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FAIR national election studies: How well are we doing?

Christina Eder¹ · Alexander Jedinger²

Abstract Election studies are an important data pillar in political and social science, as most political research investigations involve secondary use of existing datasets. Researchers depend on high-quality data because data quality determines the accuracy of the conclusions drawn from statistical analyses. We outline data reuse quality criteria pertaining to data accessibility, metadata provision, and data documentation using the FAIR Principles of research data management as a framework (Findability, Accessibility, Interoperability, and Reusability). We then investigate the extent to which a selection of election studies fulfils these criteria using studies from Western democracies. Our results reveal that although most election studies are easily accessible and well documented and that the overall level of data processing is satisfactory, some important deficits remain. Further analyses of technical documentation indicate that while a majority of election studies provide the necessary documents, there is still room for improvement.

Keywords Accessibility · Data · Documentation · Election studies · Findability · Interoperability · Research data management · Reusability

The reason to believe a scientist's claim is not because he or she wears a lab coat, have a Ph.D., or have published a widely viewed paper in the past. (...) A claim's perceived legitimacy is grounded in the fact that results are a product

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of publicly described processes that in turn are based on a stable and shared set of beliefs about how knowledge is produced. Such open access to the origins of others' claims is the hallmark of scientific ways of knowing" (Lupia and Elman 2014, p. 20).

Introduction

In recent years, the buzzwords "research transparency", "data quality and accessibility", and "research data management" have become hot topics. Beyond these phrases becoming part of the data archiving vernacular, social science researchers across disciplines have increasingly realized the extent to which access to high-quality, publicly available data is an asset. As computer capacities have steadily grown, allowing for more sophisticated and complicated statistical modelling, demands for high-quality data have grown alongside them. Political participation research within political science is no exception to this rule, as many studies on political participation reuse large-scale surveys or comparative datasets. These developments confirm the view of Gary King, who argued that "[p]olitical science is a community enterprise; the community of empirical political scientists needs access to the body of data necessary to replicate existing studies to understand, evaluate, and especially build on this work" (King 1995, p. 444).

Study data are disseminated by data archives, repositories of various kinds, and individual researchers.¹ To reuse data, researchers depend on data (and data documentation) quality because data quality is the foundation of credible statistical analyses and of the conclusions drawn from the results. A recent study by Faniel et al. (2016) found that data reusers' satisfaction is positively related to documentation quality. Through a comparative analysis of eighteen national election studies from Western democracies, we build on this work by investigating how these studies are distributed and documented. Specifically, we address the following research questions: are there criteria that are fulfilled by all studies regarding, for instance, data accessibility or the provision of the main documents and datasets in English? Are there gold standards set by one or several studies? What can we learn for the future?

Election studies were chosen due to their general importance to both social science and society. Voting is the most widespread mode of participation in the public sphere (Putnam 2000, p. 31); with their votes, people decide who represents them in national parliaments or other elected offices. Consequently, scientists employ election studies to analyse political behaviour, political attitudes, and numerous other

¹ As Box-Steffensmeier and Tate (1995) argued, making your data available for other scientists' research might be very unattractive given the resources necessary to collect and curate the data in the first place. In addition, "(...) little credit is given to those who produce datasets" (ibid: 472). Fortunately, this problem has been addressed by several initiatives striving to strengthen the connection among researchers, publications and data, for instance, DataCite, Dataverse, ORCID, the Data Citation Index, and data archives' terms and conditions that require users to properly cite the data they employ in their papers (see ICPSR, UK Data, and GESIS for examples).

related questions. The importance of these surveys can be empirically evaluated by examining the number of scientific publications. The bibliography of the American National Election Study (ANES), conducted since 1948, features more than 6500 entries. The much younger German counterpart of the ANES, the German Longitudinal Election Study (GLES), lists more than 700 bibliography entries since 2009. These examples show that election studies are an attractive data resource for researchers and that data quality, documentation and accessibility are thus relevant issues.

Data quality “cannot be assessed independent of the people who use data—data consumers” (Strong et al. 1997, p. 104). Wilkinson et al. (2016) published the *FAIR Guiding Principles for Scientific Data Management and Stewardship*, which soon gained momentum as a metric to judge the quality of data. In the present paper, we argue that the FAIR Principles form a sound basis for evaluating the quality of data and documentation. However, these principles still need to be adapted to derive concrete guidelines for data producers in the field of election studies. In the next section, we use these principles to develop a scheme to assess election studies’ accessibility, data, and documentation quality. The scheme is then transformed into a checklist and applied to eighteen national election studies to determine best practices. Finally, we outline our recommendations for election study representatives to ensure data and documentation quality.

Assessing the FAIRness of national election studies

“As quantitative social science expands, a serious attempt is at last being made to reduce the barriers between producers and users of large social science investments” (Kolsrud et al. 2007, p. 139). One example is the steps the European Union is taking towards “open science” through, amongst others, granting open access to publications written under the Horizon 2020 programme. In itself, the idea of “open science” (and its elements of open access, open methodology or open data) is not new, but with the Internet facilitating the exchange of ideas and bytes and machines able to process and link ever-growing types of information, the demand for access to existing (scientific) knowledge grows steadily.

