list multiple degree levels.

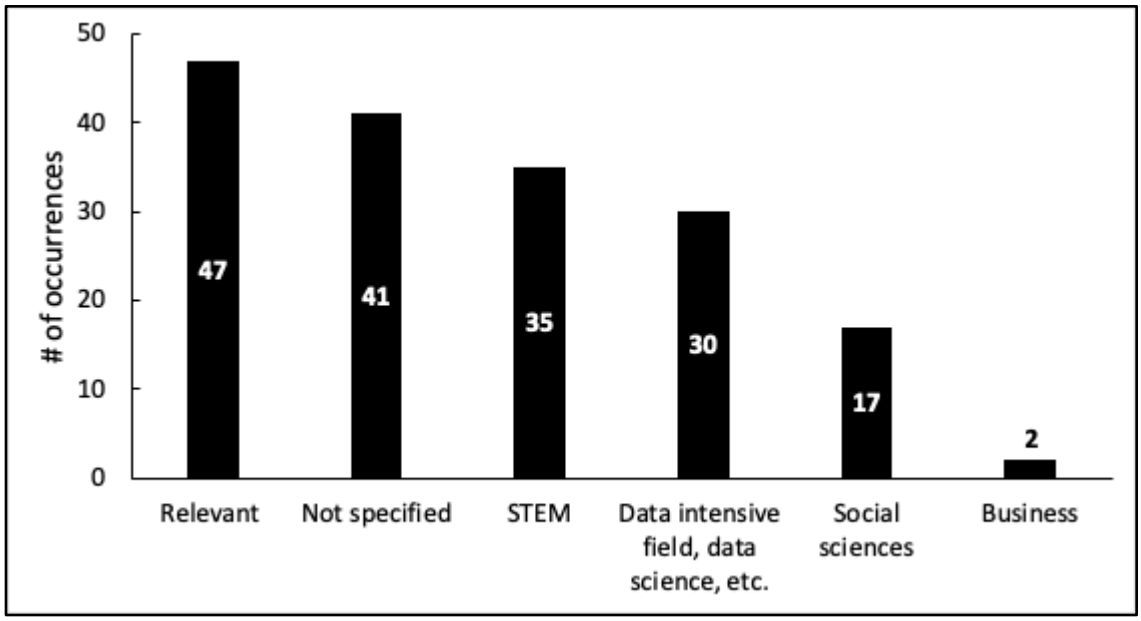

Figure 3
The disciplines of equivalent degrees mentioned. Synonyms for relevant were related, appropriate, and comparable. Note that a position could list multiple degree disciplines.

degree (n = 73) and the most frequent discipline of the equivalent degree was relevant (n = 47). While the term "relevant" is ambiguous, it does reflect the terms used in the job postings.

In addition to an MLIS or equivalent degree, 60% of job positions (n = 108) wanted the candidate to have an additional degree (either undergraduate or graduate). For example, a preferred qualification for one job position was an "additional relevant graduate degree." The majority (78%, n = 84) of these additional degrees were listed as a preferred qualification. As for the level of the degree, the majority wanted an advanced degree (n = 65; Figure 4).

When an additional degree was mentioned, discipline(s) of that degree were sometimes also mentioned. Of the 108 positions that listed an additional degree as a qualification, the science, technology, engineering and math (STEM; n = 59) and social sciences (n = 47) disciplines were mentioned most frequently (a position could list multiple disciplines and the complete disciplinary list is shown in Table 3).

Table 3
Disciplines Listed for an Additional Degree as a Qualification [b]

Discipline	***n***
STEM	59
Social Sciences	47
Data Science, Data Intensive Field, and others.	27
Business	7
Relevant	7
Health Sciences	5
Arts & Humanities	4

[b] Note that a position could list multiple disciplines. Synonyms for relevant were related, appropriate, and comparable.

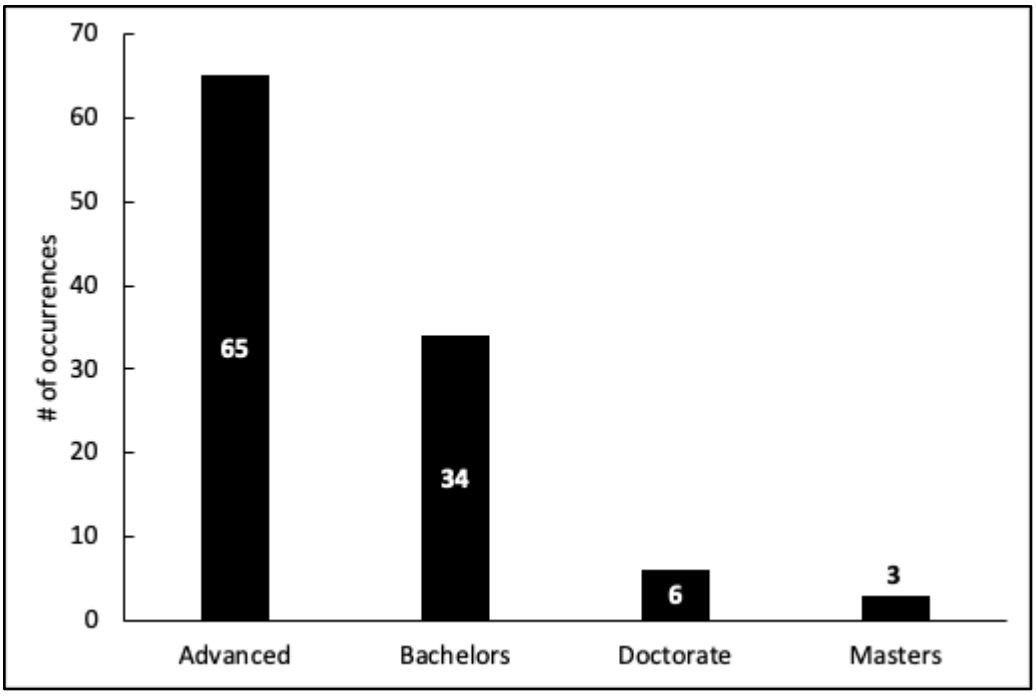

Figure 4
The level of an additional degree mentioned. Synonyms for advanced were graduate and professional; a synonym for doctorate was terminal. Note that a position could list multiple degree levels.

Of the 117 positions with the word "librarian" in the title, 62% (*n* = 73) accepted an MLIS degree or equivalent degree, while 36% (*n* = 42) only accepted an MLIS degree (Figure 5). Conversely, of the 63 postings that did not use the word "librarian" in the job title, 65% (*n* = 41) accepted an MLIS or equivalent degree and 2% (*n* = 1) only accepted an MLIS degree.

In addition to educational qualifications, many positions were seeking professional experience. Almost half (*n* = 87, 48%) wanted a candidate who had previous academic library experience, with those mentions split between required (*n* = 39) and preferred qualifications (*n* = 48). Figure 6 shows the length of academic library experience listed in the job positions, with almost half (*n* = 43) not specifying a length of time. In terms of previous experience with research data, 60% (*n* = 108) of positions wanted a candidate with this type of experience, most frequently naming it a required qualification (*n* = 85). Only a few positions (n = 21) listed a length of time for this experience, with 3 to 5 years (*n* = 11) being the most frequent length of time. For example, one position listed a required qualification as "minimum of three years professional experience working with large research datasets and/or familiarity with major data resources."

In addition to professional experience, about one-fifth of the job positions (*n* = 35, 19%) were looking for additional academic experience. Almost two-thirds of mentions were for lab or research experience (*n* = 23), while the remaining one-third of the mentions were for significant coursework or academic background in a discipline (*n* = 12; note that a position could list multiple types of academic experiences). All mentions of additional academic experience were in the required or preferred qualifications. While these terms for academic experiences are nebulous, they mirror the terms used in job postings. Examples of these qualifications are

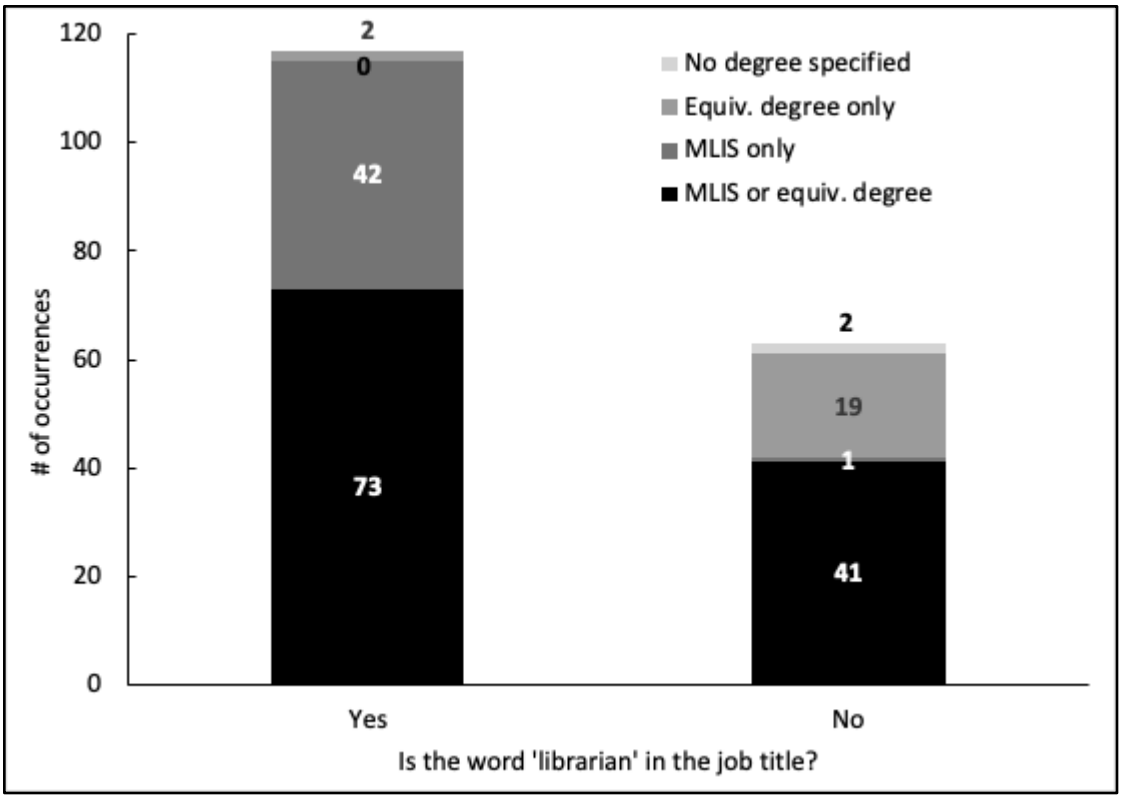

Figure 5

Degree requirements for positions with the word "librarian" in the job title (n = 117) and without the word "librarian" in the job title (n = 63).

