Standardization in science: effects and issues of guidelines for biomedical reporting

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Glossary and abbreviations

CDSR: Cochrane Database of Systematic Reviews. The (digital) library of the Cochrane Collaboration in which all Cochrane reviews get published.

CEE: Collaboration for Environmental Evidence. The Cochrane Collaboration for environmental sciences.

Cochrane: Family name of Archie Cochrane and origin of the name of the Cochrane Collaboration (→ Cochrane Collaboration). Archie Cochrane was a famous doctor and medical statistician who found in a field hospital that many interventions had no effect. He voicefully demanded that any medical specialty has to proof the effectiveness of their intervention with rigorous evaluations.

Cochrane Collaboration: A global network of national Cochrane centers who produce systematic reviews. Cochrane reviews are commonly perceived as the most rigorous and authoritative forms of medical research evidence.#

CONSORT: Acronym of "Consolidated Standards of Reporting Trials". A set of writing rules for authors of randomized controlled trials (-> RCT). CONSORT is the most important reporting guideline in medical research.

CWTS: Acronym of “Centrum voor Wetenschap en Technologische Studies” (Centre for Science and Technoloy Studies)

DZHW: Acronym of “Deutsches Zentrum für Hochschul- und Wissenschaftsforschung“ (German Centre for Higher Education Research and Science Studies)

DOI: Digital Object Identifier. An indexing string for almost any kind of digital objects. Today, most scientific articles get a unique indexing number that allows for retrieval and findability.

EBM: Evidence-based Medicine. A paradigm of medical practice that makes use of protocols and guidelines to harmonize treatments and reduce errors.

EPPI Centre: Evidence for Policy and Practice Information and Co-ordinating Centre. A UK-based center that performs evidence syntheses of educational research. It spearheaded the development of meta-analytic methodologies.

EQUATOR: Acronym of "Enhancing the Quality and Transparency of health research Network". An initial initative that develops and disseminates reporting guidelines, especially for biomedical research. See www.equator-network.org.

h-index: Bibliometric indicator proposed by Jorge Hirsch to quantify the research output by individual scientists. The index is x, if x of my publications received x citations each (Bornmann & Daniel, 2007).

ISSN: International Standard Serial Number. An indexing number for scientific journals.

JIF: Journal Impact Factor. The most well-known bibliometric indicator. It combines the publication output and citation impact of individual journals so that they can be ranked. It is commonly misused to assess the impact of individual articles or researchers.

MA: Meta-analsis. Statistical technique to aggregate the effect sizes of multiple studies.

PMID: A similar indexing string as a DOI but issued by PubMed/MEDLINE, the biggest collection of research metadata related to medicine. In contrast to DOI's, PMID's are created and curated centrally.

PRISMA: Acronym of the "Preferred reporting items for systematic reviews and meta-analysis" guidelines. This 36 item checklist provides writing rules for authors of systematic review reports.

RCT: Randomized Controlled Trials. A formalized study design to prove the efficacy of medical treatments. It involves a treatment group and a control group, the latter of which either receives a placebo or a different treatment. Participants are randomly allocated to these groups..

SR: Systematic review. A type of scientific literature review that performs and reports search, information retrieval and quality appraisal of individual studies in a formalized and supposedly reproducible manner.

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Appendix

Data and code which can be found here have also been made public on zenodo and osf.io. Details about the individual publications and references can be found in chapter 2.5.

APPENDIX A: PRISMA DEVELOPERS

A.1 INTERVIEW GUIDELINE

(*reformatted for readability*)

1. **Introduction**
    a. Information about project background, information on data collection and processing, information about anaonymization, and informed consent.
    b. Could you please tell something about your personal disciplinary background, your research trail?
    c. With which research field do you identify with? Which research field is part of your professional identity?

2. **General perspectives on standards in science**
    a. *Relevance of and reasons for standards in science*. In your opinion, why do we need standards and guidelines in research? Why do we need standards for the conduct of research overviews and review articles? Are there any discipline-specific reasons for why you feel there is a necessity for standards for review articles? Are there any deficits in research in a research field you know in more detail which would justify the introduction of standards?
    b. *Aims and goals*. Which specific aims are associated with the standards? What practices are going to be changed or improved? In what ways have these overarching aims changed or even transformed standards and the challenges they are directed to? Why do current standards for review articles focus so much more on reporting instead of conduct? Why is reporting so important?
    c. *Values*. What values are associated with standards and guidelines for review articles? Which of those do you consider most important? I.e. transparency, objectivity etc. What role do expectations from societal and political stakeholders play for the formulation of standards?

3. **Particular aspects of PRISMA (please focus on the version you contributed to)**
    a. *Regarding the version you contributed to*: Could you shortly describe your way into the project? Have you been asked to participate because of your research works, did you apply or actively engage in the organization, or were you simply asked because of a specific professional or organizational role you fulfilled?
    b. *Personal motivation*. What motivated you personally to participate or engage in the construction of the standard? Was there any intellectual motive and if yes in what ways? e.g. was there a special interest in specific

methodological, theoretical, ethical aspects of research which motivated you? Was it more about norms or more about methodologies? Is you engagement related to a specific improvement of scientific/epistemic practice? Or is it about being accountable to societal expectations?

c. *Organizational motivation* (e.g. professional role or job description). Is there any organizational motivation for engaging in standards? Does your research organization (your agency/university) support or engage in the proliferation of standards? Or did you have to convince your employer to fund your participation? Is your contribution part of your organizational role (as a researcher, leader, infrastructural provider, administration). Do you have any role or obligations with regards to quality assessment/quality assurance? Do you consider your contribution to PRISMA as an important part of your work or professional role?

4. Development procedure of PRISMA

a. Can you briefly describe the development procesure of PRISMA?
b. How time consuming and complex was it to work PRISMA?
c. Many experts are involved in the construction of guidelines on the basis of meetings, surveys and group work. How was the collaboration organized?
d. How did you handle authorship questions in the group?
e. Whicht arguments were mobilized for the articulation and argumentation of standards? How did you balance the perspective of scientific authors (their freedom of writing and reporting) with the requirements of the standards (transparency, quality).
f. Have there been debates about usability versus rigor of the standard? How have they been solved?

5. External perspectives on PRISMA

a. *Dissemination strategies*. How was the guideline disseminated to academics / wider publics? Did you personally recommend or communicate them? How was PRISMA brought to the journals and how was the journals' willingness to employ such a guideline? Are there efforts to implement reporting guidelines into editorial practices more strictly, or even algorithmicly? Do you know if reporting guidelines play any role for research funding decisions or in institutional evaluation? Since QUOROM's successor PRISMA was multi-published in five different journals, what have been the assumptions of how a community may react or adapt to a new standard?

b. Do you consider PRISMA or other reporting guidelines as a success? How is this perceived in the wider public? Does it play a role in the communication of knowledge with the media or other public stakeholders?
c. Did I miss anything or is there something you would like to add?

A.2 CODEBOOK

Code_level1	Code_level2	Code_l3	Description
General perceptions about systematic reviews	Epistemic narratives / normative aspects of SR		References to normative characteristics of systematic reviews such as robustness, consensus-forming, authority of SR evidence. Also references to the hierarchy of evidence.
	aims of SRs		Explains the aims of systematic reviews, i.e. for subsequent medical research or medical decision making.
	emphasis on SR practices		Explanation of the general procedure of systematic reviewing or reference to particulat steps. For example, systematic review steps (searching, screening, filtering etc.).
	emphasis on SR practices	Conduct/reporting	Difference and relationship between conduct and reporting of reviews; individual characterizations of reporting or conduct.
	Problem narratives		Problematizations of the aims, epistemics, social contexts of SR. References to publication/transparency/replication crisis
	Problem narratives	Misconduct	Explicit mentions of researcher misbehavior, misconduct, or even fraud.
	Problem narratives	Solutions	Explanations of how certain problems are currently or potentially solved; reporting guidelines as solution of lacking transparency
Guideline creation	Hard facts about the guidelines		Number of items, number of collaborators; final structure of the guideline etc.
	General procedures of guideline development		Subsequent steps; projectification and planning; project duration; reference to techniques (e.g. surveys, prior research, meetings etc.), focus on the sequence of events.
	Procedures of guideline development	Authorship	Explanations about how rewards were distributed / who gained authorship. Mentions authorship struggles etc.
	Procedures of guideline development	Evaluation	Mentions if the procedure was effortful, successful, unsuccessful etc. Would take/has taken part in similar project again (related to “Guideline making as new profession”)
	Item characteristics		Emphasis on particular items and individual characteristics
	Item generation (practice)		Modes of collaborative item generation; procedures of negotiating about particular items; solving conflicts over individual items

	Item generation (epistemic)		Relationship between items and project aims; in principle relationships between items (e.g. tensions); references to the balancing of different items
	Authority by procedure		Epistemic characteristics of the procedure; authority by procedure; also, other values, i.e. how the procedure established transparency
	Guideline making as new profession		Reference to metascience or guideline-making as new profession/community. Relationships to other reporting guidelines projects; novel types of expertise related to guideline-making.
	Relationship to other projects		Mentions other (EQUATOR) reporting guidelines, other unrelated projects, Cochrane etc. Discusses similarities and differences.
Involved Actors	Selection procedure		Procedures and criteria to select participants; practices in approaching and involving selected individuals
	Team characteristics		References to the overall characteristics of the team and its social stratification: size, involved fields, career stage, diversity, hierarchies etc.
	Actors and characterizations		In-depth mentioning and characterization of actors, either individual or organizational (e.g. Cochrane). Explains how certain actors contributed content-wise
	Relationships of involved expertises		Mentions of different expertises involved; interplay of disciplinary backgrounds or professional roles of the guideline team (e.g. method expert, content expert, publisher etc.); disciplinary struggles.
	Authority and legitimization		Authority and legitimization of the guideline and procedure with regards to the actors involved. Can also mean authority by representation.
Dissemination strategies	Dissemination channels		Journal publications (main) but especially mentions of other dissemination channels
	Multipublication		Explanations, rationales and discussion of the multi-publication of PRISMA
	Education		Reference ot integrating the guideline into training programs
	effectivity		Evaluation and discussion of different strategies, i.e. with regards to efficiency, efforts, efficiency etc.
	Scientific rewards		Aspects related to the evaluation and reward of guideline developers and participants (see also General procedures of guideline develoipment > Authorship)
	Journal implementation	Levels	Reference to different levels of how journals might integrate PRISMA into their submission procedures (submission guidelines, formal requirement)
	Journal implementation	Effectivity	Discusses or evaluates different levels of journal implementation.
Evaluation of PRISMA	Reception	Acceptance	Mentions how the guideline was well-received by disciplinary communities, career stages, professional groups (medical writers, editors, funders)

	Reception	Resistance	Mentions how the guideline was ill-received with regards to discipline or professional role.
	Criticism	Authority conflicts	Mentions on how peers uttered critique or negative attitudes with regards to other standards, authorities, or established practices; criticism of the guideline procedure or the project group
	Criticism	Usage costs	Mentions how peers uttered critique or negative attitudes with regards to the (potential) efforts in complying with PRISMA or levels of journal implementation
	Criticism	Applicability	Mentions how peers uttered critique or negative attitudes with regards to the SR methodologies/types they do (fit between guideline and the field)
	Evaluation of PRISMA	Content	Explicitly mentions how PRISMA was (overall) successful/unsuccessful with regards to its overall aims / problems mentioned above. Provides own experience or anecdotal evidence about how PRISMA is used.
	Evaluation of PRISMA	Context	Explains how the scientific community would better implement / adapt to PRISMA; suggestions for research funders etc.
	Metascience evidence		Names 'hard facts' about the evaluation of PRISMA, i.e. metascientific studies, item evaluations.
	Necessary updates	content	Mentions necessary improvements for the next version based on current experience or metascientific evidence.

A.3 Additional quotes

Note: These quotes do not represent the whole interview dataset but rather provide additional context and depth for the results as presented and discussed in the manuscripts.

The following quotes have been coded "illustrative quote" during the analysis (see Codebook). They have been anonymized and edited to improve readability. Edits include punctuation and the separation of sub-sentences; removal of repetitions especially when they stem from spoken language; removal of whole sentences if unclear or verbose; adding of explanatory information. Quotes have been broadly categorized.

A.3.1 Systematic reviewing and its problems

"Systematic reviews of course, if you think of the hierarchy of evidence, they kind of sit at the top of this hierarchy, because they're most used by decision makers and policymakers. That's our hope, that syntheses can be used more often than primary studies, and are more useful because they bring together a set of knowledge that, you know, each individual study can't tell you" (Guideline developer #E)

"Well, I think in the context of systematic reviews, if you think now, there's been a huge explosion in the number of reviews that get published, and people are taught how to do reviews in the university and in on postgraduate courses. For many people doing a systematic review, or at least a rigorous literature review, it is part of their masters or PhD studies" (Guideline developer #G)

"So really, the situation with meta-analysis in public health was ten times worse than randomized control trials." (Guideline developer #C)

"Here's the [Journal name removed] and we kept telling everybody we were the best journal in the world and I thought, these manuscripts that we received would cause me ... to weep. I couldn't believe that this was greatness, you know.... (Authors) didn't describe the situation; they didn't pose the questions properly or in any way. Sometimes, they didn't tell you how many patients they were dealing with, and so on. And these were the people who had the energy, enthusiasm and so on to do research... so these are the best of the best and this is rubbish they are turning out." (Guideline developer #B)

"it just occurred to me, I'm thinking they can't do that to me. They can't do that to my journal. They can't do that to the world. And that makes me feel angry on the one hand and sort of I say to myself, I'm glad that don't just shrug my shoulders and walk past and that probably made then on" (Guideline developer #A)

"And a lot of times when we would contact the authors about why didn't you report? They said; well, we just didn't have space for it" (Guideline developer #C)

"We can't have a whole lot of how people conduct their studies." (Guideline developer #D)

"I think one point to emphasize, and also to clarify is, most of these reporting standards or the conduct standards are considered by the authors as the minimum standards" (Guideline developer #F)

"And all you're talking about is numbers of patients but if you haven't said, what - how many people came to do these, volunteered, and then would drop out for some reason, some because they were too ill or because of their - so because of that, if you don't do that, then the reader has no idea, and really has no idea about patients." (Guideline developer #B)

"I think we often think like English is the universal language of science. But I think there's a lot of variation around the world in terms of people's understanding of English. I know

there was some research early, maybe it was in the 90s, looking at the specific term randomization in China, and how that was used in China. And it turns out that it's a bit of a different concept randomization in some of the Chinese literature than it is in the North American or Western literature." (Guideline developer #E)

"I think that's a very good example, why standards are needed for many of the things we do. It's about reproducibility. It's about using the same terminology and language to communicate with each other. It's about transparency in science. It's about, and I would say most of these standards are sort of minimum standards." (Guideline developer #F)

"Of course, we work a lot with doctors. And if someone is not really into this publishing business from the outset or is not very familiar with the methodology, it is of course sometimes difficult to use the English technical terms correctly." (Guideline developer #D, *translated via deepl*)

A.3.2 Aims of PRISMA

"I think standards are useful, but they've got to be in a way that they are guidance. I think there's a difference between guidance, which is recommending that you do it this way to standards, which might be somebody saying, you have to do it this way" (Guideline developer #A)

"So Prisma, which is what you started with, was really an attempt to give a framework for all of these different reviews. Just for conduct, there were conduct guidelines for gastrointestinal studies and conduct guidelines for cardiovascular studies. I mean, there were all these different flavors of the reviews for different subject matter fields. So, I think the Prisma activity was intended to give a framework that put all of these different systematic reviews into some context" (Guideline developer #C)

"Because there's lots of uncertainties about how things are done and the standards help to resolve those uncertainties and come up with some agreed, ideally evidence-based set of rules for people to follow, I would say. I'm not a clinician, but from a clinical perspective, it's the sense of there's areas of uncertainty, can we try and resolve that uncertainty and provide the best guidance possible to clinicians? I think we need the same things in relation to the methodology that we use for research." (Guideline developer #A)

"One of the interesting things with these reporting guidelines is that they actually simply consolidate what everybody already thought was good practice because it was already the structure for Cochrane reviews, which had come partly out of McMaster University's ideas around how do you assess quality of a systematic review. If you're going to say

that these are the 10 questions you should ask to assess the quality, then you need to report in guideline to make sure that the potential answers to those 10 questions are available." (Guideline developer #A)

"Why did we go down a route of saying, this is what to report, as opposed to this is how to do it? I think it's much easier to tell people you should say something about how you did your searching than it is to say to people 'this is a good way to do the searching'. And thinking back over time, it could be that we didn't know the answers and we still don't know the answers to what is a good way of doing something, but we do know that you should be telling the reader how you did it. It could be that we even had a mindset that was saying we don't know right now what is a good way, but one day someone will and as long as you've described what you did, ... we'll be able to make that judgment..." (Guideline developer #A)

"You can, if they're saying, if you're being asked to report something, that that obviously means it's important that you do it well, and I think that can lead people to be thinking you're telling me how to do it well. For example, if we take a CONSORT an easier example, you should report how well you concealed the allocation in a randomized trial. How did you keep it secret before the person joined? That makes me think it's important for me to keep it secret, which it is, but it's basically saying what did you do to keep it secret?" (Guideline developer #A)

A.3.3 Development process, group selection and configuration

"I think in my understanding of how the working group is formed, you'll want a diverse working group. You'll want people who have different expertise and come from different backgrounds and represent different stakeholder groups and can really get some work done. " (Guideline developer #F)

"the selection of the group to work on these things is very important because the people involved have to have credibility in methodology, in publication, in whatever study design you're talking about. There are like categories that you need people to be in. And that's a very important step, as we proceed is getting people with credentials and in all those fields" (Guideline developer #C)

"And so that's who would be in the Prisma group. And so I mean, that's now become the standard way that we deal with guidelines. This is not unique to Prisma. We've done this for all the guidelines I've been involved with" (Guideline developer #E)

"The collaborative effort for some of the reporting guidelines was that they did bring people together and when they were produced, you wouldn't have someone else

thinking, 'Oh, we should make it. We should write our own as well. Let's get together and write our own.' They were coming from that family, the CONSORT, PRISMA and other things, similar bunches of people involved and became the standard-standard." (Guideline developer #A)

"For example, even for the PRISMA, there were many sub items that were proposed early on, but we decided it's better to drop because it's just too tedious." (Guideline developer #F)

"It's good to have all those things, but the reporting guidance are really the mandatory, is the word I would use, so mandatory versus highly recommended is another way to distinguish where we draw the line. " (Guideline developer #F)

“And so, I think that is why when we're selecting who to invite to a meeting, you want to think of people who can bring diverse perspectives, who may not be the most agreeable people, personality wise, but you want to make sure that they're there so that they can introduce the topics that are not traditionally considered" (Guideline developer #E)

"For example, in meta-analysis, heterogeneity wasn't there when we started, and it ended up being a substantive part of the recommendation in the (final) article, and that was because of [prolific biostatistician]’s input during the process. " (Guideline developer #C)

"[P]eople who study publishing, scholarly publishing and like kind of apply scientific methods to that, studying that area. And what else could I call? I don't really know the term. There's meta epidemiologists or meta researchers. So we're compiling research on research. I've done a lot of those types of studies. So I wear a few different hats." (Guideline developer #E)

"The authorship was determined by the people who, you know, this is always the case, people who substantively contribute to the conception and the development and the writing and the revision and are willing to stand behind the work." (Guideline developer #C)

"Unfortunately, I don't always think the right motivation is behind it. As you probably know, these guidelines are highly cited. People want to have them on their CVs. It's beneficial to your career. Sure, if you have something that's been cited a thousand times" (Guideline developer #E)

A.3.4 Dissemination and Implementation

"And I have to publish it in various disciplines so that it is really recognised. That's the one point to really get a wider distribution. " (Guideline developer #D, *translated via deepl*)

"The other thing, in my view, is also a certain statement from the journals themselves that they have said that we are publishing this guideline and that also means that we want this guideline to be observed and that we want to adhere to these standards. " (Guideline developer #D, *translated via deepl*)

"And journals have a lot of influence over what gets published and the quality of what gets published or they can, they don't know that they necessarily, you know, use their authority or power in that way, but they can." (Guideline developer #E)

"The answer is you should hit them where it hurts. And an editor has this power. I won't publish your paper unless you put all this information, which could go in small print, could go in at the end of the paper, but it has to be there, readily accessible by the reader." (Guideline developer #B)

"I do a lot of reviews for [Big 5 Journal] and one of the questions for the reviewers is 'are there guidelines?', 'Do guidelines exists to cover this particular study design?', 'If yes, did the author adhere to all the guidelines?' So it's incumbent, it takes a fair amount of time. It's incumbent on me to go get the guidelines and compare them to the article but at least [Big 5 Journal] is cognizant of that issue" (Guideline developer #C)

"But they (journals) do have people who, when a paper comes in, they've got somebody who says; does the person-, did they format everything correctly? And they using the right reference style, and so on. So, I mean, that person with a little bit of training could be very instrumental, saying; oh, this is a systematic review. Let me go grab PRISMA and see if they've satisfied all of those checklists." (Guideline developer #C)

"I know this from the [a medical] Journal, for example, because that is the specialist journal or the in-house journal of one of our specialist societies. They have an extra Reproducibility Editor. " (Guideline developer #D, *translated via deepl*)

A.3.5 Reception and Usage

"So if I encounter, you know, when I get sent submissions, one of the first things I do is, I look to see if it's compliant with Prisma. And that's kind of how I do my peer review. " (Guideline developer #F)

"I think that's what the compromise between a team of so-called experts, and I don't want that label, but people would think they're putting out the guidelines like the police

versus the community who is being policed, by usually their peer reviewers in journals by following the minimum standards." (Guideline developer #F)

"And by peer reviewers, I mean, there's also there's people who can peer review, but there's the idea of automation, like Prisma is a guideline, there are standard items. I know that there are some initiatives that are being built and people are developing to look at how we automatically assess reporting of systematic reviews and of research, using automation against a guideline" (Guideline developer #E)

"People who are already working in the field of medical writing and editing are extremely grateful to hear about this stuff, it's like, oh my gosh, this is going to make my work so much easier to have this" (Guideline developer #D, *translated via deepl*)

"They usually act with a lot of confidence thinking they're the best of their kind, and they know how to do it and they don't need anyone else to tell them how to do it. " (Guideline developer #F)

"I kept getting emails from colleagues who wanted to ask again and have certain things explained again or who then reported that they had used it. " (Guideline developer #D, *translated via deepl*)

"We have a Cochrane group and they like to do things a certain way, and very standard, and you know, that's just how they do things, and they have a lot of control over the process of their systematic reviews. And that doesn't work for everyone, not everyone wants to engage at that level. They don't want to be kind of handheld along the way, entire time. " (Guideline developer #E)

"The funders would recommend, for example, use that set, use the common data elements when they exist. But once you get the grant, no one can really check or enforce that. I think the funders may have different funding mechanisms where they will have more control. " (Guideline developer #F)

"And I think it’s difficult to implement really, in practice, because people are doing systematic reviews, you can do it from your computer behind a desk, you don't need to be in a lab, you don't need to be around other people. So it's very difficult to kind of control that process of what's happening" (Guideline developer #E)

"You see, I regard the reporting guidelines as just a tool. It's just a tool. That's all it is. Editors are there. They are a tool too. Now, ...people like me like to think that we're gifted in some magical way with all sorts of other things but amongst other things we're

supposed to ensure that things were reported correctly. But in fact, there's no end to that. None." (Guideline developer #B)

APPENDIX B: PRISMA USERS

B.1 INTERVIEW GUIDELINES

(*reformatted for readability*)

1. Introduction

a. What is your scientific background, training, discipline?
b. Current academic position, experience with reviews
c. Do you practice as doctor?
d. Do you train students in research or practice?
e. Discipline: Are SR's common in your field? What is special compared to other medical domains?

2. The Review under question

a. Can you briefly characterize the overall project: Project duration, overall number of people involved, was it your main project at that time?
b. What were the most effortful steps in the project (screening, retrieval, appraisal, aggregation…)
c. When did you start with writing the manuscript? Did you register a protocol?
d. [if multiple authors]: Did the different team member brought different expertise in, like librarians for literature, statistician for aggregation. How did you handle authorship?
e. Did you consult any educational material about how to do a systematic review before or during the review? (e.g. to keep track with recent methods)
f. Was any specific software for systematic reviewing involved? Can you explain what were affected by the usage of software?

