European Universities' Guidance on Research Integrity and Misconduct: Accessibility, Approaches, and Content

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EUROPEAN UNIVERSITIES' GUIDANCE ON RESEARCH INTEGRITY AND MISCONDUCT: ACCESSIBILITY, APPROACHES, AND CONTENT

AUTHORS

Noémie Aubert Bonn

Hasselt University, Faculty of Medicine and Life Sciences; KU Leuven, Centre for Biomedical Ethics and Law, Faculty of Medicine

Simon Godecharle

KU Leuven, Centre for Biomedical Ethics and Law, Faculty of Medicine; Emmaüs healthcare group, Belgium

Kris Dierickx

KU Leuven, Centre for Biomedical Ethics and Law, Faculty of Medicine

CORRESPONDING AUTHOR

Noémie Aubert Bonn: Faculty of Medicine and Life Sciences, Hasselt University, Campus Diepenbeek, Agoralaan Block D, Office C55, Diepenbeek, B-3590. Telephone +32 11 26 85 43. Email: noemie.aubertbonn@uhasselt.be

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RUNNING HEAD

University guidance on research integrity

KEYWORDS

Research integrity; misconduct; research ethics; ethical requirements; code of conduct; values of research; Guidance on research integrity; European universities

ABSTRACT

Research integrity is imperative to good science. Nonetheless, many countries and institutions develop their own integrity guidance, thereby risking incompatibilities with guidance of collaborating institutions. We retrieved guidance for academic integrity and misconduct of 18 universities from ten European countries and investigated accessibility, general content, principles endorsed, and definitions of misconduct. Accessibility and content differ substantially between institutions. There are general trends of common principles of integrity and definitions of misconduct, yet differences remain. Parallel with previous research, we distinguish different approaches in integrity guidance; one emphasizes broad values of integrity and the other details negative behaviors of misconduct. We propose that a balance between both approaches is necessary to preserve trust, meaning, and realism of guidance on research integrity.

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AUTHOR NOTE

Correspondence and questions about this paper may be directed to Noémie Aubert Bonn. Address: Faculty of Medicine and Life Sciences, Hasselt University, Campus Diepenbeek, Agoralaan Block D, Office C55, Diepenbeek, B-3590. Telephone: +32 11 26 85 43. Email: noemie.aubertbonn@uhasselt.be

AUTHOR BIOGRAPHICAL SKETCHES

Noémie Aubert Bonn is a PhD student of the faculty of Medicine and Life Sciences at the University of Hasselt, Belgium and MSc graduate of Psychiatry from McGill University (Canada) and MSc of bioethics from the joint Erasmus Mundus program of KU Leuven

(Belgium), Radboud University Nijmegen (Netherlands), and University of Padova (Italy). Noémie currently conducts research on research integrity and academic dynamics under the supervision of Prof. dr. Wim Pinxten. Noémie is the principal investigator of the current project: she contributed to the study design, collected, analyzed, and interpreted the data, and drafted the manuscript and tables.

Simon Godecharle is affiliated with the Centre for Biomedical Ethics and Law. Until February 2016, he was a PhD fellow of the Research Foundation—Flanders at the Department of Public Health and Primary Care, University of Leuven, Belgium. He conducted research concerning the issues of research integrity and misconduct within biomedical research from a European perspective. Since March 2016, he is the coordinator of health care ethics in Emmaüs, a large health care group in Belgium. He contributed to the study design, helped in the elaboration of the methods and in the interpretation of the data, and provided multiple revisions of the manuscript.

Kris Dierickx is full professor of medical ethics at the Centre for Biomedical Ethics and Law at the Department of Public Health and Primary Care, University of Leuven, Belgium. His research interests include ethical issues concerning genetic testing, ethical and social challenges of genetic bio-banks for children, third- party reproduction, and research integrity and misconduct, and he is practically involved in research integrity training. He contributed to the study design, provided revisions of the manuscript, and supervised the project.

INTRODUCTION

Integrity in science is of utmost importance in advancing knowledge. It safeguards research subjects from harm and abuse and maintains the confidence of the public in science, but it also serves as a premise for the trustful and collaborative relationship researchers hold with one another. Only when academic integrity is respected can research findings be sound and accurate and permit scientific advancements.

Yet, the past few years bristled with media and popular books depicting breaches in academic integrity (Collins & Pinch, 1998; Goldacre, 2009). Jon Sudbø, Jan Hendrik Schön, or Diederik Stapel, heavily covered by the media, are only a few in a long list of cases of academic misconduct of the past years (see for example Bhattacharjee, 2013; Brumfield, 2002; Callaway, 2011; Pincock, 2006). While opinions diverge about responsibilities for academic misconduct—some point at the researcher's willful deception, others at the pressures imposed by institutions (Mojon-Azzi, Jiang, Wagner, & Mojon, 2003) and others at mere ignorance and lack of training (Mahmud & Bretag, 2013)—there is growing understanding that the problem is more widespread than we used to think.

Estimates vary, yet a large-scale self-report survey of researchers in the United States showed that as many as 33% of researchers admit having seriously misbehaved[1] at least once during their scientific career (Martinson, Anderson, & de Vries, 2005). Furthermore, comparing the low recorded rates of misconduct (from as low as 1 in 100 000 scientists to about 2%) to this alarming self-report rate of serious misbehavior raises concerns about the efficacy of institution in monitoring academic integrity (Fanelli, 2009).

Institutions and universities take several measures to promote academic integrity and discourage research misconduct. One very prominent method is the development of academic integrity guidance which often become part of the deontological requirements of researchers. These documents, typically composed and put forth by universities and research institutions, usually define and describe acceptable and unacceptable behaviors in research (Eastwood, 2011), explain actions taken when research misconduct occurs, and outline the rights and responsibilities of different actors involved in the scientific enterprise (Steneck, 2011).

While guidance documents on research integrity may have good value within the institutions they arbor, they may be of limited value for projects that expand beyond the institution if they are not coherent with guidance of collaborating institutions. Given the increasingly interdisciplinary, collaborative, and international (Glänzel, 2001) scope of research—take for example collaborative projects put forth through the Horizon 2020 initiative—ethical compatibility is important (Anderson & Steneck, 2011; Bosch, 2010, 2012; Glänzel & Schubert, 2004). Some countries like the United States of America tried to appease

this need for uniformity by introducing an inter-institutional regulatory panel for research integrity (i.e., the NIH office of extramural research and the USA office for research integrity) and the federal Office of Science and Technology Policy on handling allegations of misconduct (Boesz & Fischer, 2011); others, like the Netherlands, by adopting the National Board for Research Integrity to deal with research misconduct allegations. Yet, the same is not true all over the world, and few international panels have such regulatory power.

Particularly in Europe, where collaborations are more and more international, the research scene appeared generally reticent to introduce international regulatory bodies for research integrity (Godecharle, Nemery, & Dierickx, 2013). Even though Europe-wide research organizations such as the European Commission, the All European Academies (ALLEA) and the European Science Foundation (ESF) now hold a strong inspirational role on many European institutions, they still have limited regulatory authority and monitoring when it comes to research integrity (Stainthorpe, 2011). Rather, in many European countries, research misconduct allegations need to be initiated by the institution before any organization may intervene in the process. And even then, cross-institutional organizations having the possibility to intervene in integrity issues are most often councils or panels who can only provide a second opinion (e.g., VCWI in Belgium); rarely international organizations (Stainthorpe, 2011). As a result, most universities, or in some cases countries, compose, promote, and enforce their own specific guidance on research integrity. The problems behind this practice are twofold. First, there is a risk that institutions and countries are duplicating efforts, thereby wasting research resources (Handley, 2011). Second, institutions may promote different and potentially incompatible guidance for research integrity, which are of particular concern in cases of misconduct.

Before being able to give a common ground to guidance on academic integrity, it seems important to determine where guidance diverges and where it corresponds. Past research that looked at European countries where national research conduct guidance exists found that endorsements and regulations on academic integrity and misconduct substantially differ between European countries (Godecharle et al., 2013). Here, we address the question further, looking at academic integrity guidance used and endorsed by specific European research institutions.

Research objectives

This project aimed to collect and analyse guidance on research integrity from institutions of the European research scene. More specifically, our goals were to: collect official guidance documents for different European research institutions; describe the accessibility and the general content of each document; identify the recurrent themes covered; highlight similarities and distinctions between documents, institutions, and countries included; and give

a broader outlook of the compatibility and breadth of such guidance in line with European and international research scene.

METHODS

Data Collection

We collected official guidance documents on research integrity and misconduct provided by universities with membership to the League of European Research Universities (LERU; see Figure 1). We chose to include only members of LERU because such universities, by claiming to be leading research universities, are presumed to have a significant impact on research in Europe. Therefore, given the potential importance of their impact on the European scientific scene, it is crucial to investigate whether LERU universities also give due attention to research ethics and integrity guidance. Furthermore, being spread all over Western Europe and covering all major educational cultures (Scandinavian, Germanic, Roman, Anglo-Saxon), LERU universities offer a broad, yet manageable spectrum of research in western Europe. Finally, because LERU universities attract international researchers, it is especially relevant to know whether they have available and accessible (e.g., translated to English) research ethics and integrity guidance.

We collected guidance from official websites (or direct links from official websites) of each included university between March and June 2014. The full search process for data collection may be seen in the Supplementary Figure 1.

Inclusion and exclusion criteria

Included data comprised official guidance documents or websites directly relevant to research ethics, integrity, and misconduct. For the content analysis, we only included documents in English, French, and Italian (language capacities of the researchers).

We excluded documents built by a non-official third party (e.g., PowerPoint presentation of a university professor for a course), documents, or parts of documents whose main focus diverged substantially from research integrity and misconduct (e.g., where the scope does not address research; skill development packages for topics non related to research ethics and integrity; etc.), and documents inaccessible due to password restrictions. Furthermore, given the focus on research integrity and good conduct rather than on the broader sense of research ethics, we excluded documents or parts of documents specific to the involvement of animals in research. Finally, we excluded documents that did not address the conduct of researchers, such as documents directed exclusively towards students or research ethics committees. We only included documents officially endorsed by the LERU universities (when possible confirmed via an authoritative entity[2] of each LERU institute; otherwise documents recommended on the official website of LERU institutes; see Supplementary Figure 1).

Data Analysis

We conducted a content analysis of the documents based on the three-step procedure described by Elo and Kyngäs (2008). The present study is mainly exploratory; as a result, we

performed an inductive content analysis—meaning that we derived the themes and categories to analyze from the data itself. Consequently, we extracted the themes by reading all the documents, not limiting our search to specific keywords, but rather to concepts interpreted from the documents. We then organized these concepts under specific themes that we discuss in our results.