A prerequisite to conducting research is an open and transparent data landscape; our use of “open” here reflects the view that merely making the data available is of little scientific value. Without information on how, why, where, when and by whom data were gathered, what the rows and columns in a dataset represent and what a certain value in specific cell means, a number in a dataset is just a number without context that is of little or no scientific use. Thus, an effective and “open” exchange of data means high-quality research data that meet the criteria of accessibility, meaningful metadata, easy-to-use datasets and comprehensible documentation, or, as FAIR describes, the Findability, Accessibility, Interoperability, and Reusability of data (and documents).

Wilkinson et al. (2016, p. 4) argue that “elements of the FAIR Principles are related, but independent and separable. The Principles define characteristics that contemporary data resources, tools, vocabularies and infrastructures should exhibit

to assist discovery and reuse by third-parties. By minimally defining each guiding principle, the barrier-to-entry for data producers, publishers and stewards who wish to make their data holdings FAIR is purposely maintained as low as possible.” By keeping the barrier to entry low, Wilkinson et al. (2016) forego in-depth operationalizations of their four principles. Furthermore, the document uses rather technical and abstract language that might not appeal to the average social scientist. In addition, the principles are relatively new, and we have not observed many use cases from social sciences, yet the idea of “FAIR data” entered our world through, for instance, archives and repositories that adopted them into their services. One potential obstacle to implementing the FAIR Principles in the work routines of researchers is that the principles were developed with more or less professional research infrastructures in mind. Accordingly, the focus of the formulation was the machine-readability of metadata. Elements of the FAIR Principles might consequently be of more or less relevance to different actors in academia, but in general, they are more directly relevant to principal investigators and secondary users² than other guidelines³; therefore, we used them as our basis for evaluation.

As mentioned above, the FAIR Principles emphasize Findability, Accessibility, Interoperability, and Reusability. For our purpose (to wit, assessing national election studies in the light of these principles), we “customized” the FAIR elements and adapted them to better reflect the views and needs of principal investigators carrying out election studies and secondary users employing these data for their research. We introduce each principle and present our operationalization’s and measurements. The metrics are worded to evaluate whether a study possesses the characteristic, such that a “1” indicates that the respective criterion is fulfilled, while a “0” means that there is room for improvement. In some cases, we score a study “0.5” when we determine that the criterion is partly fulfilled. If a criterion is not applicable, we code it “– 1”.

Findability

For the principle of Findability, we concentrate on the list depicted in Table 1. In a general sense, to be findable means that data and descriptive metadata⁴ are

² Researchers not involved in the primary data collection but who use the data for secondary analyses.

³ Another set of criteria are the “OECD Principles and Guidelines for Access to Research Data From Public Funding”, with data quality being one of the thirteen principles. As criteria for judging the quality of data, the OECD lists adherence to data quality standards, access arrangements, metadata, documentation requirements, and citation practices (OECD 2007, p. 19f). Although some of these aspects might apply to researchers directly, others are more relevant for data repositories or even policy makers. Therefore, the criteria are very broad and cover more issues than the FAIR Principles (e.g. intellectual property rights and other legal issues). The FAIR Principles, on the other hand, were developed by a diverse group of stakeholders who wanted to establish “a guideline for those wishing to enhance the reusability of their data holdings” by placing a “specific emphasis on enhancing the ability of machines to automatically find and use the data, in addition to supporting its reuse by individuals” (Wilkinson et al. 2016, p. 1). Thus, we opted to use the FAIR Principles as guidelines to assess the quality of election study documentation.

⁴ “Metadata” as used by Wilkinson et al. (2016) is in itself a rather broad term; therefore, we deal with election studies’ metadata in more specific terms below.

Table 1 Findability
criterion: concept and
metrics

Criterion	Coding
<i>Findability</i>	
Provided via data archive?	0 = no, 1 = yes
Persistent identifier (DOI/URN)?	0 = no, 1 = yes
Study ID available?	0 = no, 1 = yes
Versioning?	0 = no, 1 = yes
Is information on errata potentially available?	0 = no, 1 = yes
Findable through search engine?	0 = no, 1 = yes
Own webpage?	0 = no, 1 = yes
Is a citation recommendation provided?	0 = no, 1 = yes

easily discovered by humans and computers (Wilkinson et al. 2016, p. 4). The authors therefore stress the importance of assigning “globally unique and persistent identifier[s]” to the data (Wilkinson et al. 2016, p. 4). This recommendation is supported by Gertler and Bullock (2017), who find that hyperlinks to individual websites holding data cited in American Political Science Review (APSR) articles are often not functional. These authors therefore recommend that scholars “archive their original data and related materials in trustworthy digital repositories” (Gertler and Bullock 2017, p. 168) and use persistent digital identifiers to avoid the problem of broken links. Whether datasets hold a Digital Object Identifier (DOI)⁵ or a Uniform Resource Name (URN) is thus included in our assessment (see Table 1 for a full list). Furthermore, we record whether the respective study features an “internal” ID received from the dissemination agent that allows the identification of the dataset in the catalogue of an archive or repository. Together with the DOI/URN and/or study ID, information about the version of the dataset in service should be provided so a secondary user can be certain whether or not she is working with the most recent version. A list of errata is a logical supplement, as it provides users with information on changes between dataset versions.