3. Usage of PRISMA (& others)

a. When did you consider using PRISMA and why?
b. Can you briefly explain how PRISMA affected the workflow of your review or provide some examples? Did you have to go back or redo some aspects, e.g. calculations with different indicators etc. Were there some challenges in applying certain items, e.g. bad fit between PRISMA and the review? Were there some uncertainties in interpreting certain items of the guideline? [if multiple authors]: Was there a specific member who focused especially on PRISMA compliance?
c. How laborious/effortful was it to use PRISMA? Would you say that it saved you more work than it imposed?

d. Why did you cite the guideline? (Why do you think are other guidelines not cited, e.g. CONSORT)

4. Reception of PRISMA (Usage)

a. Was PRISMA compliance required by the journal you wanted your SR in?
b. Can you explain what role PRISMA compliance of your review played during the editorial or review process?
c. Do you check for PRISMA compliance when you read or review other systematic reviews?
d. Is it important for readers and reviewers that SR's make any reference to PRISMA so that compliance becomes visible?
e. Did you ever had the suspicion that a review stated PRISMA compliance but did not actually apply the guideline? E.g. during peer review?
f. Did you ever found that a PRISMA compliant review was missing some crucial information?
g. Did you ever consult the supplementary material of a review such as flowchart and checklist?
h. Do you think peer reviewers should be expected to check for guideline compliance or is this too much of a burden for them? Would it be helpful or meaningful if there is some algorithmic compliance check or are you already aware of one (please name journal)?

5. Reporting guidelines in general

a. Do you think that reporting guidelines are overall beneficial for your discipline?
b. Do you think that PRISMA is widely applicable to how SR's are done in your discipline? Does it suit better to quantitative research than qualitative?
c. If you were part of the developing team, what would you change with the next update of the guideline? What do you think is missed by its developers?
d. What do your peers think about PRISMA and other guidelines? Are you aware of critical voices?
e. Do you think that compliance to strict reporting guidelines can force authors to lie about their SR's? e.g. by making up people that supposedly appraised included studies.
f. Do you think that PRISMA can be used to educate future researchers how to do SR's? Even beyond reporting?
g. Do you think that PRISMA and others tackle one of the more important problems with contemporary biomedicine? Or are there, in your perspective, other and more pressing problems with research outputs?

6. Various, outro & thanks

B.2 CODEBOOK

Code_level1	Code_level2	Code_l3	Description and background
General systematic reviewing practices and perceptions	Software usage		Mentions of particular software tools, not only for systematic reviews.
	aims of SRs		Explains the aims of systematic reviews in general, or the reason why the focal review was produced in particular (see also project background).
	protocol and registration		Information related to protocols in general or the focal protocol in special, i.e. its creation and registration or role for the review.
	emphasis on SR practices		Explanation of the general procedure of systematic reviewing without relation to the PRISMA guideline. For example, systematic review steps (searching, screening, filtering etc.). Can be either particular or general (disciplinary narrative). Can highlight individual base levels of task uncertainty and role of standardized instruments in general.
	learn SR'ing		Information about how people acquired the skills or if they consulted educational material during the process (handbooks, courses etc.). Can co-occur with collaborative interaction in case if method advice was provided by supervisors or colleagues.
	collaborative interaction		Information about hierarchies among collaborators (reviewers, supervisors, mentors, students) and instances of conflict and negotiations. Evaluation of collaborative procedure, unrelated to the usage of PRISMA (see "collaborative interaction regarding PRISMA").
Disciplinary Narrative	phd start with SR		Mentions how research careers begin with doing an SR (e.g., start of PhD-project) and explanations regarding the role of the SR for the following milestones.
	Epistemic profiles		uttered epistemic distinctions and indications of epistemic struggles. For example, qualitative versus quantitative research, high-data research, interpretative sciences, theory building.
	disciplinary epistemology		General description of the interviewees scientific field. For example, epistemic characteristics and established practices. Juxtapositions with any idea of generally established methods and standards (own discipline versus mainstream research).
	output types		Explanations of the role of SR's in the discipline, or mention of other typical output types. For example, "SR's are time critical", "start by writing methods" etc. Characterizes other SR's and output types in contrast to the SR at hand.
	output types	standard SRs	Attributions of qualifier/value words, e.g. standard, traditional, good, bad etc.
	output types	new SR sub-genres	Accounts of changing genres within the field or medicine in general.
background, project and context	personal activites in SR		Explanations of professional profile, emphasis of certain tasks ("i do statistics"), teaching, mentoring activities in general unrelated to the project in focus.
	personal background in SR		Relation of the personal profile to SR'ing in general. Indication of new roles and professions associated with systematic reviews.
	normalization of usage		Doing SR's as common practice, personally or in the lab. Substantial experience in doing SR or a long publication track.

	different expertises involved		Mentions of different types of expertise involved, either by highlighting the interplay of certain tasks taken by involved actors, or the naming of particular roles (statisticians, librarians, domain experts).
	project characteristics		Used for case summary. Project descriptions given during the interviews or included in the publication and its metadata. Involved sites and personnel, duration and timeline, size and workload, qualification project, embedded project etc. Although related to the practices, this code focuses more on comparable characterizations.
Perception & attitudes regarding PRISMA			(general perspectives not necessarily associated with the focal project)
	PRISMA & qualitative research		Perspective that PRISMA is less applicable for qualitative research in general. Based on previous findings where editors and authors mentioned how there is less awareness and consensus about guidelines in qualitative research, so that they are less applicable (Fuller et al. 2015).
	aware/unaware of PRISMA (blackbox)		Immanent judgement which indicates the awareness of PRISMA's strengths and weaknesses. Either reflective explanations or discussions provided (higher awareness), or descriptions are brief, kept general/abstract, or are enumerated textbook-like (lower awareness). This is also related to the "attention shift" that comes with standardizations. Note: hard to assign, yet fruitful code.
	effectivity		Thinks reporting guidelines are effective without further specification. Related to the social life of the guideline. Previous research indicates that experienced researchers are convinced by the effect of reporting guidelines (Fuller et al. 2015).
	epistemic narratives (related)		Utterances where PRISMA is related to common epistemic concepts, i.e. "Reproducibility", "Transparency", "Open Science" etc. and how PRISMA fits into the picture of contemporary challenges in research.
	responsibility to use PRISMA		Linkages of PRISMA to ideas of "good scientific practice", being a professional scientists or ethical responsibilities of research.
	prisma is about writing		Direct explanations that PRISMA is about writing, either given in the publications or during interviews. Mentions of related aspects such as word limits, spellings, text genres etc.
	suspicion and mistrust		Utterances of suspicion or mistrust about the usage of PRISMA and other guidelines by peers, colleagues and even collaborators. Explanations of others have motivations beside doing good research, i.e. getting published. Based on the previous literature about how suspicion is an inherent feature of review tasks (Moreira 2007), how instruments fuel awareness and reflections about accountability (Harvey et al. 2013), and how standardizations and classification enable discrimination (Bowker and Star 1999).
	PRISMA as evaluation tool		Perspectives about PRISMA's role or usefulness as evaluation tool without a particular instance where it has been used as such (see "evaluation tool" below). Can be idealized or visionary (e.g. when asked about the peer review process).
	insecurity		Any instance of uttered task uncertainty such as demands for more guidance on the same or other task. Mentions how PRISMA is insufficient in general. Moments in which participants regretted certain tasks or decisions.
	problem awareness		More detailed reflections on transparency and current issues in research against the background of what PRISMA tries to solve (compared to the codes above). Related to the official narratives of the guideline.

	shifted responsibility		Mentions on how PRISMA shifts responsibilities from one actor to another (e.g. from the author to the reader or reviewer).
	resistance		Any negative attitude against PRISMA, either own or of peers.
		Authority conflict	Statements that point towards a conflict between PRISMA and other standards or established practices.
		High usage costs	Criticisms about high efforts of applying PRISMA or reporting standards in general. Related to "cost benefit assessments"-code (below).
		other problems more important	Mention of how other problems in research are currently more important or how PRISMA is only a small part of wider issues or crises.
		strictness / limited creativity	Criticism with regards to how PRISMA changes established or common practices too much, e.g. by being too strict or less applicable.
		cookbook practice	Criticism with regards to procedurality of standardized checklists. Relation to "cookbook medicine" and procedural objectivity of meta-analysis (Stegenga 2011).
	standards improve communication		Utterances regarding how standards/PRISMA improve scientific communication, collaboration or knowledge transfer into policy and practice.
	PRISMA as standard		Explicit usage of the word "standard", or similar ("standardized protocols").
	standardization and quality		Any reference to traditional notions of quality or impact in medical research, e.g. Journal Impact Factor, citation impact or rankings.
PRISMA usage decision and facilitators			
	cost benefit assessments		Utterances regarding the efforts of applying PRISMA in contrast to the benefits. Can be about the required time to learn about and use the guideline. Also epistemic costs in relation to the guidelines impact on the manuscript. Contrastations to other standards (e.g. Cochrane guidelines). The idea is that guidelines require an initially high investment but make processes more efficient later (Fuller et al. 2015).
	availability of information		Mentions of how information about the guideline played a role before or during its application. References to one of the many information sources about PRISMA (e.g. website, publication E&E document etc.).
	conviction		Answers that indicate clearly how the personal perceptions about PRISMA were the main reason fur using it. Related to "perceptions and attitudes" (above).
	courses and training		Mentions when PRISMA usage was suggested during a course or formal training (related to "educational material code).
	evaluative requirement		Mentiones that compliance was actually required by journal, editor, reviewer, science funder, PhD supervisor etc.
	community membership and professional identity		Answers indicating PRISMA usage because of professional culture and the intention to be a systematic review expert. Can be related to codes about discipline and general perspectives about the guideline (Bowker and Star 1999).

	authority of PRISMA		Statements with a direct or indirect ascription of authority to PRISMA, either social or epistemical, which then became a use facilitator (e.g. "it is not up to me to question…").
General interaction with PRISMA			Basic information of how PRISMA was used with regards to its intended use.
	epistemic impact, fit review to prisma		Explanations of the relation between the guideline and the tasks of the review, for example with reference to statistical tests, indicators, search strategies etc. This rather abstract code highlights instances where the process is reinterpreted with regards to the guideline.
	PRISMA settles concepts		Explanations of how PRISMA was used to template concepts, definitions, or whole statements. Focus on how PRISMA impacts on the micro level.
	no tinkering		Clear statements about how PRISMA's scope was seen as well-defined, clear and understandable.
	PRISMA as checklist		Instances when PRISMA was used as checklist during or at the end of the writing phase as it is suggested by the guideline's scope. In addition, instances in which missing guideline items lead to the rewriting of certain aspects.
	information management		Explanations of how PRISMA prescribed the distribution and layout of information throughout the manuscript.
	applicatory challenges		Mentions when the application of PRISMA imposed some minor challenges without the need to make bigger adjustments in the review or reinterpretations of the guideline.
Tinkering, manipulating and overusing PRISMA			Codes based on how users do not follow standards mechanistically but rather manipulate and tinker with them.
	multiple standards involved		Mentions of other guidelines and explanations of how they resonated with PRISMA, i.e. whether there were conflicting or complementing issues.
	signifier of usage		Moments that indicated the importance of making guideline compliance visible to readers beyond just applying it in principle. Related to reasons for citing the guideline, or superficial/visual checks of guideline compliance during reading and peer reviewing.
	non-epistemic benefits		Moments of deviating from the guideline while preserving its social benefits, i.e. immunization against critique during peer review or the gain of credibility.
	coordination tool		Any instance where PRISMA is used as a coordination tool for task management and agenda setting (see also 'collaborative interaction' below).
	inapplicability or insufficiency		Explanations of how certain PRISMA items did not fit to the SR project at hand. For example, items were too detailed or related to a different method. In addition, indications of the guidelines "blind spots" and shortcomings, either in perception or practice.
	attention shift		More abstract or immanent moments of indifference or unawareness about the guideline and related practices. This code is based on the theoretical assumption that standards black-box practices and procedures. For example, participants don't remember certain aspects, do not reflect, established routines related to PRISMA, or do not consult the guideline anymore. Can also be informed by whether the most recent version of the guideline was used etc.

	shift of creative space		Mentions of documentation venues beside the systematic review manuscript and how these were used. Focus on the the relation between the different venues. For example, protocols, supplement, websites.
	interpretative uncertainties		Indications of how the meaning of certain guideline items was unclear and explanations of how this uncertainty was resolved. For example, if some concepts or tasks described in PRISMA were unknown and had to be looked up.
	usage uncertainties		Indications of how the correct application of certain items was not clear and which strategies were chosen. Related to the code "interpretative uncertainties", some items might have been understood but it remained unclear how the required information could be obtained or provided.
	collaborative interaction regarding PRISMA		Answers that reveal how PRISMA or particular items have been subject of interactions among colleagues. These could be clarifying discussions, education and advise or conflicts over the correct application of PRISMA.
	evaluation tool		Explanations about what role PRISMA played during the publication process. For example, whether there have been critical remarks regarding PRISMA compliance during peer review. In addition, participants may used PRISMA to evaluate the work of others in the same sense.
	tinkering becomes transparent		Explanations of how guideline deviations have been made transparent to readers. (e.g. officially justified deviations versus more elaborate strategies). Focus on the self-perception regarding the creative manipulation of the guideline.
	PRISMA for conduct		Assigned if the published review states that PRISMA was used for conduct or similar.
Other codes	Covid-19		Any relation to the Covid-19 pandemic.
	Illustrative quote		

B.3 Additional quotes

The following quotes have been coded "illustrative quote" during the analysis (see list of codes). They have been anonymized and edited to improve readability. Edits include punctuation and the separation of sub-sentences; removal of repetitions especially when they stem from spoken language; removal of whole sentences if unclear or verbose; adding of explanatory information. Quotes have been broadly categorized.

B.3.1 Workloads, the most effortful tasks in systematic reviewing and the cost-benefits of PRISMA

"I think that it is an investment, let's say. It takes time but actually, it has two main [benefits] let's say. One is, you don't let anything out. In other words, the reviewers and readers will find all the relevant information there. And second, the quality of the final results is better. So, it's presented in a way that it's easier for those who read and develop guidelines … to get the information right. So, they make sure that your research

is read and then is used. So, it is an effort, but then, it's like working on a, a problem in geometry. So, you need to apply some rules. And if you follow the rules, it's easier for those who are reading your exercise to understand clearly what you want to say. That's exactly what you do with PRISMA. You make sure that everything is done properly and reported properly." (Roman, Full Prof)

"And do you know Robert Pirsig's "The Art of Motorcycle Maintenance"? … [I]n the book they talk about an a English teacher. [H]is comment is that 'I can't tell you how to write a good paper but when I read it, I know it's good.' And it's so sort of the same concept here. I can't tell you exactly and I don't think PRISMA tells me exactly how to do a good systematic review. But when I read one, then I know if it's good. You know, like, English teachers can kind of help you on how to write a good paper. But in reality, you can be guided all you want, but you still write a crappy paper. … So I would parallel the PRISMA guidelines to Zen and the Art of Motorcycle Maintenance… . PRISMA is like an English teacher. You can only do so much. And then it's up to the individuals to actually produce based on some parameters." (Tina, Full Prof)

"I think that's what science is about. If you can't compare then how can you conclude?" (Mike, PhD student)

"[E]ven the reference system broke down several times, because we had so many references. And having that in a document, it basically destroyed it all. So, for example, what we also did is, we designed a search tool with [our industry partner], we also had the luxury of having IT people, so we had all the different studies which we assessed in an online search tool. Because for example, it wasn't possible to include all the studies in the publication. Because the reference list is limited. And my 500 assessed articles kind of extended this. So, we designed an IT search tool, where you can basically go online and look for different-, for example, piece A were diagnostic markers. And then it shows you, like PubMed, all the lists, all the articles which we assessed. And then you can click on it, and you can see the quality assessment. So basically, what we scored it, to say that's a good study, that's a bad study, based on our assessment. So, that's one of the outputs as well, which we developed based, on that systematic review." (Sofia, PhD student)

"(The most effortful task), I think I would say data extraction and summarization or aggregation, because everyone reported whatever they want. I mean, we were summarizing sort of case series or case reports. So, some people were reporting some details, others took different examinations or provided different treatment and so on. So, it was difficult to extract that and sort of have a coherent story across reports that

we were comparing. I think it may have been my very first systematic review of cases or case reports, and I found it very challenging because of that. Because in the past, they have done systematic reviews of prevalence estimates or association between A and B, and that's pretty standard. Everyone reports the association, I don't know, alteration, confidence intervals, and so you just pull those, and you have a clear picture. Prevalence as well, it's a percentage and standard error or 95 confidence intervals. And again, that's pretty easy to spot in any paper and extract. But in that case, it was a lot more difficult." (Alonso, Post-Doc)

"I think it's a very useful guide for identifying the characteristics that are relevant. I feel that because I dismissed a couple of steps like for registering and the meta-analysis, that it wasn't additional work but if I had done those steps, they would have been more work. But I also feel that it would have improved my study significantly more. It would have helped with the transparency if I did do those steps I dismissed." (Andrea, PhD student)

"the tables were massive. And especially because there are no numbers. You know, like there are quotes. And sometimes, you know, like our tables were like, four pages or five pages. So yeah, definitely, we have to shorten it a bit. So actually, I'm pretty sure it was in this paper that we sent one of our main tables to a supplementary material, just because it was so big that we decided just to show them things." (Dalia, Post-Doc)

B.3.2 PRISMA DURING THE DIFFERENT STEPS OF SYSTEMATIC REVIEWING

"P: I think what happened was we just looked at PRISMA, then I wrote a draft of the whole thing. And then we looked at PRISMA again and actually tried to check that we'd done everything with the boxes and what page everything was on. So, it didn't, like, drag the workflow in any way. And honestly, I think it was just me doing all this. It was in the appendix as I was sending to colleagues, but I don't think they were checking or anything. I was using it partly to give myself confidence that I could submit this because of the light touch supervision I was getting." (Adam, Post-Doc)

"Like for example, I'm going through the guideline now, but they say, 'in the methods, present … the methods to decide whether a study met the inclusion criteria'. And so, that's for me very useful because then you think beforehand, 'okay, what methods are we going to decide?' [B]ecause we know that in the end, we're going to have to report on this anyway. So, for me, in the planning of the review, I found this very useful. So, yeah, I found it very interesting, even the guidelines on what to say in the protocol were very useful because it really forces you to think of each step. Like, I was not really aware of the statistical methods for meta-analysis. But if I remember well, [the guidelines] tell

you to report in the protocol [the statistical methods], how you assess heterogeneity of the data, and which models are used. And so, if you look at it at the beginning of the of the project, then it's a nice way to discuss with colleagues: 'Okay, so what model are we going to have to use? [C]an we use a random model or not? [D]o we go for the inverse variants, et cetera?' So yeah for me, the fact that it forces you to plan things, I find it even more interesting than in the end, having everything in the manuscript." (Marco, PhD student)

"It was about the planning. And I think it's most useful as a planning tool as well as a checklist because you can't really do one well without the other in mind, I think. It makes your life easier if you are aware of what an endpoint will look like when you start." (Barbara, PhD student)

"I usually use it to sort of make a layout of the manuscript, like every or most items from the PRISMA will become a subtitle in the methods or the results or whatever. So, I use it before to frame the outline of the manuscript. And I will only use the items that apply to my work. But usually, the same items in the checklist will become titles or subtitles throughout the manuscript. And then at the end, I usually just use it to put in a number of pages. And to be honest, I probably use it at this stage only because it's requested by many journals." (Alonso, Post-Doc)

"[W]hen you write your protocol, you can write everything without issue any with the number of words. So, sometimes, when we get the review from the peer reviewers, we sent them the protocol that we had as a PDF, where most of the information was already written. [S]ometimes there are some things in the systematic review itself that are not written in the paper because they are in the protocol anyway. [W]e also used a lot of other research equations, et cetera. Everything is in a supplementary material. So, I would say that for me as a researcher, it's way more useful to look at this at the beginning, but I can understand that for a reviewer, or for someone who wants to judge the quality of my systematic review, it would be interesting for him or for her after it." (Marco, PhD student)

"Well, it's just that in the end, I guess this tool is made to help to improve the quality of papers. [B]ut many of these things to report require work and you don't want people to discover the PRISMA guidelines too late in their work, where they're going to have to report for example, how the data collection process was done, and find out that they have actually a lot of bias in the way it was done" (Marco, PhD student)

"And then the checklist I use right at the end. Because that's how you write a systematic review, I think, if you have a bit of practice in writing systematic reviews, the question

or the checklist is what you do anyway, and what is kind of engrained in you, and then you just add: 'Okay, I've done this here, I've done this there.' But for me, I do it at the end, when I submit my publication, to double check. But I don't use it from the beginning. But I don't know, maybe that's the wrong approach. But I've done quite a lot of systematic reviews, so I kind of have a structure how I do it, and I teach students as well, how to do a systematic review, and how to do protocols." (Sofia, PhD student)

"It was something that was used iteratively or referred to throughout the process. I remember reading it the first time, like the entire checklist, and then starting the process. [B]ut there were some steps that you could go through for the systematic review, like the screening process, without referring to PRISMA as much. It was more so during the writing phase where I use PRISMA a lot. It's like, okay, "I need to talk about this" or like "this is important to talk about", "this is what is included in systematic reviews" and "this is what would be interesting for readers." So, I mainly used it during the writing phase, and then I would like check things off as I completed them." (Andrea, PhD student)

"[A] lot of people say the scoping review will be conducted ACCORDING to the Prisma guidelines. And the wording, 'conducted ACCORDING' kind of implies that it's a guideline, but it's actually not. And then the wording, 'the reporting of the systematic review was GUIDED', has a different meaning to it. But I think, being non-native, that can be quite difficult to differentiate, and if you don't have a lot of experience with it, I think it can be mixed up a lot. And I think that has been done a lot. And I think, also in my systematic review, I have to double check what wording I use, but that wasn't that clear to me. This morning, when I saw this article, I was like, 'this is so true, and I need to really watch out for this.' So, I think, there are subtleties which are difficult to get." (Sofia, PhD student)

B.3.3 PRISMA and evaluation: Editing, peer reviewing and reading systematic reviews

"And I think there is also the requirement to use PRISMA as well, to a certain extent. Otherwise, at least the peer reviewers are questioning it. Because it's an easy thing to question. And for reviewers, if you're submitting to a clinical journal, often the easy, low-hanging fruit are the ones which they catch." (Sofia, PhD student)

"I do a lot of peer review for various studies that are related to my area of interest. It's really time intensive as it is, right? So actually, my opinion is that I would expect the editor to check (guideline compliance) before sending it out for review. Because if it's missing 10 or 15 items, or let's say the Prisma statement is not used at all, I would expect

the editor to send that back to the team and to say look: “please follow this and use the statement and then send it back”. So, I think that's really the job of the decision editor. (Louis, Post-Doc)

"So I totally rejected the manuscript because, for example, they did not report that two people screened the papers and suddenly, in the second version of the manuscript, a second reviewer appeared out of nowhere. And so, I have the impression sometimes that once people know the rules about Prisma, they can also lie about it." (Marco, PhD student)

"If the reviewer makes a comment which would negate the PRISMA statement, which is always a bit tricky. They say: ‘are you sure you want to have this here? Shouldn't it be here or something?’ And it's like: ‘well, no, actually, this is why we've done this.’ So, sometimes you get the impression that the reviewer isn't aware of PRISMA. And that probably extends to isn't aware of systematic reviews, and their kind of the essence. Yeah." (Barbara, PhD student)

"People just want to get their work published." (Mike, PhD student)

"And it's not only like big journals, but I have the impression that no one really realizes the Prisma checklist when you submit it, like as supplemental material." (Dalia, Post-Doc)

"I wouldn't be surprised that if you check at ten studies that say they follow the Prisma guidelines, maybe one out of two does. And even me, I would have to look back, but I think I would follow 90% of it at least, with my bias. That's how I would judge it. But I think it's very common for people to say they do (but actually) do not follow. I hope airplane pilots follow the checklist before takeoff a bit more seriously than researchers follow the PRISMA guidelines." (Marco, PhD student)

"I can only trust the authors to do what they're doing. I mean, everybody does hide information. That's common. People wouldn't be people because you can't get published unless you have positive findings. So you amp up your findings even. ... People do that all the time. So that's normal, we expect that. I think in systematic reviews, I don't think the bias is as strong because people are just trying to tell you what's out there. And I don't think a lot of people who do systematic reviews have a hidden agenda." (Tina, Full Prof)

"For me, it's a red flags, I'm almost like kind of I reject because … if they do not use PRISMA, they probably are not fully reporting on really specific kind of methodological things. For example, PRISMA clearly tells you how to report searchers." (Dalia, Post-Doc)

"So, journals struggling with high number of papers being submitted, and I think they would benefit from saying: 'with your manuscript, submit the PRISMA guideline that is filled with the lines, et cetera.'(Marco, PhD student)

"[W]hen you read a lot of PRISMA systematic reviews, you know where to find information. You know what information should be there, or you could hope would be there, unless they have a reason for not. And that is just useful, especially when you're trying to draw things from a lot of papers, or a lot of reviews, or compare reviews. So, I like it for that. I like it for the standardization. Yeah, it makes life a bit easier, I think." (Barbara, PhD student)