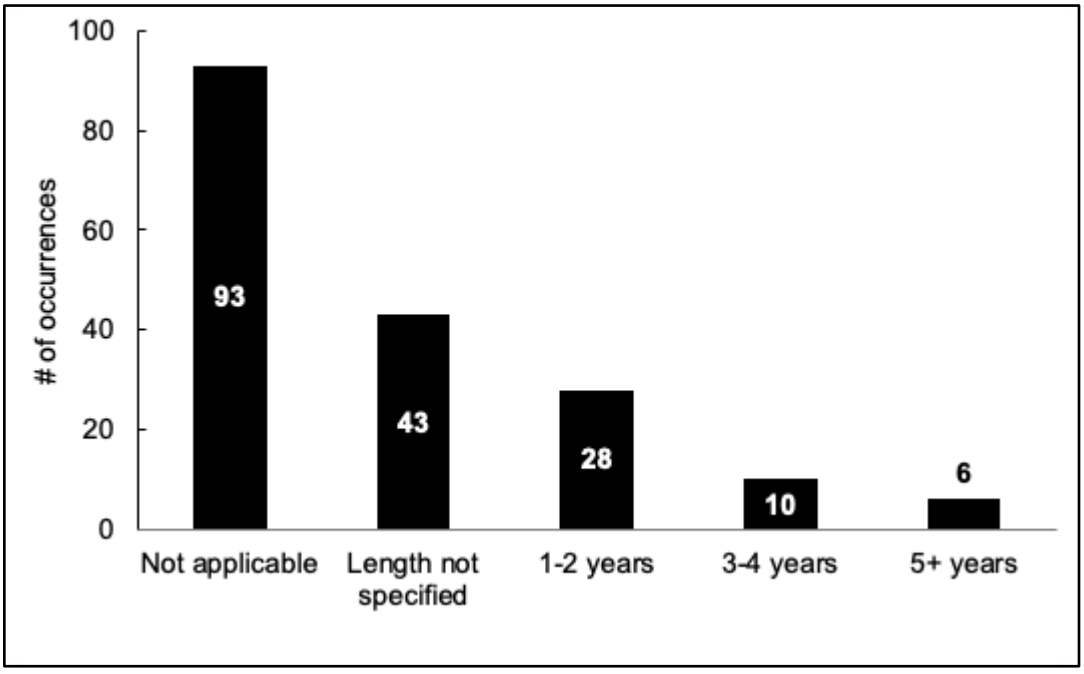

Figure 6

The length of experience in an academic library listed as a qualification (n = 180).

"research laboratory experience" as a preferred qualification and "coursework or experience leading to knowledge of the principles and practices of data curation and long-term digital preservation" as a required qualification.

Salary

Almost half (*n* = 77, 43%) of the positions did not mention salary. When salary was mentioned, about a third (*n* = 57, 32%) only used descriptive words such as commensurate or competitive (Figure 7). A quarter (*n* = 47, 25%) gave a quantitative salary value, with or without descriptive words. The range of salaries listed was from $40,000 to $157,000, with a median salary of $57,000, and over half (*n* = 25) clustered between $54,000 - 68,000 (Figure 8).

Research Data Activities

Of the 180 job positions, the most common research data activities mentioned were general data management (*n* = 154, 86%), data repository (*n* = 122, 68%), data curation (*n* = 101, 56%), data discovery (*n* = 97, 54%) and data documentation (*n* = 96, 53%; Figures 9 and 10 and Appendix C). General data management was most commonly mentioned in the preferred qualifications (*n* = 73) and the degree of complexity sought most frequently was "experience" (*n* = 58, 37%). The variable "general data management" is vague, but it reflects the actual terminology used in job postings. For example, one job position listed "assists faculty and graduate students with data management" as a responsibility; this is also an example of "implied" as the degree of complexity for this variable. In contrast, the more specific variable "data management plans" was mentioned in over 40% of positions (*n* = 76, 42%), most commonly mentioned in the required qualifications section (*n* = 24).

"Data repository" was mentioned in more than two-thirds of positions (*n* = 122, 67%). This was the variable with the highest number of occurrences in the required qualifications (*n* = 52); but it was also mentioned frequently in the responsibilities (*n* = 33) and preferred qualifications (*n* = 31). As for the degree of complexity sought, "experience" (*n* = 34) and "knowledge" (*n* = 32) were most common.

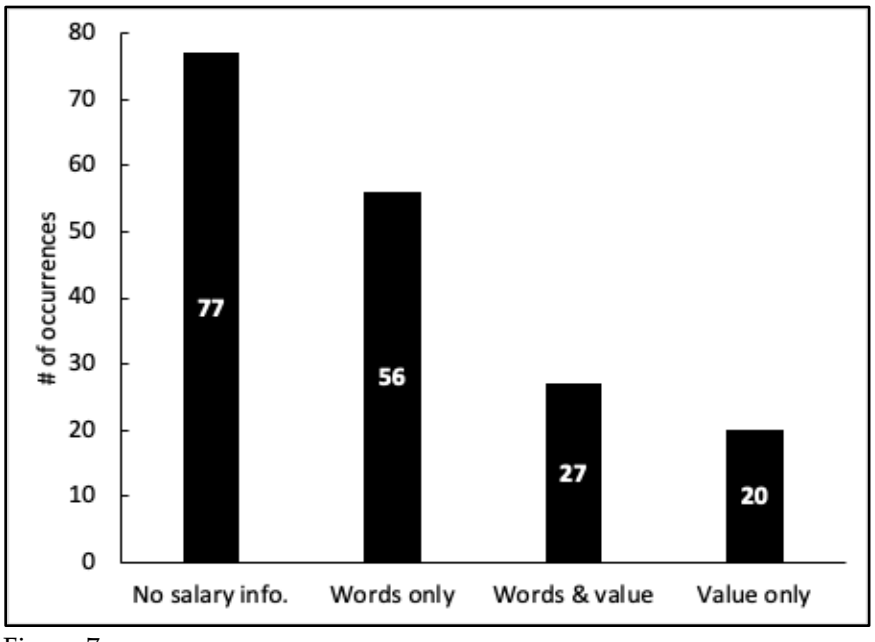

Figure 7
How salary was described in the job positions (*n* = 180).

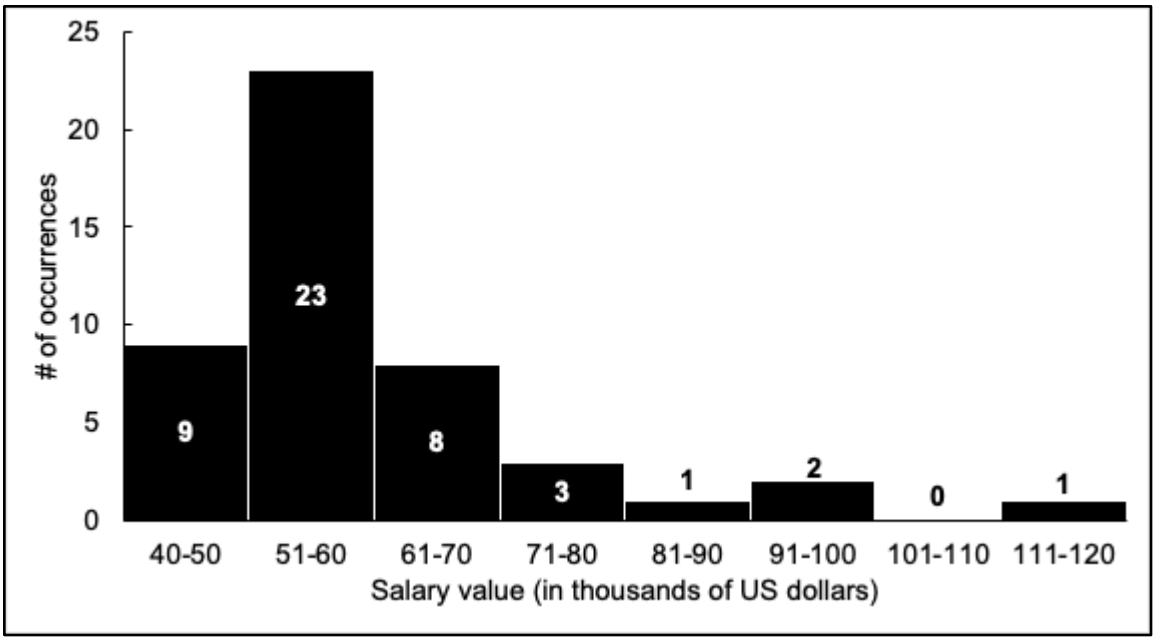

Figure 8
Histogram of salary values (n = 47). If a salary range was given for the position, the median value was used.

Different types of data analysis (general, statistical, spatial, or qualitative) were often mentioned in the job positions. In total, at least 1 type of data analysis was listed in over 60% of positions (n = 111; note that multiple types of data analysis could be listed in a position). "General data analysis", the variable used when a specific type of data analysis was not mentioned, was mentioned in over 40% of the positions (n = 78, 43%). Over half of these mentions occurred in the required qualifications section (n = 42, 53%). Additionally, half of these mentions were seeking "experience" for the degree of complexity (n = 39). For example, one job position stated, as a required qualification, "knowledge of quantitative data analysis applications." Statistical (n = 76, 42%), spatial (n = 46, 26%), and qualitative (n = 36, 20%) data analysis were also mentioned in the job positions. Statistical analysis (n = 45, 59%) was most frequently listed as a required qualification, while spatial (n = 24, 52%) and qualitative data analysis (n = 18, 50%) were most frequently listed as preferred qualifications. As for the degree of complexity sought, all 3 types of analysis were most frequently seeking "experience" (statistical analysis: n = 45; spatial analysis: n = 24; qualitative analysis: n = 21).

Other Responsibilities and Skills

About one-third (n = 60) of the job positions had faculty status; two-thirds of those with faculty status (n = 40) were also tenure-track. The requirement to research and publish was mentioned in about one-third of the positions (n = 55, 31%), most commonly listed in the responsibilities section (n = 28). Having a public or customer service perspective was mentioned in 38% of the postings (n = 69), most frequently mentioned as a required qualification (n = 46, 67%).

Instruction was mentioned in over three-fourths of positions (n = 138, 76%). Although mentioned in all 4 main locations within a job posting, mentions of instruction were most frequently mentioned in the required qualifications (n = 49) and responsibilities (n = 46). This variable listed "experience" as the most common degree of complexity sought (n = 81, 59%).