Findability also means that using a search engine or a national election study’s website and/or accessing the studies deposited in the nation’s data archive or a repository should be possible.⁶ We assessed whether it is possible to find the study online by measuring the following observations: does a webpage exist that contains relevant information providing researchers with a first impression of, for instance, the study’s scope, target population, or sampling method? Does the website belong to a project, an individual or an organization? Are data and documents provided through this project website or a website tied to a person or disseminated through a data archive or repository?

⁵ www.doi.org.

⁶ As these programs usually involve several principal investigators, provision via an individual’s website is a rare occurrence.

Table 2 Accessibility criterion: concept and metrics

Criterion	Coding
<i>Accessibility</i>	
Document access without registration?	0 = no, 1 = yes
Data access without registration?	0 = no, 1 = yes
Registration easy and free of charge?	0 = no, 1 = yes, -1 = not applicable (registration not mandatory)
Data download option?	0 = no, 1 = yes
Provision free of charge?	0 = no, 1 = yes
Are there variables excluded from the PUF?	0 = no, 1 = yes
Can they be obtained by the researcher?	0 = no, 1 = yes
Are data provided in major formats (Stata and SPSS)?	0 = no, 0.5 = partly, 1 = yes
Are questionnaires available in English?	0 = no, 1 = yes
Are study reports (field report, methods description, information on errata, etc.) available in English?	0 = no, 1 = yes
Is a codebook available in English?	0 = no, 1 = yes

Research data should be adequately cited to promote the localization of data and the reproducibility of results and to give credit to principal investigators. For this purpose, it is helpful to provide users with a recommendation for the correct citation of the data. By obtaining a permanent identifier such as a DOI or URN, election studies can be easily cited and referenced. This practice increases the incentive to share data with other researchers within the scientific community; hence, researchers are asked by some professional journals and organizations to cite the datasets used (Carsey 2014; Lupia and Elman 2014). This aspect is emphasized when a citation recommendation is provided with the dataset.

Accessibility

Accessibility refers to the ease with which data and descriptive metadata are available and can be downloaded by humans and computers. Furthermore, data should be stored for the long term to allow stable access in the future. For principal investigators and secondary social sciences users, questions of how to access documents and data are of great importance; however, access is, in many cases, less a question of technical protocols and more a question of existing legislation, registration, download options and fees, so we adapted the principle accordingly (see Table 2).

In some countries, gathering, supplying and working with survey data is subject to diverse ethical and legal boundaries. As survey data often include individual-level information regarded as particularly sensitive by data protection laws, researchers and data service providers navigate among the greatest possible openness of research data, the legitimate interests of data depositors, and data protection requirements. Some solutions for complying with these restrictions include providing public use files (PUFs) with the critical information (e.g. ZIP codes, verbatim answers)

removed and housing the full dataset in a secure data access infrastructure. In any case, data users should be informed as to whether and why certain information may not be made freely available or may be used only if certain conditions are met.

The second hurdle is whether researchers can easily gain access to the data and documentation: can both the datasets and their documentation be downloaded without restrictions, or is registration required? If registration is required, how quick and easy is it? Do charges apply for registering? Do charges apply for downloading data and/or documents? Are direct download options provided, or do datasets and documents have to be ordered by mail?

Making the available research data as easy to use as possible is the most important criterion. Yet, dataset quality depends on how well the dataset is prepared. As a minimum requirement, the data must be fully labelled, and all missing values should be defined. The data should also be provided for users in the most common statistical analysis software formats (e.g. Stata, SPSS). To ensure the comprehensibility of the data for secondary users in an international environment, the relevant documentation materials should be made available in English and should include the following components: (a) a codebook, (b) the complete survey instruments, and (c) a methodological report.

Interoperability

Interoperability refers to how easily structured metadata on methodological aspects can be exchanged (Wilkinson et al. 2016). The category thus pertains to the accompanying metadata and documentation quality of election studies. Metadata are “data about data” and should provide scientifically relevant information on the study and its data. As such, structured metadata are an indicator of data quality. Structured metadata mean that methodological aspects of the study are prepared according to a standardized scheme. This information should be provided in a repository’s data catalogue or be documented and provided with the data to help researchers determine a study’s usefulness for their own research projects. Ideally, a formal metadata schema is used that allows this information to be shared among different data-holding institutions. There are various metadata standards for different purposes, for instance, DataCite.⁷ Regardless of the specific scheme employed, election study metadata should include, at minimum, information on principal investigator(s), geographic coverage, target population, sampling, mode of data collection, survey organization, and date(s) of collection and condensed information on survey content (see Table 3).