"But I imagine putting my editorial hat on, when a review gets submitted, the editor will read it, he'll have to say: "is this reasonable to get sent out for peer review? Have they met … those standards that they need to check off to say, have they followed these guidelines?" [T]hey would look to see that that has been completed before they send it out for peer review. So, by the time it gets to peer review, it's not been a matter of if they follow those guidelines but how well they follow them. So I think as a reviewer, I would not choose to review an article on a methodology that I didn't understand." (Sabrina, Post-Doc)

B.3.4 PRISMA AND OTHER STANDARDS DURING COLLABORATIVE WORK

"We, we make sure that those who are involved in the searches and study have a background of what we will be using in terms of methodology. It will be required to read the PRISMA statement, to know what it is. They will be required to know what is a GRADE system, the, uhm, level of evidence, strength of recommendation. These kinds of methods need to be discussed with them. And we usually have a meeting with those who have not participated in any project … And then, we would make sure that everyone … is able to work with the methods or the tools we are using." (Roman, Full Prof)

"And then of course, when it came to the writing of the reviews of the synthesis piece, like I said, we had those tables and then writing those we divided and conquered to write up the narrative synthesis of each of those pieces… you break it up into manageable bites for each team member, I guess." (Sabrina, Post-Doc)

"And then we incorporated another colleague of ours who is a neurologist to give us some sort of input for when we were writing the paper, to give us some more context on the physiology or treatment or those kind of things that we were not experts in. We were trained in medicine, but it was really necessary to have someone with a 100%

neurology background. It was really useful to pin down some of the more clinical aspects of that work. And at the same time, we also included one person who had at that time, who had published the largest case series in that field. It was a physician in Italy, if I recall correctly. And so, she also had experience with that and particularly not only the neurology part, but the neurology plus COVID part." (Alonso, Post-Doc)

"So, for example, I created a Word document with inclusion and exclusion criteria and we pilot tested data extraction sheets. Uhm, I gave them feedback once in a while, but … they would just be less rigorous, I guess. [M]aybe when they had a doubt, they would say, okay, let's exclude that one. And actually, it was better to include it or they would exclude studies because some of the data are missing without thinking that it would be worthwhile to contact the authors … to ask for information." (Marco, PhD student)

"P: Yeah, I think so. I think some people will say enthusiastically, “Great. Let's do the PRISMA.” And I probably say that kind of enthusiastically as well, but then other doctors I spoke to have been a bit more like, “Well, now I guess we better do the PRISMA. It's just part of what we've got to do.” That's okay. That's unenthusiastic acceptance, but not criticism. I never heard the criticism." (Adam, Post-Doc)

B.3.5 The role of standards for the scientific community

"Who gets to decide what is strict? I think we both agree that we want them to be rigorous. We both want it to reflect unbiased results. We both want them to be helpful in the literature world and the research world. We're all on the same page. There's just who gets to make that ultimate decision. Does a committee get to make a decision about what they think is the most appropriate thing that goes into a systematic review?" (Tina, Full Prof)

"I think guidelines-, for me, guidelines are important, frameworks are important. I don't want to redevelop the world because a lot has been done. Why not use what has been done and proven to be right from other people. And if I do modifications of-, like my systematic reviews, they're still based on different checklists, and bringing in different researching guidelines, instead of just going off and developing my own thing. Because I don't think there's a need for it. You can modify, but totally coming up with something new is very rare" (Sofia, PhD student)

"Because everybody needs to follow what you're doing, that's the systematic review approach, everybody needs to basically redo your systematic review and come to the

same conclusions as you do, otherwise it doesn't make sense why you're doing it." (Sofia, PhD student)

"Similar to like many journals will not publish research that didn't have an ethical statement around it because it demonstrates rigor in your study. However, I also know that people could say that they had ethical approval, and that they followed guidelines, but really didn't. So, there are people that would just cite it for the sake of citing it because they think it will make them more publishable even though they didn't necessarily follow the guidelines (Sabrina, Post-Doc)

"So, I guess Excel is too basic to actually (cite it). I guess you could cite the Microsoft Office website, but then you're also not citing Word. So, maybe there are limits, too." (Sofia, PhD student)

B.3.6 Standards and epistemic requirements, disciplinary idiosyncrasies and systematic reviews of qualitative research

"I think perhaps in nursing because we are sort of, we bother… No, I'm going to be careful how I say that. We certainly draw on medicine for lots of our work, but we also draw on lots of social sciences. So, there's a, you know, an art and science to nursing I would say. So, looking at reviews in nursing, maybe we do less of the (model?) analysis type work and do more mixed looking at the quant and qual or looking at the qualitative synthesis from a patient's perspective and synthesizing those aspects in a qualitative nature." (Sabrina, Post-Doc)

"real-world evidence is something which is more and more important, but you can't apply the same standards to real-world evidence as you do for randomised control trials. So, you need to have justification why you're doing this and that, and explain that again. And so, I think there's a shift in perception towards real-world evidence, which also comes with a shift of perception of standards, and bringing in new standards." (Sofia, PhD student)

"P: Very early. Like I think it was really like the grounding aspect, but this is how we were going to guide our review, knowing that in nursing, I guess I won't speak for all disciplines, that's sort of the gold standard for how you want to conduct your review. … We're an evidence based discipline. So, using the best evidence in terms of reporting was important to say, these are the standards that we want to make sure we meet, be aware of them and we kept sort of referring to them as we moved through the process

so that they can see how we're meeting those criteria as we went through." (Sabrina, Post-Doc)

"Because I suppose the challenge was, in this case, we were doing something a bit lumpy, which, like I said, you know, I was slightly conflicted about, but overall, that was the approach. Is it really important in that case? Does it de-legitimize doing something more creative if everybody is focused on guidelines as being the kind of cookie-cutter approach to systematic reviewing? Which coming back to the first thing I said to you, like, you can do a systematic review of a stupid question following guidelines. Like, it's not proof that you've thought carefully about creating some useful information. I suppose, yeah, I can see both sides. (Adam, Post-Doc)

"I'm going slightly off topic here, but I think that what we did was something quite useful compared to if we'd only done a very ENTREQ systematic review, or one without any of the qualitative stuff, or without my quite rough attempt at doing a qualitative review of some ethics literature. That was quite a MESS, but I think what came up was kind of useful despite." (Adam, Post-Doc)

"And actually, some of the hardest part of that review was figuring out how the different disciplines defined different aspects of their work. So, how do you define virtual care? What does that look like in education versus medicine versus nursing versus social work? So, those types of things were challenging, but once we got that sorted, that was good." (Sabrina, Post-Doc)

"If I look at the Journal of gerontology, which has a bit of a higher impact factor and specifies different types of articles that they accept. So, they have like a specific section for reviews. I think that is a journal that might be more explicit about having the criteria (for reporting) set out. And then in those like higher impact factor journals, I've noticed that they're generally longer and have more details and systematic reviews. So, I think it's more journal dependent versus discipline dependent." (Andrea, PhD student)

"I think when you have no idea on how to conduct a review, you might be a bit overwhelmed. Because you wouldn't know where to start. And, of course, you have like the Cochrane handbook. And you have really big handbooks which are probably not friendly in the sense to have kind of a snapshot journal-like (advice) of what you need to do. Because the Cochrane handbook is like a Bible or something for people doing a systematic review." (Dalia, Post-Doc)

B.3.7 The applicability of PRISMA: standardization versus flexibility and creativity?

"I think it's really useful, because-, okay, there are limitations to it, and sometimes, they are not one hundred percent applicable. But I think they raise a certain standard, and there should be a certain standard in conducting research, and having standardisation. … But there needs to be room for flexibility. But those flexibilities need to be justified by the researcher, so it must make sense why you're doing things." (Sofia, PhD student)

"When you have it available for people who are into doing this lockstep way and following the guidelines and doing the PRISMA that way, that's great. And the people like me, who look at it and then morph it a bit, I don't think my contribution be less than theirs or their's more than mine, we're just different. And that adds value to any endeavor when you have a little bit of a mosaic going on." (Tina, Full Prof)

"I think (PRISMA) was like: 'okay, this is talking about meta-analysis.' At the stage where we were checking through it was clearly like: 'okay, this is not relevant because we've not done a meta-analysis.' Though, the whole time, we kind of had the possibility of meta-analysis in our heads as something to explore. So, it was kind of in mind that to be aware that there were things like the best practice to follow in that regard. But in the end, it was not something that we included." (Barbara, PhD student)

"There's no value in a strict checklist, there's a value in having people exposed to it." (Tina, Full Prof)

"From the author's point of view, you may just say okay this doesn't apply. So, 80% of the items do not apply so why should I use it? Just leave it there." (Alonso, Post-Doc)

"[T]hat the guideline is there doesn't mean that all of the boxes need to be ticked. But it's just like a matter of making sure that at least most of the sections are included." (Dalia, Post-Doc)

"So, they have a flowchart about who's in who's out, that's highly valuable. But the PRISMA checklist has like a million things you're supposed to include. [T]hat paper would be a million pages long. [I]t's not very helpful. It's trying to be one size fits all to me and so, I didn't use it at all." (Tina, Full Prof)

"If someone says, "did you use the guideline?" I'd expect people to at least look at it. You look at what's out there, and you gather what you can from that. So I'd expect people to look at it because others put a lot of time into this. But to follow it step wise and say A B, C, D, it's like, no, that's a technician. I'm a researcher, I'm not a technician." (Tina, Full Prof)

"(PRISMA) requires you to put a lot of information also in the manuscript itself, which may appear for a random reader to be a bit of noise. So, sometimes, I find that you have to put so much information in your review that you lose the red line a bit. So, I guess it also makes it a bit more challenging for readers. So for me, it was a bit of a compromise between putting a lot of information in my manuscript versus having something that is easy to read" (Marco, PhD student)

"And so, I remember well that initially, I specifically say “yes” to these papers and I said okay, so … they fit with inclusion criteria, but actually when we contacted the authors, we found that they were not. And in the end, in the process of converting my initial draft into a paper for the Journal, I just deleted this part and said that the studies were excluded because they did not fit with the inclusion criteria. And that's it. So, I reduce the level of detail at some point because otherwise, it would just be too long and systematic reviews are already very, very challenging in terms of number of words." (Marco, PhD student)

B.3.8 Suggested Improvements for PRISMA

"I wonder if there could be a difference between what has to be reported in the manuscript and what could be just reported in the supplementary material. I think that could be interesting because, for example (regarding the research equations), they say to you ‘present the full search strategy for all database registers and websites.’ So for me, it's like 15 pages of research equations. [S]o naturally I thought: ‘okay, I'll put this as supplementary material.’ [B]ut I think some others would just think: ‘well, I cannot do this.’ And so, they ended up reporting a very short research equation that they can put in the paper. So, maybe if it was clear what has to be in the main text because every reader has to look at it, as opposed to what can just be as a supplementary material where 1% of the readers will look at it and all the others, they will just skip it." (Marco, PhD student)

"“How far did you actually do this before you wrote your protocol?” That's something that people should be reporting, and that's something that's not transparent. I do think it's important. I do think there's a lack of transparency." (Adam, Post-Doc)

Appendix C: Bibliometric analysis chapter 6

C.1 Full table: Systematic reviews and PRISMA data by field

As extension of Table 6 Authorship characteristics of PRISMA users in selected medical subfields

TABLE 10 AUTHORSHIP CHARACTERISTICS OF PRISMA USERS BY FIELD (FULL TABLE)

Field (ASJC)	Nr. of SR authorships	Mean nr. authors per SR	Rate of PRISMA usage (in %)	Rate of first-ever authorships (in %)	Rate of first-ever first authorships (in %)	Median academic age (years)	PRISMA usage age diff. (years)	P (Kruskal-Wallis)
Agricultural and Biological Sciences (all)	5974	3,64	30,00	17,11	4,13	8	0	0,05
Anesthesiology and Pain Medicine	22800	8,94	39,00	14,32	3,18	9	1	0,00
Biochemistry	6603	3,29	29,00	19,63	4,24	8	-1	0,95
Biochemistry, Genetics and Molecular Biology (all)	20068	5,80	23,00	14,61	2,79	10	-2	0,00
Biological Psychiatry	9576	7,84	27,00	9,37	2,14	13	-3	0,00
Cancer Research	27502	5,12	21,00	11,80	2,21	11	-2	0,00
Cardiology and Cardiovascular Medicine	67683	8,76	40,00	10,79	2,06	11	-1	0,00
Cell Biology	4888	3,66	27,00	20,85	4,36	7	0	0,23
Clinical Biochemistry	3912	3,62	30,00	19,38	4,01	7	0	0,52
Clinical Psychology	11341	4,38	43,00	14,56	4,18	10	-1	0,22
Complementary and Alternative Medicine	6622	5,31	33,00	26,06	6,01	5	0	0,00
Critical Care and Intensive Care Medicine	13671	8,19	44,00	13,52	2,96	10	0	0,67
Dentistry (all)	12759	9,00	55,00	18,02	5,20	9	0	0,80
Dermatology	12607	5,81	31,00	15,14	3,93	9	-1	0,28
Developmental and Educational Psychology	4739	4,19	38,00	14,98	4,64	10	-1	0,19
Emergency Medicine	7195	6,94	47,00	17,69	4,63	9	0	0,64
Endocrinology	10416	4,29	35,00	15,30	3,15	10	-1	0,00
Endocrinology, Diabetes and Metabolism	22593	5,15	36,00	14,06	3,28	10	-1	0,00
Epidemiology	18955	6,77	24,00	9,34	2,04	12	-2	0,00
Food Science	7753	5,88	47,00	16,24	3,88	9	0	0,01
Gastroenterology	31914	7,66	40,00	14,66	2,82	9	-2	0,00
Genetics	39737	10,64	5,00	8,02	1,24	14	-7	0,00
Genetics (clinical)	14250	7,85	9,00	8,72	1,67	14	-5	0,00
Geriatrics and Gerontology	8818	5,30	43,00	14,74	3,71	11	-1	0,97
Health (social science)	3718	3,38	37,00	14,90	4,63	9	0	0,84
Health Informatics	9677	7,67	53,00	16,42	3,90	8	0	0,01
Health Policy	19345	6,34	37,00	13,99	2,86	10	0	0,00
Health, Toxicology and Mutagenesis	7494	4,50	43,00	17,20	4,71	9	-1	0,00
Hematology	17393	6,69	33,00	12,14	2,67	11	0	0,55
Hepatology	12579	6,89	35,00	10,74	1,74	12	-1	0,04
Immunology	12465	4,51	24,00	13,69	2,70	11	-3	0,00
Immunology and Allergy	14190	4,74	27,00	13,45	2,65	11	-2	0,00
Immunology and Microbiology (all)	4425	4,16	27,00	22,31	3,93	7	-1	0,00
Infectious Diseases	23939	5,61	38,00	14,17	2,85	10	-1	0,00
Internal Medicine	19233	6,85	31,00	11,74	2,06	11	-1	0,00
Medicine (all)	137813	9,81	25,00	21,32	4,16	7	1	0,00
Medicine (miscellaneous)	20169	6,15	45,00	12,92	3,08	10	-1	0,00
Microbiology (medical)	7539	4,75	37,00	14,54	2,87	10	-1	0,01
Molecular Biology	12070	4,65	11,00	12,29	2,43	11	-3	0,00

Multidisciplinary	64113	12,74	30,00	17,17	2,76	9	-2	0,00
Nephrology	9124	8,64	28,00	12,29	2,32	11	-1	0,00
Neurology	14577	4,48	33,00	13,10	2,98	11	-1	0,01
Neurology (clinical)	46019	5,73	30,00	12,77	2,70	11	-2	0,00
Nursing (all)	12612	6,40	45,00	19,71	7,12	8	0	0,00
Nutrition and Dietetics	17440	5,29	45,00	15,46	4,05	9	0	0,02
Obstetrics and Gynecology	28624	6,29	38,00	15,79	3,73	10	-1	0,70
Oncology	50708	5,62	29,00	12,97	2,66	11	-1	0,07
Ophthalmology	7605	6,36	23,00	13,32	3,54	10	-1	0,00
Orthopedics and Sports Medicine	30063	5,38	43,00	14,52	3,74	9	0	0,02
Otorhinolaryngology	15137	5,92	41,00	15,35	4,43	9	0	0,00
Pediatrics, Perinatology and Child Health	23208	5,44	35,00	15,77	4,22	10	0	0,26
Pharmacology	19224	4,75	35,00	16,60	3,51	8	0	0,12
Pharmacology (medical)	22597	4,79	35,00	17,73	3,90	9	-1	0,63
Physical Therapy, Sports Therapy and Rehabilitation	15583	5,66	49,00	15,99	4,63	9	0	0,44
Physiology (medical)	6116	5,28	33,00	9,70	1,98	12	-1	0,00
Pollution	5724	4,05	48,00	18,10	4,33	8	0	0,90
Psychiatry and Mental Health	46616	5,83	37,00	12,43	3,10	11	-1	0,00
Public Health, Environmental and Occupational Health	47059	5,58	41,00	15,78	4,11	9	0	0,27
Pulmonary and Respiratory Medicine	19095	6,68	32,00	13,07	2,59	11	-1	0,07
Radiology, Nuclear Medicine and Imaging	21517	6,29	41,00	12,85	2,96	10	0	0,00
Rehabilitation	8444	4,62	43,00	17,63	4,95	9	0	0,58
Reproductive Medicine	6616	4,31	36,00	14,37	3,17	10	0	0,73
Rheumatology	13332	6,09	26,00	12,42	2,84	11	-1	0,00
Surgery	75105	6,29	44,00	15,16	3,37	8	0	0,00
Urology	19878	8,62	38,00	10,66	2,22	11	0	0,00

C.2 FULL TABLE: SYSTEMATIC REVIEWS AND PRISMA DATA BY JOURNAL

As extension of Table 7 Authorship characteristics of PRISMA users in selected journals

TABLE 11 AUTHORSHIP CHARACTERISTICS OF PRISMA USERS BY JOURNALS WITH AT LEAST 1000 AUTHORSHIPS

Journal	Nr, of SR authorships	Mean nr, authors per SR	Rate of PRISMA usage (in %)	Rate of first-ever authorships (in %)	Rate of first-ever first authorships (in %)	Median academic age (years)	PRISMA usage age diff, (years)	P (Kruskal-Wallis)
Acta Obstetricia et Gynecologica Scandinavica	1102	10,91	51,45	11,98	3,90	11	-1	0,701
Acta Psychiatrica Scandinavica	1309	11,48	48,36	10,39	2,52	12	0	0,918
Addiction	1424	10,17	40,66	8,29	1,76	13	-1	0,821
Advances in Nutrition	1683	10,39	48,13	12,54	2,97	10	-1	0,121
Advances in Therapy	1208	10,79	39,40	19,87	2,98	9	-1	0,004
Age and Ageing	1156	9,88	40,22	15,14	4,15	12	-1	0,518
Ageing Research Reviews	1744	12,37	50,97	12,84	3,73	10	-1	0,768
Aging	1001	14,30	29,97	15,48	3,10	7	-2	0,000
AIDS and Behavior	1070	10,59	55,33	12,43	1,87	9,5	-0,5	0,292
Alimentary Pharmacology and Therapeutics	3001	9,53	39,92	10,40	2,77	12	0	0,880
Allergy: Eur. J of Allergy and Clin. Immunology	1514	14,99	15,52	4,69	0,66	17	-3	0,003

Journal	Nr. of SR authorships	Mean nr. authors per SR	Rate of PRISMA usage (in %)	Rate of first-ever authorships (in %)	Rate of first-ever first authorships (in %)	Median academic age (years)	PRISMA usage age diff. (years)	P (Kruskal-Wallis)
Amer. J of Cardiology	3221	14,19	48,90	11,30	1,58	9	0	0,161
Amer. J of Clinical Nutrition	3032	13,78	28,92	8,54	1,68	13	-3	0,000
Amer. J of Emergency Medicine	1207	11,07	49,71	29,25	6,71	4	0	0,122
Amer. J of Epidemiology	1945	14,41	8,12	3,86	0,41	15	0	0,792
Amer. J of Gastroenterology	1053	8,85	31,53	6,84	2,18	13	-1	0,303
Amer. J of Human Genetics	3648	68,83	0,25	3,43	0,11	16	-10	0,056
Amer. J of Kidney Diseases	1371	14,59	29,18	5,40	0,58	14	0	0,503
Amer. J of Obstetrics and Gynecology	1317	12,19	51,18	9,64	2,35	12	0	0,342
Amer. J of Preventive Medicine	1421	9,47	30,40	13,16	3,10	11	-2	0,008
Amer. J of Psychiatry	1023	20,46	12,32	4,11	0,49	16	-3	0,000
Amer. J of Sports Medicine	1919	10,66	49,61	10,16	2,61	9	0	0,116
Anesthesia and Analgesia	1283	10,97	43,10	12,24	1,56	11	-2	0,001
Annals of Internal Medicine	2950	11,48	28,61	9,39	0,71	12	-1	0,914
Annals of Oncology	2226	13,33	19,77	5,84	0,72	15	-1	0,055
Annals of Palliative Medicine	1651	6,71	17,32	51,54	10,54	1	2	0,000
Annals of Surgery	1914	15,07	57,52	7,58	1,20	9	-1	0,000
Annals of Surgical Oncology	1792	11,95	41,69	11,50	2,51	11	0	0,056
Annals of the Rheumatic Diseases	3380	15,65	5,71	4,14	0,41	15	1	0,712
Annals of Thoracic Surgery	1058	12,30	53,50	9,07	1,70	11,5	0,5	0,018
Annals of Vascular Surgery	1093	10,72	47,30	14,91	3,48	8	0	0,019
ANZ J of Surgery	1136	9,39	48,94	19,63	5,72	7	1	0,009
Archives of Gynecology and Obstetrics	1827	7,68	32,73	22,39	4,93	6	0	0,087
Archives of Orthopaedic and Trauma Surgery	1157	9,64	44,77	15,21	2,85	8	1	0,002
Archives of Phys. Medicine and Rehabilitation	2143	9,88	44,19	16,29	4,15	10	0	0,619
Arthritis Care and Research	1568	10,18	20,79	9,18	2,49	14	-1	0,267
Arthroscopy - J of Arthroscopic and Rel. Surgery	2996	9,95	46,16	12,28	2,97	8	0	0,008
Asian Pacific J of Cancer Prevention	2731	6,50	11,42	29,04	6,15	4	1	0,042
Atherosclerosis	1865	11,66	29,92	8,74	1,98	13	-1	0,116
Autoimmunity Reviews	1585	9,97	25,99	11,17	2,52	13	-1	0,401
Biological Psychiatry	3037	30,37	3,29	2,63	0,30	17	-6	0,000
BioMed Research Intern.	4876	8,17	27,21	25,66	5,19	5	0	0,839
Bioscience Reports	1445	7,30	21,52	33,77	7,75	4	0	0,684
BJOG: An Intern. J of Obstetrics and Gynaecology	2369	12,40	42,38	11,40	1,98	13	1	0,002
BJU Intern.	1168	10,16	39,21	7,71	2,05	12	-1	0,312
BMC Cancer	3943	10,32	35,20	17,37	3,55	8	0	0,549
BMC Cardiovascular Disorders	1523	11,81	43,01	21,01	4,27	8	-2	0,005
BMC Geriatrics	1417	13,12	55,82	14,68	2,68	10	0	0,691
BMC Health Services Research	2352	9,12	42,64	11,73	3,02	10	1	0,065
BMC Infectious Diseases	2715	12,07	47,40	16,17	2,58	8	0	0,232
BMC Medicine	3064	15,88	35,80	8,45	1,40	13	-2	0,000
BMC Musculoskeletal Disorders	1937	10,76	51,78	17,29	5,01	8	0	0,932
BMC Pregnancy and Childbirth	1789	10,52	46,84	16,88	4,42	9	-1	0,043
BMC Psychiatry	1657	10,69	47,86	16,90	4,16	8	1	0,255
BMC Public Health	4742	9,94	44,69	15,42	4,41	9	0	0,408
BMJ Open	13390	14,18	53,79	13,79	2,94	10	0	0,258
Breast Cancer Research and Treatment	2587	7,86	21,11	13,22	3,02	8	1	0,022
British J of Anaesthesia	4635	42,52	18,49	5,35	0,76	6	5	0,000
British J of Cancer	1899	14,95	15,69	7,21	1,53	15	-4	0,000
British J of Clinical Pharmacology	1688	9,87	44,91	12,32	3,44	10	-1	0,100
British J of Dermatology	1588	9,29	28,84	9,07	2,27	13	-2	0,174
British J of Nutrition	1298	9,14	34,82	14,41	4,31	9	-2	0,006
British J of Psychiatry	1220	9,61	33,52	9,59	1,23	13	-1	0,834
British J of Sports Medicine	3019	11,70	48,56	10,20	2,55	11	0	0,059
British J of Surgery	2966	18,77	42,31	8,83	1,45	13	-1	0,000
Canadian J of Cardiology	1043	12,13	42,86	10,07	2,11	11	0	0,687
Cancer	1047	12,77	23,88	5,06	0,67	13	-1	0,261
Cancer Causes and Control	1326	10,87	16,59	9,58	2,19	13	-3	0,000