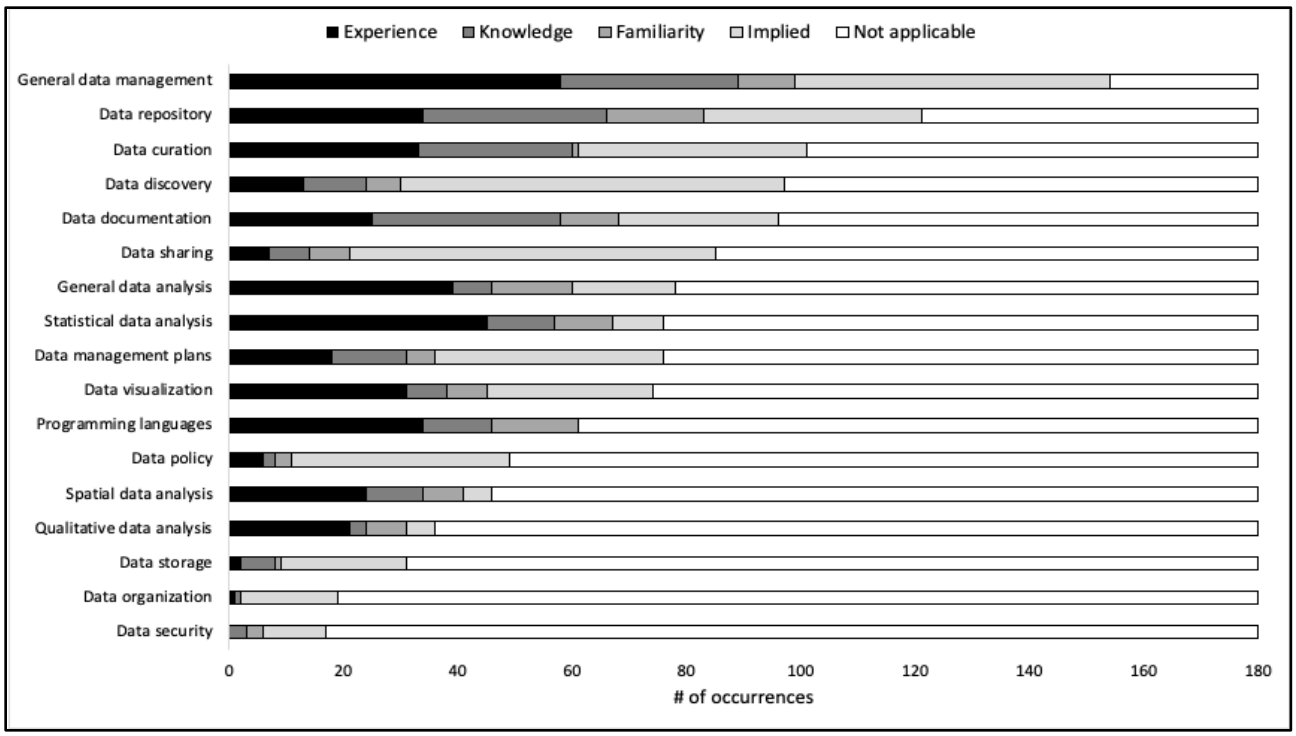

Figure 9
Summary of the degree of complexity sought. Raw values are shown in Appendix C.

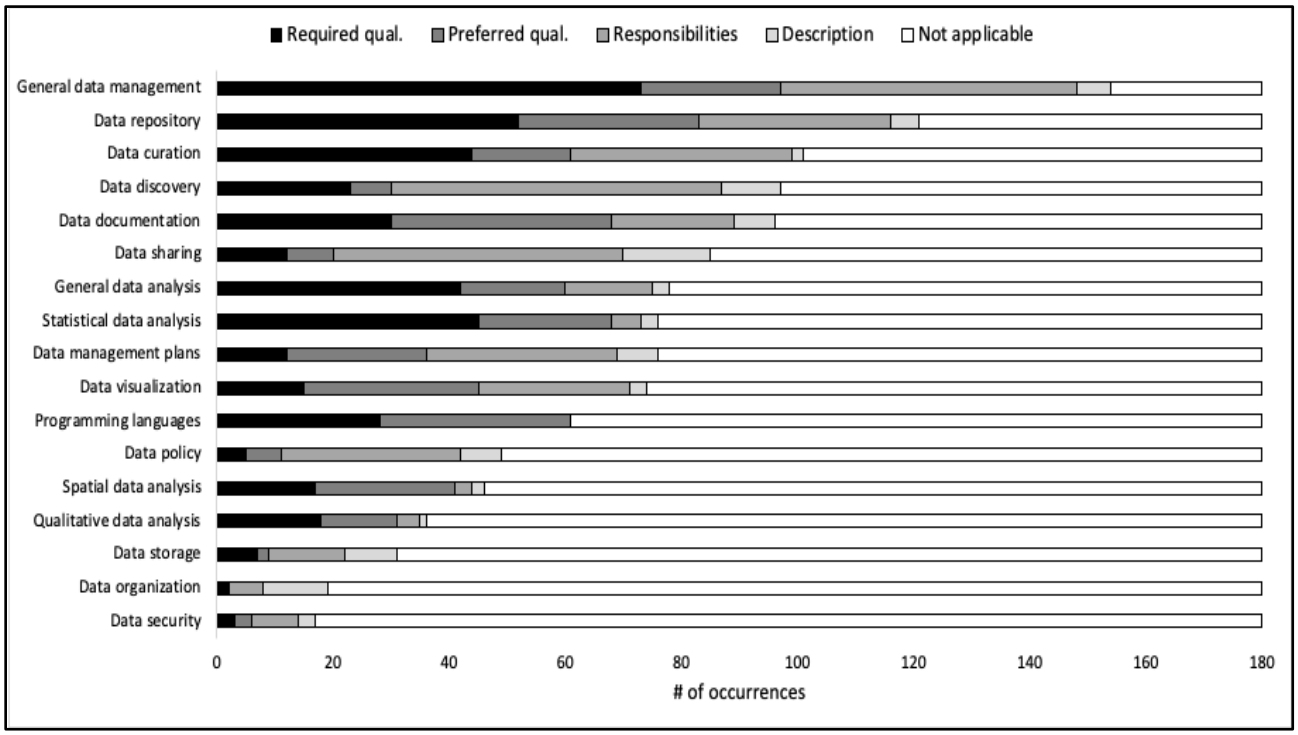

Figure 10
Summary of B) location in the job posting for 17 research data activities (n = 180).
Raw values are shown in Appendix C.

Consultation was mentioned in over two-thirds of the positions (*n* = 121, 67%), most frequently in the responsibilities section (*n* = 93). Additionally, 85% of these mentions listed "implied" as the degree of complexity sought (*n* = 103), meaning that a specific degree of complexity was not mentioned. For example, one job position stated in the description that the incumbent will "provid[e] training and consulting services."

More than 40% of the positions were focused on meeting research data needs within specific disciplines (*n* = 75, 42%). This variable was most commonly listed in the responsibilities section (*n* = 42, 23%). Of those focused on specific disciplines, the most common discipline was the social sciences (*n* = 32; Table 4 shows the complete disciplinary breakdown).

Table 4
Disciplines of Job Positions that focused on the Research Data Needs of Specific Disciplines [c]

Discipline	***n***
Social Sciences	32
STEM	22
Health Sciences	20
Business	7
Arts & Humanities	4

[c] If specific departments were listed, they were grouped into their broader discipline (multiple disciplines could be listed for a position).

Additionally, 28% (*n* = 51) of the job positions were the liaison to 1 or more departments or units on campus; this variable was most commonly listed in the responsibilities section (*n* = 40, 22%). Of those with liaison responsibilities, three-fourths (*n* = 37, 73%) listed specific departments or disciplines (Table 5) and the remaining positions had a department(s) assigned upon hiring. Of the 51 positions listing liaison responsibilities, over 85% (*n* = 44) also had instruction duties, as opposed to 72% of positions (*n* = 93) without liaison duties.

Table 5
Disciplines for Job Positions that included Liaison Responsibilities to One or More Department or Unit [d]

Discipline	***n***
STEM	14
Social Sciences	13
Business	8
Health Sciences	4
Administrative Units	3
Data Science	2
Arts & Humanities	1

[d] If specific departments were listed, they were grouped into their broader discipline (multiple disciplines could be listed for a position).

The variable of DEI&A related to the position, not the university or library, was mentioned in less than half of the positions (*n* = 75, 42%). These statements were most often included in the required qualifications section (*n* = 51), followed by the preferred qualifications section (*n* = 15). As these statements most often referred to a candidate's commitment to or understanding of the importance of DEI&A, the degree of complexity was not coded. For example, one required qualification was a "commitment to supporting and working in a multicultural and diverse environment." Figure 11 shows that this variable was included in more job positions over time.

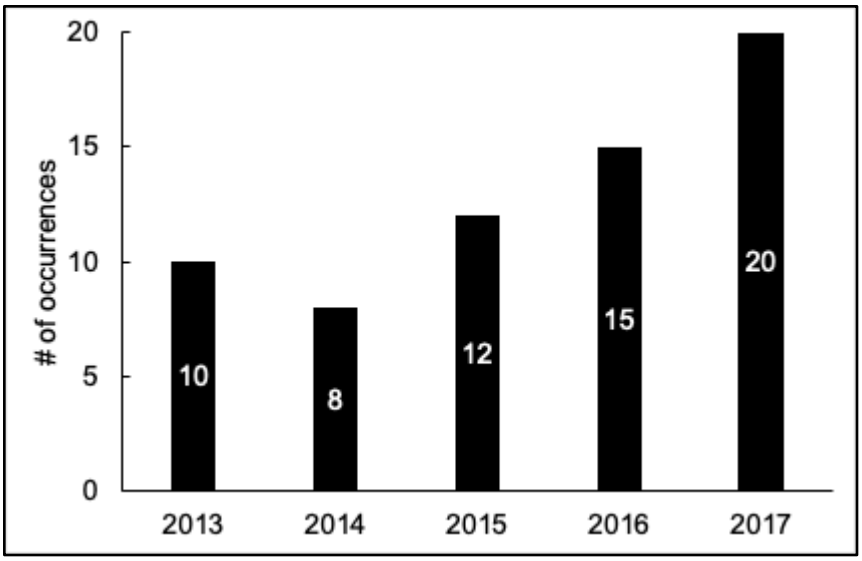

Figure 11
Number of occurrences of DEI&A statements relating to the position over time. Positions from 2018 were not included because they were only gathered for half of that year.

Discussion

What are the Required and Preferred Qualifications and Responsibilities for Data Professional Positions?

Overall, the education, experiences, and skills mentioned throughout these data professional job positions show that this sub-discipline of academic librarianship is looking for a mixture of traditional (instruction, consultation, and others) and non-traditional areas (general data management, data repositories, and others) for LIS. While the skills and experiences of those within the academic library pipeline are still sought, this mixture indicates an eagerness to recruit candidates from outside of the traditional LIS pipeline; this is a positive sign towards diversifying academic librarianship. Therefore, data professional positions are ripe to accept a variety of academic backgrounds and professional experiences, which naturally attract diverse candidates and thereby increase other forms of diversity.

Education and Experience

In the degree qualifications, over 70% (n = 132, 67%) accepted an equivalent degree in lieu of the MLIS degree. However, most positions were still seeking candidates with a degree beyond a Bachelor's (n = 104). Interestingly, for these equivalent degrees, most commonly the term "relevant" (n = 47) was used to describe the discipline or the discipline was not specified (n = 41). If a specific discipline was mentioned, STEM was the most common (n = 35). This indicates that libraries are seeking candidates with graduate degrees from all disciplines for their data professional positions, allowing for a diverse set of backgrounds and thus more diverse candidates. Many libraries were seeking candidates possessing an additional degree (n = 108, 60%), most frequently mentioned as a preferred qualification (n = 84). Again, if a specific discipline was mentioned, STEM was most common (n = 59). These degree qualifications are troubling from a DEI&A lens because many inequities in our society prevent

individuals from obtaining a graduate degree much less multiple graduate degrees (Soto & Yao, 2010). In 2018, only 10.2% of the US adult population had a Master's degree and only 2.1% had a doctoral degree (Oh and Kim, 2020). Instead of listing these degrees by default, an analysis should be done to demonstrate how the degree(s) would help the candidate to fulfill the job responsibilities (Thielen & Neeser, 2019). Also, see if an institution offers any benefits (such as tuition reimbursement) that would allow a candidate to earn another degree while working, and if so include them in the job posting.