After identifying codes around three main ideas—i) general content covered by the guidance documents; ii) principles of integrity, and iii) scientific misconduct—we created three coding sheets and subsequently grouped the codes in higher order headings that we tabulated.

We 'abstracted' broader categories from our initial codes and combined such categories in higher themes until we reached general themes that were recurrent enough to correspond to the research topic of our study.

Finally, we looked at the results within, and where appropriate between each theme and guidance to identify salient differences and commonalities.

RESULTS

We included 38 documents and websites on research integrity from 18 universities spread over 10 European countries (All guidance references are indicated in Supplementary Table 2). We separate our results between the accessibility of the guidance, its general content, principles of integrity, and definitions of misconduct. University abbreviations used in the text may be seen in Figure 1.

Accessibility

Most guidance documents were readily available online in English. From the included documents, 24 were easily found by browsing the university website, other documents were found using keyword searches on the university website (N=5) or on Google (N=3), and five additional documents and one translation were suggested by representatives of universities when confirming the guidance found at the end of our retrieval process (see Supplementary Figure 1 for a complete overview of the retrieval process). While we found most guidance in document format (generally through a downloadable PDF), five universities also had parts of their guidance in interactive website (UO, KUL, LEI, ICL, UCL).

We had to exclude the three French universities from our analysis as no guidance could be found in any of the retrieval steps. In some other institutions, guidance was available, but not readily offered in English. We found cases where guidance and websites were provided only in the local language (UNIMI); where English guidance was offered but yielded broken links (UH, but the web team quickly solved the issue after we communicated with them); where only several variations of keyword searches yielded results (LMU and UHDB which used different website arrangements and keywords), or where many more documents were available in local language than in English (German, Dutch, Swiss, and Spanish universities).

Figure 1 about here

General content

Figure 2 gives an overview of the cumulative number of institutions that include each extracted theme in their guidance. The precise coverage of each guidance document is available in Supplementary Table 3. Some themes were covered by most guidance (e.g., funding, conflicts of interests, authorship, data storage), but other themes were sparsely mentioned (e.g., data disposal, respect of environment).

There was a great variety in length, details, and coverage (e.g., UNIMI offers one document of less than 1 500 words while UO offers six documents totaling more than 29 000 words).

Style of guidance also differed: most documents were conventional codes of conduct but some documents contained in depth historical and philosophical information (LU), thorough

explanations of the culture of integrity in current times (LMU) or ethical deliberation methods (LU).

Figure 2 about here

Principles of integrity

A salient commonality in guidance for research integrity is adherence to basic principles of academic integrity. From the included guidance, 18 documents (from 17 institutions, see color markers in Figure 1) stated *principles*, *values*, *standards*, or in some cases *norms* of research and integrity, hereafter referred simply as 'principles'. Supplementary Table 4 showcases the terms each institution uses to refer to such principles.

Figure 3a provides an overview of the number of universities explicitly stating each principle as one of their guiding principles. There is a clear prevalence of the principles of *honesty* and *openness*; only three of the institutions explicitly mentioning principles of integrity mention neither. In some instances, *integrity* is itself mentioned as one of the principles for research integrity (e.g. in most UK guidance).

Certain guidance approach principles of integrity very generally while other guidance approach principles with a lot of precision. When approached generally, principles tended to be idealistic, immutable, and highly interpretable (e.g., *honesty*, *openness*, *transparency*, *respect)* or almost universal moral goals (e.g., *freedom of research*, *responsibility towards society*, *protection of human dignity*, *promotion of peace*). On the other hand, when described with high precision, principles tended to be very individual and direct, often fixed in time and situations. For example, some precise principles were formulated as specific sets of behaviors researchers should adhere to or avoid (e.g., 'perform a reasonable and appropriate ethics review' or 'avoid harm to research subjects'). Full results of the precise principles endorsed in each documents are available in Supplementary Tables 4 and 5.

Misconduct

Guidance documents from 16 institutions (i.e., 25 documents; see color markers in Figure 1) contained an explicit definition of misconduct. Of those documents, 11 were entirely dedicated to misconduct and contained a complete allegation procedure. We analyzed the passages that defined misconduct and extracted themes around definitions and terms used to describe misconduct. Because we found causes and consequences attributed to misconduct as recurrent theme in the guidance documents, we further explored these concepts within all guidance included.

Definitions of misconduct

Figure 3b gives an overview of the different behaviors qualified as misconduct (see Supplementary Table 6 for the full coverage of each institution). We found general agreement that *fabrication*, *falsification* and *plagiarism* constitute misconduct as they are mentioned in

all institutions. In two documents from UK universities, terms varied slightly such that two of the specific documents did not include falsification. Nonetheless, these documents described behaviors such as *fraud* which we interpreted as *fabrication,* and *piracy* which we interpreted as *plagiarism*, but different interpretations might have yielded different results.

Eight institutions make it explicit that *honest errors* should not be considered a form of misconduct, yet six of these institutions include *negligence* as a considerable form of misconduct. Additionally, one institution further specifies that *sloppiness* should not be considered misconduct.

Some documents attribute severity levels to different types of misbehavior. For example, KUL, and UH qualify *bad authorship practices, duplicate publication*, and *inadequate preservation or availability of the data* as a minor offence. In contrast, UNIGE mentions bad data preservation four times amongst the 22 'violations of integrity' it describes, and includes a 30-page document on authorship in its integrity guidance.

Finally, we found some variation in the terms used to refer to the general idea of research misconduct (See Supplementary Table 4). Some guidance use terms that seem to imply the deliberate malice of researchers committing misconduct, for example, *fraud in science*, *scientific dishonesty*, *dishonest behavior*. The specificity in the terms used also ranges from *research* or *scientific* misconduct (used in most instances), to *academic* misconduct or simply *misconduct*, which in some instances includes sexual harassment, abusive mentorship, etc. Words of differing specificities are often used interchangeably between documents of the same institution (UO, UC, LMU).

Figure 3 about here

Causes and consequences

Another characteristic in the way integrity guidance defines academic misconduct is how or if it mentions potential causes and consequences for misconduct. Nine of the documents mentioned potential causes of misconduct, and 21 mentioned potential consequences.

Figure 4 displays the themes of causes and consequences we extracted with the number of institutes mentioning each theme. Exact quotes are available in Supplementary Tables 7 and 8.

No clear regional or country pattern could be discerned from these themes.

Figure 4 about here

Two years later, has anything changed?

The documents used in the current analysis were gathered between March and June 2014. Yet, research integrity guidance is ever-changing, especially in current times with the hype and exposure of integrity and misconduct on the research scene. In order to understand how

things have evolved since 2014, we have re-initiated the search process for each university website to find out what has changed. Instead of simply updating our results, we found more values in exposing how things evolved as this provides a better understanding of research integrity advances.

Five universities (UvA, UF, UNIGE, UHDB, and UNIMI) have undergone no substantial changes on their guidance for research integrity since 2014. For other universities however, interesting updates have occurred.

Several universities re-worked their guidance in a user-friendly interactive website (e.g., UH, LU, LEI, and UCL). Many universities also introduced new policies and guidance. For instance, KUL and the UC introduced a new document on authorship. UC further introduced a series of new guidance such as a policy on whistleblowing, an update of its *Good Research Practice Guidelines* with a new section on collaborations, a new ethical policy for research involving human participants, and a *Research Integrity and Good Research Practice Checklist for Supervisors of Research Students*. KUL and UE have also introduced new documents specifically aiming to promote good PhD supervision and to prevent student academic misconduct. UCL extensively elaborated its policies, now providing guidance on ethical application for funding and promotions, on data management and sharing, on ethical publication and authorship, to mention only a few. UO detailed its data management recommendations, now providing a fully interactive website with tools, training, and guidance on data sharing. UH introduced ethical principles for research in the humanities, social, and behavioral sciences which remind the importance of confidentiality and autonomy. Several universities also provide new documents in their local language (e.g., multiple new documents at the UB, a procedure for whistleblowers at UZH, etc.).

Most British universities (UCL, UO, and UC) now publish Research Integrity Annual Reports or statements which are placed in evidence on their website.

Many institutions are now more clearly describing their endorsement of national or international guidance. For example, the UB now clearly links to the *European Charter for Researchers* (European Commission, 2005), UCL and UE openly link to the *Concordat to Support Research Integrity* from Universities UK and UE further links out to some policy documents of key funders and confirms its endorsement of UK RIO's Code of Practice in Research, UH links to guidelines of the Finnish Advisory Board on Research Integrity, and LU no longer links out to the CODEX.

In France, the *Charte de déontologie des métiers de la recherche* (which can be loosely translated to the *Deontological charter for research professions*) has been developed and introduced in 2015. This document specifies that each research institution has the responsibility to ensure that good research practices are respected in line with the principles of the charter. These principles include 'adherence to legal requirements', 'reliability',

'communication' in the sense of giving due credit to others, 'responsibility' in collective work, 'impartiality and independence', 'collaboration', and 'training' as a principle for the institution itself. This charter was developed by research agencies rather than universities, and is not salient on any of the French universities website. Nonetheless, when looking in the search engine of UPMC and US for the title of the charter, we could find it on a page dedicated for graduate students. US further added an allegation procedure to the charter and advertised on its website that a 3-hour introduction to the charter is mandatory for all PhD students.

Finally, a slight but inconsistent modification in the vocabulary occurred such that the guidance on integrity for 'scientific practice' was changed in some documents to 'research practice' (UO) or broadened in others to 'academic practice' (Netherlands).

Unfortunately, even in newly updated websites, broken links remain frequent and accessing the information is often confusing. Depending on the university, guidance for research integrity could be on the main 'research' section of university website, on the section on 'mission and policies' of the university, on the section about 'management and governance', in the 'resources for staff', etc. In numerous universities, more than one page on integrity and good research conduct exist, sometimes with contradicting, outdated, or slightly different guidance.

What do these updates mean to our findings?

If the project were to be re-initiated with the guidance currently available, our general results and findings would not substantially differ. Nonetheless, in select cases, important updates to documents, definitions of misconduct, or principles of integrity endorsed would change some of the specifics of our findings.