Journal	Nr. of SR authorships	Mean nr. authors per SR	Rate of PRISMA usage (in %)	Rate of first-ever authorships (in %)	Rate of first-ever first authorships (in %)	Median academic age (years)	PRISMA usage age diff. (years)	P (Kruskal-Wallis)
Cancer Epidemiology Biomarkers and Prevention	2432	19,00	12,46	7,32	1,23	15	-5	0,000
Cancer Medicine	1422	12,37	33,26	13,22	2,18	9	-1	0,081
Cancer Treatment Reviews	2083	11,51	41,62	8,59	1,92	12	0	0,637
Cardiovascular Revascularization Medicine	1275	17,23	59,22	11,22	0,86	7	2	0,000
Catheterization and Cardiovascular Interventions	1966	17,55	53,51	5,49	0,56	11	0	0,902
Chest	2063	17,05	29,76	5,96	1,41	16	-4	0,000
Chinese Medical J	1330	7,73	22,71	25,94	5,64	5	0	0,636
Circulation	2611	20,24	14,98	3,41	0,27	16	0	0,567
Circulation: Cardiovascular Genetics	1623	30,06	0,49	2,03	0,12	15	-7	0,006
Clinical Cardiology	1034	9,32	36,94	23,21	4,64	5	0	0,209
Clinical Gastroenterology and Hepatology	2038	13,32	45,88	6,77	0,88	13	0	0,614
Clinical Infectious Diseases	2377	12,51	34,75	8,29	1,39	13	0	0,236
Clinical Microbiology and Infection	1356	14,12	49,78	7,89	1,40	13	-2	0,029
Clinical Neurology and Neurosurgery	1500	10,87	44,40	19,60	4,40	6	-1	0,731
Clinical Nutrition	2221	16,33	48,31	11,03	2,21	9	-1	0,000
Clinical Oral Investigations	1694	18,02	70,01	14,17	4,19	9	0	0,731
Clinical Pharmacology and Therapeutics	1144	14,48	9,53	9,70	1,49	15	-2	0,045
Clinical Psychology Review	2540	7,20	41,02	12,95	4,09	10	0	0,268
Clinical Rehabilitation	1717	10,94	52,30	21,08	5,42	7	-1	0,001
Clinical Rheumatology	1385	8,29	36,46	19,06	4,55	6	0	0,572
Clinical Therapeutics	1161	8,23	33,94	22,05	4,31	6	0	0,083
Colorectal Disease	3883	21,81	71,23	18,21	1,21	4	-1	0,000
Complementary Therapies in Medicine	2263	11,31	50,42	24,39	5,26	5	0	0,004
Critical Care	2428	12,85	49,88	14,37	3,29	10	-1	0,030
Critical Care Medicine	1827	14,05	47,07	9,63	1,59	12	-2	0,001
Critical Reviews in Food Science and Nutrition	1566	11,03	47,32	10,28	2,11	9	0	0,018
Critical Reviews in Oncology/Hematology	3561	13,14	46,45	10,05	2,36	11	-1	0,000
Current Medical Research and Opinion	1918	7,64	29,30	17,26	2,66	8	-2	0,000
Current Pharmaceutical Design	1025	7,65	28,10	16,78	3,41	8	1	0,020
Developmental Medicine and Child Neurology	1198	8,62	40,82	15,86	5,51	12	-1	0,982
Diab. and Met. Syndrome: Clin. Res. and Reviews	1112	9,59	45,95	21,49	4,95	5	0	0,027
Diabetes Care	1435	13,67	23,90	7,11	0,84	14	-1	0,092
Diabetes Research and Clinical Practice	1771	9,52	42,01	19,48	4,23	7	1	0,007
Diabetes/Metabolism Research and Reviews	1078	11,47	37,20	12,52	1,76	10	4	0,000
Diabetes; Obesity and Metabolism	1564	10,43	35,87	11,57	1,60	11	0	0,078
Diabetic Medicine	1196	9,42	39,21	11,20	3,26	12	1	0,237
Diabetologia	1449	13,29	13,11	6,63	1,38	14	-2	0,506
Digestive Diseases and Sciences	1410	9,04	34,68	12,55	3,05	8	1	0,015
Disability and Rehabilitation	1734	8,71	48,10	13,09	3,92	10	0	0,020
Disease Markers	1055	8,05	21,71	22,65	4,45	5	1	0,002
Drug and Alcohol Dependence	1116	11,16	48,92	12,99	2,42	10	0	0,877
Endocrine	1271	10,33	41,31	16,52	3,62	7	-1	0,222
Environment Intern.	1251	11,37	28,78	7,51	1,44	14	1	0,165
Environmental Health Perspectives	1137	16,24	8,88	4,22	1,06	15	-3	0,037
Environmental Pollution	1017	9,50	34,81	17,31	3,54	8	-1	0,046
Environmental Research	1626	9,40	27,92	14,08	3,87	10	0	0,817
Environmental Science and Pollution Research	1492	8,62	32,44	18,90	4,09	7	-1	0,010
Epilepsia	1045	14,51	36,65	6,60	1,53	14	-1	0,891
Eur. Archives of Oto-Rhino-Laryngology	1544	8,17	36,20	16,52	4,40	9	0	0,269
Eur. Heart J	2560	20,16	29,77	3,52	0,27	16	-2	0,000
Eur. J of Cancer	3089	13,37	30,24	7,93	1,13	14	0	0,001
Eur. J of Cardio-thoracic Surgery	1075	12,95	43,26	10,79	1,77	11	0	0,385
Eur. J of Clinical Nutrition	1027	10,07	41,58	11,98	3,89	9	-1	0,219
Eur. J of Clinical Pharmacology	1438	9,22	40,82	17,18	4,80	8	-1	0,040
Eur. J of Epidemiology	1544	17,75	25,58	6,93	1,23	12	-2	0,020
Eur. J of Gastroenterology and Hepatology	1346	7,56	27,19	16,49	3,64	6	2	0,001
Eur. J of Neurology	1106	11,29	33,36	8,68	1,63	12	0	0,172

Journal	Nr. of SR authorships	Mean nr. authors per SR	Rate of PRISMA usage (in %)	Rate of first-ever authorships (in %)	Rate of first-ever first authorships (in %)	Median academic age (years)	PRISMA usage age diff. (years)	P (Kruskal-Wallis)
Eur. J of Nutrition	1049	12,49	46,43	10,10	2,48	10	0	0,072
Eur. J of Obstetrics and Gyn. and Repr. Biology	2386	10,03	44,43	18,02	4,27	8	1	0,000
Eur. J of Preventive Cardiology	1504	11,75	35,51	9,31	2,66	12,5	-2,5	0,000
Eur. J of Surgical Oncology	2369	13,77	52,30	12,11	2,32	11	0	0,834
Eur. J of Vascular and Endovascular Surgery	1807	15,85	57,61	9,85	2,21	12	0	0,041
Eur. Radiology	1817	15,27	56,63	10,07	2,59	10	0	0,762
Eur. Respiratory J	2038	18,04	24,34	4,86	0,93	16	-1	0,157
Eur. Review for Medical and Pharm. Sciences	2044	9,64	37,52	30,92	6,21	5	1	0,037
Eur. Spine J	2132	9,00	37,05	16,14	4,03	8	0	0,817
Eur. Urology	3551	21,14	45,31	3,49	0,42	16	0	0,012
Fertility and Sterility	1325	9,53	30,64	13,13	2,34	11	-2	0,024
Frontiers in Immunology	2182	11,48	37,81	23,33	4,63	6	-1	0,002
Frontiers in Public Health	1320	13,20	58,41	30,08	6,06	4	1	0,007
Future Oncology	1138	9,64	29,17	14,24	2,28	8	-1	0,582
Gastroenterology	1864	22,19	29,51	5,47	0,32	16	-2	0,000
Gastrointestinal Endoscopy	1426	12,85	43,20	8,20	1,33	10	1	0,013
Gene	1641	7,33	17,67	24,68	4,94	4	2	0,024
Genetics and Molecular Research	1491	5,29	2,48	35,21	7,44	3	0	0,298
Global Change Biology	1251	8,34	5,36	7,19	1,52	12	1	0,361
Gut	1246	21,48	30,66	4,98	0,08	16	-1	0,436
Gynecologic Oncology	1261	10,87	39,33	11,42	2,62	11	0	0,730
Head and Neck	1731	10,55	39,05	9,76	2,31	11	0	0,566
Health Technology Assessment	3539	15,73	28,96	11,02	0,28	11	0	0,226
Heart	1878	12,27	37,70	6,76	1,54	13	-1	0,105
Heart Failure Reviews	1217	15,41	53,90	11,91	2,14	10	-1	0,029
HPB	1531	17,60	59,90	7,45	1,83	13	-1	0,098
Human Brain Mapping	1762	14,33	8,51	4,77	1,14	15	-3	0,000
Human Molecular Genetics	6561	40,50	0,91	3,02	0,15	15	0,5	0,951
Human Reproduction Update	1760	9,26	26,93	6,76	2,10	14	0	0,213
Hypertension	1389	18,77	28,15	6,34	1,15	16	0	0,461
Implementation Science	1165	12,26	44,81	10,90	1,72	11	0	0,620
Injury	1436	9,26	46,03	14,48	4,74	9	0	0,050
Intensive Care Medicine	1403	16,51	52,10	5,99	0,93	14	-1	0,685
Intern. J of Behav. Nutrition and Physical Activity	1777	17,25	55,94	11,99	2,42	11	-1	0,005
Intern. J of Cancer	2764	12,74	14,80	6,37	1,34	13	-4	0,000
Intern. J of Cardiology	4842	12,91	47,19	9,50	1,80	11	0	0,070
Intern. J of Clinical Practice	1868	8,65	40,31	24,09	5,46	6	0	0,321
Intern. J of Colorectal Disease	2073	10,42	46,74	18,62	3,67	7	1	0,000
Intern. J of Env. Research and Public Health	12212	12,84	58,67	18,87	5,26	8	0	0,496
Intern. J of Epidemiology	2478	16,97	8,96	4,16	0,40	15	-2	0,012
Intern. J of Gynecology and Obstetrics	1049	11,28	51,95	21,45	3,24	8	-1	0,713
Intern. J of Infectious Diseases	1417	9,71	43,90	21,24	4,38	7	-1	0,955
Intern. J of Molecular Sciences	3387	10,42	38,62	13,46	3,16	11	0	0,086
Intern. J of Nursing Studies	2031	9,36	51,60	15,51	4,09	9	0	0,520
Intern. J of Oral and Maxillofacial Surgery	1400	15,05	67,50	16,00	6,14	9	0	0,015
Intern. J of Radiation Oncology Biology Physics	1064	12,98	38,35	6,30	1,03	15	-1	0,460
Intern. J of Stroke	1042	10,85	34,17	7,68	1,73	15	-1,5	0,002
Intern. J of Surgery	3434	11,37	51,08	25,89	5,47	5	0	0,000
Intern. Orthopaedics	1199	9,22	42,54	17,10	4,09	7	1	0,007
Intern. Urogynecology J	1038	9,70	45,86	16,09	4,34	9	0	0,419
Intern. Urology and Nephrology	1137	8,42	31,84	24,54	5,63	5	0	0,109
JACC: Cardiovascular Interventions	1103	20,81	43,43	6,35	0,73	15	-1	0,788
JAMA Network Open	2299	19,48	51,76	13,66	1,91	11	0	0,535
JAMA Neurology	1225	21,88	16,08	4,08	0,41	17	-4	0,015
JAMA Oncology	1570	31,40	20,57	4,59	0,25	13	1	0,396
JAMA Psychiatry	2005	32,34	35,51	5,44	0,85	15	0	0,398
J of Advanced Nursing	1751	9,95	52,88	14,91	5,20	10	-1	0,552

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J of Affective Disorders	6069	10,54	48,13	16,61	4,09	9	0	0,002
J of Allergy and Clinical Immunology	1116	18,00	13,89	5,91	0,45	16	-2	0,169
J of Alzheimer's Disease	1602	10,34	38,83	15,54	4,06	10	-0,5	0,648
J of Antimicrobial Chemotherapy	1270	10,85	38,58	9,84	1,97	13	0	0,077
J of Arthroplasty	1495	9,06	40,94	13,78	2,74	8	0	0,363
J of Cancer Research and Therapeutics	1162	6,15	16,52	37,52	8,52	3	1	0,006
J of Cardiac Surgery	1050	10,82	47,71	18,00	3,43	7	2	0,008
J of Cardiothoracic and Vascular Anesthesia	1027	15,10	42,26	14,31	2,04	9	0	0,735
J of Clinical Endocrinology and Metabolism	2155	13,30	36,47	8,86	1,76	12	-3	0,000
J of Clinical Epidemiology	2536	11,27	33,91	7,37	0,99	12	-1	0,035
J of Clinical Gastroenterology	1113	10,31	42,05	13,48	2,34	8	0	0,454
J of Clinical Neuroscience	1846	8,67	29,47	20,80	4,39	6	-1	0,190
J of Clinical Nursing	1338	7,87	53,14	19,28	8,37	9	0	0,109
J of Clinical Oncology	2663	14,71	13,33	4,81	0,26	16	-2	0,001
J of Clinical Periodontology	1168	16,00	68,32	11,73	3,00	12	-1	0,427
J of Clinical Pharmacy and Therapeutics	1034	7,66	30,95	29,69	7,54	4	-1	0,524
J of Critical Care	1037	12,06	54,10	13,31	2,80	9	0	0,150
J of Ethnopharmacology	1025	8,47	32,20	22,34	4,00	6	-1	0,253
J of Gastroenterology and Hepatology (Australia)	1509	12,27	47,45	13,85	2,65	8	-1	0,000
J of Gastrointestinal Surgery	1082	10,61	45,19	13,96	3,60	9	-1	0,393
J of General Internal Medicine	1374	11,84	48,76	13,46	1,67	9	-1	0,015
J of Hepatology	1252	23,62	13,74	9,74	0,56	15	-1	0,306
J of Hypertension	1407	12,56	47,76	8,81	1,42	13	1	0,005
J of Intern. Medical Research	1441	7,13	27,69	38,72	8,61	3	-1	0,146
J of Maternal-Fetal and Neonatal Medicine	1513	8,90	44,15	14,28	3,50	8	-1	0,805
J of Medical Internet Research	3626	13,68	59,90	17,46	3,86	9	0	0,263
J of Neurology	1726	10,92	50,75	13,56	2,95	9	1	0,024
J of Neurology; Neurosurgery and Psychiatry	1067	10,56	36,18	8,43	1,78	11	0	0,493
J of Neuro-Oncology	1035	11,63	38,65	10,05	2,90	12	-2	0,083
J of Orthopaedic Surgery and Research	2189	10,09	45,32	30,01	6,08	4	0	0,066
J of Pain and Symptom Management	1146	10,05	47,29	14,49	3,84	9	-1	0,016
J of Pediatric Surgery	1193	10,37	45,10	10,23	3,02	12	1	0,040
J of Plastic; Reconstructive and Aesthetic Surgery	1304	10,03	50,31	15,80	3,60	8	0	0,412
J of Psychiatric Research	1561	11,74	52,21	15,18	3,14	9	-1	0,931
J of Psychosomatic Research	1280	11,85	49,84	14,30	4,22	11	1,5	0,011
J of Rheumatology	1619	9,64	13,59	7,41	1,48	13	1	0,115
J of Shoulder and Elbow Surgery	1326	11,84	44,87	13,35	3,32	9	-1	0,001
J of Stroke and Cerebrovascular Diseases	1517	9,48	39,68	24,32	5,08	6	0	0,147
J of Surgical Research	1080	10,91	46,11	17,59	4,54	7	0	0,498
J of the Amer. Academy of Dermatology	1483	8,38	31,89	9,37	2,70	10	0	0,238
J of the Amer. College of Cardiology	2027	18,26	42,87	4,88	0,39	15	1	0,015
J of the Amer. Geriatrics Society	1200	10,62	46,17	11,58	2,17	12	0	0,478
J of the Amer. Heart Association	3800	21,97	44,68	9,53	1,42	13	-1	0,000
J of the Amer. Medical Association (JAMA)	8606	32,23	28,00	6,58	0,76	14	-1	0,015
J of the Amer. Medical Directors Association	1329	14,29	54,63	14,07	4,06	10	0	0,185
J of the Eur. Acad. of Dermatology and Venereology	1559	9,12	27,07	10,78	2,76	13	-3	0,358
J of the National Cancer Institute	2837	21,01	10,65	3,49	0,39	15	-3	0,000
J of the Neurological Sciences	1201	8,90	36,14	19,15	3,33	7	2	0,000
J of Thrombosis and Haemostasis	1177	10,42	28,29	5,78	1,44	14	0	0,979
J of Trauma and Acute Care Surgery	1270	15,30	51,34	13,15	2,68	11	-1	0,219
J of Urology	1020	9,11	33,63	10,49	1,86	12	-1	0,734
J of Vascular Surgery	1999	15,87	61,73	9,05	1,75	11	-1	0,000
Knee Surgery; Sports Traumatology; Arthroscopy	2640	10,52	45,34	9,81	2,20	9	0	0,660
Laryngoscope	1874	8,76	43,44	10,89	3,26	9	0	0,111
Lung Cancer	1105	9,06	17,56	15,66	2,71	9	0	0,484
Malaria J	1069	11,62	22,54	10,29	3,09	14	-5	0,000
Maturitas	1135	9,87	46,43	12,51	3,00	10	-1	0,852

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Medical Science Monitor	1414	6,80	19,73	39,60	8,27	3	-1	0,177
Medicina (Lithuania)	1763	12,96	56,61	17,81	3,91	9	-1	0,839
Medicine	5429	5,72	0,11	50,12	9,74	1	6,5	0,177
Medicine (United States)	20993	8,67	31,85	37,17	7,10	3	0	0,000
Molecular Biology Reports	1994	6,08	6,37	19,81	3,51	5	0	0,435
Molecular Psychiatry	5096	34,20	8,36	2,96	0,20	16	-6	0,000
Movement Disorders	1050	10,61	12,10	6,76	1,43	15	-2	0,172
Multiple Sclerosis and Related Disorders	1005	10,58	44,58	18,71	5,17	7	1	0,058
Nature Communications	14102	70,86	0,79	4,96	0,09	16	-7	0,000
Nephrology Dialysis Transplantation	1124	13,38	26,87	10,59	1,69	13	0	0,121
Neurological Sciences	1898	10,37	36,51	20,71	3,53	6	0	0,076
Neurology	2814	14,66	23,88	5,61	1,14	15	0	0,645
Neuroscience and Biobehavioral Reviews	5580	11,77	51,92	13,24	3,96	10	0	0,642
Neurosurgical Review	1798	11,68	48,05	11,74	2,06	9	0	0,021
Nutrients	7582	13,49	57,52	18,17	4,66	9	0	0,165
Nutrition and Cancer	1012	7,91	33,30	21,44	5,83	5	0	0,942
Nutrition Reviews	1823	11,69	53,81	13,44	3,68	10	-1	0,903
Nutrition; Metabolism and Cardiovascular Diseases	1286	11,48	41,45	14,62	2,72	9	-1	0,057
Obesity Reviews	5072	11,15	46,67	11,49	3,12	10	0	0,265
Obesity Surgery	2337	11,24	44,67	16,65	3,81	8	0	0,298
Oncotarget	2529	10,67	25,66	21,55	3,12	5	0	0,061
Ophthalmology	1290	18,17	12,56	5,27	0,54	14	-3	0,025
Oral Oncology	1088	10,88	43,01	14,34	3,22	10	0	0,076
Osteoarthritis and Cartilage	1085	9,95	37,70	11,34	3,13	11	0	0,003
Osteoporosis Intern.	2007	10,68	34,28	13,70	3,34	11	-3	0,000
Otolaryngology - Head and Neck Surgery (US)	1419	9,85	52,64	14,45	3,66	7	1	0,323
Pain	1348	10,21	28,49	11,28	2,15	13	-1	0,343
Pain Medicine (United States)	1191	9,16	24,94	17,46	2,35	7	1	0,377
Pain Physician	1437	12,18	50,31	19,28	3,13	8	1	0,007
Palliative Medicine	1376	10,67	54,07	10,54	3,34	12	0	0,626
Patient Education and Counseling	1590	8,64	48,62	15,53	5,22	10	0	0,093
Pediatrics	2950	9,42	34,75	12,78	2,41	12	0	0,191
PharmacoEconomics	1051	7,73	35,59	13,70	3,62	10	-1	0,994
Pharmacological Research	1559	14,57	51,44	16,93	2,95	8	0	0,667
Phytotherapy Research	1453	11,91	49,55	17,55	3,10	6	-1	0,000
Plastic and Reconstructive Surgery	1525	7,30	31,02	12,66	2,43	8	0	0,550
PLoS Medicine	4786	29,73	26,83	4,85	0,40	15	-2	0,000
PLoS Neglected Tropical Diseases	2488	12,26	47,11	15,35	4,14	11	0	0,341
PLoS ONE	46722	11,65	38,10	18,97	3,87	8	0	0,774
Preventive Medicine	1570	11,29	52,61	12,74	3,38	10	0	0,140
Progress in Neuro-Psychopharm.and Bio. Psych.	1057	13,73	55,06	11,07	3,22	10	1	0,000
Psychiatry Research	1869	9,94	43,07	19,58	4,76	7	0	0,631
Psychological Bulletin	1106	4,73	18,81	11,21	2,17	9	2,5	0,005
Psychological Medicine	2301	11,86	40,85	7,82	2,09	14	-1	0,324
Psycho-Oncology	1290	10,16	49,69	12,71	4,73	12	-1	0,954
Quality of Life Research	1056	10,25	47,54	11,65	2,94	10	-1	0,101
Radiotherapy and Oncology	1339	10,98	38,76	9,11	2,17	13	1	0,000
Respiratory Research	1050	15,00	27,90	15,71	1,90	11	-2	0,044
Resuscitation	1664	18,09	62,02	11,30	2,16	12	0	0,745
Rheumatology (United Kingdom)	1344	11,59	36,90	8,71	1,86	13	-1	0,975
Rheumatology Intern.	1065	7,24	22,07	16,15	4,41	9	-2	0,006
Schizophrenia Bulletin	1200	8,70	36,17	8,33	2,17	12	-0,5	0,834
Schizophrenia Research	1948	10,20	40,86	12,01	3,44	11	0	0,033
Science of the Total Environment	2759	7,97	21,17	13,12	3,19	10	0	0,144
Scientific Reports	12566	12,89	36,10	15,57	2,84	8	-1	0,000
Seminars in Arthritis and Rheumatism	2254	11,05	43,48	10,56	2,71	13	-1	0,948
Sleep Medicine	1081	11,03	43,66	20,72	5,09	7	0	0,273

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Sleep Medicine Reviews	2243	13,12	60,14	11,59	2,81	12	0	0,118
Social Science and Medicine	1054	7,42	37,76	13,95	4,55	10	0	0,813
Spine	1725	6,58	14,96	10,20	2,55	11	-2	0,035
Spine J	1243	10,72	43,12	10,22	2,33	10	0	0,168
Sports Medicine	2967	12,47	62,39	10,52	3,71	10	-1	0,386
Stroke	3524	12,36	25,45	5,62	1,31	14	-1	0,180
Supportive Care in Cancer	2849	11,13	39,66	15,20	3,26	10	-2	0,000
Surgical Endoscopy	2783	14,72	52,86	12,07	2,59	9	0	0,014
Systematic Reviews	5159	17,43	63,91	12,95	3,24	10	0	0,197
The Lancet	19674	109,91	6,59	11,69	0,05	7	9	0,000
The Lancet Global Health	1968	31,74	23,98	6,86	0,46	14	-2	0,000
The Lancet Infectious Diseases	2379	19,99	34,55	6,39	0,97	14	0	0,077
The Lancet Oncology	2685	39,49	36,01	4,73	0,45	17	2	0,000
The Lancet Psychiatry	1408	23,86	42,26	9,09	0,43	14	-2	0,000
Thrombosis and Haemostasis	1041	11,57	35,16	7,40	1,54	14	0	0,235
Thrombosis Research	1448	9,59	37,43	18,23	4,21	8	0	0,040
Translational Psychiatry	2807	23,39	13,32	7,59	1,50	14	-5,5	0,000
Trauma; Violence; and Abuse	1072	5,58	37,31	12,03	3,54	9	-1	0,923
Tumor Biology	3362	5,97	7,85	34,03	6,19	3	0	0,959
Ultrasound in Obstetrics and Gynecology	1491	13,55	52,85	7,78	1,21	13	2	0,000
Vaccine	2193	8,21	29,09	13,50	3,88	11	-1	0,149
Value in Health	1234	10,28	43,35	11,10	2,59	11	0	0,910
World J of Gastroenterology	2967	7,44	24,44	18,67	3,94	7	0	0,000
World J of Surgery	1842	11,37	52,99	13,63	2,99	9	1	0,069
World J of Surgical Oncology	1634	8,88	26,44	29,50	6,24	4	0	0,953
World J of Urology	1378	12,19	41,80	8,35	0,94	11	0	0,624
World Neurosurgery	5828	10,50	39,58	15,91	2,90	7	0	0,088
Zhongguo Zhongyao Zazhi	1294	6,41	12,06	36,24	9,04	3	0	0,497