Data analysis potential is determined by, among other things, the data’s capability for data linkage. Can the election study data be enriched with additional information and/or merged with other studies? Examples of additional information include administrative and socio-economic macro data (e.g. constituency results, economic indicators), paradata about respondent behaviour that were obtained during the survey, media data (e.g. a campaign content analysis), and social media data.

⁷ www.datacite.org.

Table 3 Interoperability criterion: concept and metrics

Criterion	Coding
<i>Interoperability</i>	
Information on primary investigators provided?	0 = no, 1 = yes
Information on funding provided?	0 = no, 1 = yes
Information on population provided?	0 = no, 1 = yes
Information on geographic coverage provided?	0 = no, 1 = yes
Information on target population provided?	0 = no, 1 = yes
Information on sampling frame provided?	0 = no, 1 = yes
Information on sampling procedure(s) provided?	0 = no, 1 = yes
Information on sample size provided?	0 = no, 1 = yes
Information on mode of data collection provided?	0 = no, 1 = yes
Information on date of data collection provided?	0 = no, 1 = yes
Information on data collector provided?	0 = no, 1 = yes
Is the study part of a larger comparative survey collection (across several countries)?	0 = no, 1 = yes
Is the study part of a larger longitudinal survey collection (across several elections)?	0 = no, 1 = yes

Ideally, data from larger projects can be linked horizontally with other data from the same project and to predecessors over time, for example, as cumulative trend files. Another question is whether the study is part of a larger longitudinal survey collection (i.e. across several elections) and/or comparative survey collection (e.g. the Comparative Study of Electoral Systems, CSES). While not a prerequisite, this information considerably improves the potential of the data for reuse.

Reusability

Reusability relates to the quality of unstructured metadata (Wilkinson et al. 2016). The category evaluates how well a study meets the basic requirements of survey *data processing*. Data preparation, often the first step in data processing, includes cleansing and editing the data (including assigning unique respondent IDs), assigning variable and value labels, and defining missing values (ICPSR 2012; Vardigan and Granda 2010). Another basic data quality measure is whether the data contain wild codes (e.g. a value of 3 for a gender variable that is defined as 1 = female and 2 = male) or out-of-range values (e.g. a value of 7 on a scale that ranges from 1 to 5). Since many electoral surveys are based on complex sampling designs or feature over-/undersampling of specific subpopulations, the dataset should also contain appropriate and clearly denoted and described weighting variables.

Election data are reusable only when the data are interpretable and the process by which the data were generated is comprehensible. To be reusable, details about the study's methodology should be well described, and the data should be free of errors. In addition to providing the research data, data-holding institutions should include extensive documentation such as methodology reports, copies of questionnaires, and codebooks (see also Vardigan and Granda 2010). A methodological

Table 4 Reusability criterion: concept and metrics

Criterion	Coding
<i>Reuseability</i>	
Are unique respondent numbers (id's) available?	0 = no, 1 = yes
Are the data free of wild codes and out-of-range values?	0 = no, 0.5 = partly, yes = no
Registration easy and free of charge?	0 = no, 0.5 = partly, 1 = yes
Are variables labels assigned?	0 = no, 0.5 = partly, 1 = yes
Are value labels assigned?	0 = no, 0.5 = partly, 1 = yes
Are missing values defined?	0 = no, 0.5 = partly, 1 = yes
Are weighting factors documented?	0 = no, 0.5 = partly, 1 = yes, -1 = not applicable (no weights)

report (also known as field report or technical report) provides detailed information about the target population, sampling design, data collection modes, response rates, and weighting procedures of the survey. A codebook is a document in which all variables and their values are named (variable names, variable labels, and value labels), filters and missing values are defined and comments on the variables are included. Ideally, the codebook provides an overview of all variables contained in a dataset, sorted by theme. If the dataset contains derived variables, new variables calculated from variables in the dataset, their construction should be documented in a way that allows for replication. The codebook may also include weighted/unweighted marginal distributions and descriptive statistics. Special survey instruments and scales and their sources should be documented, and the same is true for any additional data such as paradata, interviewer observations, interviewer characteristics, aggregate data, administrative data, and so on. The questionnaire documentation should include the original questionnaire used during the fieldwork period, advance letters, show cards, consent forms and any other relevant material. Taken together, the documentation should enable researchers to assess the relevance of the survey data for their own research questions and the reuse potential of the data.