The term "data intensive field" was often used to describe the discipline of an equivalent (n = 30) or additional degree (n = 27). This term is often used in RDS. It is hypothesized that libraries are using this term to denote that they would like a candidate with research data experience but do not want to list specific disciplines. However, from a DEI&A lens, this term is subjective, perhaps leaving a candidate unsure if their degree meets this qualification. It is suggested to avoid this ambiguous term in job postings. Further, individuals from underrepresented groups are less likely to apply to positions if they do not meet all of the qualifications (Mohr, 2014), so including ambiguous jargon will make them less likely to apply.

Over a third of the data professional positions (n = 63) did not use the word "librarian" in the job title; this may impact the degree qualifications. Of the positions that include this word in the job title (n = 117), 36% (n = 42) only accept an MLIS degree. Conversely, of the positions without this word in the job title (n = 63), 2% (n = 1) only accept an MLIS degree. The difference in degree qualifications is an excellent example of how libraries are writing job positions that seek to diversify this sub-discipline.

Another indication that many libraries are looking to recruit outside of the LIS pipeline is that of the positions that wanted candidates to have previous academic library experience (n = 87), only 45% of these mentions (n = 39) occurred in the required qualifications section.

In addition to degrees, previous experiences mentioned in the job positions also indicate an emphasis on areas traditionally considered outside the scope of LIS. Experience working with research data was a common qualification (n = 108), most frequently listed as a required qualification. Finally, it is important to note that almost 20% of the positions (n = 35) mentioned additional academic experiences (lab or research experience, academic background, and others) as a required or preferred qualification. This could be a way for a candidate to demonstrate knowledge of a particular area without having an academic degree. Asking for these types of additional academic experiences, instead of an additional degree, is another excellent way to incorporate DEI&A principles into a job posting.

Research Data Activities

Overall, the research data activities that were most frequently mentioned in the data professional job positions show that this sub-discipline of academic librarianship values areas traditionally outside of LIS (such as general data management, data repositories, and various types of data analysis). General data management (n = 155) was the second most commonly mentioned variable in the job positions, second to the MLIS degree (n = 159).

Unsurprisingly, general data management was the most frequently mentioned research data activities variable (n = 155). Interestingly, although general data management was most commonly mentioned in the preferred qualifications (n = 73), "experience" (n = 58) was the most frequent degree of complexity for this variable. This suggests that libraries want a candidate with experience managing research data, but know that it may not be feasible to ask for this as a required qualification. Data repository is the variable with the highest number of occurrences in the required

qualifications section (n = 51). This shows that there is much interest in hiring candidates with these skills and, therefore, offering these services on campus. Overall, at least 1 of the 4 types of data analysis were mentioned in over 60% of positions (n = 111; note that a position could list multiple types). Assisting patrons with data analysis is not a traditional area of LIS, but this result indicates that libraries consider this an unmet need that they are trying to fulfill on their campuses.

Academic libraries are seeking to hire specialist data professionals as well as generalist data professionals; 42% of the positions (n = 75) were seeking to hire a specialist data professional, while the other 58% (n = 104) were seeking to hire a generalist. The occurrence of these specialist data professional positions is another indication that libraries are trying to recruit candidates from outside the traditional LIS pipeline.

Other Responsibilities and Skills

Many of the common variables in this section need further explanation or different terminology entirely in order to recruit candidates from outside of LIS. Public or customer service perspective was mentioned in almost 40% of the postings (n = 69), with two-thirds of those mentions in the required qualifications section. Public or customer service is not necessarily a tenant of other fields like it is in LIS, so providing further context to this requirement would give candidates a better understanding of what this qualification entails and why it is valued in this context.

Liaison duties are another example of library jargon in these positions. Almost 30% of positions (n = 51) had liaison duties. It is unlikely that someone outside of LIS would understand what the term "liaison" means. Instead of saying "liaison to the Political Science Department", this could be rephrased as "Librarian for the Political Science Department." Small changes like this could have a huge impact on whether candidates outside of LIS decide to apply for a position. Additionally, of those listing liaison duties, three-fourths (n = 37) listed being a liaison to a specific department(s). While listing these departments adds specificity to the job position, it also may discourage applicants who do not have an academic background or experience with the subject area(s). Writing something like "departments will be assigned based on the candidate's background and interests," will help to recruit a more diverse candidate pool.

Instruction was mentioned in three-fourths of the positions (n = 138, 76%) and consultation was mentioned in two-thirds of the positions (n = 121, 67%). Both of these activities are common across job sectors within the LIS profession. The high number of mentions of these two variables shows that academic libraries, while embracing new ways of engaging with patrons, believe that these traditional means of engagement are still vital parts of the services they offer on campus.

It is encouraging to see that the mentions of DEI&A have increased during the time period studied (Figure 11). However, there is still room for improvement because, over the 5 years in this study, less than half of the positions (n = 75, 42%) included this variable. DEI&A related to the position was the focus, as opposed to generic statements about the university or library, because this was felt to be a demonstration of commitment to these principles rather than an Human Resources requirement. Having a required qualification for all job positions related to DEI&A could concretize academic libraries' commitment to these principles and practices.

What is the Median Salary and Salary Range of Data Professional Positions?

This study cannot give a definitive answer to this research question because only 26% (n = 47) of the job positions listed a quantitative salary value. Most frequently, salary was not mentioned (n = 77, 43%). An additional third of

the job positions (n = 57) only used qualitative descriptors for salary such as "competitive" or "commensurate". However, of the 47 positions listing a salary value or range, the median salary was $57,000.

Not mentioning salary or only providing qualitative salary descriptors is problematic from a DEI&A lens. This practice favors those already working in academic libraries as they will have inside access to and knowledge about common practices and resources, disadvantaging recent LIS graduates, and those outside of the traditional LIS pipeline. For example, those already working in academic libraries may have access to internal salary documents and databases or be able to ask their professional networks about salary information and practices. It also favors those working in the part of the country where the job is located, because they may have an idea of data professional salaries in their geographic area. For example, a competitive salary at a university in San Francisco, California will be very different from a competitive salary at a university in rural Michigan. Furthermore, these practices could hinder a candidate's ability to effectively negotiate salary and individuals from underrepresented groups are less likely to negotiate salaries (Silva & Galbraith, 2018). Listing a salary range indicates that candidates can negotiate; not doing so furthers inequity between those who already hold privilege from those who do not.

Additionally, the salary values listed for the job positions may not be an accurate reflection of the person hired for a position. A new employee's salary could be higher or lower than the stated salary due to their qualifications and experiences. A follow-up study could survey recently hired data professionals, asking them for their salary upon hire.

Study Limitations

This study does have some limitations. First, the sources of the job postings were chosen because they were known to attract postings for data professionals in academic libraries. However, these sources were not exhaustive for data professional job postings in academic libraries from 2013-2018. Additionally, job positions were only included in this study when the full job posting was available. As noted above, seven job positions were excluded because the full job postings were not available. This study also only included job positions within the US; data professionals are a growing sector in academic libraries worldwide. A follow-up study could analyze job postings for data professionals outside of the US.

An inherent limitation of job posting analyses is that job postings tend to be very aspirational, meaning that a data professional's actual responsibilities could vary greatly from those listed in the job posting. A follow-up study could carry out in-depth interviews with data professionals to compare how their actual responsibilities align with those in the job posting.

Finally, this study is undercounting the number of data professionals working in academic libraries, especially those working at Master's or Baccalaureate institutions. Many could have RDS roles or responsibilities added to their job duties after hiring as data needs emerge on campus. Additionally, at many small and mid-sized institutions, a librarian may be responsible for providing RDS but this responsibility is not large enough to be reflected in their job title (which was the initial screening mechanism to determine if a position should be included in this study).

Conclusion

Studies such as this do not have an impact unless the results are put into action. The following recommendations will help the reader to use this data to take steps toward incorporating DEI&A principles and practices into job postings:

- Write each and every sentence within a job posting using the lens of DEI&A principles and practices
- List a quantitative salary value; it is a simple way to make the hiring process more transparent and less prone to inequitable practices. Listing a range indicates the possibility of negotiation, which is helpful for underrepresented groups
- Carefully consider which degrees to include as required or preferred qualifications. For example, think critically about how an MLIS or an additional graduate degree would help the applicant perform the job responsibilities. Many positions in this study required an MLIS or asked for multiple degrees, which automatically limits the applicant pool. Due to inequalities built into our societal and educational systems, not everyone has access to attain a graduate degree. Consider undergraduate degrees or academic background as a way for an applicant to demonstrate expertise
- Include DEI&A as a required qualification in the job posting to demonstrate that the institution is committed to hiring applicants who understand the value and importance of DEI&A
- Write the job description that the candidate will perform; job postings should be realistic not aspirational. One way to accomplish this is to limit preferred qualifications
- Finally, this data can be used to initiate conversations; showing quantitative evidence of how disparities are inadvertently woven into hiring practices and providing evidence based suggestions for improvement can be a valuable tool for data-driving decision-making. This set of recommendations is also transferable to other sub-disciplines of librarianship

Job postings are a small yet very important part of the hiring process. It is hoped that this article will inspire reviews of hiring processes as a whole. The data is openly available in the Dryad Repository https://datadryad.org/stash/dataset/doi:10.6078/D1K419; the authors strongly encourage other researchers to further analyze this data.

Acknowledgements

The authors thank Kristin Briney for reviewing the codebook, as well as Marie Kennedy, Abigail Goben, and Tina Griffin for reviewing a draft of this article and providing valuable feedback.

References

ACRL Research Planning and Review Committee. (2016). 2016 top trends in academic libraries: A review of the trends and issues affecting academic libraries in higher education. *College & Research Libraries News, 77*(6), 274-281. https://doi.org/10.5860/crln.77.6.9505

ACRL Planning and Review Committee. (2018). 2018 top ten trends in academic libraries: A review of the trends and issues affecting academic libraries in higher education. *College & Research Libraries News, 79*(6), 286-300. https://doi.org/10.5860/crln.79.6.286

Association of College & Research Libraries Science & Technology Section [Electronic mailing list]. (n.d.). Retrieved from lists.ala.org/sympa/info/sts-l

Brown, S. (2019). Want a more diverse campus? Start at the top. In *The Chronicle of Higher Education*. Retrieved from

https://www.chronicle.com/article/Want-a-More-Diverse-Campus-/247285

Code4Lib Jobs [Electronic mailing list]. (n.d.). Retrieved from jobs.code4lib.org

Chen, H., & Zhang, Y. (2017). Educating data management professionals: A content analysis of job descriptions. *The Journal of Academic Librarianship, 43*(1), 18–24. https://doi.org/10.1016/j.acalib.2016.11.002 0099-1333

Cox, A. M., & Pinfield, S. (2014). Research data management and libraries: Current activities and future priorities. *Journal of Librarianship and Information Science, 46*(4), 299–316. https://doi.org/10.1177/0961000613492542

Digital Library Federation Job Board [Electronic mailing list]. (n.d.). Retrieved from jobs.diglib.org/

Educause Diversity, Equity, and Inclusion. (n.d.). Retrieved from https://www.educause.edu/about/diversity-equity-and-inclusion

Fernandes, J.D., Sarabipour, S., Smith, C.T., Niemi, N.M., Jadavji, N.M., Kozik, A.J., Holehouse, A.S., Pejaver, V., Symmons, O., Filho, A.W.B., & Haage, A. (2020). A survey-based analysis of the academic job market. eLife, 9:e54097. https://doi.org/10.7554/eLife.54097

Guest, G., MacQueen, K., & Namey, E. (2012). *Applied Thematic Analysis*. Los Angeles, CA: Sage Publications.