Of importance, US and UPMC would be included in parts of the analyses. With regards to principles of integrity, the *Netherlands Code of Conduct for Scientific Practice* endorsed by all three Dutch universities included in our analysis has been revised and updated in late 2014 into the *Netherlands Code of Conduct for Academic Practice*. With the revision, the principles have been modified: a new principle of 'responsibility' has been added and the principle of 'scrupulousness' became 'honesty and scrupulousness', in which the importance of realism and humility in research dissemination as well as disapproval for salami slicing have been added. This change brings 'honesty' as the most cited principle in the guidance included. Furthermore, given changes in official endorsement of national or international guidelines, principles of integrity endorsed by specific universities have changed slightly. For instance, the principles put forth officially by UCL are now those of Universities UK rather than those of UK RIO, UE now endorses both Universities UK and UK RIO, and LU no longer points directly to the CODEX[3] nor to the *Notes for guidance* that were initially included.

The definition of misconduct of some universities have also been modified. The definition of UCL now includes statements on ghostwriting and on the importance of intentionality in misconduct. LU now officially endorses the U.S.A. National Institute of Health legal definition of misconduct (CFR 93.103). UE introduced its own definition of misconduct, which brings together elements from different definitions of UK institutions. The definition of UO has also been updated and now includes not only misconduct but also 'attempted acts' of misconduct. Furthermore, the guidance of UO now concerns not only researchers of the University of Oxford, but also any party receiving funds or using the facilities of the university.

DISCUSSION

Accessibility

Given the international competitiveness of research universities with LERU membership, it is surprising that some institutes have a limited accessibility of English guidance documents on research integrity and misconduct. Nonetheless, our inability to find guidance in certain institutions might be explained by the actors responsible for research integrity. In France for example, funders, rather than institutions, are generally responsible for establishing guidance on academic integrity (Bungener & Hadchouel, 2012). Differences in the channels that put forth research integrity may compromise the accessibility of such guidance to external collaborators unaware of such differences. External collaborators risk exhibiting inconsistencies in research practices by being unaware of local research rules and customs."

General content

We found variation in the size and the level of coverage of the guidance analyzed. We also found that select guidance (e.g., LMU and LU) differed substantially in style from other guidance. *Safeguarding Good Scientific Practice* (Deutsche Forschungsgemeinschaft, 2013, p. 91) and the *Notes for guidance* of Lund University (Lund University Vice Chancellor, 2005) both introduce a historical background of research integrity and explain its centrality in research practice. Unlike many other documents which tend to list do's and don'ts of research, these two documents explain deeper reasons and values behind academic integrity with minimal behavior description.

Principles of integrity

Honesty and *openness* are the two most mentioned principles of integrity. The predominance of these principles is no surprise as they originate from the basis of research ethics (q.v. omnipresent in the declaration of Helsinki) and are also two of the eight principles put forth by the All European Academies and the European Science Foundation (European Science Foundation and ALLEA, 2011). Furthermore, *honesty* was found to be one of the two most featured principles in national guidance for research integrity in Europe (Godecharle, Nemery, & Dierickx, 2014).

Definitions of misconduct

When guidance contained an explicit definition of misconduct, it almost inevitably mentioned the FFPs (falsification, fabrication, plagiarism). This corroborates findings at the national level within Europe (Godecharle et al., 2013) and research supporting that the FFPs are the most commonly and internationally recognized forms of research misconduct (Lee, 2011). Publication misconduct such as *selective reporting*, *misrepresentation,* and *authorship* issues,

are also extensively covered in the guidance analyzed; a finding that is reflected in the growing importance of editorial organizations such as the Committee on Publication Ethics (COPE) or the International Committee of Medical Journal Editors (ICMJE).

Factors contributing to misconduct

Potential factors contributing to research misconduct, although not covered by many of the guidance documents, revealed different levels and layers of responsibility. Some institutions emphasized problems of the scientific system such as *productivity demands*, *competition*, and *constraining regulations*. This vision is shared by the European Code of Conduct for Research Integrity, which mentions that "[p]ressure to publish, commercialisation, greater competition for funds, more opportunities for instance through the internet, evaluation practices, and the current career system for scientists, may all contribute to [increased incidences of research misconduct]" (European Science Foundation and ALLEA, 2011, p. 11). Other institutions rather mention *desire for recognition* and *personal interests* of researchers as potential causes of misconduct.

In certain institutions, potential causes for misconduct mentioned seemed to allude to details in the definition of misconduct. For example, two of the four institutions that mention researchers' personal interest as a cause for misconduct—thereby giving misconduct a blameworthy individual responsibility—fail to exclude honest mistake from their definition of misconduct, and two of these four institutions use the terms *fraud* and *dishonest behavior* to refer to misconduct. It thus seems plausible that the causes of and vocabulary for misconduct expressed in integrity guidance provide insights on the particular perception institutions hold towards integrity and the responsibilities around it. Along these lines, precision of the vocabulary used to describe misconduct may also influence how misconduct is defined. For example, the Netherlands Code of Conduct for Scientific Practice VSNU-working group (2004, revisions 2012) and the European Code of Conduct for Research Integrity (European Science Foundation and ALLEA, 2011) who refer to misconduct as *research misconduct* and both explicitly exclude personal misconduct (e.g., intimidation, harassment, discrimination) from research misconduct. Using the term *academic* misconduct, or merely *misconduct*, may ignore this distinction and imply a much wider definition.

Recent updates and current state of affair

The recent updates on institutional guidance suggest that research integrity remains a top priority for institutions. On the one hand, this is encouraging as it indicates that research integrity is growing in visibility and consideration throughout Europe. But on the other hand, the quantity of documents and guidance on research integrity seems, at least to us, to rapidly become overwhelming and at times confusing. National and international guidance are swapped, institutional website duplicate information on different pages and updates are lost or inconsistent. Even though new interactive websites are helpful and do seem to target

researchers more directly, institutions should probably be mindful of the confusion that ever-changing details in definitions of misconduct and principles for integrity might create.

Results in perspective: different approaches

In past research, Godecharle, Nemery, and Dierickx (2014) exposed the coexistence of distinct approaches in national integrity guidance: value- and norm-based approaches. "Values are universal and guide people in what or how they ought to be. Values are translated into norms, which are embedded in a specific context: situation, time, and place. Norms are subject to change. They must be adhered to and generate clear rules." (p. 8) Godecharle and colleagues translate these approaches to research in the content and organization of guidelines: explicit definitions of misconduct showcase a norm-based approach, and broad principles of integrity exemplify a value-based approach. While the definition of norms is not univocal amongst integrity experts (see for example Merton's norms of research which would measure up to values in this definition, as well as select included guidelines in which integrity values are referred to as 'norms of research'), the distinction by Godecharle and colleagues sheds light on two meaningful characteristics.

First, the *adaptability* of the principles and definitions differ between the approaches. Guidance sometimes puts forth detailed and context-specific behaviors to follow or avoid (e.g., 'working in accordance with accepted rules', 'documenting research findings', '[avoid] deliberate attempts to decieve while making a research proposal', etc.), and sometimes provides general values with no further contextual details (e.g., honesty, openness, etc.).

Second, guidance can be *positive* (promoting integrity) or *negative* (condemning misconduct). Positive guidance based on values and principles assumes a role of model and educator (Godecharle et al., 2014) while negative guidance sets rules and interdictions, assuming a role of regulator. In our analysis, most institutions use both positive and negative guidance (Figure 1), yet some institutions included only one or the other.

To these two characteristics, we would add a third one: the *rationale* and *responsibility* for preserving integrity and avoiding misconduct. At times, guidance elaborates on the communal role and responsibility of researchers towards society and progress, and such goals are put forward as a rationale to condemn misconduct. Other times, guidance does not detail such a role and rather reflects the individual responsibility of preventing misconduct to avoid personal sanctions. This difference is especially apparent in how institutions describe consequences or research misconduct.

Together, these three characteristics illustrate that the manner in which institutions approach research integrity might not only change the format and content of their recommendations, but also transform the manner in which guidance is delivered to its audience. Specifically, different approaches may reflect different levels of trust towards researchers. By putting forward positive, broad values of science and by explaining the

potential harms of misconduct for society, institutions apparently rely on researchers' moral capacity to do good and to understand the importance of integrity; they seem to entrust researchers to do their best to maintain high standards of research quality. Conversely, in stressing sanctions and presenting ethical guidance through precise lists of negative behaviors, institutions seem to shift the focus away from trust towards surveillance, monitoring, and compliance; a view reflected in the concept of *institutional distrust* (Johnsson, Eriksson, Helgesson, & Hansson, 2014). Future investigations on the relevance of such approaches to researchers' perceptions of research climate and organizational justice (cf. Ferguson et al., 2007; Wells et al., 2014) might help understand the concrete impacts of such approaches on the culture of integrity.

CONCLUSIONS

The coexistence of different approaches in research integrity guidance raises an important question: Is there a superior approach in promoting research integrity?

On the one hand, precise approaches with clear and concrete courses of actions and individual consequences have been described as promoting adherence to good conduct (Giorgini et al., 2015). Furthermore, in line with the growing considerations that misconduct should be sanctioned legally (Dresser, 1993; Redman & Caplan, 2005) or even criminalized (Bhutta & Crane, 2014; Sovacool, 2005), highly detailed approaches may minimize ambiguity in misconduct allegations by tying sentencing to pre-established factual norms.

But on the other hand, broad, adaptable, and positive approaches leaves room for *intentions* and *diversity*; elements that certain researchers consider intrinsic to integrity and misconduct (Kalichman, 2014; Resnik & Stewart, 2012). Past research probing opinions of researchers have shown that perceptions of research misconduct and integrity are far from univocal (De Vries, Anderson, & Martinson, 2006; Franzoni, Scellato, & Stephan, 2011). By promoting adaptability in time, place, and situations, values of integrity might better capture the richness of perceptions and situations in which research integrity issues. Finally, given the myriad of actors and circumstances involved in misconduct (e.g., institutional pressures, funding competitions, editors' requirements, etc. see Bhutta & Crane, 2014; Deutsche Forschungsgemeinschaft, 2013), finite and rigid regulations addressed solely to researchers are likely to ignore deeper problems entrenched in the academic structure.

To sum up, we recognize that codes and guidance documents are only a small portion of the efforts needed to promote research integrity. Yet, given their value and preeminence amongst research institutions—and, as we showcase here, given the potential for inconsistencies—they must be carefully crafted to optimally promote a sustainable culture of good research. In this regard, two essential aspects illustrated in several codes and guidance as well as in ongoing discussions should be considered. First, research integrity hinges on the understanding, trust, and dialogue between all stakeholders involved in research. Second, integrity requires, yet goes well beyond simple compliance to pre-established norms and behaviors. As a result, we propose that guidance on research integrity should at the same time reaffirm broad values of integrity for the whole research community and exemplify precise norms, behaviors, and consequences. It is specifically through this complementary balance of norms and values that, in our opinion, guidance on research integrity will preserve the trust, meaning, and realism it needs to nurture a genuine culture of research integrity.

