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M5.4 - Practical tests for automated FAIR digital object assessment in disciplinary context

Work Package	**WP5 - Metrics, certification, and guidelines**
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Dissemination Level

X	PU: Public
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1 Versioning and contribution history

Version	Date	Author	Notes
0.1	25.10.2023	Robert Huber (UBremen)	TOC and V0.1
0.2	28.11.2023	Robert Huber (UBremen), Hannah Mihai (DeIC), Maaike Verburg (KNAW-DANS)	Drafting full content and internal review
1.0	11.12.2023	Robert Huber (UBremen), Maaike Verburg (KNAW-DANS)	Final version published

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Terminology

Terminology/Acronym	Description
CESSDA	Consortium of European Social Science Data Archives
DCAT	Data Catalog Vocabulary
DDI	Data Documentation Initiative
FAIR	Findable, Accessible, Interoperable, Reusable
OAI-PMH	Open Archives Initiative Protocol for Metadata Harvesting
REST API	An application programming interface (API) that conforms to the design principles of the REST, or representational state transfer architectural style.
SSH	Social Sciences and Humanities
YAML	“YAML Ain't Markup Language”, a human-readable data serialisation language.

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3 Introduction

Building on the FAIRsFAIR FAIR metrics for data object assessment[1], which provide 17 metrics for checking domain agnostic FAIRness, a set of discipline-specific metrics for the social sciences was developed in FAIR-IMPACT[2].

In recent months, these metrics have been technically implemented in the F-UJI tool and made available to the scientific community as open source[3]. A collection of reference datasets from the social sciences were previously collected to test these discipline-specific metrics and their implementation[4].

This Milestone report summarises both the newly implemented functionalities which enable F-UJI to assess FAIRness in a disciplinary context, as well as the results of the first FAIR assessments performed on the above mentioned reference collection of social sciences datasets with these new disciplinary-specific metrics. The report is accompanied by the raw data of the assessment results so that the findings may be checked or replicated.

3.1 Role of the milestone

This Milestone presents the translation from theoretical metrics for discipline-specific FAIR assessment into the practical application of them. This allows users to assess their datasets using these specifications and therefore allows the observation of social science specific assessment results. This gives the opportunity to compare results with discipline-agnostic metrics, also presented in this report, to evaluate the overall added value of discipline-specific metrics, and the further developments that may be needed to tailor these metrics better.

3.1.1 Means of verification

The achievement of this Milestone is verified by the inclusion of the disciplinary-specific metric specification in F-UJI as per version 3.0.0 (October 13, 2023)[5]. The ability to run a F-UJI assessment using the social science specific metrics is dependent on the formulation of the practical tests, and the formulation of the practical tests can be seen in the assessment results and their specifications.

[1] Devaraju, A., Huber, R., Mokrane, M., Herterich, P., Cepinskas, L., de Vries, J., L'Hours, H., Davidson, J., & Angus White. (2022). FAIRsFAIR Data Object Assessment Metrics (0.5). Zenodo. https://doi.org/10.5281/zenodo.6461229

[2] Robert Huber, Maaike Verburg, Mike Priddy, Hervé L'Hours, Joy Davidson, & Hannah Mihai. (2023). D5.1 Implementing metrics for automated FAIR digital objects assessment in a disciplinary context (V1.0). Zenodo. https://doi.org/10.5281/zenodo.7784120

[3] https://github.com/pangaea-data-publisher/fuji

[4] Robert Huber, & Maaike Verburg. (2023). M5.1 - Reference collection of test data sets (v1.0). Zenodo. https://doi.org/10.5281/zenodo.7746205

[5] https://github.com/pangaea-data-publisher/fuji/releases

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4 Description of the Milestone

4.1 Upgrading F-UJI for discipline specific metrics

With F-UJI's latest release 3.0.0, it is now possible to perform FAIR assessments using discipline-specific FAIR metrics specifications. This new release allows configuration of metrics via YAML[6] files, which also affects how tests are performed. The role of the YAML metric definition file, which previously only has been used to expose the metrics in a machine-readable way, is thus more important now. It also allows defining individual scores and maturity levels which are now longer hardcoded. Metrics and tests which are not listed in the YAML files are not performed/assessed. This allows to switch metrics on or off and tests for community-specific metrics to be defined in dedicated YAML files.