C.3 STATISTICAL MODELS

Quadratic model with focal authorship

$$UsageRate = \beta_0 + \beta_1 \cdot FocalAcademicAge + \beta_2 \cdot FocalAcademicAge^2 + \beta_3 \cdot FocalAuthorshipPosition + \beta_4 \cdot (FocalAcademicAge \cdot FocalAuthorshipPosition) + \beta_5 \cdot (FocalAcademicAge^2 \cdot FocalAuthorshipPosition) + \epsilon$$

Residuals				
Min	1Q	Median	3Q	Max
-0.037742	-0.012756	0.000504	0.011955	0.047593

Coefficients

	Estimate	*Std. Error*	*t value*	*Pr(>t)*
(Intercept)	0.66732167	0.01278414	52.199	<0.0000000000000002
focal_aage	-0.01942457	0.00201501	-9.640	0.00000000000000207
I(focal_aage^2)	0.00042047	0.00006770	6.210	0.0000000347052913
focal_aposFirst author	0.03540026	0.01807951	1.958	0.0543
focal_aposLast author	0.01746500	0.01807951	0.966	0.3374
focal_aage:focal_aposFirst author	0.00409902	0.00284966	1.438	0.1548
focal_aage:focal_aposLast author	-0.00155029	0.00284966	-0.544	0.5882
I(focal_aage^2):focal_aposFirst author	-0.00022874	0.00009575	-2.389	0.0196
I(focal_aage^2):focal_aposLast author	0.00018586	0.00009575	1.941	0.0563

Residual standard error: 0.01733 on 69 degrees of freedom
Multiple R-squared: 0.9352
Adjusted R-squared: 0.9277
F-statistic: 124.4 on 8 and 69 DF
p-value: < 0.00000000000000022

Comparison to base model (without authorship position)

Analysis of Variance Table
Model 1: rate ~ focal_aage + I(focal_aage^2)
Model 2: rate ~ (focal_aage + I(focal_aage^2)) * focal_apos

Res.Df	*RSS*	*Df*	*Sum of Sq*	*F*	*Pr(>F)*
75	0.084603				
69	0.020723	6	0.063881	35.451	< 0.00000000000000022

Akaike Information Criterion (AIC)

	Model	*df*	*AIC*
	1	4	-303.1118
	2	10	-400.8384

Quadratic model with focal authorship & previous authorship

$$\begin{aligned} UsageRate \;=\; & \beta_0 + \beta_1 FocalAcademicAge + \beta_2 FocalAuthorshipPosition \\ & + \beta_3 (FocalAcademicAge \cdot FocalAuthorshipPosition) \\ & + \beta_4 FocalAcademicAge^2 \\ & + \beta_5 (FocalAcademicAge^2 \cdot FocalAuthorshipPosition) \\ & + \beta_6 PreviousAuthorshipPosition \\ & + \beta_7 (FocalAcademicAge \cdot PreviousAuthorshipPosition) \\ & + \beta_8 (FocalAcademicAge^2 \cdot PreviousAuthorshipPosition) + \epsilon \end{aligned}$$

Residuals				
Min	1Q	Median	3Q	Max
-0.094326	-0.021847	0.000701	0.021011	0.103500

Asasd

Coefficients				
	Estimate	*Std. Error*	*t value*	*Pr(>t)*
(Intercept)	0.61442600	0.01819949	33.761	<0.00000
focal_aage	-0.01640392	0.00286857	-5.718	<0.00000
focal_aposFirst author	0.04839055	0.01993654	2.427	0.016023
focal_aposLast author	0.02555669	0.01993654	1.282	0.201233
I(focal_aage^2)	0.00034949	0.00009638	3.626	0.000358
prisma_aposFirst author	0.07379954	0.01993654	3.702	0.000271
prisma_aposLast author	0.05833654	0.01993654	2.926	0.003794
focal_aage:focal_aposFirst author	0.00033594	0.00314236	0.107	0.914960
focal_aage:focal_aposLast author	-0.00052837	0.00314236	-0.168	0.866626
focal_aposFirst author:I(focal_aage^2)	-0.00012798	0.00010558	-1.212	0.226781
focal_aposLast author:I(focal_aage^2)	0.00010376	0.00010558	0.983	0.326839
focal_aage:prisma_aposFirst author	0.00238308	0.00314236	0.758	0.449044
focal_aage:prisma_aposLast author	-0.00815690	0.00314236	-2.596	0.010076

I(focal_aage^2):prisma_aposFirst author	-0.00004101	0.00010558	-0.388	0.698112
I(focal_aage^2):prisma_aposLast author	0.00031433	0.00010558	2.977	0.003237

Residual standard error:	0.0331 on 219 degrees of freedom
Multiple R-squared:	0.8266
Adjusted R-squared:	0.8156
F-statistic:	74.59 on 14 and 219 DF
p-value:	< 0.00000000000000022

Comparison to base model

Analysis of Variance Table

Model 1: rate ~ (focal_aage + I(focal_aage^2)) * focal_apos

Model 2: rate ~ focal_aage * focal_apos + I(focal_aage^2) * focal_apos + focal_aage * prisma_apos + I(focal_aage^2) * prisma_apos

Res.Df	*RSS*	*Df*	*Sum of Sq*	*F*	*Pr(>F)*
225	0.66068				
219	0.23993	6	0.42075	64.007	< 0.00000000000000022

Akaike Information Criterion (AIC)

Model	*df*	*AIC*	*BIC*
1	10	-689.4724	-654.9192
2	16	-914.4946	-859.2095

APPENDIX D: SOFTWARE AND ANALYSIS CODE

All of the code below can be found on zenodo and other dataverses of this project (see chapter 2.5.1 for exact references). The parts of the code that directly lead to the data or the analytical results are provided here for the sake of archiving, quick reference, and error checking. In some cases, however, additional files are required to make the code run.

D.1 PUBMED DATA RETRIEVAL TOOL

```
# -*- coding: utf-8 -*-
# Python Module PubmedParser
"""
Created on Mon May  9 15:17:38 2022
@author: alexs
License: CC0
"""

import xml.etree.ElementTree as ET
import psycopg2
from urllib.request import urlopen
from tempfile import NamedTemporaryFile
import gzip
from datetime import datetime
from datetime import timedelta
import json
from dateutil.parser import parse
import time
from databasecredentials import database_credentials

conn = database_credentials()
current_id = 0
current_url = ""
var_lastSet = False
nrArticles = 0
setduration = ""
updatemode = False
overwrites = 0
uniqueitemid = 0


def globalpurge():
    global current_id
    global current_url
    current_id = 0
    current_url = ""

    global setduration
    global overwrites


    setduration = ""
    overwrites = 0
    pass

```

```
 46.
 47. def saveDict():
 48.     global current_id
 49.     global current_url
 50.     global nrArticles
 51.     global setduration
 52.     global updatemode
 53.     global overwrites
 54.     global uniqueitemid
 55.
 56.     setdict = {
 57.         "set_ID": current_id,
 58.         "url":current_url,
 59.         "nrArticles":nrArticles,
 60.         "nrOverwrites":overwrites,
 61.         "parsingtime":setduration,
 62.         "wasLastSet":var_lastSet,
 63.         "lastitemid":uniqueitemid
 64.         }
 65.
 66.     if updatemode == False:
 67.         with open( "parsingdicts.json", 'a' ) as f:
 68.             f.write("\n"+ json.dumps(setdict))
 69.     else:
 70.         with open( "parsingdicts_updates.json", 'a' ) as f:
 71.             f.write("\n"+ json.dumps(setdict))
 72.
 73. def readLastDictForNextUrl():
 74.     global current_id
 75.     global current_url
 76.     global updatemode
 77.     global var_lastSet
 78.     global uniqueitemid
 79.
 80.     if updatemode == False:
 81.         #Normales Parsi ng der PubMed Bulk Baseline
 82.         with open( "parsingdicts.json", 'r' ) as f:
 83.             for line in f:
 84.                 pass
 85.             lastdict = json.loads(line)
 86.             current_id = lastdict.get("set_ID") -1
 87.             uniqueitemid = lastdict.get("lastitemid")
 88.
 89.             idstring = str(current_id).zfill(4)
 90.               current_url = "https://ftp.ncbi.nlm.nih.gov/pubmed/baseline/pubmed24n" +
idstring +".xml.gz"
 91.             if current_id == 1050:
 92.                 print(f"id is {current_id}, last parsable set")
 93.                 var_lastSet = True
 94.     else:
 95.         #Parsing der Updatefiles
 96.         with open( "parsingdicts_updates.json", 'r' ) as f:
 97.             for line in f:
 98.                 pass
 99.             lastdict = json.loads(line)
100.             current_id = lastdict.get("set_ID") +1
101.             uniqueitemid = lastdict.get("lastitemid")
102.
103.             idstring = str(current_id).zfill(4)
104.              current_url = "https://ftp.ncbi.nlm.nih.gov/pubmed/updatefiles/pubmed24n"
+ idstring +".xml.gz"
105.             if current_id == 1500:
106.                 print(f"id is {current_id}, last parsable set")
107.                 var_lastSet = True
```

```
108.     pass
109.
110. #Unzip function
111. def get_xml(zipurl):
112.     with urlopen(zipurl) as zipresp, NamedTemporaryFile() as tfile:
113.         tfile.write(zipresp.read())
114.         tfile.seek(0)
115.         with gzip.open(tfile, 'rb') as f:
116.             currentxml = f.read().decode('utf-8')
117.             return currentxml
118.
119. def parsestuff(article):
120.     pmid = ""
121.     doi = ""
122.     modeldescr = ""
123.     titletext = ""
124.     abstext = ""
125.     pmid_version = ""
126.     journal_abbrev = ""
127.     j_nlm_id_unique = ""
128.     global updatemode
129.     global uniqueitemid
130.
131.     fpk_item = uniqueitemid
132.
133.
134.     #get the identifiers PMID and DOI
135.     pmid = article.findall('MedlineCitation')[0].findall('PMID')[0].text
136.                                                                 pmid_version            =
article.findall('MedlineCitation')[0].findall('PMID')[0].get('Version')
137.
138.                                                                       idset             =
article.findall('PubmedData')[0].findall('ArticleIdList')[0].findall("ArticleId")
139.     for singelid in idset:
140.         if singelid.get("IdType") == "doi":
141.             doi = singelid.text
142.             break
143.         else:
144.             pass
145.
146.
147.     #get timestamp for PubMed Model (print, electronic etc.) NOTE: This only saves the
last one, but it seems that there is only "print" in the xml files
148.      #I used this codde at all because otherwise I would get multiple timestamps for
each item that are inseparable
149.     for pubmodel in article.iter("Article"):
150.         modeldescr =  pubmodel.get("PubModel")
151.
152.         try:
153.             model_elocation = pubmodel.findall('ELocationID')[0]
154.             doi_pubmodel = ""
155.           if model_elocation.get("EIdType") == "doi" and model_elocation.get("ValidYN")
== "Y":
156.                 doi_pubmodel = model_elocation.text
157.         except:
158.             doi_pubmodel = ""
159.
160.
161.         for timeinfo in pubmodel.iter("PubDate"):
162.             try:
163.                 jou_d_type = "journaldate_" + str(modeldescr)
164.             except:
165.                 jou_d_type = "journaldate_None"
166.             try:
```

```
                jou_d_year = timeinfo.find("Year").text
            except:
                jou_d_year = ""
            try:
                jou_d_month = timeinfo.find("Month").text
            except:
                 jou_d_month = ""
            try:
                jou_d_day = timeinfo.find("Day").text
            except:
                jou_d_day = ""
            try:
                jou_d_season = timeinfo.find("Season").text
            except:
                jou_d_season = ""

            if jou_d_year != "" and jou_d_month != "" and jou_d_day != "":
                try:
                                jou_d_timestamp = parse(f"{jou_d_year}-{jou_d_month}-
{jou_d_day}").strftime('%Y-%m-%d')
                except:
                    pass
            else:
                try:
                 jou_d_timestamp = create_valid_date(jou_d_year,jou_d_month,jou_d_day)
                except:
                    jou_d_timestamp = ""

            write_dates(jou_d_type, jou_d_timestamp, jou_d_year,jou_d_month,jou_d_day,
jou_d_season, pmid_version)


    # get the title
    for title in article.iter("ArticleTitle"):
        try:
           #itertext() is used and should be used in other cases, since the text fields
can have additional xml fields, e.g. for formatting super- and subscript numbers!
            titletext = "".join(title.itertext())
        except:
            titletext = "NULL"

    # get the abstract
    for abstract in article.iter("Abstract"):
        try:
            abstext = "".join(abstract.itertext())
        except:
            abstext = "NULL"

    # get the journal info and add cochrane to types
     # INFO: The type writer could become a problem if a PK-FK constraints is checked
before the commit!
    for sourceinfo in article.iter("MedlineJournalInfo"):
        journal_abbrev = sourceinfo.find("MedlineTA").text
        j_nlm_id_unique = sourceinfo.find("NlmUniqueID").text
        if j_nlm_id_unique == "100909747":
            write_types("Cochrane Systematic Review", fpk_item)
        else:
            pass

     write_item(pmid, doi, titletext, abstext, modeldescr, doi_pubmodel, pmid_version,
journal_abbrev, j_nlm_id_unique, fpk_item)
    uniqueitemid +=1

```

```
226. #relational data
227.     #publication types
228.     for ptypes in article.iter("PublicationType"):
229.         try:
230.             pubtypes = ptypes.text
231.             write_types(pubtypes, fpk_item)
232.         except:
233.             pass
234.
235.     #mesh Headings
236.     for meshes in article.iter("MeshHeading"):
237.         meshDescr = meshes.find("DescriptorName").text
238.         hascorona = IsMeshCorona(meshDescr)
239.         meshDescrMT = meshes.find("DescriptorName").attrib["MajorTopicYN"]
240.         try:
241.             if len(meshes) == 1:
242.                 qualText = ""
243.                 qualMT = ""
244.             else:
245.                 for meshQual in meshes.iter("QualifierName"):
246.                     qualText = meshQual.text
247.                     qualMT = meshQual.attrib["MajorTopicYN"]
248.             write_meshes(meshDescr,meshDescrMT,qualText,qualMT,hascorona,fpk_item)
249.         except:
250.             pass
251.
252.
253.
254.     # Date catcher for the PubMed Dates Which reflect the PubMed History (first entry,
finished entry, updates etc.)
255.     for pubdates in article.iter("PubMedPubDate"):
256.         try:
257.             pub_d_datetype = pubdates.get("PubStatus")
258.         except:
259.             pub_d_datetype = ""
260.         try:
261.             pub_d_year = pubdates.find("Year").text
262.         except:
263.             pub_d_year = ""
264.         try:
265.             pub_d_month = pubdates.find("Month").text
266.         except:
267.             pub_d_month = ""
268.         try:
269.             pub_d_day = pubdates.find("Day").text
270.         except:
271.             pub_d_day = ""
272.         try:
273.            pub_d_season = pubdates.find("Season").text
274.         except:
275.            pub_d_season = ""
276.
277.         if pub_d_year != "" and pub_d_month != "" and pub_d_day != "":
278.             try:
279.                                     pub_d_string  =  parse(f"{pub_d_year}-{pub_d_month}-
{pub_d_day}").strftime('%Y-%m-%d')
280.             except:
281.                 try:
282.                     pub_d_string = create_valid_date(pub_d_year,pub_d_month,pub_d_day)
283.                 except:
284.                     pub_d_string = ""
285.         else:
286.             try:
287.                 pub_d_string = create_valid_date(pub_d_year,pub_d_month,pub_d_day)
```

```
288.             except:
289.                 pub_d_string = ""
290.
291.          write_dates(pub_d_datetype, pub_d_string, pub_d_year, pub_d_month, pub_d_day,
pub_d_season, fpk_item)
292.
293.
294.
295.     #get references (citingpmid, citedpmid and the unstructured reference string)
296.     for reference in article.iter("Reference"):
297.         try:
298.             for elem in reference.iter("Citation"):
299.                 reference_string = "".join(elem.itertext())
300.         except:
301.             reference_string = ""
302.
303.         cited_pmid = ""
304.         for each_id in reference.iter("ArticleId"):
305.             if each_id.get("IdType") == "pubmed":
306.                 cited_pmid = each_id.text
307.             else:
308.                 cited_pmid = ""
309.
310.         write_refs(cited_pmid, reference_string, fpk_item)
311.
312.
313.
314.
315.
316. def write_refs(cited_pmid = "", reference_string = "", fk_item = 0):
317.     global conn
318.
319.     try:
320.         cur = conn.cursor()
321.           cur.execute('INSERT INTO raw_bibliography values (%s,%s,%s)', (cited_pmid,
reference_string, fk_item))
322.     except psycopg2.OperationalError as e:
323.         print('Unable to connect!\n{0}').format(e)
324.     finally:
325.         cur.close()
326.
327.
328. def write_dates(datetype = "", datevalue = "", year = "", month = "", day = "", season
= "", fk_item = 0):
329.     global conn
330.
331.
332.     try:
333.         cur = conn.cursor()
334.         cur.execute("""INSERT INTO raw_pubdates VALUES (%s, TO_DATE(%s, 'YYYY-MM-DD'),
%s,%s,%s,%s,%s,%s)""",  (datetype,  datevalue,  str(year),  str(month),  str(day),  str(season),
fk_item))
335.     except psycopg2.OperationalError as e:
336.         print('Unable to connect!\n{0}').format(e)
337.     finally:
338.         cur.close()
339.
340. def write_item(pmid, doi, titletext, abstext, modeldescr, doi_pubmodel, pmid_version =
"0", journal_abbrev = "",j_nlm_id_unique = "", fk_item =0):
341.     global conn
342.
343.     try:
344.         cur = conn.cursor()
```

```
345.         cur.execute('INSERT INTO raw_items VALUES (%s,%s,%s,%s,%s,%s,%s,%s,%s,%s,%s)',
(str(pmid), doi, modeldescr,current_id, doi_pubmodel, titletext, abstext, pmid_version,
journal_abbrev,j_nlm_id_unique, fk_item))
346.     except psycopg2.OperationalError as e:
347.         print('Unable to connect!\n{0}').format(e)
348.     finally:
349.         cur.close()
350.
351.
352. def write_types(pubtype = "", fk_item = 0):
353.     global conn
354.
355.     try:
356.         cur = conn.cursor()
357.         cur.execute('INSERT INTO raw_ptypes VALUES (%s,%s)', (pubtype, fk_item))
358.     except psycopg2.OperationalError as e:
359.         print('Unable to connect!\n{0}').format(e)
360.     finally:
361.         cur.close()
362.
363. def write_meshes(meshDescr = "",meshDescrMT = "",qualText = "",qualMT ="", has_corona
= "0", fk_item = 0):
364.     global conn
365.
366.     try:
367.         global conn
368.         cur = conn.cursor()
369.         cur.execute('INSERT INTO raw_meshinfo VALUES (%s,%s,%s,%s,%s,%s)', (meshDescr,
qualText, to_bool(meshDescrMT), to_bool(qualMT), has_corona, fk_item))
370.     except psycopg2.OperationalError as e:
371.         print('Unable to connect!\n{0}').format(e)
372.     finally:
373.         cur.close()
374.
375. def checkAndDelete(pmid):
376. # This function produces a lot of table scans und makes everything super slow!
377.     global conn
378.     global overwrites
379.     try:
380.         cur = conn.cursor()
381.         cur.execute('SELECT * FROM items WHERE pmid = %s', (str(pmid),))
382.         p = cur.fetchone()
383.         if p != None:
384.             cur.execute('DELETE FROM items WHERE pmid = %s', (str(pmid),))
385.             cur.execute('DELETE FROM meshinfo WHERE pmid = %s', (pmid,))
386.             cur.execute('DELETE FROM ptypes WHERE pmid = %s', (str(pmid),))
387.             cur.execute('DELETE FROM pubdates WHERE pmid = %s', (pmid,))
388.             print("kicked some stuff out", end = "; ")
389.             overwrites +=1
390.     except:
391.         pass
392.     finally:
393.         cur.close()
394.
395.
396. def to_bool(string):
397.     if string == "Y":
398.         return True
399.     else:
400.         return False
401.
402. #Deal with different date schemes, check dates fro range and neglect empty fields
403. def create_valid_date(year = "", month = "", day = "", season = ""):
404.     if year != "" and month != "":
```

```
405.         if day == "":
406.             day = "01"
407.         else:
408.             pass
409.
410.
411.         isdatevalid = False
412.         while isdatevalid == False and int(day) >0:
413.
414.             try:
415.                 validdate = parse(f"{year}-{month}-{day}")
416.                 isdatevalid = True
417.             except:
418.                 day = str(int(day) -1)
419.                 isdatevalid = False
420.
421.         if isdatevalid == True:
422.             endstring = validdate.strftime('%Y-%m-%d')
423.         else:
424.             endstring = ""
425.
426.
427.     elif year != "" and month == "" and season == "":
428.         endstring = year
429.     elif year != "" and month == "" and season != "":
430.         endstring = year + season_to_month(season)
431.     else:
432.         endstring = ""
433.     return endstring
434.
435.
436. def season_to_month(season):
437.     relations = {
438.      "spring":"-03-21",
439.      "summer":"-06-21",
440.      "autumn":"-09-21",
441.      "fall":"-09-21",
442.      "winter":"-12-21"
443.         }
444.     try:
445.         newstring = relations.get(season.lower(), "")
446.     except:
447.         newstring = ""
448.     return newstring
449.
450. def IsMeshCorona(heading):
451.     infestedmeshs = [
452.         "coronavirus 3c proteases",
453.         "coronavirus envelope proteins",
454.         "coronavirus m proteins",
455.         "coronavirus nucleocapsid proteins",
456.         "coronavirus papain-like proteases",
457.         "coronavirus protease inhibitors",
458.         "coronavirus rna-dependent rna polymerase",
459.         "covid-19",
460.         "covid-19 nucleic acid testing",
461.         "covid-19 serological testing",
462.         "covid-19 testing",
463.         "covid-19 vaccines",
464.         "receptors, coronavirus",
465.         "sars-cov-2",
466.         "spike glycoprotein, coronavirus"
467.         ]
468.     if heading.lower() in (infestedmesh.lower() for infestedmesh in infestedmeshs):
```

```
469.         return '1'
470.     else:
471.         return '0'
472.
473.
474. # Does the sql connection stuff and calls the mainParser function for each Article
475. def main_Parser(a):
476.     global conn
477.     global userdata
478.     global var_lastSet
479.     global overwrites
480.     global nrArticles
481.     global current_id
482.
483.     try:
484.         conn = database_credentials()
485.         root = ET.fromstring(a)
486.         for article in root.findall('PubmedArticle'):
487.             parsestuff(article)
488.             nrArticles += 1
489.         conn.commit()
490.     except psycopg2.OperationalError as e:
491.         print('Unable to connect!\n{0}').format(e)
492.         conn.rollback()
493.         var_lastSet = True
494.         print(f"finished due to connection error. Rollback. Recrawl {var_lastSet}")
495.     finally:
496.         conn.close()
497.         print("", end = ".")
498.         if current_id % 10 == 0:
499.             print("")
500.           print(datetime.now().strftime("%H:%M:%S") + f" | {nrArticles} items commited,
last set was {current_id}", end = "")
501.
502.
503. # envelope function, loops and calls the various functions: get an url, get its xml,
parse the xml report stuff to globalfile
504. def mainfunction(duration):
505.     global var_lastSet
506.     global setduration
507.     global current_url
508.
509.     endtime = timedelta(minutes = duration) + datetime.now()
510.     print("start job until: ",format(endtime), "minutes")
511.
512.     while var_lastSet == False:
513.         try:
514.             starttime = datetime.now()
515.             readLastDictForNextUrl()
516.             nexturl = current_url
517.             main_Parser(get_xml(nexturl))
518.         except Exception as e:
519.             print("ERROR! mainfunction will end: " + format(datetime.now()))
520.             print(e)
521.             var_lastSet = True
522.         finally:
523.             setduration = format(datetime.now() - starttime)
524.             saveDict()
525.             globalpurge()
526.
527.         if datetime.now() > endtime:
528.             var_lastSet = True
529.             print("finished due to job time")
530.
```

```
531.
532.
533.
534. # Loads a PMID List from a JSON into python and crawls its contents from the server.
Use id_for_fetchedset to assign a "version number"
535. def efetcher_single_pmids(name_of_fetchedset ,id_for_fetchedset):
536.     global current_id
537.     global var_lastSet
538.     current_id = id_for_fetchedset
539.     setcount = 0
540.     restcount = 0
541.     var_lastSet == False
542.
543.    baseurl = "https://eutils.ncbi.nlm.nih.gov/entrez/eutils/efetch.fcgi?db=pubmed&id="
544.     endurl = "&rettype=xml&tool=pubmedparser&email=schniedermann@dzhw.eu"
545.           #  between  them  comes  a  list  of  pmid's,  separated  by  comma,  e.g.
27558065,27466125,27127816,26842040
546.     # fetch no more than 200 articles per attempt!
547.
548.     habefertig = False
549.     while habefertig == False:
550.         with open(name_of_fetchedset, 'r' ) as f:
551.                 for line in f:
552.                     pass
553.                 lastlist = list(json.loads(line))
554.                 if len(lastlist) == 0:
555.                     habefertig = True
556.                     setcount = setcount + len(lastlist)
557.                 elif len(lastlist) > 200:
558.                     newset = lastlist[:200]
559.                     restset = lastlist[200:]
560.                     setcount += 200
561.                     restcount = len(restset)
562.                 else:
563.                     newset = lastlist
564.                     restset = []
565.                     habefertig = True
566.                     print("Last set")
567.
568.         uidliststring = ','.join(str(e) for e in newset)
569.         fetchurl = baseurl + uidliststring + endurl
570.
571.         with urlopen(fetchurl) as directxml, NamedTemporaryFile() as tfile:
572.             tfile.write(directxml.read())
573.             tfile.seek(0)
574.             fetchedrecord = tfile.read()
575.
576.
577.            # Pass to parser and let him do his magic. Update the JSON and print if
applicable
578.         main_Parser(fetchedrecord)
579.         if var_lastSet == False:
580.             with open(name_of_fetchedset, 'w' ) as f:
581.                 f.write(json.dumps(restset))
582.             if setcount % 10000 == 0:
583.                 print(f"finished some {setcount} records, {restcount} records left")
584.             else:
585.                 pass
586.         else:
587.             print("mainParser Error: end fetch loop")
588.             habefertig = True
589.
590.         time.sleep(2)
591.
```

```
#efetcher_single_pmids("cochrane_dict.json",9005)
# efetch URL for checking purpose:
# https://eutils.ncbi.nlm.nih.gov/entrez/eutils/efetch.fcgi?db=pubmed&id=36434555&retmode=xml
# def efetcher_add_lists(file, table = '', valuelist=''):
#     #This tool is designed to read an PMID List of an XML document that results from a PubMed search. It was originally developed to get a list of Cochrane Systematic Reviews
#     #global userdata
#     global conn
#     global current_id
#     tree = ET.parse(file)
#     root = tree.getroot()
#     idlist = root.find('IdList')
#     ptype = valuelist[0]
#     current_id = valuelist[1]
#     pmid_version = valuelist[2]
#     conn = database_credentials()
#     try:
#         for eachid in idlist:
#             pmid = eachid.text
#             write_types(pmid, ptype, pmid_version)
#         conn.commit()
#     except Exception as e:
#         conn.rollback()
#         print(e + ", rollback")
#     finally:
#         conn.close()
 #efetcher_add_lists('cochrane_reviews_esearch.xml','',['Cochrane Systematic Review', 9999, 0])
```