Coding the FAIRness of election studies

The checklists presented in Tables 1, 2, 3 and 4 were applied to eighteen largescale election studies from the Western democracies listed in Table 5. All studies under analysis cover national elections; are conducted primarily for academic purposes, which means that at least one principal investigator holds a professorship at a public university and/or that a university/a university's institute is part of the study's consortium; have been conducted for at least two consecutive legislative terms; and sample the whole voting population. In addition, the data the studies produce have (also) been used for scientific analyses and publications. The studies included in our inspection cover most of the Western world, Europe as well as Northern America and the Pacific, and differ greatly in regard to "study age". Some fulfil only the minimum criterion of covering at least two elections;

Table 5 National Election Studies under analysis (alphabetical order)

Study title	Acronym	Conducted since
American National Election Studies	ANES	1948
Australian Election Study	AES	1987
Austrian National Election Studies	AUTNES	2008
Belgian National Election Study	BNES	1991
British Election Study	BES	1964
Canadian Election Study	CES	1965
Danish National Election Study	DNES*	1971
Dutch Parliamentary Election Study	DPES	1971
Estonian National Election Study	ENES	2003
Finnish National Election Study	FNES*	2003
German Longitudinal Election Study	GLES	2009
Hellenic National Election Studies	ELNES	2009
Italian National Election Study	ITANES	2007
Icelandic National Election Study	ICENES	1983
New Zealand Election Study	NZES	1990
Norwegian Election Studies	NES*	1957
Swedish National Election Studies	SNES	1954
Swiss Electoral Studies	SELECTS	1995

Note: Information provided by the election's studies, either on their webpages or in related documents

*Acronym given by authors for the purpose of this paper

however, the ANES and the Swedish National Election Study (SNES) date back as far as the late 1940s/early 1950s. In some countries such as Germany, national election studies have been conducted for decades, but the GLES, as “the” national election study and coherent project, was introduced only in the late 2000s. Ireland and Portugal are excluded because they have provided no data for the last two elections. We also had to drop the French and Spanish election studies as we could not find the necessary general information in English.

For all studies listed in Table 5, we gathered the information necessary for our endeavour from the programmes' or repositories' websites and from the studies' documentation. In the case of contradictory information, we relied on the information provided in the documentation. Additionally, when data and documents were provided through several channels, as in the case of New Zealand, we referred to the source with the most recent data and chose the repository over the website. For the New Zealand Election Study (NZES), this meant that all information was coded from the New Zealand Social Science Data Service. We always downloaded the documentation and datasets to undergo the real world experience, and we went through the registration and data ordering processes when needed to gain first-hand impressions. Websites, documents, and datasets were then scanned for the information required to fill Tables 1, 2, 3, and 4 for each study, and the information was validated by an eight-eye principle. We subsequently coded the data as indicated above.

Table 6 Findability

Findability	Result (in %)
Provided via data archive?	83
Persistent identifier (DOI/URN)?	67
Study ID available?	72
Versioning?	61
Errata available?	17
Findable through search engine?	100
Own webpage?	83
Citation recommendation?	50
Findability Index (0-8)	5.33
Note: $\alpha = 0.71$, $SD = 1.88$, $\min = 2.0$, $\max = 8.0$	

Data and documentation quality of election studies

Working our way through the checklists presented in Tables 1, 2, 3 and 4, we assess the FAIRness of the studies in general and highlight best practice models.⁸ Turning to our first criterion, findability, we obtain the following results (see Table 6).

Of the eighteen studies under analysis, fifteen provide the data through a data archive or repository, while three use other dissemination channels such as a project website. Ten studies feature persistent identifiers and versioning, all of which are provided through data archives. Two more studies have a DOI/URN but no information on dataset versions, and another study has versions but no persistent identifier. Only three studies offer information on errata between versions. All programmes are findable through online search engines. Three studies do not feature their own project webpage; in these cases, the information is provided through the website of the hosting institution (FORS in Switzerland, NSD in Norway) or the principal investigators' home institution (Institute for Social and Political Opinion Research at the KU Leuven in Belgium). The examined datasets do not appear to be well positioned to provide secondary users with citation support, as just nine of eighteen studies refer to a recommended citation.

In sum, the findability of most election studies is rather good. Constructing an additive index consisting of the eight criteria presented above, we obtain an overall mean of 5.3 ($SD = 1.88$), with three studies (the ANES, the Austrian National Election Study (AUTNES) and the GLES) reaching the maximum value of 8, two (the British Election Study (BES) and the Finnish National Election Study (FNES)) reaching the excellent value of 7, and four studies reaching the good value of 6 (the Australian Election Study (AES), the Hellenic National Election Study (ELNES), the NZES, and the SNES).

⁸ The data required to replicate all analyses in this article are available at the GESIS Data Archive for the Social Sciences, <http://dx.doi.org/10.7802/1761>.

Table 7 Accessibility

Accessibility	Result (in %)
Document access without registration?	83
Data access without registration?	22
Registration easy and free of charge?	56
Data download option?	78*
Provision free of charge?	94
Are there variables excluded from the PUF?	17
Can they be obtained by the researcher?	
Data provided in major formats (Stata and SPSS)?	67
Questionnaires available in English?	56
Study reports (field report, methods description, information on errata, etc.) available in English?	61
Codebook available in English?	67
Accessibility index (0–8)	5.44 ⁺

Note: *In six countries, there is no registration at all. + Index calculated without free of charge criterion. $\alpha = 0.64$, $SD = 1.79$, $min = 3.0$, $max = 9.0$

For our second criterion, accessibility, the picture is as follows (see Table 7): four of the eighteen studies cannot be downloaded directly but must be ordered through an online form, and the data are then delivered via mail or fileserver. In fourteen of eighteen cases, registration is mandatory for data access; here, the privacy regulations of the countries come into play. If registration is required to download data, it is most often free of charge for scientific purposes; however, in one case, this applies only to member institutions. The registration process can take minutes if completed via an online form or days in cases in which the information provided by the users is reviewed by the archive or repository. Data provision is free of charge for scientific purposes—with the one restriction to member institutions mentioned above. In fourteen cases, documents can be accessed without any restrictions.