F-UJI is now able to use different metrics at runtime, therefore the REST API now has an additional parameter 'metric_version' by which the metric YAML file can be defined (default metrics_v0.5.yaml)[7].

The social sciences specific metrics which have been defined in previously in FAIR-IMPACT[8] have been implemented in F-UJI using such YAML file specifications. In an initial version, this YAML specification only consists of those metrics which differ from the domain-agnostic metrics (V0.5)[9]. FIgure 1 shows the original discipline-agnostic FAIR assessment metrics and the social science specific metrics next to each other to visualise which FAIR metrics are specifically indicated.

F-UJI 3.0.0 has more testing methods implemented which allow to define metrics and tests which are more compatible with RDA FAIR Data Maturity Model Working Group maturity indicators[10] and other FAIR assessment tools such as The Evaluator[11]:

- FsF-F1-01DD unique identifier of data (planned for metrics version 0.6)
- FsF-F1-02DD persistent identifier of data (planned for metrics version 0.6)
- FsF-F1-01M which will replace FsF-F1-01D unique identifier of metadata (planned for metrics version 0.6)
- FsF-F1-02M which will replace FsF-F1-02D persistent identifier of metadata (planned for metrics version 0.6)

[6] YAML is a human-friendly data serialisation language for all programming languages. https://yaml.org/
[7] http://f-uji.net:1071/fuji/api/v1/ui/#/FAIR%20object/assess_by_id
[8] Robert Huber, Maaike Verburg, Mike Priddy, Hervé L'Hours, Joy Davidson, & Hannah Mihai. (2023). D5.1 Implementing metrics for automated FAIR digital objects assessment in a disciplinary context (V1.0). Zenodo. https://doi.org/10.5281/zenodo.7784120
[9] Devaraju, A., Huber, R., Mokrane, M., Herterich, P., Cepinskas, L., de Vries, J., L'Hours, H., Davidson, J., & Angus White. (2022). FAIRsFAIR Data Object Assessment Metrics (0.5). Zenodo. https://doi.org/10.5281/zenodo.6461229
[10] FAIR Data Maturity Model Working Group. (2020). FAIR Data Maturity Model. Specification and Guidelines (1.0). Zenodo. https://doi.org/10.15497/rda00050
[11] https://fairsharing.github.io/FAIR-Evaluator-FrontEnd/#!/