BEST PRACTICE

The present study includes several insights for actors of research ethics and academic management. Our findings showcase the level of discrepancy and accordance between guidance for research integrity and misconduct of collaborating universities in Europe, and might be useful to improve harmonization of future guidance not only in Europe, but between any collaborating institutions. Straightforward accessibility and readily available English translations of documents, for example, should be a clear priority in guidance on research integrity.

Yet probably the most important message from the current project is that guidance documents also differ in how they approach integrity. Here we suggest that better communication of the values harbored by science may help research actors embrace their responsibility towards society and knowledge and make better ethical decisions; yet we sustain that specific behavior descriptions are also useful and necessary, especially given the diverse interpretations of values embedded in the research culture (e.g., plagiarism as a mark of admiration and respect versus a mark of disrespect and theft).

We hope that the present project will not only help research institutions reflect on and improve their own guidance, but also remind all actors of the scientific community about the importance of carefully, responsibly, and genuinely protecting the culture of integrity.

RESEARCH AGENDA

Evaluating the compatibility of regulations and guidance of academic integrity in inter-institutional and especially international collaborations pushes further the need to better understand the differences that currently predominate. Future research could compare the roles and responsibilities of the different actors involved in the academic world; both from what is mentioned in academic integrity guidance and from what happens in practice. Also, even though some studies already exist on the topic, more research on the genuine impact that guidance documents have on the behavior (as opposed to the ethical awareness) of researchers as well as the impact they have on perceptions of research climates could help us better understand the role and limits of guidance and alternative approaches in promoting integrity and tackling misconduct. Finally, as pointed out by one of our anonymous reviewer, a better understanding of how and by whom integrity guidance documents are commissioned might be important to better understand what triggers the development of such guidance, what the guidance aims to achieve, and what responsibilities are held by the authors.

EDUCATIONAL IMPLICATIONS

Understanding the differences and similarities, as well as the impact of the different approaches of guidance might be relevant to research ethics committees, but also to educators and students who are using such guidance in the front line. Beyond written documents, universities must consider how guidance is presented and introduced in the regular curriculum. Training on how to find and use such guidance may be essential to exploit the meaning and underlying values that the institution is attempting to put forth.

ENDNOTES

[1] In general, serious misconduct is defined as fabricating, falsifying, or plagiarizing data, results, ideas. Nonetheless, in the paper of Martinson, Anderson, and de Vries define serious misbehaviors in research as behaviors constituting great threat to science integrity and leading to serious sanctions to the misbehaving researchers. They included falsification; disregard of human-subject requirement; unreported conflicting interests; questionable relationships with students or research subjects; plagiarism; breach of confidentiality; convenient cleaning of data; circumvention of human-subject requirements; overlook of other's questionable practices; submitting to pressure from funding sources to change research design or results (Martinson, Anderson, & de Vries, 2005).

[2] Entities contacted included LERU contacts obtained via http://www.leru.org/index.php/public/about-leru/members/ (UvA, UH, UCL, UO); research management entities (UB); research strategy office (UC); administrative assistant of research (UNIGE); rector and vice-rector of research (UHDB, UZH); academic affairs policy entities (LEI); director of research evaluation vice-provost office (UCL); academic integrity officer of legal affairs department (UU).

[3] We would like to thank one of the anonymous reviewer for bringing this to our attention.

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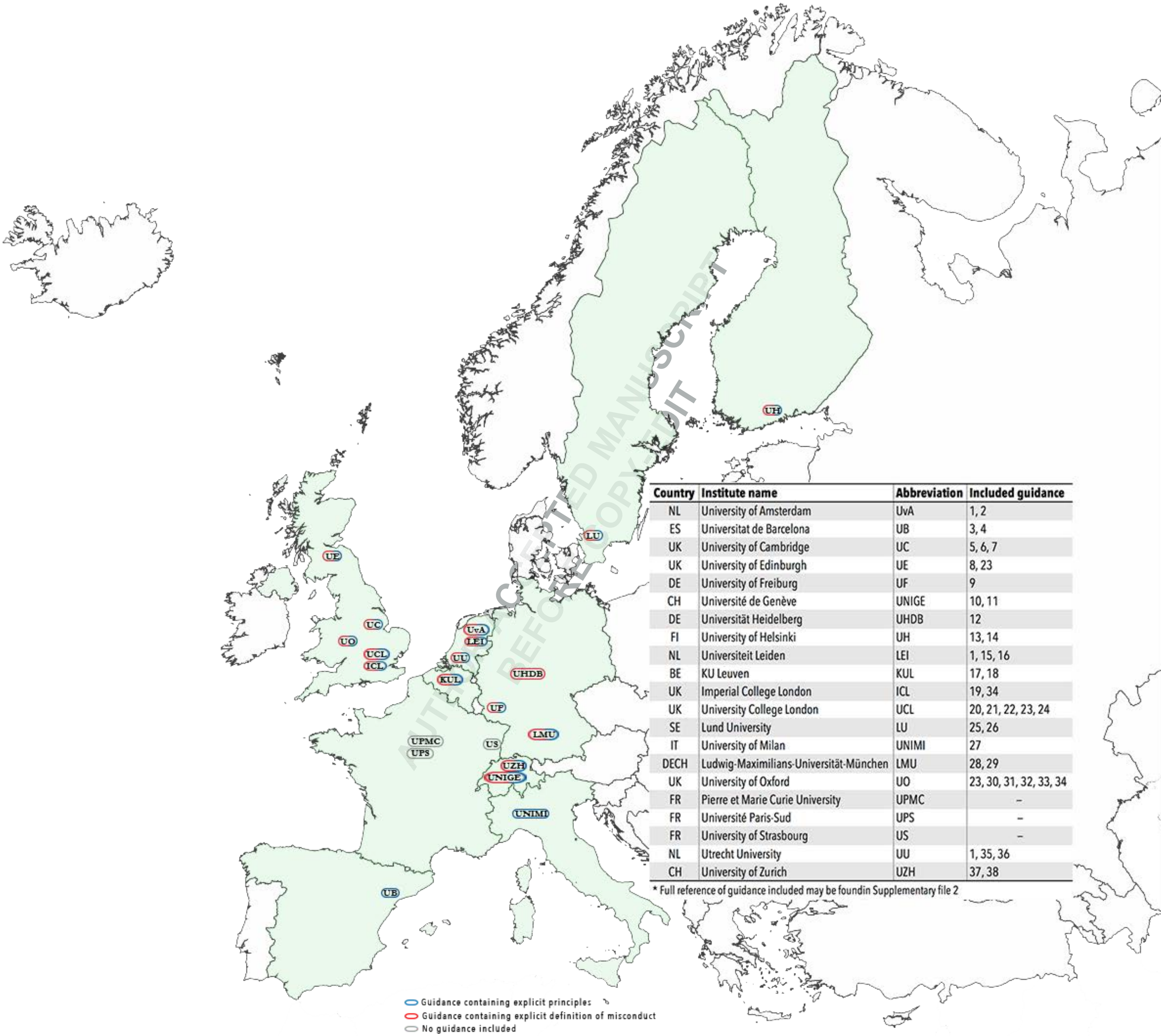
Figure 1. Map of LERU institutes with corresponding abbreviations, overview of content, and documents included in our analysis



Country	Institute name	Abbreviation	Included guidance
NL	University of Amsterdam	UvA	1, 2
ES	Universitat de Barcelona	UB	3, 4
UK	University of Cambridge	UC	5, 6, 7
UK	University of Edinburgh	UE	8, 23
DE	University of Freiburg	UF	9
CH	Université de Genève	UNIGE	10, 11
DE	Universität Heidelberg	UHDB	12
FI	University of Helsinki	UH	13, 14
NL	Universiteit Leiden	LEI	1, 15, 16
BE	KU Leuven	KUL	17, 18
UK	Imperial College London	ICL	19, 34
UK	University College London	UCL	20, 21, 22, 23, 24
SE	Lund University	LU	25, 26
IT	University of Milan	UNIMI	27
DECH	Ludwig-Maximilians-Universität-München	LMU	28, 29
UK	University of Oxford	UO	23, 30, 31, 32, 33, 34
FR	Pierre et Marie Curie University	UPMC	–
FR	Université Paris-Sud	UPS	–
FR	University of Strasbourg	US	–
NL	Utrecht University	UU	1, 35, 36
CH	University of Zurich	UZH	37, 38

* Full reference of guidance included may be foundin Supplementary file 2

Note*: See the Supplementary Table 2 for the full references corresponding to each guidance number

Figure 2. General themes extracted from included guidance and number of institutions covering each theme