Hall-Ellis, S. D. (2005). Descriptive impressions of entry-level cataloger positions as reflected in American Libraries, AutoCAT, and the Colorado State Library Jobline, 2000-2003. *Cataloging & Classification Quarterly, 40*(2), 33-72. https://doi.org/10.1300/J104v40n02_05

Hall-Ellis, S. D. (2006). Descriptive impressions of managerial and supervisory cataloger positions as reflected in American Libraries, AutoCAT, and the Colorado State Library Jobline, 2000-2004: A content analysis of education, competencies, and experience. *Cataloging & Classification Quarterly, 42*(1), 55-92. https://doi.org/10.1300/J104v42n01_06

Indiana University. (2017). About the Carnegie Classification. In *The Carnegie Classification of Institutions of Higher Education*. Retrieved from http://carnegieclassifications.iu.edu/

International Association for Social Science Information Service & Technology Jobs Portal [Electronic mailing list]. (n.d.). Retrieved from https://iassistdata.org/jobs-repository/

Internet Archive WayBack Machine. (n.d.). Retrieved from archive.org/web

Jardine, F. M., & Zerhusen, E. K. (2015). Charting the course of equity and inclusion in LIS through iDiversity. *The Library Quarterly, 85*(2), 185-192. https://doi.org/10.1086/680156

Kim, J., & Angnakoon, P. (2016). Research using job advertisements: A methodological assessment. *Library & Information Science Research, 38*(4), 327-335. https://doi.org/10.1016/j.lisr.2016.11.006

Kim, J., Warga, E., & Moen, W. (2013). Competencies required for digital curation: An analysis of job advertisements. *International Journal of Digital Curation, 8*(1), 66-83. https://doi.org/10.2218/ijdc.v8i1.242

Mohr, T. S. (2014). Why women don't apply for jobs unless they're 100% qualified. In *Harvard Business Review*. Retrieved from https://hbr.org/2014/08/why-women-dont-apply-for-jobs-unless-theyre-100-qualified

Oh, B., & Kim, C. (2020). Broken promise of college? New educational sorting mechanisms for intergenerational association in the 21st century. *Social Science Research, 86*(102375), 1-15. https://doi.org/10.1016/j.ssresearch.2019.102375

Research Data Access & Preservation Association [Electronic mailing list]. (n.d.). Retrieved from https://rdapassociation.org

Si, L., Zhuang, X., Xing, W., & Guo, W. (2013). The cultivation of scientific data specialists: Development of LIS education oriented to e-science service requirements. *Library Hi Tech, 31*(4), 700-724. https://doi.org/10.1108/LHT-06-2013-0070

Silva, E., & Galbraith, Q. (2018). Salary negotiation patterns between women and men in academic libraries. *College & Research Libraries, 79*(3), 324-335. https://doi.org/10.5860/crl.79.3.324

Soto, M. & Yao, C. (2010). Retention of women of color in STEM doctoral programs. *Proceedings of the 29th Annual Midwest Research to Practice Conference in Adult, Continuing, Community, and Extension Education*. East Lansing, Michigan, 207-213.

Tenopir, C., Sandusky, R. J., Allard, S., & Birch, B. (2013). Academic librarians and research data services: Preparation and attitudes. *IFLA Journal, 39*(1), 70-78. https://doi.org/10.1177/0340035212473089

Tenopir, C., Kaufman, J., Sandusky, R., & Pollock, C. (2019). Research data services in academic libraries: Where are we today? [White paper]. In *Choice*. Retrieved from https://choice360.org/librarianship/whitepaper

Thielen, J., & Neeser, A. (2019). How you can write more inclusive data practitioner job postings. *Journal of eScience Librarianship, 8*(2), e1167. https://doi.org/10.7191/jeslib.2019.1167

University of California Berkeley. (2018). Berkeley strategic plan. In *Berkeley University of California.* Retrieved from https://strategicplan.berkeley.edu/publications/

University of Michigan. (2020). Rackham Professional Development Diversity, Equity, and Inclusion Certificate. In *Rackham Graduate School*. Retrieved from https://rackham.umich.edu/professional-development/dei-certificate/

Willis, D. S. (2017). Getting up to speed on diversity. In *Inside Higher Ed.* Retrieved from https://www.insidehighered.com/advice/2017/08/21/how-graduate-students-can-demonstrate-commitment-diversity-job-interviews-essay

Xia, J., & Wang, M. (2014). Competencies and responsibilities of social science data librarians: An analysis of job descriptions. *College & Research Libraries, 75*(3), 362-388. https://doi.org/10.5860/crl13-435

Yoon, K., Hulscher, L., & Dols, R. (2016). Accessibility and diversity in library and information science: Inclusive information architecture for library websites. *The Library Quarterly, 86*(2), 213-229. https://doi.org/10.1086/685399

Appendix A
Metadata about Data Professional Job Postings
(Note, this appendix only includes the 177 job postings analyzed in this study)

University Name	Carnegie Classification	Position Title	Posting Date	Notes
American University	Doctoral Universities: High Research Activity	Research Data Librarian	2013-01	
Auburn University	Doctoral Universities: Very High Research Activity	Research Data Management Librarian	2017-03	
Boston College	Doctoral Universities: Very High Research Activity	Data and Visualization Librarian	2016-12	
Brown University	Doctoral Universities: Very High Research Activity	Scientific Data Management Specialist	2013-11	
Brown University	Doctoral Universities: Very High Research Activity	Scientific Data Curator	2013-03	
Bryn Mawr College	Baccalaureate Colleges: Arts & Sciences Focus	Social Sciences and Data Librarian	2018-02	
California State University Northridge	Master's Colleges & Universities: Larger Programs	Business & Data Librarian	2013-01	
Carnegie Mellon University	Doctoral Universities: Very High Research Activity	Data Services Librarian	2014-05	
Case Western Reserve University	Doctoral Universities: Very High Research Activity	Research Data Specialist	2018-01	
Colby College	Baccalaureate Colleges: Arts & Sciences Focus	Social Sciences Data Librarian	2014-02	
Colorado State University	Doctoral Universities: Very High Research Activity	Data Management Specialist	2017-11	
Colorado State University	Doctoral Universities: Very High Research Activity	Data Management Specialist	2016-01	
Columbia University	Doctoral Universities: Very High Research Activity	Research Support & Data Services Librarian	2014-04	
Columbia University	Doctoral Universities: Very High Research Activity	Research Support & Data Services Librarian	2016-10	
Columbia University	Doctoral Universities: Very High Research Activity	Data Services Librarian	2014-12	
Columbia University	Doctoral Universities: Very High Research Activity	Data Services & Emerging Technologies Librarian	2014-05	
Columbia University	Doctoral Universities: Very High Research Activity	Research Support & Data Services Librarian	2015-04	

Cornell University	Doctoral Universities: Very High Research Activity	Social Science and Geospatial Data Librarian	2017-09	
Cornell University	Doctoral Universities: Very High Research Activity	Research Data and Environmental Sciences Librarian	2014-02	
CUNY Graduate School and University Center	Doctoral Universities: Very High Research Activity	Data Librarian	2014-12	
Dartmouth College	Doctoral Universities: Very High Research Activity	Data & Visualization Librarian	2015-12	
DePaul University	Doctoral Universities: High Research Activity	Data Services & Government Information Librarian	2016-06	
Drake University	Doctoral/Professional Schools	Data and Business Librarian	2015-04	
Drexel University	Doctoral Universities: Very High Research Activity	Director, Data & Digital Stewardship	2015-10	
Drexel University	Doctoral Universities: Very High Research Activity	Director, Informatics for Research Engagement	2014-02	
Duke University	Doctoral Universities: Very High Research Activity	Senior Research Data Management Consultant	2016-08	This posting was for two positions
East Carolina University	Doctoral Universities: High Research Activity	Data Services Librarian	2017-03	
Florida Institute of Technology	Doctoral Universities: High Research Activity	Research Data Specialist	2014-11	
Florida Institute of Technology	Doctoral Universities: High Research Activity	Data Librarian	2018-05	
Florida State University	Doctoral Universities: Very High Research Activity	Data Research Librarian	2013-11	
Florida State University	Doctoral Universities: Very High Research Activity	Social Sciences Research & Data Librarian	2016-10	
George Washington University	Doctoral Universities: Very High Research Activity	Data Services Librarian	2017-10	
George Washington University	Doctoral Universities: Very High Research Activity	Data Services Librarian	2014-07	
Georgia Southern University	Doctoral Universities: High Research Activity	Discovery Services and Data Curation Librarian	2014-12	
Georgia State University	Doctoral Universities: Very High Research Activity	Team Leader, Research Data Services	2016-01	
Georgia State University	Doctoral Universities: Very High Research Activity	Quantitative Data Specialist for the Social Sciences	2017-08	

Georgia State University	Doctoral Universities: Very High Research Activity	Business Data Services Librarian	2014-06	
Harvard University	Doctoral Universities: Very High Research Activity	Librarian for the Social Sciences and Visualization	2014-10	
Harvard University	Doctoral Universities: Very High Research Activity	Research Data Management Librarian for the Sciences	2018-04	
Harvard University	Doctoral Universities: Very High Research Activity	Research Data & Collections Librarian	2017-05	
Indiana University	Doctoral Universities: Very High Research Activity	Research Data Management Librarian	2016-06	
Indiana University Bloomington	Doctoral Universities: Very High Research Activity	Research Data Management Librarian	2015-08	
Indiana University Bloomington	Doctoral Universities: Very High Research Activity	Research Data Management Librarian and Head of Scholarly Communication Department	2016-05	
Johns Hopkins University	Doctoral Universities: Very High Research Activity	Data Management Services Manager	2015-12	
Johns Hopkins University	Doctoral Universities: Very High Research Activity	Data Informationist	2016-03	
Johns Hopkins University	Doctoral Universities: Very High Research Activity	Data Services Manager	2017-01	
Johns Hopkins University	Doctoral Universities: Very High Research Activity	Data Management Consultant	2015-04	
Johns Hopkins University	Doctoral Universities: Very High Research Activity	Data Management Specialist	2016-02	
Kenyon College	Baccalaureate Colleges: Arts & Sciences Focus	Social Sciences and Data Librarian	2016-03	
Lehigh University	Doctoral Universities: High Research Activity	Business/Data Librarian	2015-11	
Lewis & Clark College	Baccalaureate Colleges: Arts & Sciences Focus	Science & Data Services Librarian	2014-10	
Louisiana State University	Doctoral Universities: Very High Research Activity	Data Curation Librarian	2015-01	
Massachusetts Institute of Technology	Doctoral Universities: Very High Research Activity	Program Head, Data Management Services	2016-11	
Michigan State University	Doctoral Universities: Very High Research Activity	Data Librarian	2016-04	
Middlebury College	Baccalaureate Colleges: Arts & Sciences Focus	Data Services Librarian	2015-05	
Montana State University	Doctoral Universities: High Research Activity	Data Management Librarian	2013-08	
New York University	Doctoral Universities: Very High Research Activity	Knowledge Management Librarian	2014-10	