D.2 APPENDIX TO CHAPTER 3: SQL CALCULATIONS

```
/* Base table and citation impact data for Figure 5 and 6

NOTE: The workflwo starts with the "importeddata" table which results from a match between Web of Science and the PubMed data.
It contains WoS Item ID's (FK_UT); PMID ID's; hierarchly unified document types from PubMed (mtypefinal. PRISMA-citation is an own document type, see related publication for explanation); and the official publication year

Creates "citations_data.csv"

*/

--Calculate cpin values in the base table "importeddata"
    CREATE TABLE gubi_newnew_cpin as
    WITH gubi_new_wb_dist as (
                        SELECT
                        aa.FK_UT,
                        aa.pmid,
                        aa.mtypefinal,
                        aa.pubyear
                        FROM importeddata aa
    ), gubi_new_tens AS (
                        SELECT aa.fk_ut,
                        count(DISTINCT CASE WHEN bb.CITYEAR <= aa.pubyear + 3 THEN bb.UT_CITING  ELSE NULL end) cit_cnt_3y,
                        count(DISTINCT CASE WHEN bb.CITYEAR <= aa.pubyear + 5 THEN bb.UT_CITING  ELSE NULL end) cit_cnt_5y,
                        count(DISTINCT CASE WHEN bb.CITYEAR <= aa.pubyear + 10 THEN bb.UT_CITING  ELSE NULL end) cit_cnt_10y
                        FROM gubi_new_wb_dist aa
                        LEFT JOIN wos_b_2019.KB_CITINGITEMS bb ON aa.fk_ut = bb.UT_CITED
                        GROUP BY aa.fk_ut
    ), gubi_new_wb_dist_2 AS (
                        SELECT aa.*, bb.cit_cnt_10y
                        FROM gubi_new_wb_dist aa LEFT JOIN gubi_new_tens bb ON aa.FK_UT =bb.fk_ut
    ), gubi_newnew AS (
                        SELECT aa.*, cc.FK_CLASSIFICATIONS
                        FROM gubi_new_wb_dist_2 aa
                        LEFT JOIN WOS_B_2019.items bb ON aa.FK_UT =bb.UT_EID
                        LEFT JOIN WOS_B_2019.ITEMS_CLASSIFICATIONS cc ON bb.PK_ITEMS =cc.FK_ITEMS
    ), gubi_wosclass_3Y as (
                        SELECT FK_CLASSIFICATIONS, pubyear, CIT_CNT_3Y, count(fk_UT) pub_per_cit_cnt_3Y
                        FROM gubi_newnew
                        GROUP BY FK_CLASSIFICATIONS, pubyear, CIT_CNT_3Y
                        ORDER BY CIT_CNT_3Y
    ), gubi_wosclass_5Y as (
                        SELECT FK_CLASSIFICATIONS, pubyear, CIT_CNT_5Y, count(fk_UT) pub_per_cit_cnt_5Y
                        FROM gubi_newnew
                        GROUP BY FK_CLASSIFICATIONS, pubyear, CIT_CNT_5Y
                        ORDER BY CIT_CNT_5Y
    ), gubi_wosclass_10Y as (
                        SELECT FK_CLASSIFICATIONS, pubyear, CIT_CNT_10Y, count(fk_UT) pub_per_cit_cnt_10Y
                        FROM gubi_newnew
                        GROUP BY FK_CLASSIFICATIONS, pubyear, CIT_CNT_10Y
                        ORDER BY CIT_CNT_10Y
    ), gubi_wosclass_3Y_final as (
```

```
 51.                SELECT
 52.                fk_classifications,
 53.                pubyear,
 54.                cit_cnt_3Y,
 55.                pub_per_cit_cnt_3Y,
 56.                sum(pub_per_cit_cnt_3Y) OVER(PARTITION BY fk_classifications, pubyear
ORDER BY fk_classifications, pubyear) totoalcnt,
 57.                sum(pub_per_cit_cnt_3Y) OVER(PARTITION BY fk_classifications, pubyear
ORDER BY fk_classifications, pubyear, cit_cnt_3Y) cumcnt
 58.                FROM gubi_wosclass_3Y
 59.      ),        gubi_wosclass_5Y_final as (
 60.                SELECT
 61.                fk_classifications,
 62.                pubyear,
 63.                cit_cnt_5Y,
 64.                pub_per_cit_cnt_5Y,
 65.                sum(pub_per_cit_cnt_5Y) OVER(PARTITION BY fk_classifications, pubyear
ORDER BY fk_classifications, pubyear) totoalcnt,
 66.                sum(pub_per_cit_cnt_5Y) OVER(PARTITION BY fk_classifications, pubyear
ORDER BY fk_classifications, pubyear, cit_cnt_5Y) cumcnt
 67.                FROM gubi_wosclass_5Y
 68.      ), gubi_wosclass_10Y_final as (
 69.                SELECT
 70.                fk_classifications,
 71.                pubyear,
 72.                cit_cnt_10Y,
 73.                pub_per_cit_cnt_10Y,
 74.                sum(pub_per_cit_cnt_10Y) OVER(PARTITION BY fk_classifications, pubyear
ORDER BY fk_classifications, pubyear) totoalcnt,
 75.                sum(pub_per_cit_cnt_10Y) OVER(PARTITION BY fk_classifications, pubyear
ORDER BY fk_classifications, pubyear, cit_cnt_10Y) cumcnt
 76.                FROM gubi_wosclass_10Y
 77.      )  SELECT aa.*,
 78.                round((100*(bb.cumcnt / bb.totoalcnt)),2) cpin_3Y,
 79.                round((100*(cc.cumcnt / cc.totoalcnt)),2) cpin_5Y,
 80.                round((100*(dd.cumcnt / dd.totoalcnt)),2) cpin_10Y
 81.                FROM gubi_newnew aa
 82.                LEFT  JOIN  gubi_wosclass_3Y_final  bb  ON  aa.FK_CLASSIFICATIONS  =
bb.fk_classifications AND aa.PUBYEAR =bb.pubyear AND aa.CIT_CNT_3Y = bb.cit_cnt_3Y
 83.                LEFT  JOIN  gubi_wosclass_5Y_final  cc  ON  aa.FK_CLASSIFICATIONS  =
cc.fk_classifications AND aa.PUBYEAR =cc.pubyear AND aa.CIT_CNT_5Y = cc.cit_cnt_5Y
 84.                LEFT  JOIN  gubi_wosclass_10Y_final  dd  ON  aa.FK_CLASSIFICATIONS  =
dd.fk_classifications AND aa.PUBYEAR =dd.pubyear AND aa.CIT_CNT_10Y = dd.cit_cnt_10Y
 85.
 86.
 87. --Calculate mncs value and match to cpin table
 88.      CREATE TABLE GUBI_NEWNEW_CP_MNCS as
 89.      WITH gubi_mncs_field AS (
 90.                SELECT bb.field, bb.pubyear, round((bb.ccnt / bb.pcnt),4) mean_exp_cit
 91.                FROM (
 92.                SELECT  aa.field  field,  aa.pubyear  pubyear,  sum(aa.pubcnt)  pcnt,
sum(aa.citcnt) ccnt
 93.                FROM wos_b_2019.D_expected_citations_field aa
 94.                WHERE aa."WINDOW" = 3 AND PUBTYPE ='Journal'
 95.                GROUP BY aa.field, aa.pubyear) bb
 96.      ),  gubi_mncs_field_2 AS (
 97.                SELECT aa.*, bb.PK_CLASSIFICATIONS FROM gubi_mncs_field aa
 98.                LEFT JOIN wos_b_2019.CLASSIFICATIONS bb ON aa.field=bb.CLASSIFICATION
 99.      ) SELECT aa.*,
100.                round((aa.CIT_CNT_3Y / bb.mean_exp_cit),4) MNCS_3Y
101.                FROM GUBI_NEWNEW_CPIN aa
102.                LEFT  JOIN  gubi_mncs_field_2  bb  ON  aa.pubyear=bb.pubyear  AND
aa.FK_CLASSIFICATIONS =bb.pk_classifications
103.
```

```
104.
105.
106. /* Field-based data for Figure 1 and 2
107. Based on gubi_newnew_cpin (see above)
108.
109. Creates
110. "fields_WoS_extended_peryear.csv"
111. "fields_top_fields_rates.csv"
112. */
113.
114. --Creates annual item numbers for each WoS field and document type (wide format)
115.      SELECT cc.CLASSIFICATION , pubyear,
116.      count(fk_ut) total_cnt,
117.      count(CASE WHEN MTYPEFINAL = 'med_News' THEN fk_ut ELSE NULL end) med_News,
118.      count(CASE  WHEN  MTYPEFINAL  =  'med_Editorial'  THEN  fk_ut  ELSE  NULL  end)
med_Editorial,
119.      count(CASE WHEN MTYPEFINAL = 'med_Letter' THEN fk_ut ELSE NULL end) med_Letter,
120.      count(CASE WHEN MTYPEFINAL = 'med_review' THEN fk_ut ELSE NULL end) med_review,
121.      count(CASE WHEN MTYPEFINAL = 'med_Article' THEN fk_ut ELSE NULL end) med_Article,
122.      count(CASE WHEN MTYPEFINAL = 'med_SReview' THEN fk_ut ELSE NULL end) med_SReview,

123.      count(CASE  WHEN  MTYPEFINAL  =  'med_SReview_Titled'  THEN  fk_ut  ELSE  NULL  end)
med_SReview_Titled
124.      FROM GUBI_NEWNEW_CPIN aa
125.      LEFT    JOIN    wos_b_2019.CLASSIFICATIONS    cc    ON    aa.FK_CLASSIFICATIONS
=cc.PK_CLASSIFICATIONS
126.      WHERE CLASSIFICATION_TYPE = 'sc_extended'
127.      GROUP BY cc.CLASSIFICATION, pubyear
128.
129. --Creates document type rates for different fields
130.      WITH overallcounts as (
131.                          SELECT cc.CLASSIFICATION,
132.                          count(fk_ut) total_cnt,
133.                          count(CASE WHEN MTYPEFINAL = 'med_News' THEN fk_ut ELSE NULL
end) med_News,
134.                          count(CASE WHEN MTYPEFINAL = 'med_Editorial' THEN fk_ut ELSE
NULL end) med_Editorial,
135.                          count(CASE WHEN MTYPEFINAL = 'med_Letter' THEN fk_ut ELSE NULL
end) med_Letter,
136.                          count(CASE WHEN MTYPEFINAL = 'med_review' THEN fk_ut ELSE NULL
end) med_review,
137.                          count(CASE WHEN MTYPEFINAL = 'med_Article' THEN fk_ut ELSE NULL
end) med_Article,
138.                          count(CASE WHEN MTYPEFINAL = 'med_SReview' THEN fk_ut ELSE NULL
end) med_SReview,
139.                          count(CASE WHEN MTYPEFINAL = 'med_SReview_Titled' THEN fk_ut
ELSE NULL end) med_SReview_Titled
140.                          FROM GUBI_NEWNEW_CPIN aa
141.                          LEFT      JOIN      wos_b_2019.CLASSIFICATIONS      cc      ON
aa.FK_CLASSIFICATIONS =cc.PK_CLASSIFICATIONS
142.                          WHERE   CLASSIFICATION   IN   ('Physical   Sciences','Arts   &
Humanities','Technology','Social Sciences','Life Sciences & Biomedicine')
143.                          GROUP BY cc.CLASSIFICATION ORDER BY total_cnt desc
144.      )         SELECT aa.classification,
145.                          round((100*(aa.med_News / aa.total_cnt)),2) news_rate,
146.                          round((100*(aa.med_Editorial / aa.total_cnt)),2) edit_rate,
147.                          round((100*(aa.med_Letter / aa.total_cnt)),2) letter_rate,
148.                          round((100*(aa.med_review / aa.total_cnt)),2) review_rate,
149.                          round((100*(aa.med_Article / aa.total_cnt)),2) article_rate,
150.                          round((100*(aa.med_SReview / aa.total_cnt)),2) srev_rate,
151.                          round((100*(aa.med_SReview_Titled     /     aa.total_cnt)),2)
prisma_rate
152.                from overallcounts
153.
```

```
154.
155. --Additional data to get the field classification of all PRISMA documents
156.      SELECT DISTINCT dd.PK_CLASSIFICATIONS, dd.CLASSIFICATION
157.      FROM PUBMED_GUIDES aa
158.      LEFT JOIN wos_b_2019.items bb ON aa.UT_EID =bb.UT_EID
159.      LEFT JOIN wos_b_2019.ITEMS_CLASSIFICATIONS cc ON bb.PK_ITEMS =cc.FK_ITEMS
160.      LEFT    JOIN    wos_b_2019.CLASSIFICATIONS    dd    ON    cc.FK_CLASSIFICATIONS
=dd.PK_CLASSIFICATIONS
161.      WHERE   aa.TYPE   IN   ('PRISMA-G','PRISMA-E&E')   AND   dd.CLASSIFICATION_TYPE   =
'sc_extended'
162.
163.
164.
165. /* Country-based data for Figure 3 and 4
166. based on gubi_newnew_cpin (see above)
167.
168. Creates:
169. "country_totals.csv"
170. "country_SSR_annaul.csv"
171.
172. */
173.
174. -- Base data gubi_cntry: Calculation of fractional author counts
175.      CREATE TABLE gubi_cntry as
176.      WITH gubi_cntry_bomb AS (
177.                SELECT aa.fk_ut, dd.COUNTRYCODE, cc.role, aa.pubyear, aa.MTYPEFINAL
178.                FROM (SELECT DISTINCT fk_UT, pubyear, mtypefinal FROM gubi_newnew_cpin)
aa
179.                LEFT JOIN wos_b_2019.items bb ON aa.FK_UT =bb.UT_EID
180.                LEFT  JOIN  wos_b_2019.ITEMS_AUTHORS_INSTITUTIONS  cc  ON  bb.PK_ITEMS
=cc.FK_ITEMS
181.                LEFT   JOIN   wos_b_2019.INSTITUTIONS   dd   ON   cc.FK_INSTITUTIONS   =
dd.PK_INSTITUTIONS
182.                WHERE dd.COUNTRYCODE IS NOT NULL
183.      ), gubi_cntry_bombfra AS (
184.                SELECT  aa.fk_ut,  aa.COUNTRYCODE,  aa.ROLE,  aa.pubyear,  aa.mtypefinal,
bb.anzahl
185.                FROM gubi_cntry_bomb aa
186.                LEFT JOIN (SELECT fk_ut, 1 / count(fk_ut) anzahl FROM gubi_cntry_bomb
GROUP BY fk_ut) bb ON aa.fk_ut =bb.fk_ut
187.      ), gubi_cntry_grouped as (
188.                SELECT  aa.fk_ut,   aa.ROLE,  aa.pubyear,  aa.mtypefinal,  aa.COUNTRYCODE,
sum(aa.anzahl) fraction
189.                FROM gubi_cntry_bombfra aa
190.                GROUP BY aa.fk_ut,  aa.ROLE, aa.pubyear, aa.mtypefinal, aa.COUNTRYCODE
191.      ), gubi_cntry_filtered as (
192.                SELECT COUNTRYCODE,
193.                MTYPEFINAL, pubyear,
194.                sum(fraction) cnts
195.                FROM gubi_cntry_grouped
196.                WHERE MTYPEFINAL IN ('med_review','med_SReview','med_SReview_Titled')
197.                GROUP BY mtypefinal, COUNTRYCODE, pubyear
198.      ) SELECT aa.COUNTRYCODE,aa.mtypefinal,aa.pubyear, aa.cnts,
199.                sum(aa.cnts) over(PARTITION BY aa.COUNTRYCODE, aa.mtypefinal ORDER BY
aa.pubyear) cum_cnt,
200.                sum(aa.cnts)  over(PARTITION  BY  aa.COUNTRYCODE  ORDER  BY  aa.pubyear)
tot_cnt_per_year
201.                FROM gubi_cntry_filtered
202.                ORDER BY COUNTRYCODE, mtypefinal, pubyear) aa;
203.
204. -- Dataset for Figure 3 (Bubbleplot)
205.      CREATE TABLE gubi_cntry_bomb_bubble AS
206.      WITH widedata as (
207.                SELECT COUNTRYCODE,
```

```
208.                max(aa.TOT_CNT_PER_YEAR) total,
209.                round((CASE WHEN mtypefinal = 'med_SReview' THEN (max(cum_cnt) /
max(aa.TOT_CNT_PER_YEAR)*100) ELSE NULL END), 2) rate_sr,
210.                round((CASE WHEN mtypefinal = 'med_SReview_Titled' THEN (max(cum_cnt) /
max(aa.TOT_CNT_PER_YEAR)*100) ELSE NULL END), 2) rate_ssr
211.                FROM gubi_cntry aa
212.                GROUP BY COUNTRYCODE, mtypefinal
213.      )  SELECT  bb.countrycode,  max(bb.total)  total,  max(bb.rate_sr)  rate_sr,
max(bb.rate_ssr) rate_ssr
214.                FROM widedata bb
215.                GROUP BY bb.COUNTRYCODE;
216.
217.                --remove NULL values
218.                UPDATE gubi_cntry_bomb_bubble SET rate_sR = 0 WHERE rate_sR IS NULL;
219.                UPDATE gubi_cntry_bomb_bubble SET rate_SsR = 0 WHERE rate_SsR IS NULL;
220.
221.      --> This table (gubi_cntry_bomb_bubble) is exported as "country_totals.csv"
222.
223. -- Dataset for Figure 4, filtered for the 17th greates publishing countries of reviews
224.      CREATE TABLE gubi_cntry_annual AS
225.                SELECT  aa.countrycode,  mtypefinal,  pubyear,  round(cnts,2)  cnts,
round(cum_cnt,2) cum_cnt, round(TOT_CNT_PER_YEAR, 2) TOT_CNT_PER_YEAR,
226.                round(((cum_cnt / tot_cnt_per_year)*100),2) ANNUAL_GROWTH_Rate
227.                FROM gubi_cntry aa
228.                WHERE                          countrycode                          IN
('USA','GBR','DEU','ITA','FRA','CAN','CHN','AUS','JPN','ESP','NLD','IND','CHE','BRA','BEL'
,'POL','DNK')
229.                ORDER BY aa.COUNTRYCODE, aa.mtypefinal, aa.pubyear;
230.                --> This table is exported as "country_SSR_annaul.csv"
231.
```