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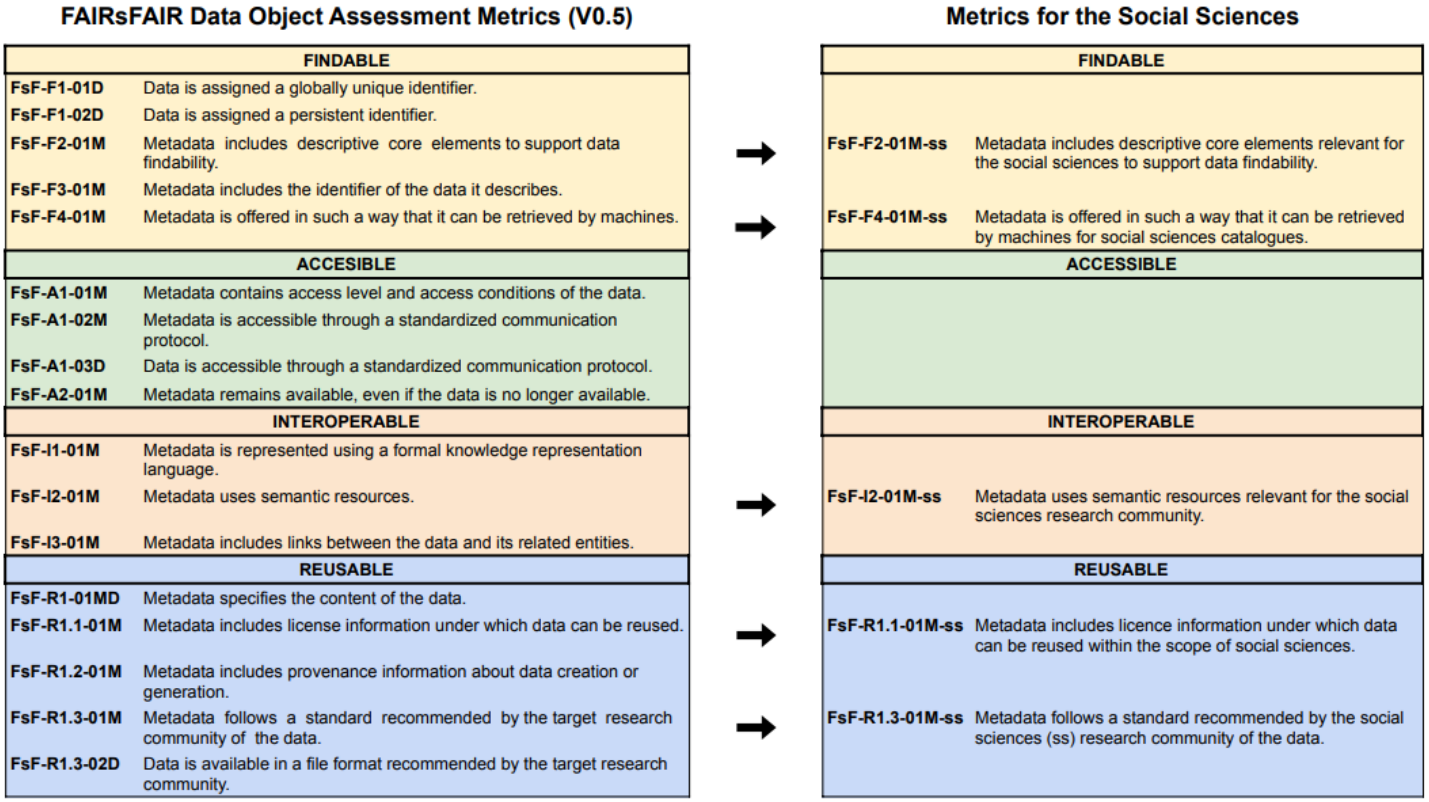
- FsF-F3-02M metadata include identifier of dataset (planned for metrics version 0.6)
- FsF-F4-01M-2 which tests if OAI-PMH, SPARQl or CSW is used to offer metadata

The last metric test has specifically been designed for the social sciences metrics. As mentioned above, all these metrics and associated tests can be added to a YAML file in order to be performed during an assessment.



FAIRsFAIR Data Object Assessment Metrics (V0.5)

FINDABLE	
FsF-F1-01D	Data is assigned a globally unique identifier.
FsF-F1-02D	Data is assigned a persistent identifier.
FsF-F2-01M	Metadata includes descriptive core elements to support data findability.
FsF-F3-01M	Metadata includes the identifier of the data it describes.
FsF-F4-01M	Metadata is offered in such a way that it can be retrieved by machines.
ACCESIBLE	
FsF-A1-01M	Metadata contains access level and access conditions of the data.
FsF-A1-02M	Metadata is accessible through a standardized communication protocol.
FsF-A1-03D	Data is accessible through a standardized communication protocol.
FsF-A2-01M	Metadata remains available, even if the data is no longer available.
INTEROPERABLE	
FsF-I1-01M	Metadata is represented using a formal knowledge representation language.
FsF-I2-01M	Metadata uses semantic resources.
FsF-I3-01M	Metadata includes links between the data and its related entities.
REUSABLE	
FsF-R1-01MD	Metadata specifies the content of the data.
FsF-R1.1-01M	Metadata includes license information under which data can be reused.
FsF-R1.2-01M	Metadata includes provenance information about data creation or generation.
FsF-R1.3-01M	Metadata follows a standard recommended by the target research community of the data.
FsF-R1.3-02D	Data is available in a file format recommended by the target research community.