New York University	Doctoral Universities: Very High Research Activity	Data Services Librarian	2015-03	
New York University	Doctoral Universities: Very High Research Activity	Research Data Management Librarian	2014-11	
North Carolina State University	Doctoral Universities: Very High Research Activity	Research Data & Infrastructure Librarian	2018-03	
North Carolina State University	Doctoral Universities: Very High Research Activity	Research Librarian for Engineering and Biotechnology	2015-09	
Northwestern University	Doctoral Universities: Very High Research Activity	Data Scientist	2017-03	
Oakland University	Doctoral Universities: High Research Activity	Research Data Librarian	2015-11	
Occidental College	Baccalaureate Colleges: Arts & Sciences Focus	Data and Information Specialist for the Social Sciences	2017-08	
Ohio State University	Doctoral Universities: Very High Research Activity	Data Management Services Librarian	2013-05	
Oregon Health & Science University	Special Focus Four-Year: Medical Schools & Centers	Basic Science Liaison/Research Data Management Librarian	2015-12	
Oregon State University	Doctoral Universities: Very High Research Activity	Data Management Specialist	2015-12	
Pennsylvania State University	Doctoral Universities: Very High Research Activity	Science Data Librarian	2014-11	
Princeton University	Doctoral Universities: Very High Research Activity	Data Services Specialist	2013-06	
Princeton University	Doctoral Universities: Very High Research Activity	Interdisciplinary Quantitative Research Librarian	2015-08	
Purdue University	Doctoral Universities: Very High Research Activity	Data Repository Outreach Specialist	2015-08	
Purdue University	Doctoral Universities: Very High Research Activity	Research Data Specialist	2015-02	
Purdue University	Doctoral Universities: Very High Research Activity	Digital Data Repository Specialist	2014-12	
Reed College	Baccalaureate Colleges: Arts & Sciences Focus	Data Services Librarian	2015-07	
Rice University	Doctoral Universities: Very High Research Activity	Data and Government Information Librarian	2017-11	
Rice University	Doctoral Universities: Very High Research Activity	Head, Kelley Center for Government Information, Data & Geospatial Services	2014-06	
Rutgers University	Doctoral Universities: High Research Activity	Data Services Librarian	2013-06	
San Diego State University	Doctoral Universities: High Research Activity	Social Science & Data Librarian	2018-01	
San Jose State University	Master's Colleges & Universities: Larger Programs	Data Services Librarian	2017-05	

Southern California University of Health Sciences	Special Focus Four-Year: Other Health Professions Schools	Knowledge Management & Data Specialist	2015-09	
Stanford University	Doctoral Universities: Very High Research Activity	Data Services and Visualization Librarian	2017-05	
Stanford University	Doctoral Universities: Very High Research Activity	Engineering Librarian for Data and Collections	2018-06	
Temple University	Doctoral Universities: Very High Research Activity	Research and Data Services Librarian	2018-05	
Texas A&M University	Doctoral Universities: Very High Research Activity	Data Librarian	2016-09	
Tufts University	Doctoral Universities: Very High Research Activity	Librarian for Research Data	2016-09	
Tufts University	Doctoral Universities: Very High Research Activity	Social Science Data Librarian	2017-05	
University of Arizona	Doctoral Universities: Very High Research Activity	Research Data Management Librarian	2017-03	
University of Arkansas at Little Rock	Doctoral Universities: High Research Activity	Data Services Librarian	2018-06	
University of California - Irvine	Doctoral Universities: Very High Research Activity	E-Research and Digital Scholarship Services Librarian	2014-10	
University of California - Los Angeles	Doctoral Universities: Very High Research Activity	Sciences Data Informationist	2016-11	
University of California - Los Angeles	Doctoral Universities: Very High Research Activity	Grand Challenges Data Administrator	2016-09	
University of California - Los Angeles	Doctoral Universities: Very High Research Activity	Director of UCLA Libraries Social Science Data Archive	2016-06	
University of California - San Diego	Doctoral Universities: Very High Research Activity	Data Services and Collections Librarian	2014-03	
University of California - San Diego	Doctoral Universities: Very High Research Activity	Director, Research Data Curation Services	2013-01	
University of California - San Diego	Doctoral Universities: Very High Research Activity	Metadata Specialist	2018-06	
University of California - San Diego	Doctoral Universities: Very High Research Activity	Data Science Librarian	2017-09	

University of California - San Diego	Doctoral Universities: Very High Research Activity	Director, Research Data Curation Services	2013-01	
University of California - San Diego	Doctoral Universities: Very High Research Activity	Research Data Metadata Librarian	2017-11	
University of California - San Diego	Doctoral Universities: Very High Research Activity	Research Data Curation Program Technical Analyst	2013-07	
University of California Berkeley	Doctoral Universities: Very High Research Activity	Science Data & Engineering Librarian	2015-07	
University of California Berkeley	Doctoral Universities: Very High Research Activity	Business & Data Librarian	2015-08	
University of California Berkeley	Doctoral Universities: Very High Research Activity	Research Data Management Service Design Analyst	2015-01	
University of California Berkeley	Doctoral Universities: Very High Research Activity	Data Services Librarian	2017-01	
University of California Davis	Doctoral Universities: Very High Research Activity	Associate Director, Data Management Program	2015-08	
University of California Davis	Doctoral Universities: Very High Research Activity	Data Management Analyst	2017-03	
University of California San Francisco	Special Focus Four-Year: Medical Schools & Centers	Data Services and Assessment Librarian	2016-12	
University of California Santa Barbara	Doctoral Universities: Very High Research Activity	Humanities Data Curator	2015-09	
University of California Santa Barbara	Doctoral Universities: Very High Research Activity	Geospatial Data Curator	2013-08	
University of California Santa Barbara	Doctoral Universities: Very High Research Activity	Data Services and Digital Scholarship Librarian	2018-05	
University of Chicago	Doctoral Universities: Very High Research Activity	Biomedical Data Librarian	2017-12	
University of Chicago	Doctoral Universities: Very High Research Activity	Social Science Data and Sociology Librarian	2017-04	
University of Chicago	Doctoral Universities: Very High Research Activity	Data Research Services and Biomedical Librarian	2017-04	
University of Colorado Boulder	Doctoral Universities: Very High Research Activity	Data Services Librarian	2017-07	

University of Florida	Doctoral Universities: Very High Research Activity	Data Management Librarian	2015-04	
University of Houston	Doctoral Universities: Very High Research Activity	Social Science Data Librarian	2014-03	
University of Houston	Doctoral Universities: Very High Research Activity	Data Services Librarian	2016-11	
University of Houston	Doctoral Universities: Very High Research Activity	Research Data Management Librarian	2018-05	
University of Illinois Urbana-Champaign	Doctoral Universities: Very High Research Activity	Director, Research Data Service and Open-Rank Professor	2013-10	
University of Illinois Urbana-Champaign	Doctoral Universities: Very High Research Activity	Data Curation Specialist	2014-11	This posting was for two positions
University of Iowa	Doctoral Universities: Very High Research Activity	Data Services Manager	2017-02	
University of Kansas	Doctoral Universities: Very High Research Activity	Data Services Librarian	2013-06	
University of Maryland	Doctoral Universities: Very High Research Activity	Data Services Librarian	2017-01	
University of Maryland	Doctoral Universities: Very High Research Activity	Data Services Librarian	2018-07	
University of Massachusetts Amherst	Doctoral Universities: Very High Research Activity	Data Services Librarian	2017-05	
University of Miami	Doctoral Universities: Very High Research Activity	Data Services Librarian	2016-09	
University of Michigan	Doctoral Universities: Very High Research Activity	Data Workflows Specialist	2017-01	
University of Michigan	Doctoral Universities: Very High Research Activity	Research Data Curation Librarian	2014-11	
University of Michigan	Doctoral Universities: Very High Research Activity	Research Data Services Manager	2013-12	
University of Michigan	Doctoral Universities: Very High Research Activity	Data Curation Librarian	2017-07	
University of Michigan	Doctoral Universities: Very High Research Activity	Health Sciences Data Services Informationist	2015-11	
University of Minnesota	Doctoral Universities: Very High Research Activity	Biosciences Liaison Librarian and Scientific Data Curator	2017-06	
University of Minnesota	Doctoral Universities: Very High Research Activity	Informatics/Data Services Specialist	2013-06	
University of Minnesota	Doctoral Universities: Very High Research Activity	Public Health Liaison and Data Curation Specialist	2015-10	
University of Nebraska - Lincoln	Doctoral Universities: Very High Research Activity	Data Curation Librarian	2016-08	

University of Nebraska - Lincoln	Doctoral Universities: Very High Research Activity	Data Curation Librarian	2013-12	
University of Nevada Las Vegas	Doctoral Universities: High Research Activity	Social Sciences Data Librarian	2014-08	
University of New Hampshire	Doctoral Universities: Very High Research Activity	Business and Data Reference Librarian	2015-03	
University of New Hampshire	Doctoral Universities: Very High Research Activity	Research Data Services Librarian	2018-01	
University of New Mexico	Doctoral Universities: Very High Research Activity	Director of Research Data Services	2013-12	
University of New Mexico	Doctoral Universities: Very High Research Activity	Data Curation Librarian	2017-07	
University of North Carolina at Chapel Hill	Doctoral Universities: Very High Research Activity	Repository Librarian	2015-04	
University of North Carolina at Greensboro	Doctoral Universities: High Research Activity	Research and Data Support Coordinator	2013-10	
University of North Carolina Wilmington	Doctoral Universities: High Research Activity	Digital Program and Data Management Librarian	2013-03	
University of Notre Dame	Doctoral Universities: Very High Research Activity	Digital Library Data Curation Developer	2015-07	
University of Pennsylvania	Doctoral Universities: Very High Research Activity	Business & Data Analysis Librarian	2018-04	
University of Pennsylvania	Doctoral Universities: Very High Research Activity	Scholarly Communications & Data Curation Librarian	2016-03	
University of Pittsburgh	Doctoral Universities: Very High Research Activity	Data Services Librarian	2017-07	
University of Pittsburgh	Doctoral Universities: Very High Research Activity	Data Curation Librarian	2018-06	
University of Rhode Island	Doctoral Universities: High Research Activity	Data Services Librarian	2016-05	
University of Rochester	Doctoral Universities: Very High Research Activity	Science & Engineering Outreach Librarian (Data)	2018-01	
University of Tennessee	Doctoral Universities: Very High Research Activity	Data Curation Librarian	2013-03	
University of Texas at Arlington	Doctoral Universities: Very High Research Activity	Data & eScience Librarian	2014-12	