D.3 Appendix to chapter 3: Visualizations

```
library(ggplot2)
library(ggpubr)
library(ggrepel)
library(tidyr)
library(dplyr)
theme_set(theme_pubr())

# Figure 1 (Fields by output)
# Original description: "Scatterplot of the rates of systematic reviews and PRISMA-standardized systematic reviews among all secondary research of Web of Science subject categories which published at least 500 reviews and 50 systematic reviews from 2009 to 2015"
# Figure 1 - Data Preparation

percents = read.csv2("./data/fields_top_fields_rates.csv")
prisma_fields = c("Health Care Sciences & Services",
                  "General & Internal Medicine",
                  "Surgery",
                  "Development Studies",
                  "Public, Environmental & Occupational Health")

names(percents) = c("ID","CLASSIFICATION","SSR_RATE","SR_RATE","RELATION")

# read and clean set with annual data
allrates = read.csv("./data/fields_WoS_extended_peryear.csv")
allrates$PUB_PRISMA = "No"
allrates$PUB_PRISMA[allrates$CLASSIFICATION %in% prisma_fields] = "Yes"
allrates <- subset(allrates, allrates$PUBYEAR <= 2015 & allrates$PUBYEAR > 2009)
allrates <- allrates %>%
  group_by(CLASSIFICATION) %>%
  summarise(TOTALPRISSR = sum(MED_SREVIEW_TITLED), PUB_PRISMA = first(PUB_PRISMA))

plotdata <- percents %>%
  left_join(allrates, by=join_by(CLASSIFICATION))



# Figure 1 - Plot
#Note that due to the ggrepel labeling algorithm, each plot looks a bit different. However, the data and provided information is always the same


#plot mit ggrepel
bubblefield = ggplot(plotdata, aes(x=SSR_RATE, y=SR_RATE, label = CLASSIFICATION)) +
  geom_point(aes(color = PUB_PRISMA, size = TOTALPRISSR), alpha=0.5) +
  scale_size(range = c(1, 18)) +
  scale_x_continuous(breaks = scales::pretty_breaks(n = 12)) +
  scale_y_continuous(breaks = scales::pretty_breaks(n = 10)) +
  geom_text_repel(size = 3.8,
                  force = 8,
                  force_pull=3,
                  min.segment.length = 0.5,
                  max.iter = 100000,
                  max.overlaps = 11) +
  theme(legend.position="bottom") +
  labs(x="Field assignation of PRISMA-based systematic reviews (in %)",
       y="Field assignation of systematic reviews (in %)",
       size="Total count of assignations tp PRISMA reviews",
       color="Assigned to PRISMA guideline document") +
  guides(color = guide_legend(override.aes = aes(size = 10)))







# Figure 2 (Fields by rank)
# Original description: "Ranked cumulative proportions of field assignments and cumulative counts to PRISMA-based systematic reviews from 2010 to 2015. Restricted to fields that have at least a 2% rate of overall assignments"
# Note that the data for 2010 is slightly different as in the published version. In the original version, the papers per field counts started in 2010 while the annual overall counts started in 2009.
# Figure 2 - Preparing the data


# read and clean set with annual data
allrates = read.csv("./data/fields_WoS_extended_peryear.csv")
```

```
allrates$PUB_PRISMA = "No"
allrates$PUB_PRISMA[allrates$CLASSIFICATION %in% prisma_fields] = "Yes"
allrates <- subset(allrates, allrates$PUBYEAR <= 2015 & allrates$PUBYEAR > 2009)


# calculate sums, cumulative sums, ranking positions, and labels based on annual set
allrates <- allrates %>%
  arrange(PUBYEAR) %>%
  mutate(CUMCNT = cumsum(MED_SREVIEW_TITLED)) %>%
  group_by(PUBYEAR) %>%
  mutate(ANNUAL_TOTAL = sum(MED_SREVIEW_TITLED),
         TOTAL_CUMUL_SUM = max(CUMCNT)) %>%
  ungroup() %>%
  group_by(CLASSIFICATION) %>%
  arrange(PUBYEAR) %>%
  mutate(FIELDCUMUL = cumsum(MED_SREVIEW_TITLED)) %>%
  ungroup() %>%
  mutate(ANNUAL_RATE_RND = round((FIELDCUMUL / TOTAL_CUMUL_SUM )*100,1),
         ALT_LABEL = paste(sprintf("%5.1f", ANNUAL_RATE_RND), CLASSIFICATION, sep="%: ")
         ) %>%
  group_by(PUBYEAR) %>%
  mutate(ANNUAL_RANKS = as.numeric(rank(ANNUAL_RATE_RND, ties.method = "first")))


# exclude all fields that have less than 2% in 2015, create ranks for cisualization
filteredset <- allrates %>%
  filter(CLASSIFICATION %in% filter(allrates, PUBYEAR == 2015 & ANNUAL_RATE_RND >= 2)$CLASSIFICATION) %>%
  group_by(PUBYEAR) %>%
  mutate(ANNUAL_RANKS = as.numeric(rank(ANNUAL_RATE_RND, ties.method = "first")))




# Figure 2 - Plot
plot_annual_ranks =
  ggplot(data = filteredset, aes(x = PUBYEAR, y = ANNUAL_RANKS, group = CLASSIFICATION)) +
  geom_line(aes(color = PUB_PRISMA , alpha = 0.5, size = 2),show.legend = FALSE) +
  geom_point(aes(color = PUB_PRISMA , size = 2 ,alpha = 1)) +
  geom_point(aes(color = PUB_PRISMA , size = FIELDCUMUL ,alpha = 0.8)) +
  scale_size(range = c(1, 15)) +
  labs(color = "Assigned to PRISMA guideline document",
       x="Publication year",
       y="Ranked cumulative %",
       size = "Cumulative counts") +
  geom_text(data = subset(filteredset, filteredset$PUBYEAR==2010),
            aes(label=ALT_LABEL), hjust = -0.00001,position = position_nudge(x = -1.5, y=-0.3)) +
  geom_text(data = subset(filteredset, filteredset$PUBYEAR==2015),
            aes(label=ALT_LABEL), hjust = -0.00001,position = position_nudge(x = 0.1)) +
  scale_x_continuous(breaks = c(2010:2015), expand=c(0,0), limits =c(2008.5,2017)) +
  theme(axis.line.y=element_blank(),
        axis.text.y=element_blank(),
        axis.ticks.y=element_blank(),
        legend.position="bottom"
  ) +
  guides(alpha = FALSE, color = guide_legend(override.aes = aes(size = 10)))


# Figure 3 (Countries by output)
# Original description: "Overall number of research syntheses, portions of systematic reviews and PRISMA-based systematic reviews by country, and national association with the Commonwealth. Based on fractional assignment of author’s affiliations. Labels are restricted to countries that published at least 500 reviews, have at least 10% systematic reviews or 2% for PRISMA-based reviews accordingly"
# Figure 3 - Preparing the data


# read data, ISO countrycodes, merge...
countrydata_a = read.csv("./data/country_totals.csv")


# Filter data so that only entries with >5000 tiems, 10%SR or 2%SSR get labels (--> 43 instead of 67 countries)
countrydata_a$COUNTRY_FILTERED <- NA
countrydata_a[countrydata_a$TOTAL >= 5000 | countrydata_a$RATE_SR >= 10 | countrydata_a$RATE_SSR >= 2,c("COUNTRY_FILTERED")] <- countrydata_a[countrydata_a$TOTAL >= 5000 | countrydata_a$RATE_SR >= 10 | countrydata_a$RATE_SSR >= 2,c("COUNTRY")]

```

```
143.
144.
145.
146. # Figure 3 - Plot
147.
148. country_bubble_plot = ggplot(countrydata_a, aes(x=RATE_SSR, y=RATE_SR, label = COUNTRY_FILTERED)) +
149.   geom_point(aes(color = COMMONWEALTH, size = TOTAL), alpha=0.5) +
150.   scale_size(range = c(1, 30)) +
151.   scale_x_continuous(breaks = scales::pretty_breaks(n = 16)) +
152.   scale_y_continuous(breaks = scales::pretty_breaks(n = 8)) +
153.   geom_text_repel(aes(fill = COMMONWEALTH),
154.                   size = 3.8,
155.                   nudge_y = 1,
156.                   force = 22,
157.                   force_pull=2,
158.                   min.segment.length = 0,
159.                   box.padding = 0.1,
160.                   segment.curvature = -0.1,
161.                   segment.ncp = 3,
162.                   segment.angle = 20,
163.                   max.iter = 100000) +
164.   theme(legend.position="bottom") +
165.   labs(x="Portion of PRISMA-based systematic reviews among domestic Reviews (in %)",
166.        y="Portion of systematic reviews among domestic reviews (in %)",
167.        size="Absolute number of domestic research syntheses",
168.        color="Associated with the Commonwealth") +
169.   guides(color = guide_legend(override.aes = aes(size = 10)))
170.
171.
172.
173. # Figure 4 (Countries by rank)
174. # Original description: "Ranked cumulative proportions and cumulative counts of country assignments to
PRISMA-based systematic reviews from 2010 to 2015"
175.
176.
177.
178. # Figure 4 - Preparing the data
179. cnanpp = read.csv("./data/country_SSR_annual.csv")
180.
181. #calculate and add cumulative percentages
182. cumul_cnts = aggregate(cnanpp$CNTS, by=list(cnanpp$PUBYEAR), FUN = "sum")
183. names(cumul_cnts) = c("PUBYEAR","ANNUAL_TOTAL")
184. cumul_add = merge(x = cnanpp, y = cumul_cnts, by = "PUBYEAR", all.x=TRUE)
185.
186. cumul_annual = aggregate(cumul_add$CUM_CNT, by=list(cumul_add$PUBYEAR), FUN = "sum")
187. names(cumul_annual) = c("PUBYEAR","CUMUL_TOTAL")
188. cumul_add = merge(x = cumul_add, y =cumul_annual, by="PUBYEAR", all.x = TRUE)
189.
190. cumul_add$ANNUAL_RATE_RND = round((cumul_add$CUM_CNT  / cumul_add$CUMUL_TOTAL)*100,2)
191.
192. #create labels
193.  cumul_add$ANNUAL_RATE_LABEL  =  paste(sprintf("%5.1f",  cumul_add$ANNUAL_RATE_RND),  cumul_add$COUNTRY,
sep="%: ")
194.
195. #create ranks based on annual rate
196. cumul_add$ANNUAL_RANKS=""
197.   cumul_add$ANNUAL_RANKS[cumul_add$PUBYEAR  ==2010]  =  rank(cumul_add[cumul_add$PUBYEAR  ==  2010,12],
ties.method="first")
198.   cumul_add$ANNUAL_RANKS[cumul_add$PUBYEAR  ==2011]  =  rank(cumul_add[cumul_add$PUBYEAR  ==  2011,12],
ties.method="first")
199.   cumul_add$ANNUAL_RANKS[cumul_add$PUBYEAR  ==2012]  =  rank(cumul_add[cumul_add$PUBYEAR  ==  2012,12],
ties.method="first")
200.   cumul_add$ANNUAL_RANKS[cumul_add$PUBYEAR  ==2013]  =  rank(cumul_add[cumul_add$PUBYEAR  ==  2013,12],
ties.method="first")
201.   cumul_add$ANNUAL_RANKS[cumul_add$PUBYEAR  ==2014]  =  rank(cumul_add[cumul_add$PUBYEAR  ==  2014,12],
ties.method="first")
202.   cumul_add$ANNUAL_RANKS[cumul_add$PUBYEAR  ==2015]  =  rank(cumul_add[cumul_add$PUBYEAR  ==  2015,12],
ties.method="first")
203.   cumul_add$ANNUAL_RANKS[cumul_add$PUBYEAR  ==2016]  =  rank(cumul_add[cumul_add$PUBYEAR  ==  2016,12],
ties.method="first")
204.
205.
206.
207. # Figure 4 - Plot
208.
209. plot_annual_ranks =
210.   ggplot(data = cumul_add, aes(x = PUBYEAR, y = as.numeric(ANNUAL_RANKS), group = COUNTRY))+
211.   geom_line(aes(color = COMMONWEALTH, alpha = 0.5, size = 2),show.legend = FALSE) +
```

```
  geom_point(aes(color = COMMONWEALTH, size = 2 ,alpha = 1)) +
  geom_point(aes(color = COMMONWEALTH, size = CUM_CNT,alpha = 0.8)) +
  scale_size(range = c(1, 15)) +
  labs(color = "Associated with the Commonwealth",
       x="Publication year",
       y="Ranked cumulative %",
       size = "Cumulative counts") +
  geom_text(data = subset(cumul_add, cumul_add$PUBYEAR==2010),
            aes(label=ANNUAL_RATE_LABEL), hjust = -0.00001,position = position_nudge(x = -1.5)) +
  geom_text(data = subset(cumul_add, cumul_add$PUBYEAR==2015),
            aes(label=ANNUAL_RATE_LABEL), hjust = -0.00001,position = position_nudge(x = 0.3)) +
  scale_x_continuous(breaks = c(2010:2015), expand=c(0,0), limits =c(2008.5,2017)) +
  scale_y_continuous(limits=c(0,17)) +
  theme(axis.line.y=element_blank(),
        axis.text.y=element_blank(),
        axis.ticks.y=element_blank(),
        legend.position="bottom"
  ) +
  guides(alpha = FALSE, color = guide_legend(override.aes = aes(size = 10)))


# Figure 5 (Citation impact)
# Original description: "Box plots with median and mean (dots) values showing citation impact ranks by document type for absolute citations (ABS), mean-normalized citations (MNCS) and cumulative percentile ranks (CPIN), based on publications published from 2009 to 2015 with a 3-year citation window. The y-axes for ABS and MNCS are stripped of extreme outliers for the purpose of better visualization"

# Figure 5 - Preparing the data
fullset= read.csv("./data/citations_data.csv")
 comparison_abs = list(c("Article", "Review"), c("Review", "SysReview"), c("SysReview", "SysReview (PRISMA)"))


# Figure 5 - Plot
# Here, three individual plots are created and combined because facet_wrap() and similar functions struggle with different axis scales.

#plot with absolute values
secondplot_abs = ggboxplot(fullset,
                           x="MTYPEFINAL",
                           y="ABSOLUTES",
                           color ="MTYPEFINAL",
                           palette="Dark2",
                           shape="dose",
                           ylab="Absolute Citation Scores",
                           xlab = FALSE,
                           ylim=c(0,75),
                           outlier.shape =NA,
                           add = "mean_se",
                           legend.title="Publication Types on x-Axis:"
                           ) + rotate_x_text(angle = 65) +
                            stat_compare_means(comparisons = comparison_abs) +
                            stat_compare_means(label.y = 70)


# plot with mean normalied citation scores (MNCS)
secondplot_mncs = ggboxplot(fullset,
                            x="MTYPEFINAL",
                            y="MNCS",
                            color ="MTYPEFINAL",
                            palette="Dark2",
                            shape="dose",
                            ylab="Mean Normalized Citation Scores (MNCS)",
                            xlab = FALSE,
                            ylim=c(0,7.5),
                            add = "mean_se",
                            outlier.shape =NA
                            ) + rotate_x_text(angle = 65) +
                            stat_compare_means(comparisons = comparison_abs) +
                            stat_compare_means(label.y = 7)


# plot with inclusive cumulative percentile ranks (cpin)
secondplot_cpin = ggboxplot(fullset,
                            x="MTYPEFINAL",
                            y="CPIN_3Y",
```

```
                              color ="MTYPEFINAL",
                              palette="Dark2",
                              shape="dose",
                              outlier.shape =NA,
                              add = "mean_se",
                              ylab="Cumulative Percentile Ranks, Inclusive (in %)",
                              xlab = FALSE
                              ) + scale_y_continuous(breaks=c(25,50,75,100)) +
                              rotate_x_text(angle = 65) +
                              stat_compare_means(comparisons = comparison_abs) +
                              stat_compare_means(label.y = 125)



#combination of three plots
finalplot = ggarrange(
  secondplot_abs, secondplot_mncs, secondplot_cpin, labels = c("ABS", "MNCS","CPIN"), ncol=3,
  common.legend = TRUE, legend = "bottom", hjust =-1
)


# Figure 6 (annual Citation impact)
 # Original description: "Average annual cumulative percentile ranks (CPIN) for each document types and corresponding errors, grouped by three different citation windows. As 2018 is the maximum year of citation data, the 5- and 10-year windows are short of data in 2014 and 2009 respectively"
# Figure 6 - Plot
# Again, three individual plots are created and combined. These plots use the same data as those of Figure 5


# 3 year window
  rel_3_plot = ggline(fullset,
              x = "PUBYEAR",
              y = "CPIN_3Y",
              color ="MTYPEFINAL",
              palette="Dark2",
              add = "mean_se"
  ) +
  scale_x_continuous(name="Year of Publication", limits=c(2008.9, 2015.1), breaks=c(2009:2015)) +
  scale_y_continuous(name="Publication Type") +
  rotate_x_text(angle = 65)

# 5 year window
  rel_5_plot = ggline(fullset,
                      x = "PUBYEAR",
                      y = "CPIN_5Y",
                      color ="MTYPEFINAL",
                      palette="Dark2",
                      add = "mean_se"
  ) +
    scale_x_continuous(name="Year of Publication", limits=c(2008.9, 2015.1), breaks=c(2009:2015)) +
    scale_y_continuous(name="Publication Type") +
    rotate_x_text(angle = 65)

# 10 year window
  rel_10_plot = ggline(fullset,
                      x = "PUBYEAR",
                      y = "CPIN_10Y",
                      color ="MTYPEFINAL",
                      palette="Dark2",
                      add = "mean_se"
  ) +
    scale_x_continuous(name="Year of Publication", limits=c(2008.9, 2015.1), breaks=c(2009:2015)) +
    scale_y_continuous(name="Publication Type") +
    rotate_x_text(angle = 65)


# combine
  finalplot = ggarrange(
     rel_3_plot, rel_5_plot, rel_10_plot, labels = c("3-Year Window","5-Year Window","10-Year Window"), ncol=3,
    common.legend = TRUE, legend = "bottom"
  )


```

D.4 APPENDIX TO CHAPTER 6: SQL CALCULATIONS

```
-- SQL Queries

/* Import Data into KB
Import to KB database via SQLBeaver's Import function into an empty table:
*/

create table aa_data_from_local_pubmed (
        pmid text,
        j_nlm_id_unique text,
        min_rank integer
);

/*
Base tables

Combination of imported data with KB-internal Scopus Data
*/
create table aa_master as
WITH aa_authorsinfo as (
        select scopus_author_id,
                    min(bb.pubyear) pubyear_first,
                    max(bb.pubyear) pubyear_last,
        count(distinct aa.item_id) papercount
        from scp_b_202210.items_authors aa left join scp_b_202210.items bb on aa.item_id=bb.item_id
        group by aa.scopus_author_id
), prisma_citation_list as (
        select
                    aa.item_id_citing,
                    max(bb.prisma_iteration) prisma_ver
                    from scp_b_202210.refs aa
                    right join
                                (select aa.scp_id,
                                case
                                            when pubyear = 1999 then 1999
                                            when pubyear between 2009 and 2019 then 2009
                                            when pubyear >=2020 then 2020
                                end as prisma_iteration
                                from sv_reporting_guidelines_new aa
                                where family = 'PRISMA' and project in ('GUIDELINE','FORK') and scp_id is
not null) bb
                    on aa.item_id_cited = bb.scp_id
                    group by aa.item_id_citing
) select
        aa.item_id,
        aa.pmid,
        aa.doi,
        CASE
                    WHEN min_rank = '11' THEN 'Editorial'
                    WHEN min_rank = '12' THEN 'Letter'
                    WHEN min_rank = '13' THEN 'News'
                    when min_rank = '20' THEN 'SR_Cochrane'
                    WHEN ee.prisma_ver is not null AND min_rank = '21' then 'SR_PRISMA'
                    when min_rank = '21' then 'SR'
                    when min_rank = '22' then 'Review'
                    when min_rank = '50' then 'Article'
                    ELSE NULL
        END min_rank,
        ee.prisma_ver
        aa.class_name,
        aa.author_count,
        aa.pubyear,
        bb.scopus_author_id,
        cc.author_seq_nr,
        bb.pubyear_first,
        bb.pubyear_last,
        bb.papercount
from scp_b_202210.items aa
left join scp_b_202210.items_authors cc on aa.item_id = cc.item_id
left join aa_authorsinfo bb on cc.scopus_author_id = bb.scopus_author_id
left join aa_data_from_local_pubmed dd on aa.pmid=dd.pmid
left join prisma_citation_list ee on aa.item_id = ee.item_id_citing
where aa.pubyear >= 2009 and aa.pmid is not null
```

```
-- Data for analysis/export

/* Base data for full overview
Create view that calculates aa and reduces field sizes for export/import. The data will be analyzed in R
*/


CREATE OR REPLACE VIEW aa_res_anova AS
SELECT pmid,
    scopus_author_id,
    min_rank,
    pubyear - pubyear_first + 1 AS academic_age,
        CASE
            WHEN author_seq_nr = 1 THEN 'f'::text
            WHEN author_seq_nr = author_count THEN 'l'::text
            ELSE 'b'::text
        END AS authorship_position
   FROM aa_master am
  WHERE min_rank = ANY (ARRAY['Review'::text, 'SR'::text, 'SR_PRISMA_1999'::text, 'SR_PRISMA_2009'::text, 'SR_PRISMA_2020'::text, 'SR_Cochrane'::text]);


/* Data for table 1
Table with different metrics for reviews, systematic reviews, prisma-based systematic reviews and cochrane reviews. Metrics are item count, mean number of authors, portion of first-year authors, maximum academic age, median academic age (first author), median academic age (all authors), Q25, Q75.
*/

create table aa_res_ab_table_1 as
select
aa.min_rank,
aa.item_count,
aa.aa_avg_authorships,
aa.aa_first_evers_per_authorships, aa.aa_oldest_authorship, aa.aa_percentile_25, aa.aa_percentile_median, aa.aa_percentile_75,
bb.fa_first_evers_per_authorships, bb.fa_oldest_authorship, bb.fa_percentile_25, bb.fa_percentile_median, bb.fa_percentile_75,
cc.la_first_evers_per_authorships, cc.la_oldest_authorship, cc.la_percentile_25, cc.la_percentile_median, cc.la_percentile_75
from
        (select min_rank,
        count(distinct item_id) item_count,
        round((count(item_id)::numeric / count(distinct item_id)::numeric),2) aa_avg_authorships,
        round((count(case     when     pubyear-pubyear_first     =     0     then     1     else     null end)::numeric/count(item_id)::numeric),2) aa_first_evers_per_authorships,
        max(pubyear-pubyear_first+1) aa_oldest_authorship,
        percentile_disc(0.25) within group (order by (pubyear-pubyear_first+1)) aa_percentile_25,
        percentile_disc(0.5) within group (order by (pubyear-pubyear_first+1)) aa_percentile_median,
        percentile_disc(0.75) within group (order by (pubyear-pubyear_first+1)) aa_percentile_75
        from aa_master
        where min_rank in ('Review','SR','SR_PRISMA_1999','SR_PRISMA_2020','SR_PRISMA_2009','SR_Cochrane')
        group by min_rank) aa
left join
        (select min_rank,
        round((count(case     when     pubyear-pubyear_first     =     0     then     1     else     null end)::numeric/count(item_id)::numeric),2) fa_first_evers_per_authorships,
        max(pubyear-pubyear_first+1) fa_oldest_authorship,
        percentile_disc(0.25) within group (order by (pubyear-pubyear_first+1)) fa_percentile_25,
        percentile_disc(0.5) within group (order by (pubyear-pubyear_first+1)) fa_percentile_median,
        percentile_disc(0.75) within group (order by (pubyear-pubyear_first+1)) fa_percentile_75
        from aa_master
        where min_rank in ('Review','SR','SR_PRISMA_1999','SR_PRISMA_2020','SR_PRISMA_2009','SR_Cochrane') and author_seq_nr = 1
        group by min_rank) bb
on aa.min_rank=bb.min_rank
left join
        (select min_rank,
        round((count(case     when     pubyear-pubyear_first     =     0     then     1     else     null end)::numeric/count(item_id)::numeric),2) la_first_evers_per_authorships,
        max(pubyear-pubyear_first+1) la_oldest_authorship,
        percentile_disc(0.25) within group (order by (pubyear-pubyear_first+1)) la_percentile_25,
        percentile_disc(0.5) within group (order by (pubyear-pubyear_first+1)) la_percentile_median,
        percentile_disc(0.75) within group (order by (pubyear-pubyear_first+1)) la_percentile_75
        from aa_master
        where min_rank in ('Review','SR','SR_PRISMA_1999','SR_PRISMA_2020','SR_PRISMA_2009','SR_Cochrane') and author_seq_nr = author_count
        group by min_rank) cc
on aa.min_rank=cc.min_rank
```

```
143.
144. /*
145. field and journal names
146. Adds journal and field names to aa_master and exports the data for PRISMA-based SR's. Field-
multiclassification is solved by random to preserve ordinal scale of academic age values
147. */
148.
149. create view aa_res_fieldsjournals as
150. with basedata as (
151.        select am.pmid pmid, am.scopus_author_id scopus_author_id, am.pubyear - am.pubyear_first + 1 AS
academic_age,
152.                    am.class_name[1 + floor((random() * array_length(am.class_name, 1)))::int] random_field,
153.                    sc.source_title journal,
154.            CASE
155.                        WHEN am.author_seq_nr = 1 THEN 'f'::text
156.                        WHEN am.author_seq_nr = am.author_count THEN 'l'::text
157.                        ELSE 'b'::text
158.                    END AS authorship_position,
159.                    case
160.                                when am.min_rank in ('SR_PRISMA_1999', 'SR_PRISMA_2009', 'SR_PRISMA_2020')
then 'SR_PRISMA'::text
161.                                else min_rank
162.                    end as dtype
163.        FROM aa_master am
164.        left join scp_b_202304.items sc on am.item_id=sc.item_id
165.        WHERE    min_rank    =    ANY    (ARRAY['Review'::text,    'SR'::text,    'SR_PRISMA_1999'::text,
'SR_PRISMA_2009'::text, 'SR_PRISMA_2020'::text, 'SR_Cochrane'::text])
166. ), fieldcounts as (
167.        select random_field, count(distinct pmid) cnt_allitems,
168.        count(distinct case when dtype = 'SR' then pmid else null end) cnt_sr,
169.        count(distinct case when dtype = 'SR_PRISMA' then pmid else null end) cnt_sr_x_prisma
170.        from basedata
171.        group by random_field
172. ), journalcounts as (
173.        select journal, count(distinct pmid) cnt_allitems,
174.        count(distinct case when dtype = 'SR' then pmid else null end) cnt_sr,
175.        count(distinct case when dtype = 'SR_PRISMA' then pmid else null end) cnt_sr_x_prisma
176.        from basedata
177.        group by journal
178. ) select
179.        aa.pmid,
180.        aa.scopus_author_id,
181.        aa.academic_age,
182.        aa.dtype,
183.        aa.authorship_position,
184.        aa.random_field,
185.        bb.cnt_sr f_cnt_sr,
186.        round((bb.cnt_sr_x_prisma::numeric  /  nullif(bb.cnt_sr  +  bb.cnt_sr_x_prisma,  0)::numeric),3)
f_rate_prismausage,
187.        aa.journal,
188.        cc.cnt_sr j_cnt_sr,
189.        round((cc.cnt_sr_x_prisma::numeric  /  nullif(cc.cnt_sr  +  cc.cnt_sr_x_prisma,  0)::numeric),3)
j_rate_prismausage
190.        from basedata aa
191.        left join fieldcounts bb on aa.random_field = bb.random_field
192.        left join journalcounts cc on aa.journal = cc.journal
193.        where dtype in ('SR_PRISMA', 'SR')
194.
```