Metrics for the Social Sciences

FINDABLE	
FsF-F2-01M-ss	Metadata includes descriptive core elements relevant for the social sciences to support data findability.
FsF-F4-01M-ss	Metadata is offered in such a way that it can be retrieved by machines for social sciences catalogues.
ACCESSIBLE	
INTEROPERABLE	
FsF-I2-01M-ss	Metadata uses semantic resources relevant for the social sciences research community.
REUSABLE	
FsF-R1.1-01M-ss	Metadata includes licence information under which data can be reused within the scope of social sciences.
FsF-R1.3-01M-ss	Metadata follows a standard recommended by the social sciences (ss) research community of the data.

Figure 1 - Comparison of the original FAIRsFAIR Data Object Assessment Metrics (V0.5) and the social science specific metrics created in FAIR-IMPACT.

The following practical tests have been implemented for the metrics listed above in F-UJI:

- **FsF-F2-01M-3-ss** Core descriptive metadata is available
  The availability of the following metadata properties (internally mapped from various formats)is tested: title, object_identifier, publisher, abstract, language. For social sciences the language property has additionally been mapped from schema.org, DCAT, Dublin Core and DDI.
- **FsF-F4-01M-3-ss** Metadata is offered via metadata exchange standard interface (OAI-PMH)
  The presence of an OAI-PMH interface is tested here. By now, this is done using user provided input or information retrieved from re2data.
- **FsF-I2-01M-2-ss** Namespaces of known semantic resources can be identified in metadata

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Presence of namespace URIs, e.g. used in actionable ontology term identifiers, indicating discipline specific vocabularies is tested, namely : https://vocabularies.cessda.eu/*,http://rdf-vocabulary.ddialliance.org/*, https://www.gesis.org/vocabulary/*.

- **FsF-R1.1-01M-2-ss** Recognized licence is valid (community specific or registered at SPDX)
  Creative Commons licences of type CC-BY* are required to pass this test.
- **FsF-R1.3-01M-1-ss** Community specific metadata standard is detected using namespaces or schemas found in provided metadata or metadata services outputs
  Here we test for namespaces or schemas indicating DDI or Da|ra metadata formats.
- **FsF-R1.3-01M-2-ss** Community specific metadata standard is listed in the re3data record of the responsible repository
  This test checks if re3data entries are indicating the presence of DDI or Da|ra metadata formats.
- **FsF-R1.3-01M-3-ss** Multidisciplinary but community endorsed metadata standard is listed in the re3data record or detected by namespace
  Availability of domain agnostic but DDI or Da|ra compatible/mappable metadata formats are tested, these have been defined by the community to be DataCite, Dublin Core, schema.org and DCAT.

4.2 Assessment results for the reference collection datasets

Using the reference collection of social sciences specific datasets[12] provided by SSH use case partners, we practically tested FAIR assessment in a disciplinary context.

We ran all 79 reference collection datasets against both sets of metrics, the domain-agnostic metrics (V0.5) and the social science specific metrics that have been implemented within the recently published F-UJI version 3.0.0 (labelled 0.5ss). Since the social science metric implementation in F-UJI only covers those metrics which differ from the domain-agnostic metrics, we merged the discipline-specific assessment results with those domain-agnostic results not covered by the discipline specific subset already collected during the domain agnostic tests, to enable comparability of results.

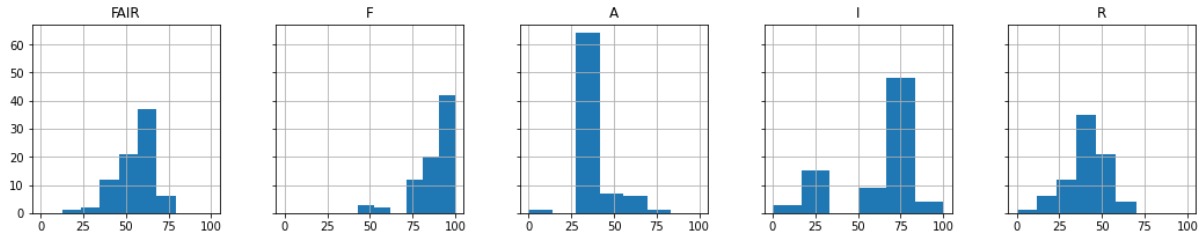

Figure 2 - Results for the domain-agnostic metrics applied to the reference collection of social sciences datasets.