University of Texas at Arlington	Doctoral Universities: Very High Research Activity	Social Sciences Data Librarian	2014-11	
University of Texas at Austin	Doctoral Universities: Very High Research Activity	Data Management Coordinator	2015-09	
University of Vermont	Doctoral Universities: High Research Activity	Science and Data Librarian	2017-02	
University of Virginia	Doctoral Universities: Very High Research Activity	Senior Research Data Scientist	2014-05	
University of Virginia	Doctoral Universities: Very High Research Activity	Data and Geographical Information Librarian	2013-01	
University of Virginia	Doctoral Universities: Very High Research Activity	Research Data Specialist	2017-02	
University of Virginia	Doctoral Universities: Very High Research Activity	Clinical Data Research Specialist	2017-02	
University of Washington	Doctoral Universities: Very High Research Activity	Data Management Librarian	2015-05	
University of Wisconsin Madison	Doctoral Universities: Very High Research Activity	Science & Engineering Data & Information Specialist	2018-04	This posting was for two positions
University of Wisconsin Madison	Doctoral Universities: Very High Research Activity	Digital Curation Coordinator	2017-06	
University of Wisconsin Milwaukee	Doctoral Universities: Very High Research Activity	Data Services Librarian	2013-07	
Upstate Medical University	Special Focus Four-Year: Medical Schools & Centers	Data Services Librarian	2018-05	
Vanderbilt University	Doctoral Universities: Very High Research Activity	Business and Data Analysis Librarian	2016-12	
Vassar College	Baccalaureate Colleges: Arts & Sciences Focus	Social Sciences and Data Librarian	2016-03	
Villanova University	Doctoral Universities: High Research Activity	Social Sciences and Data Services Librarian	2015-12	
Virginia Commonwealth University	Doctoral Universities: Very High Research Activity	Research Data Librarian	2017-05	
Virginia Polytechnic Institute and State University	Doctoral Universities: Very High Research Activity	Data and Informatics Consultant	2013-12	
Virginia Polytechnic Institute and State University	Doctoral Universities: Very High Research Activity	Social Science Data Consultant & Data Educator Coordinator	2017-04	

Virginia Polytechnic Institute and State University	Doctoral Universities: Very High Research Activity	Research Data Consultant	2014-05	
Washington University in St. Louis	Doctoral Universities: Very High Research Activity	Data Specialist	2015-04	
Western Michigan University	Doctoral Universities: High Research Activity	Data Librarian	2018-02	
Yale University	Doctoral Universities: Very High Research Activity	Data Librarian	2017-11	
Yale University	Doctoral Universities: Very High Research Activity	Data Librarian for the Health Sciences	2018-03	
Yale University	Doctoral Universities: Very High Research Activity	Research Data Support Specialist	2016-07	
Yale University	Doctoral Universities: Very High Research Activity	Librarian for Finance, Accounting & Business Data	2018-04	

Appendix B
Codebook

	Variable	Attributes							
Education, experience, and salary									
	MLIS degree	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Equivalent degree	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Equivalent degree level*	Not applicable	Bachelor's	Master's	Doctorate	Advanced	Not specified		
	Equivalent degree discipline(s)*	Not applicable	Arts & Humanities	Social Sciences	STEM	Data Intensive/Data Science	Business	Relevant	Not specified
	Academic library experience	No	1-2 years	3-5 years	5+ years	Length not specified			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Research data experience	No	1-2 years	3-5 years	5+ years	Length not specified			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Supervisory experience	No	1-2 years	3-5 years	5+ years	Length not specified			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Additional experience or degree	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Additional degree level*	Not applicable	Bachelor's	Master's	Doctorate or PhD	Advanced			
	[Discipline of additional degree*]	Not applicable	Arts & Humanities	Social Sciences	STEM	Data Intensive, Data Science, and others.	Business	Relevant	Not specified

	Additional experience*	Not applicable	Significant coursework or academic background	Subject knowledge	Lab or research experience	Other, specify: [free text]			
	Carnegie Classification of Institution	Baccalaureate	Master's	Doctoral	Special Focus				
	[For doctoral institutions, specify the research intensity level]	Not applicable	Very high	High	Doctoral/Professional				
	Salary information*	Not applicable	Commensurate	Competitive	Other, specify: [free text]				
	Salary range or minimum	Not applicable	[Exact salary values]						
Research Data Activities									
Management									
	General Data Management	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Data Management Plans	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
Discovery and Re-Use									
	Data Discovery	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
Collection									
	Data Organization	Not applicable	Implied	Familiarity	Knowledge	Experienced			

	[Location in job posting]	Not applicable	Description	Respon.	preferred Qual.	Required Qual.			
	Data Documentation	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
Storage									
	Data Storage	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Data Security	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
Analysis									
	Data Visualization	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	General Data Analysis	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Statistical Data Analysis	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Spatial Data Analysis	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			

	Qualitative Data Analysis	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Programming Languages	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	[List programming languages]	Not applicable	[List programming languages]						
Sharing									
	Data Sharing	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
Preservation									
	Data Repository	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Data Curation	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
Other									
	Data Policy	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
Other Responsibilities or Skills									
	Instruction	Not applicable	Implied	Familiarity	Knowledge	Experienced			

	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Consultation	Not applicable	Implied	Familiarity	Knowledge	Experienced			
	[Location in job posting]	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Public/customer service perspective	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Faculty status	No	Yes						
	Tenure requirement	No	Yes						
	Research/Publishing requirement	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Liaison to department	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	[Whether depts. are listed]	Depts. as assigned	Specific depts. listed	Not applicable					
	[List all depts. specified]	Not applicable	[List specific depts.]						
	Research data role focused on specific discipline(s)	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	[Whether disciplines are listed]	Disciplines as assigned	Specific discipline listed	Not applicable					
	[List all disciplines specified]	Not applicable	[List specific disciplines]						
	Assessment	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Scholarly Communication	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Outreach	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			
	Collaboration with other campus units	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			

	Diversity, equity, inclusion and accessibility	Not applicable	Description	Respon.	Preferred Qual.	Required Qual.			

NOTES
* = select all attributes that apply

Synonyms for attributes
- Doctorate = terminal
- Advanced = graduate, professional
- Knowledge = understanding, competent, competence
- Experience = ability, demonstrated ability, aptitude
- Relevant = related, appropriate, comparable
- Commensurate = dependent

Hierarchy for location
- Required qual > Preferred qual > Responsibilities > Description

Operational Definitions

	Variable	Definition	When to Use	When NOT to Use	How to Use	Definition source
Experience, education and salary						
	MLIS degree	Master's of Library or Information Science degree (often abbreviated MLIS, MLS, MSI, and others)	Any reference of a Master's degree in Library and Information Science	Graduate degree other than a MLIS (or equivalent); Undergraduate degree(s)	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Equivalent degree	A degree (besides a MLIS) that provides a relevant educational background	If phase like "equivalent degree" is used to describe the educational background needed for the position	Additional graduate degree or undergraduate degree; MLIS degree	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--

	Equivalent degree level(s)	The level of an equivalent degree that provides a relevant educational background	If the level of the degree is specified in the phase "equivalent degree"	Additional graduate degree or undergraduate degree; MLIS degree	Code level of degree: Not applicable, Bachelor's, Master's, Doctorate, Advanced, Not specified	--
	Equivalent degree discipline(s)	The discipline of the degree (besides a MLIS) that provides a relevant educational background	If the discipline of the degree is specified in the phase "equivalent degree"	Additional graduate degree or undergraduate degree; MLIS degree	Code for all disciplines specified: Not applicable, Arts & Humanities, Social Sciences, STEM, Data Intensive/Data Science, Business, Relevant, Not specified	--
	Academic library experience	Experience working in an academic library	Any experience working in an academic library (including work as a student)	Experience working in any setting outside of an academic library	1) Code the length of experience (# of years) or length not specified (if not stated, code "No"); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Research data experience	Professional experience working with research data, either inside or outside of a library context	Work experience relating to any aspect of the research data lifecycle, either in an academic library or outside (i.e., experience as a researcher)	Professional experience working in any other area (either inside or outside of a library); supervisory experience	1) Code the length of experience (# of years) or length not specified (if not stated, code "No"); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--

	Supervisory experience	Professional experience working as a supervisor or manager	Supervisory or managerial experience	Other types of experience	1) Code the length of experience (# of years) or length not specified (if not stated, code "No"); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Additional degree	Experience or degree (undergraduate or graduate) mentioned in addition to the MLIS or equivalent degree	Experience or degree (undergraduate or graduate) mentioned in addition to the MLIS or equivalent degree	MLIS degree; equivalent degree	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Additional degree level	Level of degree (undergraduate or graduate) in any discipline other than library and information science	Level of degree (undergraduate or graduate) in any discipline other than library and information science	MLIS degree; equivalent degree	1) Code level of degree: Not applicable, Bachelor's, Master's, Doctorate or PhD, Advanced; 2) Code for all disciplines specified: Not applicable, Arts & Humanities, Social Sciences, STEM, Data Intensive/Data Science, Business, Relevant, Not specified	--
	Additional experience	Additional types of academic or professional experience	Additional types of academic or professional experience	Any mentions of degrees	Code for all experiences specified: Not applicable, Significant coursework or academic background, Subject knowledge, Lab or research experience, other, specify: [free text]	--

	Carnegie Classification of Institution	The Carnegie Classification of the institution which can be found at: http://carnegieclassifications.iu.edu/classification_descriptions/basic.php	Identify name of the posting institution and then look up the Carnegie Classification on this website: http://carnegieclassifications.iu.edu/classification_descriptions/basic.php	--	1) Code this classification by looking up the institution's name on this website: http://carnegieclassifications.iu.edu/classification_descriptions/basic.php; 2) Code the level of research activity for Doctoral-granting universities or Not applicable	--
	Salary information	Salary information listed in the job posting	Description of salary information such as "competitive" or "commensurate"	Numerical salary values; Description of any benefits	Code the salary descriptors used: commensurate, competitive, other, specify: [free text]	--
	Salary range or minimum	Numerical salary values given	Exact numerical salary values given (minimum, maximum, range, and others)	Salary descriptors such as "competitive" or "commensurate"; descriptions of any benefits	Code exact salary values given (the salary range or minimum) or Not applicable	--
Research Data Activities						
Management						
	Data Management	Process of controlling & managing data, and its associated actions, created during planning and acquisition phases of observation and research	Any reference to the term "data management" or the actions associated with data management	Data management plans or other data plans (data sharing plans, data security plans, and others)	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	Adapted from RDA Term Definition Tool