D.5 Appendix to chapter 6: R calculations and visualizations

```r
library(tidyverse)
library(ggstatsplot)
library(report)
library(mgcv)
library(pROC)
library(lme4)

options(scipen = 999)

# ================================================ #
#                 Load  and clean data             #
# ================================================ #

# load and prepare datasets
data_raw <- read.csv("./data/aa_res_base.csv") %>%
   mutate(combinedtype = case_when(min_rank %in% c("SR_PRISMA_1999","SR_PRISMA_2009","SR_PRISMA_2020") ~ "PRISMA-based systematic review",
                                   min_rank == "Review" ~ "(Narrative) Review",
                                   min_rank == "SR" ~ "Systematic review",
                                   min_rank == "SR_Cochrane" ~ "Cochrane review")) %>%
  mutate(PRISMAver = ifelse(combinedtype == "PRISMA-based systematic review",gsub("\\D", "",min_rank),NA)) %>%
  mutate(authorship_position = case_when(authorship_position == "f" ~ "First author",
                                         authorship_position == "b" ~ "Middle author",
                                         authorship_position == "l" ~ "Last author")) %>%
  mutate_if(is.character, as.factor) %>%
  unique()

          # save for publication
          data_base <- data_raw %>%
            select(pmid, academic_age, authorship_position, combinedtype, PRISMAver)

          write.csv(data_base ,"./paper/data_published/data_base.csv")

# Data for fields and journals
data_fj = read.csv("./data/aa_res_fieldsjournals_bigger.csv")
data_fjmut <- data_fj %>%
  mutate(authorship_position = case_when(authorship_position == "f" ~ "First author",
                                         authorship_position == "b" ~ "Middle author",
                                         authorship_position == "l" ~ "Last author")) %>%
      mutate(journal  =  replace(journal,  journal  %in%  c("JAMA  -  Journal  of  the  American  Medical Association","JAMA"), "Journal of the American Medical Association (JAMA)")) %>%
  mutate(journal = replace(journal, journal %in% c("The BMJ","BMJ (Online)","BMJ","BMJ (Clinical research ed.)","British Medical Journal"), "The BMJ"),
        j_rate_prismausage = replace(j_rate_prismausage, journal %in% c("The BMJ","BMJ (Online)","BMJ","BMJ (Clinical research ed.)","British Medical Journal"), 0.278)) %>%
  mutate_if(is.character, as.factor) %>%
  unique()

         # save data for publication
          data_fjmut %>%
          select(!scopus_author_id) %>%
            write.csv(. ,"./paper/data_published/data_fieldsjournals.csv")

# ================================================ #
#      Analysis 1 - Distributions of academic age    #
# ================================================ #

# GGplot for the histogram
figure_aahist <- grouped_gghistostats(
  data                 = data_raw,
  x                    = academic_age,
  xlab                 = "Academic age",
  ggplot.component    = list(ggplot2::scale_y_continuous(labels = scales::comma)),
  #scale_y_continuous   = list(labels = scales::comma),
  binwidth             = 1,
  grouping.var         = combinedtype,
  type                 = "nonparametric",
  results.subtitle     = FALSE,
  bin.args             = list(colour= "#0072B2"),
  centrality.line.args = list(color = "#D55E00", linetype = "dashed"),
  annotation.args      = list(title = "Distributions of academic age", caption = "based on Scopus citation data and AuthorID"),
  plotgrid.args        = list(nrow = 2)
)

```

```
ggsave("figure_aahist.png", figure_aahist, device = "png", scale = 1, width = 210, height = 210, units="mm", dpi = 300)
ggsave("figure_aahist.eps", figure_aahist, device = "eps", scale = 1, width = 210, height = 210, units="mm")


# ================================================ #
# Analysis 2 - aa Distributions by field and journal #
# ================================================ #


# ==== Field Analysis ====

# Set inclusion limit for field
SR_threshold <- 1000

# Create table for download/supplementary material
fields_table <- data_fjmut %>%
  filter(f_cnt_sr >= SR_threshold) %>%
  group_by(random_field) %>%
  summarise("Nr. of SR authorships" = n(),
            "Mean nr. authors per SR" = round(n() / max(f_cnt_sr), digits = 2),
            "Rate of PRISMA usage (in %)" = round(sum(ifelse(dtype=="SR_PRISMA",1,0)) / n(), digits = 2),
            "Rate of first-ever authorships (in %)" = round((sum(academic_age[academic_age == 1]) / n() * 100), digits = 2),
             "Rate of first-ever first authorships (in %)" = round((sum(academic_age[academic_age == 1 & authorship_position == "First author"]) / n() * 100), digits = 2),
            "Median academic age (years)" = median(academic_age),
                "PRISMA usage age diff. (years)" = median(ifelse(dtype=="SR_PRISMA", academic_age, NA), na.rm=TRUE) - median(academic_age),
              "P (Kruskal-Wallis)" = round(kruskal.test(academic_age ~ dtype, data = pick(academic_age, dtype))$p.value, digits = 4),
            ) %>%
  rename("Field (ASJC)" = random_field)
write.csv2(fields_table, "./paper/fields_table.csv", row.names = F)

#selection of fields based on different criteria (p-value; subjective list)
 fieldselection_favourites <- c("Epidemiology", "Public Health, Environmental and Occupational Health", "Surgery", "Oncology", "Dentistry (all)", "Psychiatry and Mental Health", "Clinical Psychology", "Nursing (all)", "Genetics", "Cardiology and Cardiovascular Medicine")


fields_table %>%
  filter(fields_table$`Field (ASJC)` %in% fieldselection_favourites) %>%
  write.csv(. ,"./paper/fields_table_filtered.csv", row.names = F)



# Create long data table with pSR rates, adjust/filter labels and ggplot
figure_fields <- data_fjmut %>%
  filter(f_cnt_sr >= SR_threshold & random_field %in% fieldselection_favourites) %>%
  group_by(random_field, academic_age, dtype) %>%
  mutate(typecount = n()) %>%
  group_by(random_field, academic_age) %>%
  mutate(prismarate = typecount / n()) %>%
  group_by(random_field) %>%
  mutate(median_aa = median(academic_age), max_aa = max(academic_age)) %>%
  mutate(median_aa = replace(median_aa, median_aa != academic_age, NA),
         fieldlabel = if_else(academic_age == max_aa, random_field, NA)) %>%
  filter(dtype == "SR_PRISMA" & prismarate < 1) %>%
  select(random_field, median_aa, academic_age, prismarate, fieldlabel) %>%
  unique() %>%
  mutate(random_field = as.character(random_field)) %>%
 mutate(random_field = replace(random_field, random_field == "Public Health, Environmental and Occupational Health", "Public Health, Environmental\nand Occupational Health")) %>%
   mutate(random_field = replace(random_field, random_field == "Cardiology and Cardiovascular Medicine", "Cardiology and Cardiovascular\nMedicine")) %>%
  ggplot(aes(x = academic_age, y = prismarate, group = random_field, fill = random_field)) +
  geom_line(aes(color = random_field, linetype = random_field), linewidth = 0.8) +
  geom_point(aes(x = median_aa, fill = random_field), color = "black", size = 2.5, shape = 21) +
  scale_color_discrete(name = "Field (ASJC)") +
  scale_linetype_discrete(name = "Field (ASJC)") +
  scale_fill_discrete(name = "Field (ASJC)") +
  labs(x = "Academic age", y = "Portion of pSR") +
  theme_minimal() +
  theme(legend.position="right") %>%
figure_fields

```

```
ggsave("./paper/figure_fields.png", figure_fields, device = "png", scale = 1, width = 210, height = 210, units="mm", dpi = 300)
ggsave("./paper/figure_fields.eps", figure_fields, device = "eps", scale = 1, width = 210, height = 210, units="mm")


# ==== Journal Analysis ====
SR_threshold_j <- 50
 journalselec_sub_tab <- c("Biological Psychiatry", "American Journal of Human Genetics", "Colorectal Disease", "BMJ Open", "Medicine (United States)", "New England Journal of Medicine","Annals of Internal Medicine", "The Lancet", "The BMJ", "Journal of the American Medical Association (JAMA)", "PLoS ONE", "Journal of Clinical Epidemiology", "Systematic Reviews")


# Table for download/supplementary material
journal_table <- data_fjmut %>%
filter(journal %in% journalselec_sub_tab) %>%
  group_by(journal) %>%
  summarise(
            "Nr. of SR authorships" = n(),
            "Mean nr. authors per SR" = round(n() / max(j_cnt_sr), digits = 2),
            "Rate of PRISMA usage (in %)" = round(sum(ifelse(dtype=="SR_PRISMA",1,0)) / n() * 100, digits = 2),
            "Rate of first-ever authorships (in %)" = round((sum(academic_age[academic_age == 1]) / n() * 100), digits = 2),
             "Rate of first-ever first authorships (in %)" = round((sum(academic_age[academic_age == 1 & authorship_position == "First author"]) / n() * 100), digits = 2),
            "Median academic age (years)" = median(academic_age),
                "PRISMA usage age diff. (years)" = median(ifelse(dtype=="SR_PRISMA", academic_age, NA), na.rm=TRUE) - median(academic_age),
                      "P (Kruskal-Wallis)" =   round( max(ifelse(j_rate_prismausage %in% c(0,1), 999, kruskal.test(academic_age ~ dtype, data = pick(academic_age, dtype) )$p.value)), digits = 4)
            ) %>%
  rename("Journal" = journal) %>%
write.csv("./paper/journal_table.csv", row.names = F)


#make selections of journals (by p; subjective)
journalseection_byp <- c(slice_min(journal_table, p_value, n=5)$journal, slice_max(journal_table, p_value, n=5)$journal)
journalselec_sub <- c("New England Journal of Medicine","Annals of Internal Medicine", "The Lancet", "The BMJ", "Journal of the American Medical Association (JAMA)", "PLoS ONE", "Journal of Clinical Epidemiology", "Systematic Reviews")


# Journal selection and plotting
figure_journals <- data_fjmut %>%
  filter(journal %in% journalselec_sub) %>%
  group_by(journal, academic_age, dtype) %>%
  mutate(typecount = n()) %>%
  group_by(journal, academic_age) %>%
  mutate(prismarate = 1-(typecount / n())) %>%
  group_by(journal) %>%
  mutate(median_aa = median(academic_age), max_aa = max(academic_age)) %>%
  mutate(median_aa = replace(median_aa, median_aa != academic_age, NA),
         journallabel = if_else(academic_age == max_aa, journal, NA)) %>%
  filter(dtype == "SR", academic_age <= 20) %>%
  select(journal, typecount, median_aa, academic_age, prismarate, journallabel) %>%
  unique() %>%
  ggplot(aes(x = academic_age, y = prismarate, group = journal, fill = journal)) +
  geom_line(aes(color = journal, linetype = journal), linewidth = 0.7) +
  #geom_ma(aes(color = journal, linetype = journal), ma_fun = WMA, wts=typecount, n = 3) +
  geom_point(aes(x = median_aa, fill = journal), color = "black", size = 2.5, shape = 21) +
  scale_color_discrete(name = "Journal") +
  scale_linetype_discrete(name = "Journal") +
  scale_fill_discrete(name = "Journal") +
  labs(x = "Academic age", y = "Portion of pSR") +
  theme_minimal() +
  theme(legend.position="right")

figure_journals


ggsave("./paper/figure_journals.png", figure_journals, device = "png", scale = 1, width = 210, height = 150, units="mm", dpi = 300)
ggsave("./paper/figure_journals.eps", figure_journals, device = "eps", scale = 1, width = 210, height = 150, units="mm")

```

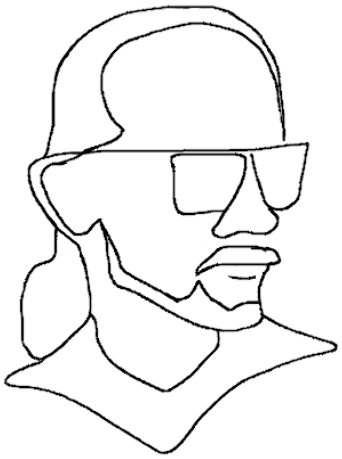
```
202.
203.
204. # ================================================= #
205. #     Analysis 3 - PRISMA usage rate by pos and aa     #
206. # ================================================= #
207.
208. # Data preparation
209.
210.     # Base data
211.     sr_only <- data_raw %>%
212.       filter(combinedtype %in% c("Systematic review","PRISMA-based systematic review"))
213.
214.     # creating the base dataset where each SR/pSR authorship is joined with its first pSR authorship
215.      # NOTE (July 2025):There is a huge amount of douplets. Fro example the authorship "57201803540" @
"30122082" had 17 previous PRISMA based SR's (1 of 60)! In sum, I have 134.766 douplets because of this.
216.     sr_only_comb <- sr_only %>%
217.       group_by(scopus_author_id, combinedtype) %>%
218.       filter(combinedtype == "PRISMA-based systematic review") %>%
219.       slice_min(order_by = academic_age) %>%
220.       left_join(sr_only, by=join_by(scopus_author_id, academic_age < academic_age), keep = TRUE) %>%
221.       filter(pmid.x != pmid.y) %>%
222.       select(focal_pmid = pmid.y,
223.              focal_scpauthid = scopus_author_id.y,
224.              focal_type = combinedtype.y,
225.              focal_prismaver = PRISMAver.y,
226.              focal_aage = academic_age.y,
227.              focal_apos = authorship_position.y,
228.              prisma_pmid = pmid.x,
229.              prisma_ver = PRISMAver.x,
230.              prisma_aage = academic_age.x,
231.              prisma_apos = authorship_position.x
232.              ) %>%
233.       # Added these three lines to account for multiple "previous papers" that produced 134.766 douplets
234.       group_by(focal_pmid, focal_scpauthid) %>%
235.       sample_n(size = 1) %>%
236.       ungroup()
237.
238.
239.               # save data for publication
240.               sr_only_comb %>%
241.                 select(!focal_scpauthid) %>%
242.                 write.csv(. ,"./paper/data_published/sr_only_comb.csv")
243.
244.
245.
246.     # creating portion data for line plot (with "any position", current and previous authorship)
247.     sr_only_combhist <- sr_only_comb %>%
248.        mutate(prisma_apos = fct_expand(prisma_apos, "Any position"), focal_apos = fct_expand(focal_apos,
"Any position")) %>%
249.       bind_rows(mutate(sr_only_comb, focal_apos = "Any position")) %>%
250.       bind_rows(mutate(sr_only_comb, prisma_apos = "Any position")) %>%
251.       bind_rows(mutate(sr_only_comb, prisma_apos = "Any position", focal_apos = "Any position")) %>%
252.       select(focal_aage, focal_type, focal_apos, prisma_apos) %>%
253.       group_by(focal_aage, focal_apos, prisma_apos) %>%
254.       mutate(overall_authorship_count= n()) %>%
255.       group_by(focal_aage, focal_type, focal_apos, prisma_apos) %>%
256.       mutate(rate = n()/overall_authorship_count) %>%
257.       filter(focal_type == "PRISMA-based systematic review", overall_authorship_count >= 50) %>%
258.       summarise(overall_authorship_count = max(overall_authorship_count), rate = max(rate))
259.
260.     # Prepare Data for U-Tests
261.     ULMmodelData <- sr_only_combhist %>%
262.       filter(prisma_apos == "Any position" & focal_apos != "Any position") %>%
263.       mutate(focal_apos = factor(focal_apos, levels = c('Middle author', 'First author', 'Last author')))
264.
265. #-------------------------------------#
266. # Visualization of descrioptive data #
267. #-------------------------------------#
268. figure_dopout <- ggplot(data = sr_only_combhist, aes(x = focal_aage, y = rate, group = prisma_apos)) +
269.   geom_line(aes(linetype = prisma_apos, color = prisma_apos), size = 0.9) +
270.   scale_color_discrete(name = "Authorship position on previous pSR") +
271.   scale_linetype_discrete(name = "Authorship position on previous pSR") +
272.   labs(x = "Academic age (at focal SR)", y = "Portion of pSR") +
273.   facet_wrap(~focal_apos, labeller = labeller(focal_apos = c("A", "B", "C", "D"))) +
274.   theme_minimal() +
275.   theme(legend.position="bottom")
276.
```

```
ggsave("./paper/figure_dopout.png", figure_dopout, device = "png", scale = 1, width = 210, height = 210, units="mm", dpi = 300)
ggsave("./paper/figure_dopout.eps", figure_dopout, device = "eps", scale = 1, width = 210, height = 210, units="mm")


#-------------------------------------------------#
# Analysis 3b - Lind & Mehlum's U-test for groups #
#-------------------------------------------------#


# Function for group-specific Lind & Mehlum U-test
Utest_by_group <- function(model, groupvar, xvar, data, alpha = 0.05) {
  groups <- levels(data[[groupvar]])
  ref_group <- groups[1]

  coefs <- coef(model)
  vc <- vcov(model)

  results <- lapply(groups, function(g) {
    # Group-specific coefficients
    if(g == ref_group) {
      linear <- coefs[xvar]
      quad <- coefs[paste0("I(", xvar, "^2)")]
    } else {
      linear <- coefs[xvar]
      lin_int <- paste0(xvar, ":", groupvar, g)
      if(lin_int %in% names(coefs)) linear <- linear + coefs[lin_int]
      quad <- coefs[paste0("I(", xvar, "^2)")]
      quad_int <- paste0("I(", xvar, "^2):", groupvar, g)
      if(quad_int %in% names(coefs)) quad <- quad + coefs[quad_int]
    }

    # Slope at min and max
    xmin <- min(data[[xvar]], na.rm = TRUE)
    xmax <- max(data[[xvar]], na.rm = TRUE)
    slope_min <- linear + 2 * quad * xmin
    slope_max <- linear + 2 * quad * xmax

    # Approximate z and p (diagonal only)
     se_slope_min <- sqrt(vc[xvar, xvar] + (2*xmin)^2 * vc[paste0("I(", xvar, "^2)"), paste0("I(", xvar, "^2)")])
     se_slope_max <- sqrt(vc[xvar, xvar] + (2*xmax)^2 * vc[paste0("I(", xvar, "^2)"), paste0("I(", xvar, "^2)")])
    z_min <- slope_min / se_slope_min
    z_max <- slope_max / se_slope_max
    p_min <- 2 * (1 - pnorm(abs(z_min)))
    p_max <- 2 * (1 - pnorm(abs(z_max)))

    # Curve type
    shape <- if(slope_min < 0 & slope_max > 0 & p_min < 0.05 & p_max < 0.05) {
      "U-shape"
    } else if(slope_min > 0 & slope_max < 0 & p_min < 0.05 & p_max < 0.05) {
      "Inverted U"
    } else {
      "No U-shape"
    }

    # Turning point
    tp <- -linear / (2 * quad)

    # Delta method for SE of turning point
    d_beta1 <- -1 / (2 * quad)
    d_beta2 <- linear / (2 * quad^2)

    # Extract covariance
    cov12 <- vc[xvar, paste0("I(", xvar, "^2)")]
    se_tp <- sqrt(d_beta1^2 * vc[xvar, xvar] + d_beta2^2 * vc[paste0("I(", xvar, "^2)"), paste0("I(", xvar, "^2)")] + 2 * d_beta1 * d_beta2 * cov12)

    # Confidence interval
    z_alpha <- qnorm(1 - alpha / 2)
    tp_lower <- tp - z_alpha * se_tp
    tp_upper <- tp + z_alpha * se_tp

    data.frame(
      group = g,
```

```
      slope_min = slope_min,
      slope_max = slope_max,
      z_min = z_min,
      z_max = z_max,
      p_min = p_min,
      p_max = p_max,
      shape = shape,
      turning_point = tp,
      tp_lower = tp_lower,
      tp_upper = tp_upper
    )
  })

  do.call(rbind, results)
}

# Specify quadratic regression models (base model & with authorship position as random effect)
  ULMmodel_interaction <- lm(rate ~ (focal_aage + I(focal_aage^2)) * focal_apos, data = ULMmodelData)
  ULMmodel_base <- lm(rate ~ focal_aage + I(focal_aage^2), data = ULMmodelData)

# Model comparison
anova(ULMmodel_base, ULMmodel_interaction)
AIC(ULMmodel_base, ULMmodel_interaction)

# Run U test
Utest_by_group(ULMmodel_interaction, groupvar = "focal_apos", xvar = "focal_aage", data = ULMmodelData)


# Plot curves
ULMmodelData <- cbind(ULMmodelData, predict(ULMmodel_interaction, interval = "prediction"))

ULMmodel_plot <- ggplot(ULMmodelData, aes(x = focal_aage, y = rate, color = focal_apos)) +
  scale_alpha_continuous(range = c(0.01,1)) +
  geom_point(alpha = 0.5) +
  geom_line(aes(y = fit, linetype = focal_apos), size = 0.9) +
  geom_ribbon(aes(ymin = lwr, ymax = upr, fill = focal_apos), alpha = 0.07, linetype=0) +
  scale_color_discrete(name = "Authorship position") +
  scale_linetype_discrete(name = "Authorship position") +
  scale_fill_discrete(guide="none") +
  labs(x = "Academic age", y = "Portion of pSR") +
  theme_minimal() +
  theme(legend.position="bottom")

ggsave("./paper/ULMmodel_plot.png", ULMmodel_plot, device = "png", scale = 1, width = 210, height = 210,
units="mm", dpi = 300)
ggsave("./paper/ULMmodel_plot.eps", ULMmodel_plot, device = "eps", scale = 1, width = 210, height = 210,
units="mm")


# Test B model that also considers previous authorship
# --> It seems that some are significant. I wonder whether I should run a general logistic test without
groupings, before I directly focus on curvature...
ULMmodelDataB <- sr_only_combhist %>%
  filter(prisma_apos != "Any position" & focal_apos != "Any position") %>%
  mutate(focal_apos = factor(focal_apos, levels = c('Middle author', 'First author', 'Last author'))) %>%
  mutate(prisma_apos = factor(prisma_apos, levels = c('Middle author', 'First author', 'Last author')))


ULMmodel_interactionA <- lm(rate ~ (focal_aage + I(focal_aage^2)) * focal_apos, data = ULMmodelDataB)

# assuming a 3-way interaction
 ULMmodel_interactionB <- lm(rate ~ (focal_aage + I(focal_aage^2)) * focal_apos * prisma_apos, data =
ULMmodelDataB)

# assuming previous and current authorship position are independent
ULMmodel_interactionC <- lm(rate ~ focal_aage * focal_apos + I(focal_aage^2) * focal_apos + focal_aage *
prisma_apos + I(focal_aage^2) * prisma_apos, data = ULMmodelDataB)


summary(ULMmodel_interactionC)
anova(ULMmodel_interactionA, ULMmodel_interactionC)
AIC(ULMmodel_interactionA, ULMmodel_interactionC)


# Plot Bcurves
ULMmodelDataB <- cbind(ULMmodelDataB, predict(ULMmodel_interactionC, interval = "prediction"))

```

```
423. ULMmodel_plotB <- ggplot(ULMmodelDataB, aes(x = focal_aage, y = rate, color = prisma_apos)) +
424.   scale_alpha_continuous(range = c(0.01,1)) +
425.   geom_point(alpha = 0.5) +
426.   geom_line(aes(y = fit, linetype = prisma_apos), size = 0.9) +
427.   geom_ribbon(aes(ymin = lwr, ymax = upr, fill = prisma_apos), alpha = 0.07, linetype=0) +
428.   scale_color_discrete(name = "Authorship position") +
429.   scale_linetype_discrete(name = "Authorship position") +
430.   scale_fill_discrete(guide="none") +
431.   labs(x = "Academic age", y = "Portion of pSR") +
432.   theme_minimal() +
433.   theme(legend.position="bottom") +
434.   facet_wrap(~focal_apos)
435.
436. ggsave("./paper/ULMmodel_plotB.png", ULMmodel_plotB, device = "png", scale = 1, width = 210, height = 210,
units="mm", dpi = 300)
437. ggsave("./paper/ULMmodel_plotB.eps", ULMmodel_plotB, device = "eps", scale = 1, width = 210, height = 210,
units="mm")
438.
```

Curriculum vitae



Alexander Schniedermann was born in Gütersloh, Germany, in 1991. After he finished his Abitur at Hans-Ehrenberg Gymnasium in Bielefeld-Sennestadt in 2011, he studied analytic philosophy at Bielefeld University (BA) as well as the tri-disciplinary master's program "History, economics, and philosophy of science" (MA). During his master's he enjoyed the rare opportunity to study and practice bibliometrics and became interested in the epistemology of computer science and the history of medical research. In 2016, Alexander visited the University of Zürich (UZH) to deepen his study in the history of science. Despite his strong background in the humanities, he later turned more towards sociological questions and methodologies. His master's thesis was concerned with economic and social aspects of data reuse in science. During that time, Alexander joined the Bavarian State Institute for Higher Education Research and Planning (IHF) in Munich as a student assistant, where he analyzed the third mission activities of Bavarian universities and the impact of a federal research funding program.

In 2018, Alexander moved to Berlin and became a research associate at the German Centre for Higher Education Research and Science Studies (DZHW) in Berlin. He joined a project to analyze the functions, roles, and reception of the scientific review literature, the context against which he developed his doctoral research about standards for research reporting and especially systematic reviews in biomedicine. During his time at DZHW, Alexander also nurtured his interest in the epistemic implications of the open science transformation. In this regard, he analyzed the state of research software development in Germany in 2024 and joined a project to assess the impact of the German National Research Data Infrastructure (NFDI) the year after. Besides his professional occupations, Alexander served as a PhD student representative and co-speaker of the working group for the visualization of bibliometric data at DZHW. Outside of the institute, he joined the German association stsing e.V., where he served as a board member and treasurer from 2021 to 2023 and has been an Ombuds group member since 2024.