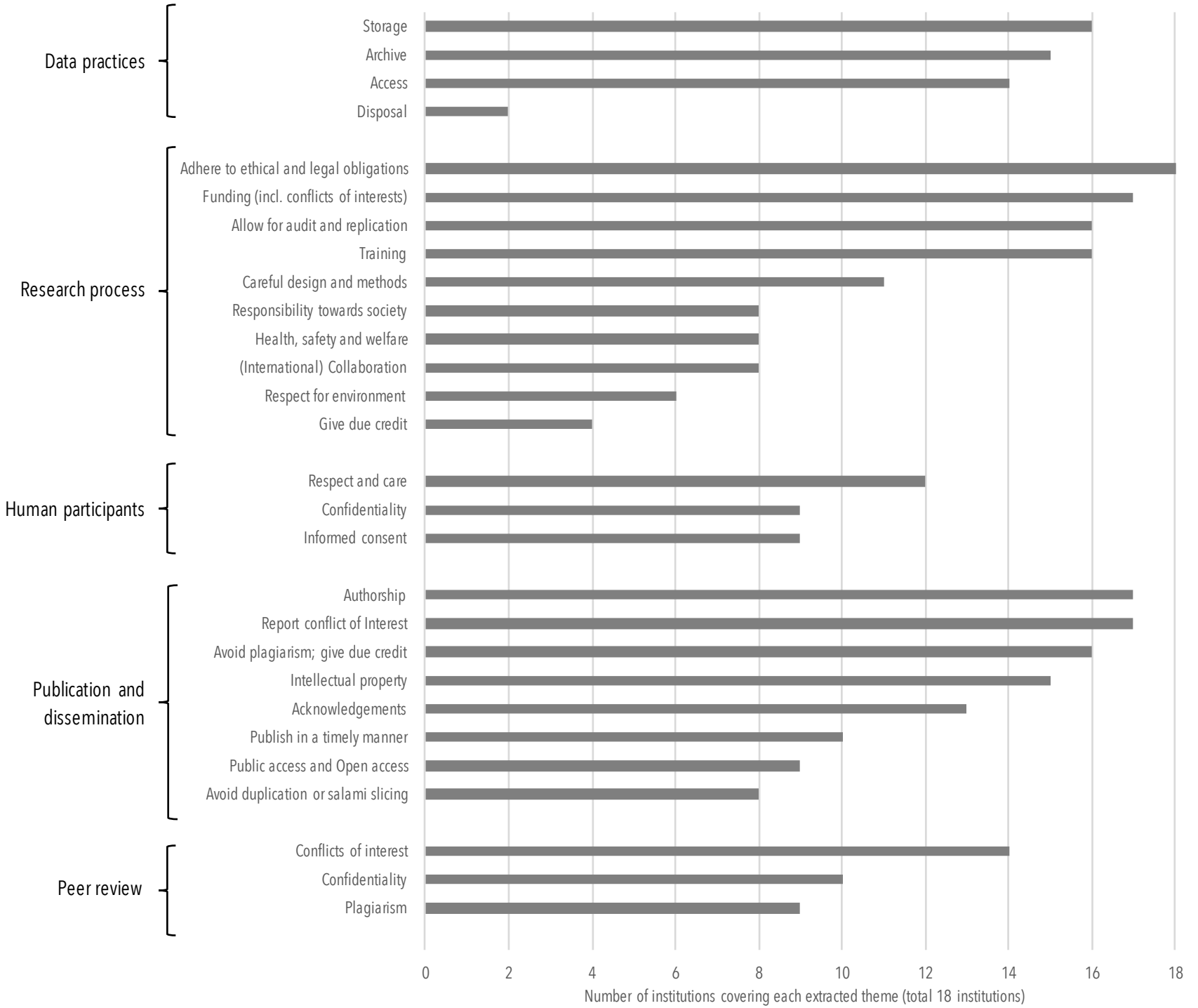
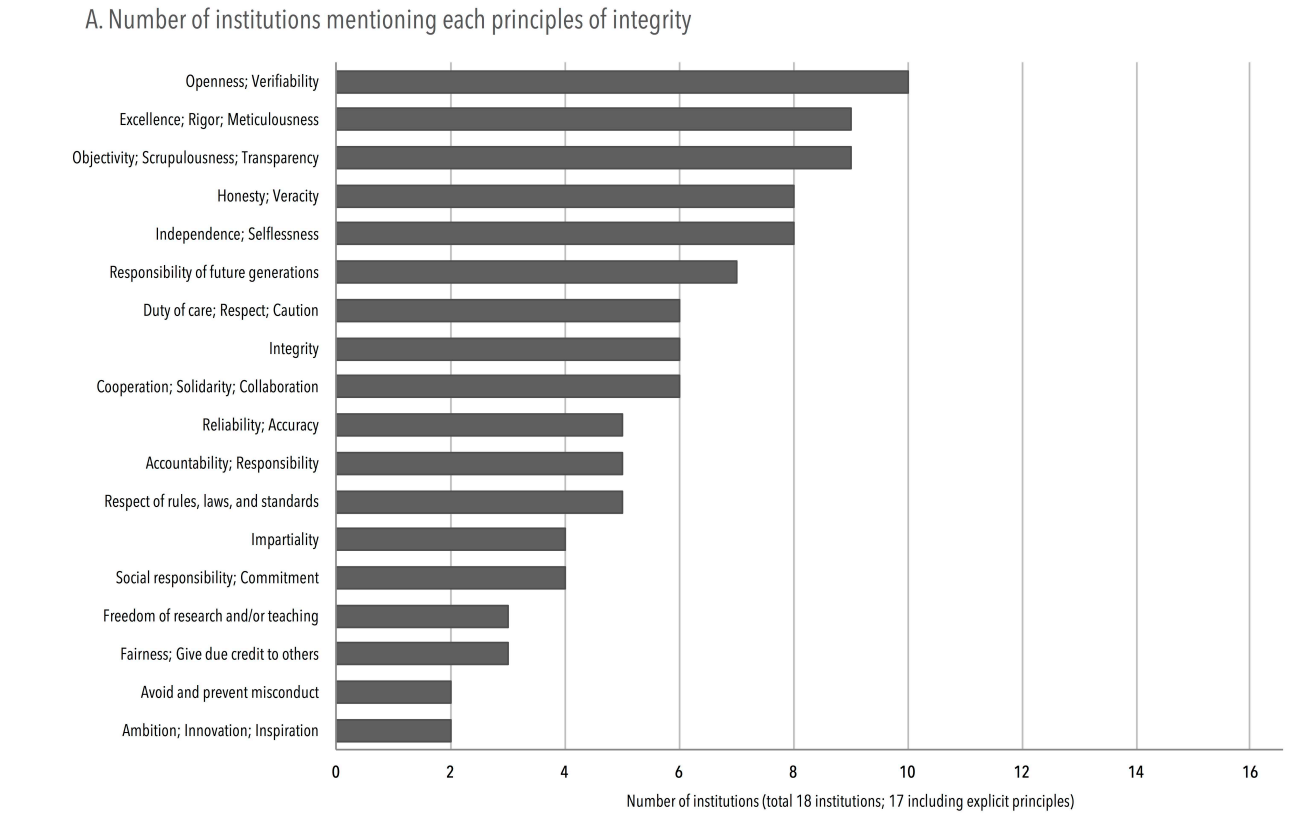


Figure 3. Number of institutions explicitly adressing different principles of integrity (A) and types of misconduct (B)