	Data Management Plans	A formal statement describing how research data will be managed and documented throughout a research project and the terms regarding the subsequent deposit of the data with a data repository for long-term management and preservation	Any reference to data management plans, DMPs, data sharing plans or any other type of written data plan required for a grant application	Data management	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	CASRAI Dictionary: Research Data Domain
Discovery and Re-Use						
	Data Discovery	Process of query or search to find (research) data of interest	Any reference to locating, discovering or re-using existing datasets (including research data, reference data, government data, and others). Other terms could include data access and data identification	--	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	RDA Term Definition Tool
Collection						
	Data Organization	Process of creating a logical system for storing data files and folders	Any reference to creating a data file organization system; Examples of organization technique: file naming conventions and file structures	--	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required	--

					qualifications, preferred qualifications, responsibilities, description)	
	Data Documentation	The metadata or information about a data product (e.g., data table, database) that enables one to understand and use the data. Such information may include the scientific context underlying the data as well as who collected the data, why the data were collected, and where, when, and how the data were collected; Metadata: data about data, data that defines and describes the characteristics of other data	Any reference to creating documentation (print or electronic format) about data or documenting data (including metadata and metadata standards); Reference to cleaning or cleansing research data prior to sharing, publishing, and others; Other terms: data quality	--	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	Definition of metadata: CASRAI Dictionary Research Data Domain; Definition of documentation: DataONE Best Practices Primer
Storage						
	Data Storage	Recording of data on a storage media	Any reference to how and where to store data, including storage media, storage locations, storage hardware or storage devices	Data preservation	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications,	--

					responsibilities, description)	
	Data Security	Measures taken to protect data from unauthorized access, change, destruction, or other threats	Any reference to data security, preventing unauthorized access, and others.	De-identification of data	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	Adapted from Society of American Archivists' definition
Analysis						
	Data Visualization	Visual representations of data	Any reference to data visualization or visualization software (such as Tableau, and others.)	--	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	General Data Analysis	Analyzing data to search for trends or patterns	Any reference to data analysis that DOES NOT specify one or more of the three specific types listed below; quantitative data analysis	Spatial, geospatial, GIS, statistical, or qualitative analysis	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required	--

					qualifications, preferred qualifications, responsibilities, description)	
	Statistical Data Analysis	Using statistics to analyze data for patterns and trends	Any reference to statistical analysis methods or tests; Common tests include ANOVA, Chi-square tests, T-tests, Factor Analysis and Cluster Analysis. References to common software packages (such as SAS, SPSS, and others)	Spatial, geospatial or GIS analysis	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Spatial Data Analysis	Type of geographical analysis which seeks to explain patterns of human behavior and its spatial expression in terms of mathematics and geometry, that is, locational analysis	Any reference to spatial analysis, geospatial, or GIS analysis; Mentions of using specific software such as ArcGIS	Statistical analysis	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	Dartmouth Libraries Geospatial Information Systems research guide
	Qualitative Data Analysis	The identification, examination, and interpretation of patterns and themes in textual data and determining how these patterns and themes help answer the	Any reference to qualitative data analysis, including text mining; Mentions of qualitative analysis software such as NVivo, Dedoose, ATLAS.ti, and others.	Any analysis of quantitative data (statistical or spatial)	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred	Pell Institute Evaluation Tool Kit: Analyzing Qualitative Data

		research questions at hand			qualifications, responsibilities, description)	
	Programming Languages	If the position needs to know one or more computer programming languages (Python, C, Java, HTML, and others)	Specific programming language(s) are mentioned	Providing programming for the campus community (i.e., planning events)	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description); 3) List the specific programming languages mentioned (if none, use "Not applicable")	--
Sharing						
	Data Sharing	The practice of making data available for discovery and reuse. This may be done, for example, by depositing the data in a repository or through data publication	Any reference to sharing or publishing research data (outside of a research team) through a variety of possible avenues (data repository, data journal, and others); Mention on assigning persistent identifiers (PURLs, DOIs, and others). Other terms include data publishing and data dissemination	Sharing within a research group or collaboration	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	CASRAI Dictionary: Research Data Domain

Preservation						
	Data Repository	A digital archive that provides services for the storage and retrieval of digital content	Any reference to using, creating, facilitating, and others. A data repository or data archive; other terms could include collecting datasets	--	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	Data Curation Network: Data Curation Terms and Activities Report
	Data Curation	The encompassing work and actions taken by curators of a data repository in order to provide meaningful and enduring access to data. These activities include ingest, appraisal, curation, access and preservation	Any reference to data curation, curating research data or related data curation activities; Other term: data curator	--	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	Data Curation Network: Data Curation Terms and Activities Report
Other						
	Data Policy	An organization's stated data/information management processes designed to assist and protect research data assets	Any reference to data policies (a library's policies, university's policies, funder policies, and others) including data management plan policies, deposit policies, intellectual property policies, data	--	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications,	Adapted from RDA Term Definition Tool

			curation policies, and others		responsibilities, description)	
Other Responsibilities or Skills						
	Instruction	Teaching (online or in-person) researchers about any research data management activities (including the variables listed in the Research Data Activities section of this codebook)	Reference to teaching (in-person or online) sessions, workshops, courses, and others on research data management; Creating or maintaining tutorials, online modules, and others for asynchronous instruction	Instruction for liaison, scholarly communication or other non-research data roles/responsibilities	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Data Consultation	A meeting in which a data librarian or research data staff and patron discuss research data management issues and potential solutions	Any reference to providing consultations or reference interactions for patrons to discuss research data management issues	--	1) Code degree of complexity sought for this variable (Not applicable, implied, familiarity, knowledge, experienced); 2) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Public/customer service perspective	Mindset focused on providing high quality public/ customer service	Description of a mindset focused on providing high quality public/ customer service	--	Code where it occurs in the job posting (required qualifications, preferred qualifications,	--

					responsibilities, description)	
	Faculty status	The position has faculty status at the institution (as opposed to being staff, academic staff, and others)	Faculty status is mentioned	Tenure-track position	Code if this variable appears in the job posting (Yes, No)	--
	Tenure requirement	If this position is a tenure-track position at the institution	Tenure-track is mentioned	Status at the institution (faculty, staff, academic staff, and others)	Code if this variable appears in the job posting (Yes, No)	--
	Research/Publishing requirement	If the successful candidate needs to have a demonstrated record of research/publishing (books, book chapters, journal articles, and others) or they demonstrate the ability to do research/ publish in the future	Any mention that scholarly research/ publishing is a requirement of the position	Publishing data for patrons; need to know about current topics in scholarly communication	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Liaison to department	This position will serve as the library liaison to one or more departments or units at the institution, in addition to their research data responsibilities; provide reference/ research assistance, instruction, outreach, collection	Liaison activities or work are mentioned (either with or without naming specific departments or units that the position will be the liaison to)	Collaboration with other campus departments/ units; Research data role focused on specific disciplines	1) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description); 2) Whether specific departments are listed in the job posting (depts. as assigned, specific depts. listed, not applicable); 3) List the	--

		development, and others			specific depts (free text, not applicable)	
	Research data role focused on specific discipline(s)	This position focuses on the research data management needs of specific disciplines, schools, colleges, and others	This position focuses on the research data management needs of specific disciplines, schools, colleges, and others	Liaison to department; Collaboration with other campus departments/units	1) Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description); 2) Whether specific disciplines are listed in the job posting (depts. as assigned, specific depts. listed, not applicable); 3) List the specific disciplines (free text, not applicable)	--
	Assessment	If the position will be involved in assessment projects, relating to the research data responsibilities	Assessment is mentioned relating to research data responsibilities (such as assessment of patron satisfaction with the library's research data services)	Assessment activities related to responsibilities outside of research data responsibilities (such as service work, liaison work, and others)	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Scholarly Communication	If the position needs to know about the current landscape of scholarly communication	Mentions of knowing about scholarly communication	If the position required to publish	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--

	Outreach	If the position will be conducting outreach to the campus community (outside of the library) to advertise the library's research data services	Mention of outreach, marketing or advertising the library's research data services	Outreach for responsibilities outside of research data responsibilities (such as liaison activities)	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Collaboration with other campus units	If this position will collaborate with campus units outside of the library (such as IT, research office, Provost's office, and others) on research data projects	Collaboration with campus units outside of the library	Liaison duties to campus departments/units	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--
	Diversity, equity, inclusion and accessibility	If the applicant needs to know about and recognize the importance of these issues within a library or university	Any mention of applicant being committed or recognizing the importance of diversity, equity, inclusion, and accessibility (such as having to submit a Diversity Statement as part of the application or having a commitment to fostering these on campus)	Language about the university's commitment to diversity, equity, inclusion, and accessibility	Code where it occurs in the job posting (required qualifications, preferred qualifications, responsibilities, description)	--

Sources

Sources of some Variables	
Hall-Ellis (2005).	
Hall-Ellis (2006).	
Chen, H. L., & Zhang, Y. (2017). Educating data management professionals: A content analysis of job descriptions. The Journal of Academic Librarianship, 43(1), 18-24.	
Xia & Wang (2014).	
Indiana University. (2017). Institution Lookup. In *The Carnegie Classification of Institutions of Higher Education*. Retrieved from https://carnegieclassifications.iu.edu/lookup/lookup.php	
Sources of some Operational Definitions	
DataONE Best Practices Primer	https://www.dataone.org/sites/all/documents/DataONE_BP_Primer_020212.pdf
Research Data Alliance (RDA) Term Definition Tool	https://smw-rda.esc.rzg.mpg.de/index.php/Main_Page
CASRAI Dictionary Research Data Domain	http://dictionary.casrai.org/Category:Research_Data_Domain
Society of American Archivists Glossary	https://www2.archivists.org/glossary/terms
Dartmouth Libraries Geographical Information Systems research guide	https://researchguides.dartmouth.edu/gis/spatialanalysis
Pell Institute Evaluation Toolkit: Analyzing Qualitative Data	http://toolkit.pellinstitute.org/evaluation-guide/analyze/analyze-qualitative-data/
Data Curation Network: Data Curation Terms and Activities report	https://conservancy.umn.edu/bitstream/handle/11299/188638/DefinitionsofDataCurationActivities%20%281%29.pdf?sequence=1&isAllowed=y

Appendix C
Supplementary Table

Summary of mentions of 19 research data management activities: A) degree of complexity sought and B) location in the job posting.

A)

	Experience	Knowledge	Familiarity	Implied	Not applicable
General data management	58	31	10	55	26
Statistical data analysis	45	12	10	9	104
General data analysis	39	7	14	18	102
Data repository	34	32	17	38	59
Data curation	33	27	1	40	79
Data visualization	31	7	7	29	106
Data documentation	25	33	10	28	84
Spatial data analysis	24	10	7	5	134
Qualitative data analysis	21	3	7	5	144
Programming languages	21	3	7	5	144
Data management plans	18	13	5	40	104
Data discovery	13	11	6	67	83
Data sharing	7	7	7	64	95
Data policy	6	2	3	38	131
Data storage	2	6	1	22	149
Data organization	1	1	0	17	161
Data security	0	3	3	11	163

B)

	Required qualifications	Preferred qualifications	Responsibilities	Description	Not applicable
Data repository	51	32	33	5	59
Statistical data analysis	45	23	5	3	104
Data documentation	38	30	21	7	84
Programming languages	33	28	0	0	119
Data visualization	30	15	26	3	106
Data management plans	24	12	33	7	104
General data management	24	73	51	6	26
Spatial data analysis	24	17	3	2	134
General data analysis	18	42	15	3	102
Data curation	17	44	38	2	79
Qualitative data analysis	13	18	4	1	144
Data sharing	8	12	50	15	95
Data discovery	7	23	57	10	83
Data policy	6	5	31	7	131
Data security	3	3	8	3	163
Data storage	2	7	13	9	149
Data organization	0	2	6	11	161