[12] Robert Huber, & Maaike Verburg. (2023). M5.1 - Reference collection of test data sets (v1.0). Zenodo. https://doi.org/10.5281/zenodo.7746205

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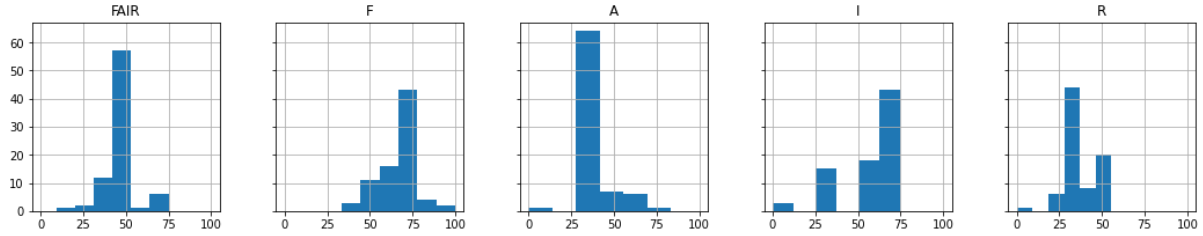

Figure 3 - Results for the social sciences specific metrics applied to the reference collection of social sciences datasets.

It can be noticed that scores reached using the discipline-specific metrics for social sciences are significantly lower in comparison to scores obtained using the domain-agnostic metric collection. This most probably is due to the fact that discipline specific metrics are explicitly testing for e.g. the presence of specific metadata standards or ontologies, thus are more strict in comparison to domain-agnostic FAIR metrics that include a wider array of standards. However, the development and implementation of discipline-specific metrics is still in development and evolving. This report will serve to stimulate further discussions with the relevant community (e.g. CESSDA) in order to refine and revise our approach if necessary.

Some of the new metric tests rely on the discoverability and findability of information such as community-specific services. This is particularly important as we found that for example the required OAI-PMH interfaces are not easy to find and consequently only three out of nine known OAI-PMH endpoints could be identified by F-UJI, those which have been registered at re3data. This situation is caused by the lack of re3data registry entries for available services but mainly because methods to expose or advertise the location of service or API endpoints like 'api-catalog' or via metadata standards such as DCAT are emerging[13] but widely unknown or rarely used. We therefore will further investigate how discipline specific FAIR results can be practically improved using the above mentioned emerging methods, an activity which will be intensified within task 5.4 when it comes to provide guidelines and specifications to transparently expose such information for data portals, repositories and registries.

[13] https://datatracker.ietf.org/doc/draft-ietf-httpapi-api-catalog/

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5 Next steps

After this initial launch of the social sciences specific practical tests and assessment of the reference collection, work will continue to evaluate and finetune the metrics specification for use. This will be done in collaboration with CESSDA, and wide community input is also welcomed. Wider dissemination and engagement will be rolled out once initial testing and refinement has been completed.

Next to this process, a new discipline will also be explored using the same approach as presented in the social sciences use case. Based on established connections inside and outside of the project, the Earth and Environmental sciences will be targeted this time. Information about this discipline will be gathered using different techniques, to establish community-standards and identify candidate metrics to specify. The metrics will then be presented, after which they will also be specified using practical tests and incorporated into F-UJI to run assessments. A reference collection of datasets from this discipline will also be built to run the same assessments as presented in this Milestone report. These new metrics will then also open up to community-feedback and testing.

Final conclusions and recommendations based on the explorations of discipline-specific FAIR assessment metrics will be presented towards the end of the FAIR-IMPACT project, to present a cohesive overview of the explorations and lessons learned.