Depending on the questionnaire and the country's privacy rules, there might be information that cannot be publicly distributed. This constraint might apply to verbatim answers, geographic information such as postal codes and addresses, or combinations of variables that allow for the relatively easy identification of individual survey participants. In these instances, the respective variables are dropped from the PUF and provided only after a separate contract is signed or via secure data access on-site or off-site. If variables are removed from the PUF for any reason, data users should be made aware of the removal; this seems to be the area with the most room for improvement, as in many cases, information about sensitive or disclosed information is not available or well hidden.

Twelve of the studies distribute their data in both Stata and SPSS, while the other six provide their data in at least one of the two formats (usually SPSS).

Conducting secondary research with election studies requires complete and transparent documentation of the survey methodology. Otherwise, it can be difficult for data users to assess the analytical potential and the quality of a dataset for their own

research. As shown in Table 7, ten studies provide documentation of the original questionnaire in English with their data. Given that the original wording and order of questions are key to understanding what is happening in the data, this is a rather low number.

During the design and implementation stages of a study, important methodological decisions are made that should be fully documented in a methodological or technical report to enable secondary users to assess the quality of the data collected. Eleven of the eighteen studies make this technical information fully available, though the depth and quality of the methodological reports vary widely. In a similar vein, only twelve of the studies provide a codebook for their datasets.⁹

Again, we construct an additive index¹⁰ indicating accessibility on a scale of 0–9. The mean index score is 5.44 (SD = 1.79). Most studies perform well on the first items: information and data are easy to find and obtain, dissemination mainly operates through stable and trustworthy channels, and very few monetary costs apply. However, there seems to be room for improvement in regard to providing information on variables omitted from the PUFs and on how to access variables in cases in which country-specific rules require restricting access to certain variables. Additionally, some studies could benefit from providing more extensive reports and codebooks to allow for easier assessment. The two studies performing best on the criterion of accessibility are the AES (value of 9) and the Canadian Election Study (CES, value of 8), followed by the ANES, the AUTNES and the Icelandic National Election Study (ICENES) with a value of 7 each.

The results for our third criterion, interoperability, are displayed in Table 8. The large majority of studies provide a full set of metadata, which is reflected in a metadata index value of 11.94 of 13 (SD = 1.51), and eight of the eighteen¹¹ studies reach the maximum value of 13: the ANES, the AUTNES, the BES, the FNES, the ELNES, the GLES, the Swiss Electoral Studies (SELECTS), and the SNES. This metadata can be found on the respective study's webpage, via data catalogue entries and/or in extra documents. Researchers can then easily evaluate whether the data fit their purposes with regard to target population, field period, sampling technique, etc. Additionally, these “data about data” allow for connecting principal investigators and field institutes with their work and thus permit the attribution of credit. In two cases, no information on funding is provided; in one case, we could not find information on the population, at least not on the English pages and documents; and in one case each, information on the coverage, sampling frame, date of data collection or the data collector is missing. The majority of the studies (fourteen of eighteen),

⁹ Some studies include short methodological descriptions in their codebooks. In this case, we coded both criteria as met.

¹⁰ Easy registration features six countries where the rules are non-applicable, as data protection laws do not require the restriction of access. Thus, we calculated two versions of the accessibility index, one with and one without the criterion. Here, we present the index without the criterion to cover all eighteen studies.

¹¹ For Italy, we could not locate information on coverage and sampling frame. This information may be available on the Italian version of the websites or from Italian documents, but it is not in the English versions. Thus, we coded both criteria as not met.

Table 8 Interoperability

Interoperability	Result (in %)
Information on primary investigators provided?	100
Information on funding provided?	89
Information on population provided?	94
Information on geographic coverage provided?	89
Information on target population provided?	94
Information on sampling frame provided?	89
Information on sampling procedure(s) provided?	94
Information on sample size provided?	100
Information on mode of data collection provided?	100
Information on date of data collection provided?	94
Information on data collector provided?	94
Is the study part of a larger comparative survey collection (across several countries)?	78
Is the study part of a larger longitudinal survey collection (across several elections)?	78
Interoperability index (0–13)	11.94
Note: $\alpha = 0.80$, SD = 1.51, min = 7.0, max = 13.0	

Table 9 Reusability

Reusability	Result (in %)
Are unique respondent numbers (id's) available?	94
Are the data free of wild codes and out-of-range values?	100
Are variables labels assigned in English?	83
Are value labels assigned in English?	83
Are missing values defined?	39
Are weighting factors documented?	61
Reusability index (0–5)	4.31 ⁺

Note: ⁺Index calculated without weighting documentation criterion. $\alpha = 0.57$, SD = 0.84, min = 2.0, max = 5.0

however, provide information on whether the study is part of a larger longitudinal survey collection (i.e. across several elections) and/or comparative survey collection (e.g. the CSES). Overall, the provision of metadata is very good, with very little need for improvement.