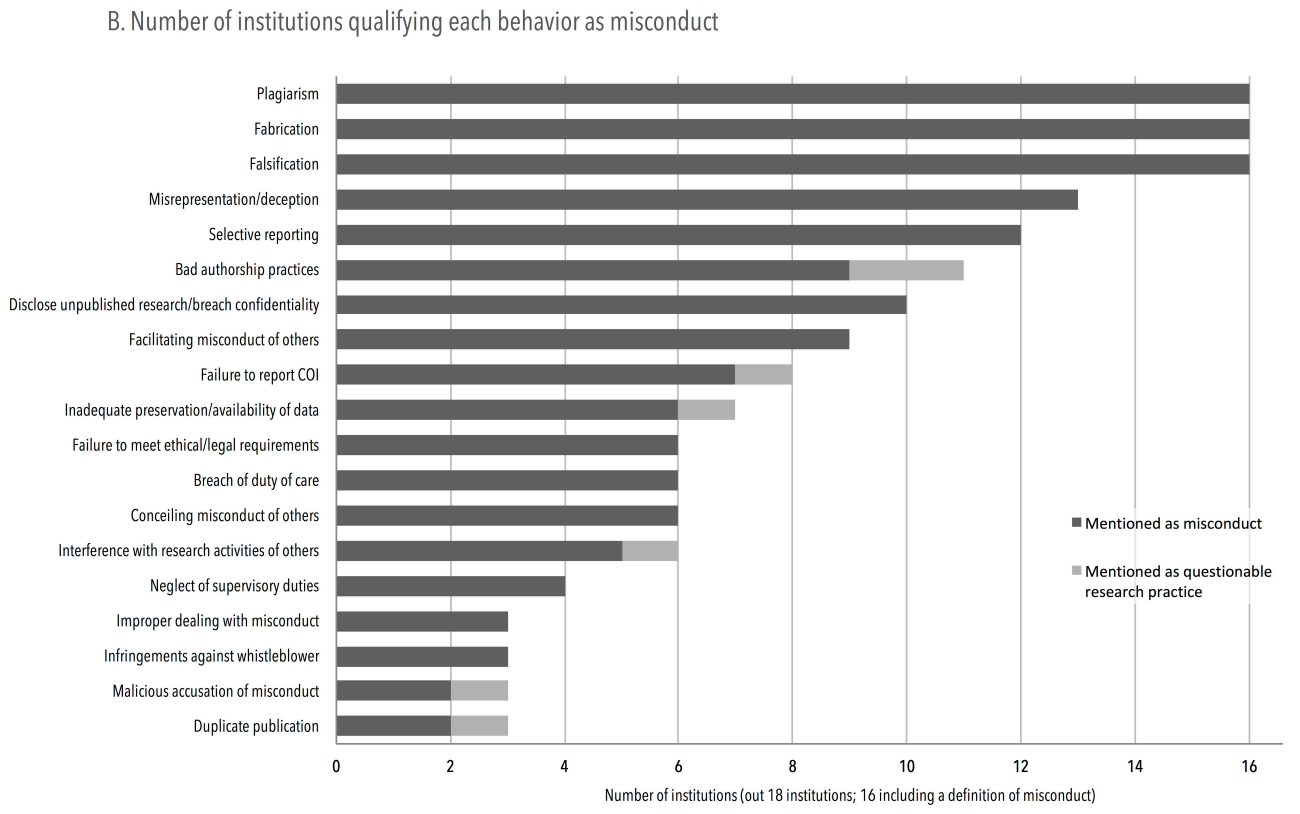
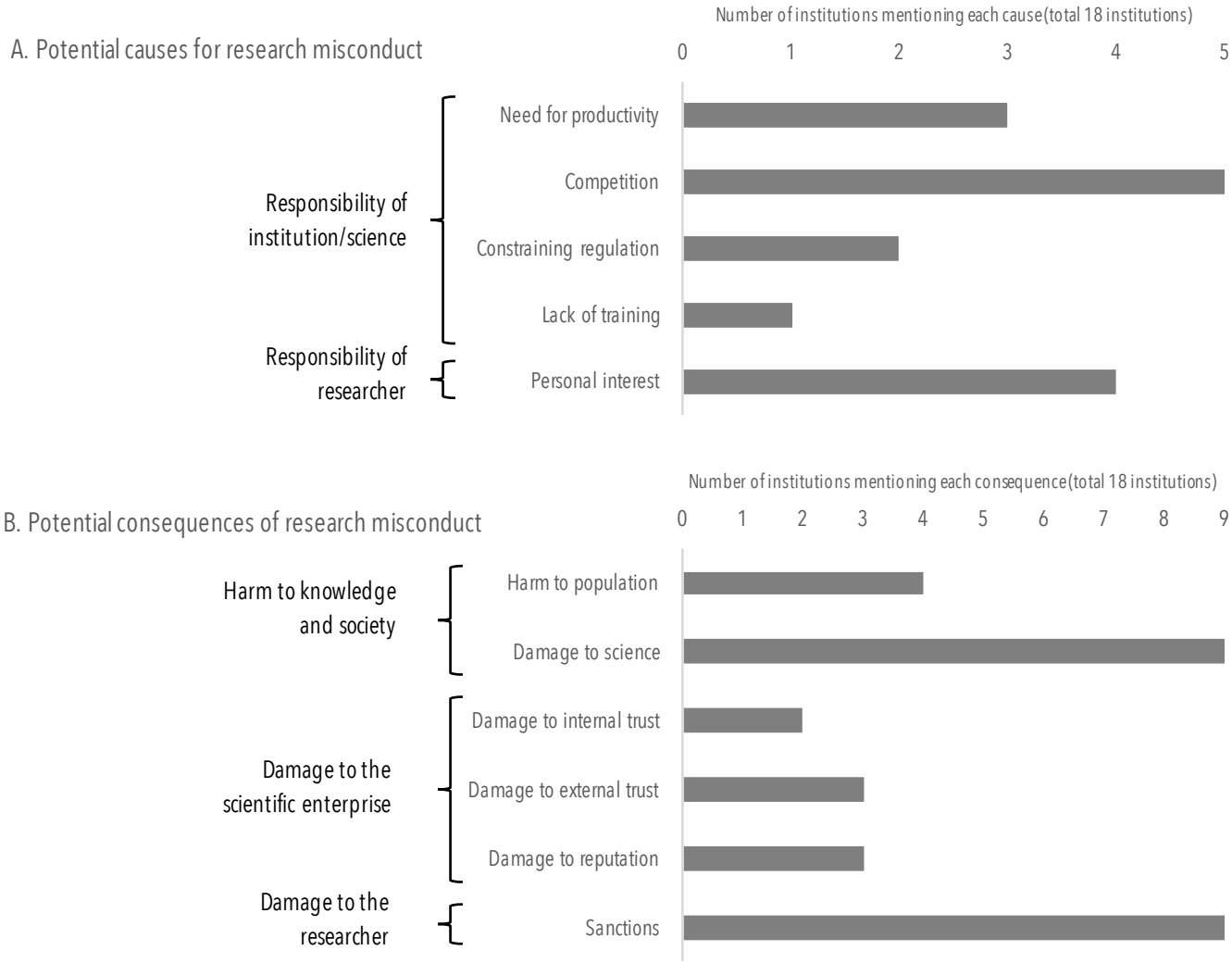
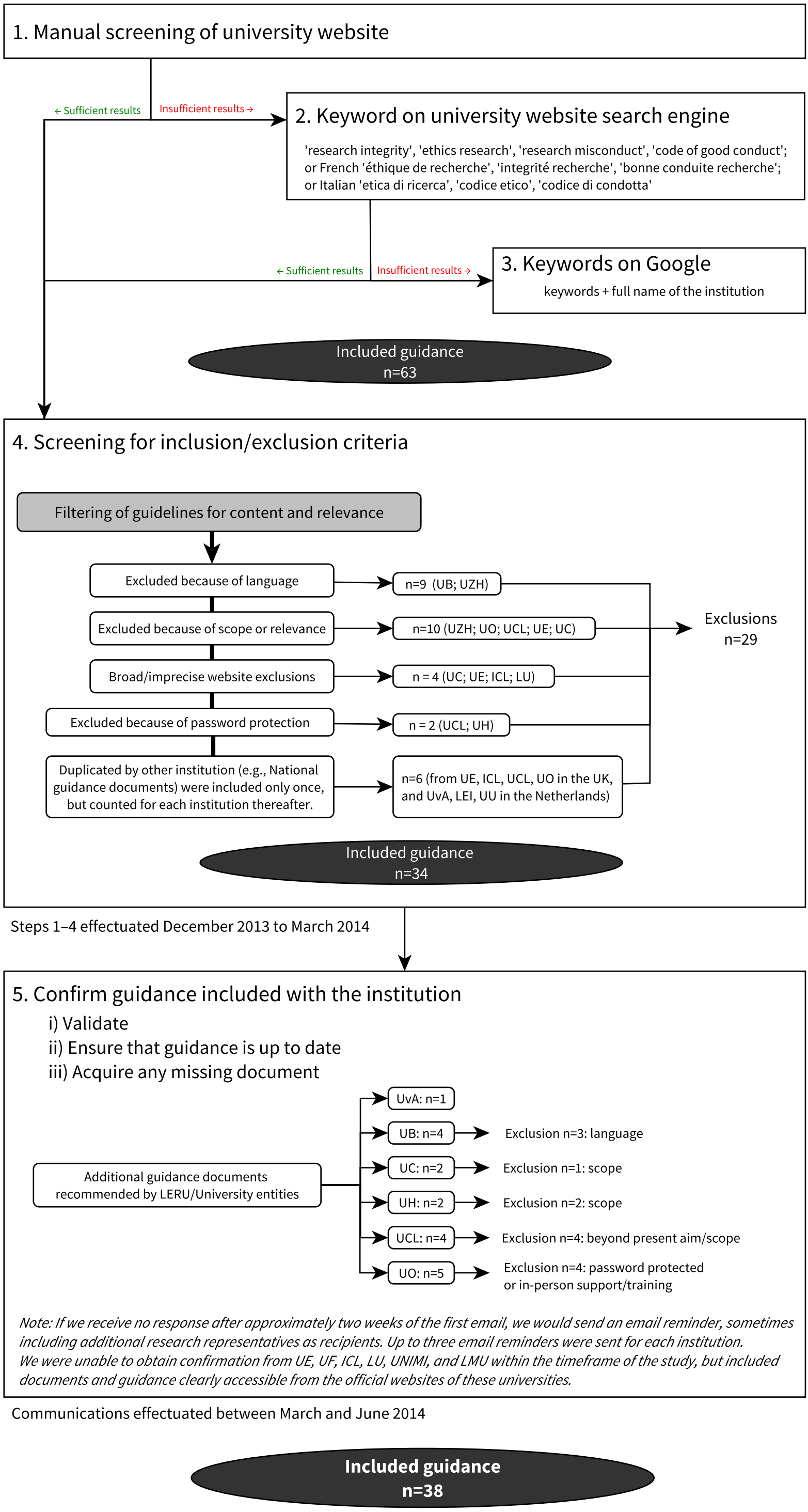


Figure 4. Number of institutions mentioning different causes (A) and consequences (B) of research misconduct



Supplementary figure 1. Retrieval process with inclusions and exclusions



Supplementary table 2. Guidance included with associated numbers

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Supplementary Table 3. General content extracted from included guidance documents

		UvA		UB		UC			UE			UNIGE			UH		LEI			KUL		ICL		UCL					LU			LMU		UO						UU			UZH	
		1	2	3	4	5	6	7	8	23	9	10	11	12	13	14	1	15	16	17	18	19	34	20	21	22	23	24	25	26	27	28	29	23	30	31	32	33	34	1	35	36	37	38
	Themes covered																																											
Data practices	Storage	X		X	X	X	X	X	X	X	X		X	X	X	X	X				X	X		X		X	X					X	X	X		X				X			X	
	Archive	X				X				X		X		X		X	X				X	X		X		X	X			X		X	X	X						X			X	
	Disposal					X																		X		X																			
	Access	X		X	X	X			X	X		X	X	X		X	X			X	X			X		X	X	X				X		X		X				X			X	
Research process	Careful design and methods			X					X	X			X		X	X				X	X	X	X				X				X		X		X	X			X	X	X	X	
	Funding (consider CoI)	X		X		X	X		X	X		X	X	X	X	X	X			X	X	X	X	X	X		X		X		X	X	X		X		X	X	X			X	
	Respect for environment			X									X								X				X				X												X				
	Responsibility towards society	X					X					X	X				X												X							X				X	X		X	
	Adhere to ethical/legal obligations	X		X		X	X		X	X	X	X	X	X		X	X			X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X		X			X	
	Give due credit												X		X	X			X																	X		X							
	Health, safety and welfare			X		X	X		X	X			X									X		X	X		X	X					X	X			X				X			
	Allow for audit and replication	X		X		X	X		X		X	X		X		X	X			X	X	X		X		X				X				X				X	X	X	X	
	Training	X		X		X			X	X	X			X		X	X	X		X	X	X	X	X			X			X	X		X		X	X	X	X		X			X	
	International collaboration					X			X	X												X	X	X	X		X	X				X		X		X							X	
Research with humans	Confidentiality			X		X	X			X	X	X	X	X											X		X	X					X		X		X						X	
	Respect and care	X				X			X	X			X				X				X		X		X		X	X	X		X				X		X	X	X				
	Informed consent	X		X			X										X				X	X	X						X						X	X	X	X	X				
Publication	Publish in a timely manner	X								X		X					X				X					X			X			X		X					X				
	Authorship	X		X		X			X	X	X	X		X	X	X	X		X	X	X	X	X	X			X			X	X		X		X		X	X	X		X	X	
	Acknowledgements	X		X		X				X	X	X					X			X	X	X					X				X		X		X				X				
	Avoid plagiarism/Give due credit	X	X			X				X		X		X	X	X	X		X	X	X	X	X		X		X		X	X	X	X	X	X	X		X	X		X			
	Intellectual property	X	X	X		X			X	X		X					X				X	X	X		X		X		X		X	X	X		X			X		X			
	Report CoI	X		X		X			X	X		X	X	X	X	X	X			X	X	X	X	X	X		X		X		X	X	X		X		X	X	X		X		
	Public access/Open access				X	X			X	X											X	X					X				X		X		X									
	Avoid duplication/salami slicing								X	X		X				X				X	X					X					X		X		X						X			
Peer Review	CoI	X						X	X	X		X		X		X	X			X	X	X					X		X			X		X		X				X				
	Confidentiality							X		X		X		X								X	X				X					X	X	X		X						X			
	Plagiarism	X							X	X		X					X					X					X				X		X		X		X							
	Number of themes covered	18	2	15	3	18	8	3	17	22	7	17	12	13	7	14	18	1	3	12	22	19	10	12	9	7	22	6	12	2	10	18	5	22	5	22	5	14	10	18	10	2	17	1
		18		16		22			UE		7	23		13	14		19			22		20		25					13		10	18		26						21			17	

Note. See the Supplementary Table 2 for the full references corresponding to each guidance number.