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Appendix

Results using the domain agnostic metrics (score in percentages)

	FAIR	F	A	I	R
https://doi.org/10.7910/DVN/KLCKL5	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-x22-hmng	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.5255/UKDA-SN-6614-17	45.83	71.43	33.33	50.0	30.0
https://doi.org/10.5255/UKDA-SN-8755-1	45.83	71.43	33.33	50.0	30.0
https://doi.org/10.17026/dans-xcy-ac9q	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-x2z-kyq6	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-xpp-gxsr	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-xsr-tp2v	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-zjn-wtnp	64.58	92.86	33.33	75.0	50.0
https://doi.org/10.17026/SS/MCA9ZF	64.58	92.86	33.33	75.0	50.0
https://doi.org/10.5255/UKDA-SN-856038	52.08	85.71	50.00	75.0	20.0
https://doi.org/10.17026/dans-xv8-9ymb	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-22h-8zw5	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-zw4-bxtk	79.17	100.00	66.67	75.0	70.0
http://researchdata.gla.ac.uk/id/eprint/519	41.67	57.14	33.33	75.0	20.0
https://doi.org/10.17026/dans-xk3-dabp	64.58	92.86	33.33	75.0	50.0
https://doi.org/10.5255/UKDA-SN-856076	52.08	85.71	50.00	75.0	20.0
https://doi.org/10.7488/ds/2742	54.17	85.71	33.33	25.0	50.0
http://dx.doi.org/10.5525/gla.researchdata.433	56.25	71.43	50.00	75.0	40.0

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https://doi.org/10.17026/dans-zhr-eswk	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-zmp-pjwe	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-2ap-vj3p	79.17	100.00	66.67	75.0	70.0
https://doi.org/10.7488/ds/2739	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.17026/dans-2cv-8uhq	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.5255/UKDA-SN-855999	52.08	85.71	50.00	75.0	20.0
https://doi.org/10.5255/UKDA-SN-9013-1	45.83	71.43	33.33	50.0	30.0
https://edatos.consorciomadrono.es/dataset.xhtml?persistentId=doi:10.21950/VDUJD1	64.58	92.86	33.33	75.0	50.0
https://doi.org/10.17026/dans-xww-tpyh	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.7910/DVN/YHXJSU	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-xmh-q2h8	60.42	92.86	33.33	75.0	40.0
http://researchdata.gla.ac.uk/id/eprint/811	45.83	71.43	33.33	75.0	20.0
https://doi.org/10.17026/dans-25c-56vs	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.7910/DVN/NOAT0W	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-zkv-7r4c	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-x8j-b75n	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.5255/UKDA-SN-8682-2	45.83	71.43	33.33	50.0	30.0
https://doi.org/10.5281/zenodo.6671510	66.67	85.71	66.67	75.0	50.0
https://doi.org/10.7488/ds/2734	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.17026/dans-2z7-9bjm	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-xh9-h9a8	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.1594/PANGAEA.938536	77.08	100.00	83.33	100.0	50.0

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https://doi.org/10.17026/dans-x5c-7q5e	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-29q-4hes	37.50	57.14	33.33	25.0	30.0
https://doi.org/10.7488/ds/2738	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.7488/ds/2737	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.5257/census/aggregate-2021-1	45.83	85.71	33.33	25.0	30.0
http://dx.doi.org/10.5525/gla.researchdata.1325	56.25	71.43	50.00	75.0	40.0
http://dx.doi.org/10.5525/gla.researchdata.604	56.25	71.43	50.00	75.0	40.0
https://doi.org/10.5255/UKDA-SN-855300	52.08	85.71	50.00	75.0	20.0
https://doi.org/10.7488/ds/2736	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.17026/dans-z74-4pm9	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.7910/DVN/6N5V1K	64.58	92.86	33.33	100.0	40.0
https://doi.org/10.17026/dans-2ax-c8z8	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-zn5-3szb	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/SS/CXXHLD	58.33	85.71	33.33	75.0	40.0
https://doi.org/10.17026/dans-2zu-rxcn	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.17026/dans-28f-qghs	79.17	100.00	66.67	75.0	70.0
https://doi.org/10.17026/SS/BXIK2X	56.25	92.86	33.33	50.0	40.0
https://doi.org/10.7488/ds/2733	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.5255/UKDA-SN-9022-1	45.83	71.43	33.33	50.0	30.0
https://github.com/hausanlp/NaijaSenti	31.25	50.00	33.33	0.0	30.0
https://doi.org/10.17026/dans-x7h-hmh5	60.42	92.86	33.33	75.0	40.0