Table 9 presents the results for our final criterion, reusability. Almost all (seventeen of eighteen) the studies assign unique respondent identifiers. All datasets are delivered completely clean; that is, we did not discover wild codes and out-of-range values in the sample. Another important step in data preparation includes the assignment of variable labels and value labels in English. Both criteria are met by the majority of the projects under consideration, with fifteen studies providing complete variable labels and containing full sets of value labels for all

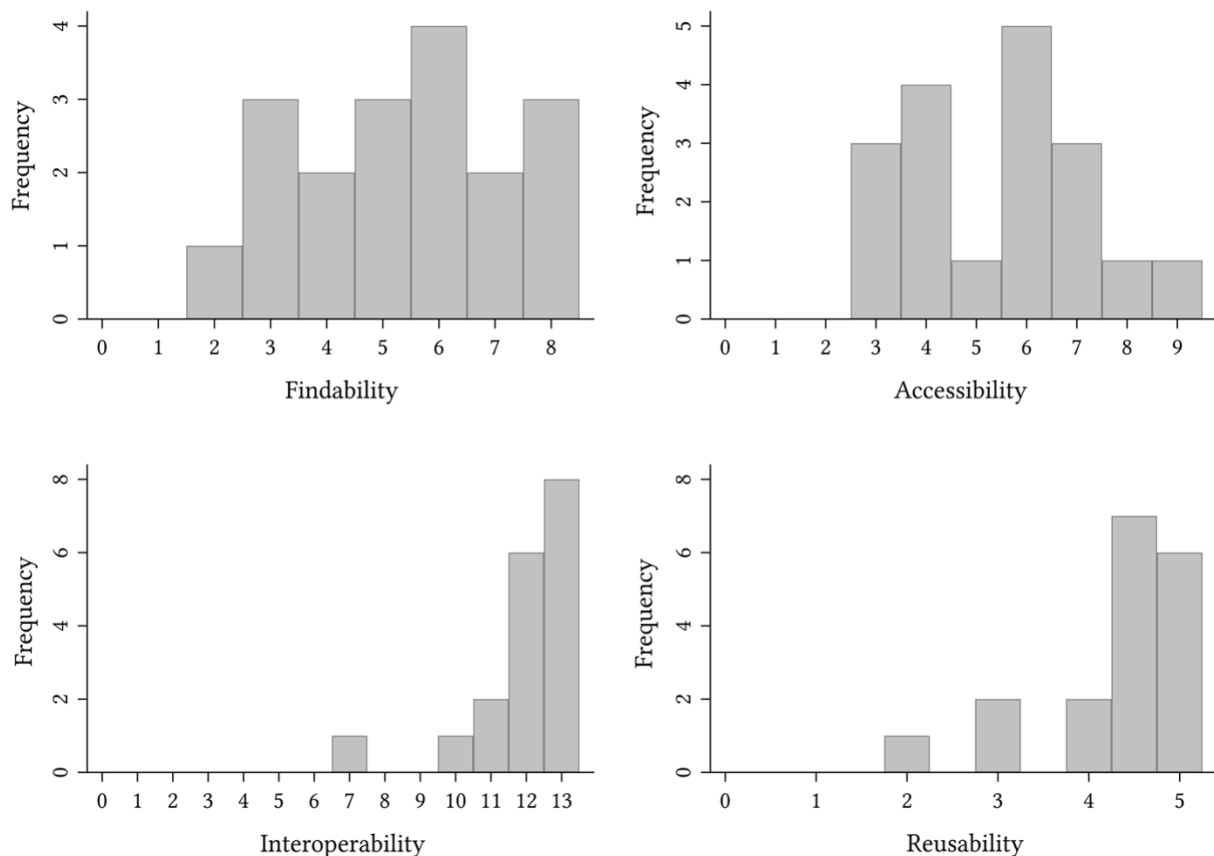


Fig. 1 Distribution of FAIR indices

variables. Notably, only seven studies assign a clear, complete and comprehensible missing data scheme to their datasets. With the exception of Sweden and Iceland, where a simple probability sample of voters is employed, most of the surveys involve complex, multistage sampling procedures and/or include oversampling of certain segments of the target population. Nearly all datasets contain some kind of weighting factor, but only eleven of those describe exactly how the weighting factors are generated.

In summary, the level of data reusability is quite satisfying. Excluding the description of weights and constructing an additive index that covers the remaining five criteria yields a mean value of 4.31 (SD = 0.84), with six studies achieving the maximum value of five (the AES, the ANES, the AUTNES, the Belgian National Elections Study (BNES), the GLES, and the ICENES) and no study that reaches only the minimum value of zero. Although most of the basic reusability requirements are met, there is room for improvement, particularly with regard to the documentation of missing data schemes and procedures for generating weight factors.