Supplementary table 4. Terms used to refer to principles and to the general idea of misconduct in relevant documents

Institution	Term used for principles (i.e., 'Guidance number'–[Term])	Types of principles endorsed (i.e., [Term…] ('guidance number'))	Note regarding principles	Term used for misconduct (i.e., 'Guidance number'–[Term…])
UVA	**1–Principles of good conduct for scientific practice**	**Scrupulousness** **Reliability** **Verifiability** **Impartiality** **Independence**	—	**2–Research misconduct**
UB	**3–Principles**	**Honesty** **Responsibility** **Rigor** **Conflicts of interests** (interpreted as independence)	—	
UC	**5–'Seven principles identified by the Committee on Standards in Public Life'**	**Selflessness** **Accountability** **Integrity** **Openness** **Objectivity** **Honesty** **Leadership**	—	**5–Serious disciplinary offence** **7–Misconduct**
UE	**8–Principles** **23–Principles which set out responsibilities and values relevant to research**	**Research excellence** (8 and 23) **Integrity** (8 and 23) **Respect, ethics, and professional standards (i.e., including respect for participants–**(8) **Honesty** (8 and 23) **and transparency** (8) **Openness** (8) **and accountability** (8 and 23) **Supporting training and skills** (8 and 23) **Co-operation** (23) **Safety** (interpreted as caution) (23)	—	**8–Research misconduct**
UF	**9–Principles of academic integrity**	**Working in accordance with accepted rules** **Documenting research findings** (interpreted as verifiability) **Acting with integrity towards the work of partners, rivals, and predecessors** **Avoid academic misconduct and take preventions to prevent it**	—	**9–Academic misconduct**
UNIGE	**11–Ethical values**	**Search for truth** (interpreted as verifiability) **Academic and research freedom** **Responsibility towards the University community, society, and the environment** **Respect for persons**	Each of the above was followed by a short description, which raised the following principles (Included as implicit in figure 3): scrupulousness, fair credit, respect of rules, laws, and standards, accountability, responsibility of future generations,	**10–Violations of the principle of scientific integrity**
UHDB	–	—	—	**12–Academic misconduct**
UH	**14–Principles endorsed by the research community**	**Integrity** **Meticulousness** **Accuracy in conducting research and in recording, presenting, and evaluating research results**	—	**13–Misconduct in science; fraud in science** **14–Research misconduct; disregard of the responsible conduct of research lesser severity; other irresponsible practices lowest severity**
LEI	**15–'Five principles of academic integrity** **1–Principles of good conduct for scientific practice**	**Scrupulousness** (15 and 1) **Reliability** (15 and 1) **Verifiability** (15 and 1) **Impartiality** (15 and 1) **Independence** (15 and 1)	—	**16– Violations of academic integrity**
KUL	**18–Principles of ethically justified scientific practices**	**Rigor** **Caution** **Reliability** **Independence** **Verifiability** **Impartiality**	—	**17–Scientific misconduct; Questionable research practices lesser severity**
ICL	**19–The three principles of the Council for Science and Technology's Universal Code for Scientists** **34–Standards of research**	**Rigor** (19 and 34) **Honesty** (19 and 34) **Integrity** (19) **Respect for Life, the Law and Public Good** (19) **Responsible Communications: Listening and Informing** (interpreted as respect for society and future generations) (19) **Transparency and open communication** (34) **Care and respect** (34)	—	**20–Research misconduct**
UCL	**23–Principles which set out responsibilities and values relevant to research**	**Excellence** **Honesty** **Integrity** **Co-operation** **Accountability** **Training and skills** **Safety**	Document 20 from UCL also expresses 'general principles of conduct' but such principles are expressed throughout the entire document under subtitles of Professional and personal integrity of researchers; 'research design and methodology'; 'publication process'; 'leadership responsibilities'; and 'institutional responsibilities' and are not explicitly highlighted.	**20–Misconduct** **23–Misconduct in research**
LU	**25–Few founding standards and norms**	**Protection of human dignity, people's equal value and human rights** **Different freedoms** (included as freedom of research) **[Tolerance]** **[Democracy]** **Equality** (interpreted as fairness) **Non-discrimination** (interpreted as impartiality) **[Promotion of peace]** **Global sustainable development** (interpreted as responsibility for future generations) **Social welfare** (interpreted as responsibility for society) **International cooperation**	Document 25 contains a lengthy list of values and principles not only for research, but also for society. We did not include all values discussed in the document, but only those explicitly stated as the 'few founding standards and norms' of Lund University. Note also that since many were unique, we did not include all of them in our general principles themes (i.e., did not include those in square brackets).	**26–Science misconduct**
UNIMI	**27–"Principi etici"** [Ethical principles]	**Freedom of research** **Right and duties** (interpreted as accountability and right to knowledge) **Protection of merit** (interpreted as fairness) **External collaboration** **Rigor and transparency in scientific activity** **Private property and plagiarism** (interpreted as fairness) **Conflict of interests** (interpreted as independence) **Teaching and assessment** (interpreted as responsibility for future generations) **[Rights and duties of students]** **[Correct use of research funds]** **Obligation of collaboration** **Respect of the code's duties** **[Ethics committee]**	This section is a series of subtitles each followed by a paragraph with multiple ideas of norms and principles. We only included the ideas found in the subtitles, and did not include all subtitles (i.e., did not include those in square brackets) as they were too unique to constitute a theme.	
LMU	**28–Norms of science**	**Honesty**	—	**28–Scientific dishonesty** **29–Scientific misconduct**
UO	**33–Principles** **34–Standards of research**	**Honesty** (33 and 34) **Openness** (33) **Transparency** (33 and 34) **and open communication** (34) **Research Rigor** (33) **Care and respect** (34)	—	**30–Misconduct** **31–Research misconduct** **33–Unacceptable research conduct** **34–Research misconduct**
UU	**35–Core values of the university** **1–Principles of good conduct for scientific practice**	**Inspiration** (35) **Ambition** (35) **Independence** (35 and 1) **Commitment** (35) **Scrupulousness** (1) **Reliability** (1) **Verifiability** (1) **Impartiality** (1)	—	**36–Violations of academic integrity**
UZH	**37–Principles of scientific integrity** (Conditions)	**Veracity and transparency** **Exemplary behaviour and fairness** **Promotion of the coming generation of young scientists**	The section entitled 'Principles' continues with themes of 'Planning of research projects', 'Realisation of research projects', 'Misconduct in the scientific context', each separated in multiple sub-sections containing guidance on how research should be performed. We only included the sub-titles explained above (under the section 'Condition').	**37–Dishonest behavior; scientific misconduct**

Note. See the Supplementary Table 2 for the full references corresponding to each guidance number.

Supplementary table 5. Principles explicitly mentioned in the relevant documents

	Institutes and relevant documents																								
Institute	UvA	UB	UC	UE		UF	UNIGE	UH	LEI		KUL	ICL		UCL	LU	UNIMI	LMU	UO			UU		UZH
Guidance number	1	3	5	8	23	9	11	14	1	15	18	19	34	23	25	27	28	23	33	34	1	35	37
Category of principle																							
Honesty; Veracity		X	X	X	X							X	X	X			X	X	X	X			X
Openness; Verifiability	X		X	X		X	X		X	X	X		X						X	X	X		
Reliability; Accuracy	X							X	X	X	X										X		
Objectivity; Scrupulousness; Transparency	X		X	X					X	X			X			X			X	X	X		X
Independence; Selflessness	X	X	X						X	X	X					X					X	X	
Impartiality	X								X	X	X										X		
Ambition; Innovation; Inspiration			X																			X	
Excellence; Rigor; Meticulousness		X		X	X			X			X	X	X	X		X		X	X	X			X
Duty of care; Respect; Caution				X	X		X				X	X	X		X					X			
Fairness; Give due credit to others															X	X							X
Respect of rules, laws, and standards				X		X								X		X		X					
Cooperation; Solidarity; Collaboration					X	X								X	X	X		X					
Responsibility of future generations				X	X							X		X	X	X		X					X
Social responsibility; Commitment							X					X			X							X	
Accountability; Responsibility		X	X	X	X									X				X					
Avoid and prevent misconduct						X										X							
Freedom of research and/or teaching							X								X	X							
Integrity			X	X	X			X				X		X				X					
Number of principles in each document	5	4	7	9	7	4	4	3	5	5	6	6	5	7	6	9	1	7	4	5	5	3	5
Number of principles in each institution	5	4	7	10		4	4	3	6		6	8		7	6	9	1	10			8		5

Note. This table represents the coverage of extracted principles of integrity in the 17 guidance which explicitly refer to 'principles' of good conduct or 'principles' of integrity. See the Supplementary Table 2 for the full references corresponding to each guidance number.

Supplementary table 6. Themes included in the definition of misconduct of relevant documents

		Institutes and relevant documents																											
	Institute	UvA	UC		UE		UF	UNIGE	UHDB	UH		LEI	KUL	ICL		UCL		LU	LMU	UO					UU	UZH			
	Guidance number	2	5	7	8	23	9	10	12	13	14	16	17	19	34	21	23	26	29	23	30	31	33	34	36	37			
	Theme included																												
Intention	Negligence			X					X	X	X	X		X				X	X		X	X	X		X	X			
	Deliberate	X		X				X	X		X	X						X	X		X	X	X		X	X			
Exclusions	Exclude honest mistake	X		X							X	X	X	X	X						X	X	•	X	X			
	Excludes diverging opinion	X		X						X	X		X		X						X	X		X	X			
	Excludes personal/professional misconduct	X		X																	X	X						
Setting	Proposing (job application, grants application, CV, etc.)			X			X		X		•		X			X			X		X	X	X			X		
	Performing Science	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
	Reporting findings (publication, conferences, etc.)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
	Reviewing (peer-review)							X	X		•		X						X				X			X			
Types of misconduct	Falsification	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X			
	Fabrication	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
	Plagiarism (including misappropriation)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
	Misrepresentation/deception		X	X	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X	X		X	X			
	Concealing misconduct of others			X			X					X				X					X	X	X		X			
	Facilitating misconduct of others			X			X		X			X				X			X		X	X			X	X			
	Inadequate preservation/availability of data				X			X	X	X	•		•						X							X			
	Violate duty of discretion (disclose unpublished research) or breach of confidentiality	X				X	X	X	X						X	X	X		X	X			X	X			X		
	Breach of duty of care	X		X	X	X									X	X	X			X	X	X	X	X					
	Interference with research activities of others						X	X	X		•								X								X		
	Bad authorship practices						X	X	X		•	X	•	X	X				X				X	X	X	X	X		
	Failure to meet ethical/legal requirements	X				X	X								X	X	X			X			X	X					
	Failure to report COI	X						X	X				•		X	X	X			X			X	X			X		
	Selective reporting	X					X	X	X	X	X	X	X	X					X				X		X	X			
	Duplicate publication									X	•		•										X						
	Neglect of supervisory duties						X	X	X										X										
	Malicious accusation of misconduct										•			X		X													
	Infringements against whistleblower	X																						X		X			
	Improper dealing with misconduct (institution)	X													X								X	X					
Source	Causes (see note)																						X						
	Consequences (see note)	X		X	X			X		X		X	X	X	X			X	X			X	X	X	X	X			
	Number of principles in each document	17	6	16	9	9	15	16	17	12	11 [18]	14	12 [16]	10	14	13	10	9	18	10	15	16	21 [22]	15	15	19			
	Number of principles in each institution	17	17		11		15	16	17	14 [19]		14	12 [16]	16		16		9	18			25			15	19			
	This document is a full allegation procedure	Yes		Yes					Yes		Yes	Yes	Yes	Yes	Yes				Yes				Yes	Yes					

Note. This table represents behaviors classified as misconduct in the 16 institutions whose guidance contain an explicit definition of misconduct. '•' and number in square brackets mean that the category was present as a *questionable research practice* rather than *misconduct* per se. See the Supplementary Table 2 for the full references corresponding to each guidance number. Note that UvA1, KUL2, LU1, and UZH2 also mentioned causes of misconduct, and that LU1, UNIMI1, and UO3 also mentioned consequences of misconduct; yet these guidance are absent from this table as they did not contain an explicit definition of misconduct.