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https://doi.org/10.17026/dans-xek-6rng	60.42	92.86	33.33	75.0	40.0
https://hdl.handle.net/11403/wikidisc	12.50	42.86	0.00	0.0	0.0
https://doi.org/10.17026/SS/KUVW6L	64.58	92.86	33.33	75.0	50.0
https://doi.org/10.5255/UKDA-SN-8149-1	45.83	71.43	33.33	50.0	30.0
https://github.com/asmelashteka/HornMT	31.25	50.00	33.33	0.0	30.0
https://doi.org/10.7488/ds/2741	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.7488/ds/2743	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.7910/DVN/OTL0LM	64.58	92.86	33.33	100.0	40.0
https://doi.org/10.5255/UKDA-SN-6721-24	45.83	71.43	33.33	50.0	30.0
https://doi.org/10.7488/ds/2735	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.7488/ds/2730	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.17026/dans-zd4-mv9c	60.42	92.86	33.33	75.0	40.0
https://doi.org/10.7488/ds/2732	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.7488/ds/2740	54.17	85.71	33.33	25.0	50.0
https://doi.org/10.5255/UKDA-SN-9023-1	45.83	71.43	33.33	50.0	30.0
https://www.doi.org/10.6084/m9.figshare.6187256	75.00	100.00	66.67	100.0	50.0
https://doi.org/10.17026/dans-267-6uc3	79.17	100.00	66.67	75.0	70.0

Results using the social sciences specific metrics (score in percentages)

	FAIR	**F**	**A**	**I**	**R**
https://doi.org/10.7910/DVN/KLCKL5	52.27	58.33	33.33	75.0	44.44
https://doi.org/10.17026/dans-x22-hmng	47.73	58.33	33.33	75.0	33.33

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https://doi.org/10.5255/UKDA-SN-6614-17	40.91	50.00	33.33	50.0	33.33
https://doi.org/10.5255/UKDA-SN-8755-1	40.91	50.00	33.33	50.0	33.33
https://doi.org/10.17026/dans-xcy-ac9q	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-x2z-kyq6	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-xpp-gxsr	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-xsr-tp2v	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-zjn-wtnp	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/SS/MCA9ZF	47.73	58.33	33.33	75.0	33.33
https://doi.org/10.5255/UKDA-SN-856038	43.18	66.67	50.00	50.0	22.22
https://doi.org/10.17026/dans-xv8-9ymb	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-22h-8zw5	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-zw4-bxtk	68.18	83.33	66.67	75.0	55.56
http://researchdata.gla.ac.uk/id/eprint/519	36.36	50.00	33.33	50.0	22.22
https://doi.org/10.17026/dans-xk3-dabp	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.5255/UKDA-SN-856076	43.18	66.67	50.00	50.0	22.22
https://doi.org/10.7488/ds/2742	50.00	66.67	33.33	25.0	55.56
http://dx.doi.org/10.5525/gla.researchdata.433	52.27	66.67	50.00	50.0	44.44
https://doi.org/10.17026/dans-zhr-eswk	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-zmp-pjwe	47.73	58.33	33.33	75.0	33.33
https://doi.org/10.17026/dans-2ap-vj3p	68.18	83.33	66.67	75.0	55.56
https://doi.org/10.7488/ds/2739	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.17026/dans-2cv-8uhq	52.27	75.00	33.33	75.0	33.33