To examine the distribution of the FAIR criteria in greater detail, we created histograms for all four dimensions. As shown in Fig. 1, findability scores vary considerably, but most of the studies are in the upper range of the index. Accessibility scores are bimodally distributed, with one group of studies clustering around a score of 4, and another group clustering around a score of 6. Figure 1 also reveals that the majority of studies fully meet the interoperability and reusability criteria. We can thus establish that most national election studies perform quite well across all the criteria, while others have some room for improvement. This finding means that in

many cases, researchers are already provided with high-quality data and documents, although some advancement could be pursued in some of the programmes.

Conclusion

Election studies are important data resources for political and social sciences and, most often, secondary users. Given this fact, it is crucial that the data are easily accessible and accompanied by high-quality documents. However, despite the prominence of openness and research transparency in scientific debates, researchers currently lack sound theoretically derived and empirically grounded metrics to evaluate the present level of data openness and design appropriate interventions to improve data and documentation quality. In this article, we advanced the discussion one step further by adapting a relatively new metric, namely the FAIR Principles (Wilkinson et al. 2016), to the field. Using these criteria as guidelines, we rigorously assessed the data accessibility, metadata provision, and data documentation quality of eighteen national election studies based on a self-developed checklist. We found that the examined election studies are most often easily findable, but there are still some barriers to accessing the relevant data in terms of registration and availability of the methodological documentation. An analysis of interoperability shows that the corresponding metadata are most often well documented, and apart from some minor deficits, the level of reusability is quite high.

Our results provide a series of practical starting points from which to further improve the level of FAIRness in comparative election research. First, it is important to make use of existing best practices for data processing and management. While there are no uniform standards on how to prepare data properly, principal investigators can rely on the guidelines of well-established data archives such as the Interuniversity Consortium for Political and Social Research (ICPSR 2012), the UK Data Service (Corti et al. 2014) or GESIS (Netscher and Eder 2018). Furthermore, several institutions provide ready-to-use templates for data management plans (DMPs).¹² Second, to simplify data access, data should (also) be made available in non-prohibitive formats (csv, etc.) to reduce the need to transform data from one format into the other and thus risk losing information along the way. From our own experience, we know that the demands for creating DMPs might seem overwhelming and that the rather technical lingo in the field of data management and archiving might be daunting to a social scientist. We therefore, third, urge researchers to seek partnerships with professional data archives or local experts, e.g. in university libraries, early in the process, as they offer consulting, guidelines and training in this field. Furthermore, by distributing data and documents through an established archive, primary investigators, regardless of the size of the project, are able to outsource many of the rather technical issues related to long-term preservation, metadata schemes, and data

¹² See, for instance, CESSDA (Consortium of European Social Science Data Archives European Infrastructure Consortium) <http://www.cessda.eu/DMGuide>; European Commission http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf.

access. In fact, several of the FAIR criteria might be met automatically by transferring data and documents to an archive, as archives increasingly strive to include FAIR criteria in their services. In this context, however, one should be careful not to archive the same research data more than once, as parallel distribution channels can cause irritation and potentially have negative side effects (e.g. multiple versions in circulation).

We further believe that the main barrier to achieving the FAIR Principles is that for the individual researcher or project, there might be few incentives to invest in the FAIRness of (electoral) data. Consequently, an important first step is to raise awareness about the FAIR Principles in the scientific community and familiarize researchers with the basics. The more researchers know about FAIRness and its relevance for everyday scientific work, the greater its acceptance. Second, the best standards serve no purpose if there is no incentive for principal investigators to implement them. However, it is obvious that well-prepared and documented data are used more frequently and, consequently, cited more often, and the trend towards data journals and the citation of datasets, which are demanded by a growing number of prestigious journals, fits well with this. However, preparing the necessary materials can be a labour-intensive endeavour, particularly if this work is postponed to the very end of the project. While funders increasingly require open data practices, the work necessary to achieve the FAIR criteria is unfortunately often not taken into account: the publication of a scientific article is still of much greater value than the publication of a well-documented original dataset. Thus, we advocate establishing open science activities as a separate element in academic CVs so that they can be recognized by appointment committees in the recruitment process. Principal investigators should therefore have a legitimate self-interest in the quality of their data and documentation.

Although we consider this research to be rather explorative, we acknowledge some limitations and directions for future research. We have examined only a small number of election studies, as we concentrated on the Western world. Extending the focus to other regions and other types of surveys might provide additional insights. In a next step, one could further explore the corresponding documents in greater detail and more closely examine their content. We nevertheless believe that our analyses provide important clues for both established programmes and novel studies regarding what aspects to pay attention to with respect to processing, documenting and distributing data. Most of us might not wear lab coats when running our models, but we are still dependent on publicly available high-quality data that we can trust.

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