Supplementary table 7. Quotes for potential causes of misconduct

Guidance number	Institution(s)	Quote	Page
Responsibility of the research institution			
Need for productivity			
18	KUL	*Neither the pressure to transpose the research results as quickly as possible to exploitable applications, nor the concern to protect the results justifies constraints to ethical behaviour when carrying out research.*	4
28	LMU	Describing the professionalization of science: *The essential criterion for success in the competition for grants is scientific productivity, measured in terms of its results made available to the scientific community. […] and research results were viewed in terms of their utility for financial success with growing frequency.* *grants is scientific productivity, measured in terms of its results made available to the scientific community. [...] and research results were viewed in terms of their utility for financial success with growing frequency.*	93
28	LMU	*Second, the use of publications as a performance indicator in the competition of scientists for career chances, research funds, etc. has in turn accelerated the growth in the number of publications and led to the technique of splitting up their content into smaller and smaller portions.*	95
28	LMU	*… a productive scientific activity at international level is difficult to achieve, leaving the so-called "off duty research". This overburdening is one possible cause of organizational faults in the communication structure and the supervision of clinical research groups.*	98
37	UZH	For authorship disputes: *The problem has been exacerbated by the increasing number of publications with multiple authors […] [and failure of] the relevant guidelines […] to address or provide sufficiently clear answers to important questions. […] "Publish-or-perish" pressures, power differentials and a (false) sense of loyalty may lead to violations of the rules of authorship.*	7
Competition			
1	UVA, UU, LEI	*Increasing competition in scientific research worldwide in addition to rising pressure on researchers to achieve results and to obtain funding have made it necessary for standards to be explicitly formulated regarding honesty in research so as to create procedures in handling reports of suspicion of misconduct.*	3
28	LMU	*Besides provoking the temptation to break the rules, the pressure of competition may also lead to sloppiness and lack of care.*	94
28	LMU	Organization problems: *[Researchers may] describe an atmosphere of competitive pressure and mutual distrust in their environment. A problem frequently referred to in situations like this is the lack of accessible, impartial counsellors with whom concerns and problems may be discussed without having to fear that criticism will lead directly to the loss of one's job.*	97
(Both) Need for productivity and competition			
37	UZH	*The increased administrative tasks, time pressure, financial constraints, the pressure of competition and social changes are all factors which today increase the temptation to attract more attention and to achieve rapid scientific success through questionable and unfair means.*	7
Constraining regulations			
1	LU	*One starting point is that there are two legitimate requirements: the requirement to produce new knowledge, something that is important for the development of individuals and society, and well as the requirement for protection from physical, mental and other injuries in association with research. These requirements sometimes come into conflict with each other; so they then must be weighed against each other.*	6
28	LMU	*Yet the practice of research is governed by a large number of specific legal provisions which may also restrict the freedom of scientific enquiry in individual cases.*	98
Lack of training			
33	UO	*Poor research practices, such as weak procedures, inadequate documentation of procedures, or inadequate record-keeping, might only require further training or development rather than formal disciplinary action, and are normally a matter solely for the employer.*	6
Responsibility of the researcher			
Personal interests			
18	KUL	*[…] constraints to ethical behaviour when carrying out research [cannot be justified by] […] a researcher's desire for recognition.*	4
13	UH	*Although they are rare, the quest for prestige or other benefits in the research community may sometimes lead to the use of dishonest means.*	21
25	LU	*It is difficult to find the right balance between the requirements for transparency, scientific dialogue and the opportunity of a patent or commercialisation of research results.*	7
25	LU	*There are situations when the researcher's objectivity may be affected by other interests, such as his/her own career, intellectual fixation on a hypothesis or profitable financial interests. Sometimes these influences may be so strong that they result in nothing less than scientific dishonesty.*	7
38	UZH	*[Authorship d]isputes may also arise from genuine abuses, such as deliberate omission or inappropriate placement of co-authors, granting of undeserved authorship and academic ghostwriting.*	7

Note. See the Supplementary Table 2 for the full references corresponding to each guidance number.

Supplementary table 8. Quotes for potential causes for misconduct

Guidance number	Institution(s)	Quote	Page
Damage to knowledge and society			
Harm to population			
37	UZH	*… through scientific misconduct, either intentional or due to negligence, society and in particular the scientific community is deceived and possibly harmed.*	10
37	UZH	*… scientific research can also destroy cultural assets, harm public interests, use resources in a manner not compatible with sustainable development or it can provide knowledge that constitutes a threat to humanity and the environment.*	19
2	UvA	*It could mislead other researchers, it may threaten individuals or society — for instance if it becomes the basis for unsafe drugs or unwise legislation […]*	6
Damage to science			
16	LEI	*Academic misconduct damages truth, other researchers and society itself.*	5
36	UU	*Scientific misconduct causes harm to truth, other scientists, and society.*	6
2	UvA	*Research misconduct is harmful for knowledge.*	6
37	UZH	*Without scientific integrity, scientific progress is at risk*	9
14	UH	*Violations of the responsible conduct of research refer to the unethical and dishonest practices that damage research and in worst cases, these invalidate the research results.*	34
13	UH	*Misconduct and fraud in Science have serious consequences for science*	21
8	UE	*Duplicate or redundant submission or publication is not acceptable as it may distort the evidence base upon which meta-analyses rely.*	17
28	LMU	*Dishonesty therefore not merely throws research open to doubt; it destroys it.*	92
Both harm to population and damage to science			
31	UO	*Not upholding [ethical principles and professional] standards, either intentionally or through lack of knowledge, damages the scientific process and may harm research participants, colleagues, the University and society as a whole.*	
34	UO, ICL	*[Research misconduct] is a problem because it can cause harm (for example to patients, the public and the environment), damages the credibility of research, undermines the research record, and wastes resources.*	17
Damage to the scientific enterprise			
Internal trust			
38	UZH	*It is argued that inappropriate listing of authors merely compromises the interests of individuals, and that science itself is only damaged by dishonest practices such as falsification or fabrication of data. […] However, anyone who considers values such as fairness, honesty and transparency to be of central importance for academic research will come to a different conclusion. While inappropriate authorship is not directly detrimental to the expansion of scientific knowledge, it has demotivating effects for some of the individuals concerned and it undermines the system of responsibility and public confidence in science.*	8
28	LMU	*On the other hand, a lack of integrity can represent a threat to science, destroying the confidence of researchers in each other and that of the public in science; research is unthinkable without this confidence.*	64
28	LMU	*For dishonesty – in contrast to error – not only fundamentally contradicts the principles and the essence of scientific work, it is also a grave danger to science itself. It can undermine public confidence in science, and it may destroy the confidence of scientists in each other without which successful scientific work is impossible.*	67
External trust			
2	UvA	*… by subverting the public's trust, it could lead to a disregard for or undesirable restrictions being imposed on research.*	6
11	UNIGE	*Scientific Fraud undermines confidence in science as a whole.*	3
25	LU	*… in order to maintain public trust, it is important that the researcher discloses any financial interests in association with the application for research funding.*	7
Reputation			
27	UNIMI	*Tutti i componenti dell'Università hanno il dovere di cooperare a mantenerne alti il buon nome e il prestigio.*	1
31	UO	*… conflicts [of interest] which are not managed effectively may jeopardise the University's public standing and may cause serious damage to the reputation of the University and of the individuals concerned.*	
37	UZH	*… in society integrity enhances the reputation of scientific research, and promotes understanding for new developments and the acceptance of innovations.*	9
Direct damage to the researcher			
Sanction			
7	UC	*Proven misconduct […] will normally merit dismissal*	1
13	UH	*Misconduct and fraud in science not only violate the integrity of science, but those perpetrating them may also be guilty of an unlawful act.*	23
13	UH	There is a statement about sanctions labeled under '*Consequences*'.	25–26
17	KUL	There is a list of sanctions in the outcome of investigation # 36.	13
19	ICL	*Research misconduct committed by staff members is a disciplinary offence and disciplinary sanctions can range from a formal warning to dismissal.*	7
25	LU	*… serious forms of unethical treatment may be penalised and subject to public prosecution.*	2
27	UNIMI	*L'Università pone in essere le misure necessarie per diffondere la conoscenza del presente Codice, ottenerne da tutti il puntuale rispetto e sanzionarne la violazione, secondo quanto previsto dal proprio Statuto.*	4
28	LMU	*… legal regulations […] should include: […] sanctions depending on the seriousness of proven misconduct.*	76
29	LMU	The possible sanctions are explicitly stated.	7
32	UO	*The University regards any breach of this policy or any breach of the approved terms of a project, as a very serious matter, which may result in disciplinary action, the ultimate sanction being dismissal for staff, expulsion for students and withdrawal of access to University premises and facilities for others.*	[3]
33	UO	*Section on the elaboration of clear sanctions and penalties*	9
34	UO, ICL	*Failure to comply with [ethical and legal] frameworks may result in sanctions; where legal obligations are concerned, this could mean a criminal offence has been committed.*	13

Note. See the Supplementary Table 2 for the full references corresponding to each guidance number.