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https://doi.org/10.5255/UKDA-SN-855999	43.18	66.67	50.00	50.0	22.22
https://doi.org/10.5255/UKDA-SN-9013-1	40.91	50.00	33.33	50.0	33.33
https://edatos.consorciomadrono.es/dataset.xhtml?persistentId=doi:10.21950/VDUJD1	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-xww-tpyh	47.73	58.33	33.33	75.0	33.33
https://doi.org/10.7910/DVN/YHXJSU	52.27	58.33	33.33	75.0	44.44
https://doi.org/10.17026/dans-xmh-q2h8	52.27	75.00	33.33	75.0	33.33
http://researchdata.gla.ac.uk/id/eprint/811	36.36	50.00	33.33	50.0	22.22
https://doi.org/10.17026/dans-25c-56vs	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.7910/DVN/NOAT0W	52.27	58.33	33.33	75.0	44.44
https://doi.org/10.17026/dans-zkv-7r4c	47.73	58.33	33.33	75.0	33.33
https://doi.org/10.17026/dans-x8j-b75n	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.5255/UKDA-SN-8682-2	40.91	50.00	33.33	50.0	33.33
https://doi.org/10.5281/zenodo.6671510	68.18	83.33	66.67	75.0	55.56
https://doi.org/10.7488/ds/2734	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.17026/dans-2z7-9bjm	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-xh9-h9a8	47.73	58.33	33.33	75.0	33.33
https://doi.org/10.1594/PANGAEA.938536	75.00	100.00	83.33	75.0	55.56
https://doi.org/10.17026/dans-x5c-7q5e	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-29q-4hes	40.91	66.67	33.33	25.0	33.33
https://doi.org/10.7488/ds/2738	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.7488/ds/2737	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.5257/census/aggregate-2021-1	40.91	66.67	33.33	25.0	33.33

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http://dx.doi.org/10.5525/gla.researchdata.1325	52.27	66.67	50.00	50.0	44.44
http://dx.doi.org/10.5525/gla.researchdata.604	52.27	66.67	50.00	50.0	44.44
https://doi.org/10.5255/UKDA-SN-855300	43.18	66.67	50.00	50.0	22.22
https://doi.org/10.7488/ds/2736	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.17026/dans-z74-4pm9	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.7910/DVN/6N5V1K	52.27	58.33	33.33	75.0	44.44
https://doi.org/10.17026/dans-2ax-c8z8	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-zn5-3szb	47.73	58.33	33.33	75.0	33.33
https://doi.org/10.17026/SS/CXXHLD	45.45	50.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-2zu-rxcn	47.73	58.33	33.33	75.0	33.33
https://doi.org/10.17026/dans-28f-qghs	68.18	83.33	66.67	75.0	55.56
https://doi.org/10.17026/SS/BXIK2X	43.18	58.33	33.33	50.0	33.33
https://doi.org/10.7488/ds/2733	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.5255/UKDA-SN-9022-1	40.91	50.00	33.33	50.0	33.33
https://github.com/hausanlp/NaijaSenti	27.27	33.33	33.33	0.0	33.33
https://doi.org/10.17026/dans-x7h-hmh5	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.17026/dans-xek-6rng	47.73	58.33	33.33	75.0	33.33
https://hdl.handle.net/11403/wikidisc	9.09	33.33	0.00	0.0	0.00
https://doi.org/10.17026/SS/KUVW6L	47.73	58.33	33.33	75.0	33.33
https://doi.org/10.5255/UKDA-SN-8149-1	40.91	50.00	33.33	50.0	33.33
https://github.com/asmelashteka/HornMT	27.27	33.33	33.33	0.0	33.33
https://doi.org/10.7488/ds/2741	50.00	66.67	33.33	25.0	55.56

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https://doi.org/10.7488/ds/2743	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.7910/DVN/OTL0LM	52.27	58.33	33.33	75.0	44.44
https://doi.org/10.5255/UKDA-SN-6721-24	40.91	50.00	33.33	50.0	33.33
https://doi.org/10.7488/ds/2735	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.7488/ds/2730	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.17026/dans-zd4-mv9c	52.27	75.00	33.33	75.0	33.33
https://doi.org/10.7488/ds/2732	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.7488/ds/2740	50.00	66.67	33.33	25.0	55.56
https://doi.org/10.5255/UKDA-SN-9023-1	40.91	50.00	33.33	50.0	33.33
https://www.doi.org/10.6084/m9.figshare.6187256	72.73	100.00	66.67	75.0	55.56
https://doi.org/10.17026/dans-267-6uc3	63.64	66.67	66.67	75.0	55.56

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