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An International Study of Research Misconduct Policies

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Abstract

Research misconduct is an international concern. Misconduct policies can play a crucial role in preventing and policing research misconduct, and many institutions have developed their own policies. While institutional policies play a key role in preventing and policing misconduct, national policies are also important to ensure consistent promulgation and enforcement of ethical standards. The purpose of this study was to obtain more information about research misconduct policies across the globe. We found that twenty-two of the top forty research and development funding countries (55%) had a national misconduct policy. Four countries (18.2%) are in the process of developing a policy, and four (18.2%) have a national research ethics code but no misconduct policy. All twenty-two countries (100%) with national policies included fabrication, falsification, and plagiarism in the definition of misconduct, but beyond that there was considerable diversity. Unethical authorship was mentioned in 54.6% of the misconduct definitions, followed by unethical publication practices (36.4%), conflict of interest mismanagement (36.4%), unethical peer review (31.8%), misconduct related to misconduct investigations (27.3%), poor record keeping (27.3%), other deception (27.3%), serious deviations (22.7%), violating confidentiality (22.7%), and human or animal research violations (22.7%). Having a national policy was positively associated with research and development funding ranking and intensiveness. To promote integrity in international research collaborations, countries should seek to harmonize and clarify misconduct definitions and develop procedures for adjudicating conflicts when harmonization does not occur.

Keywords

definitions; ethics; international variation; policies; research misconduct

INTRODUCTION

Research misconduct is an international concern. In the 1980s, highly publicized cases of misconduct in U.S. federally funded research alerted scientists and policymakers to the significance of the problem, but misconduct scandals have taken place in many other

countries since then, including Canada, China, Denmark, Germany, Italy, Japan, the Netherlands, South Korea, and the U.K. (Ana et al., 2013; Resnik and Master, 2013). Many cases, most notably South Korean scientist Woo Suk Hwang's data fabrication in human embryonic stem cell research, have involved international collaborations (Kim and Park, 2013). Investigating and adjudicating misconduct allegations related to international collaborations can be difficult, because different countries may have conflicting laws, regulations, and policies pertaining to research misconduct (Boesz and Lloyd, 2008). Some organizations and scholars have urged the global research community to develop international guidelines to harmonize conflicting misconduct rules (European Science Foundation and Office of Research Integrity, 2007; Boesz and Lloyd, 2008; Resnik, 2009). In the last decade, researchers have responded to this perceived need by drafting international research integrity guidelines, such as the Organization for Economic Cooperation and Development's Best Practices for Ensuring Scientific Integrity and Preventing Misconduct (2007), the European Science Foundation's (2011) Code of Conduct for Research Integrity, and the Singapore Statement on Research Integrity (2011). While these guidelines can help researchers deal with misconduct involving international collaborations, they cannot resolve all legal issues, because they are ethical, not legal documents. Additionally, these guidelines have not been accepted by representatives from all of the world's major research funders.

Misconduct policies can play a crucial role in preventing and policing research misconduct. Policies typically include a definition of misconduct as well as procedures for investigating and adjudicating misconduct. Many institutions have developed their own policies (Shamoo and Resnik, 2015). While institutional policies play a key role in preventing and policing misconduct, national policies are also important to ensure consistent promulgation and enforcement of ethical standards. The purpose of this study was to obtain more information about research misconduct policies across the globe. This information may be useful to scientists and policymakers who are developing or revising misconduct rules in their countries, or are seeking to harmonize their rules with those found in other countries. Our specific aims were to 1) determine the percentage of top research and development (R&D) funding countries that have a national misconduct policy, 2) describe the variation in misconduct definitions used by different countries, and 3) to determine whether having a national research misconduct policy is associated with R&D funding ranking, gross national product (GNP), or percentage of R&D funding as a percentage of GNP (also known as R&D intensiveness).

METHODS

We attempted to obtain information about the national research misconduct policies of the top forty R&D funding countries for 2014 (Battelle, 2013). A national misconduct policy was defined as a law, regulation, or government funding agency policy operating at the national level that addresses research misconduct. We collected our data on national policies from February to April 2014. We searched for policies on publicly available websites using the Google search engine. When we could not find policies on websites, we emailed scientists, ethicists, or attorneys to ask them for information about their country's policies. We identified these individuals by searching for their publications (e.g., articles on research

ethics) and affiliations (e.g., a research integrity official or bioethicist), since these characteristics indicated that they may have some knowledge of their country's policies. When the people we contacted did not know about their country's policies, they referred us to others who might know. Eight of these policies were not in English. When a policy was not in English, we obtained a translation from a proficient speaker of the language who provided the policy or from Google Translate.

We classified the definitions of misconduct in national policies according to a coding system based on Resnik et al. (2015). We modified this system to include some additional categories (such as “unethical peer review” and “interfering with research”) that matched the policies examined in this study. We distinguished among seventeen different types of behaviors that policies classified as misconduct and included the category “other” for behaviors that did not fit these categories. Most of the categories are self-explanatory, except for those we mention here: “misconduct related to misconduct investigations” included interfering with a misconduct investigation or retaliating against a whistleblower; “conflict of interest mismanagement” included not disclosing a significant conflict of interest; “other deception” included deception not specifically defined as fabrication or falsification, such as deliberately misrepresenting or misinterpreting data. We classified a definition as including “serious deviations” if it mentioned the phrase “serious deviations” or a similar wording. We adjusted our interpretation of the coding scheme after examining a few policies. Two of us, DBR and LMR, independently coded the policies and then resolved disagreements. We did not modify the coding scheme once we initiated the coding process. We also obtained data on each country's R&D funding ranking, GNP, R&D funding as a percentage of GNP, and the year a policy was adopted or significantly revised (Battelle, 2013). Taiwan was treated as a separate country.

Kappa statistics were used to assess inter-rater agreement for the coding of the policies. Using Shapiro–Wilks tests for normality, R&D funding rank and R&D as a percentage of GDP were found to be normally distributed, while GDP was not normally distributed. Therefore, countries having a misconduct policy were compared to countries not having a misconduct policy using two-sample *t*-tests for R&D funding rank and R&D as a percentage of GDP, while a Mann–Whitney test was used to compare GDP. *P*-values were two-sided and considered statistically significant if less than .05. For countries with misconduct policies, we present the frequencies and percentages of those that include specific behaviors.

RESULTS

Twenty-two of forty countries (55%) had a national misconduct policy. Four countries (18.2%) are in the process of developing a policy, and four (18.2%) have a national research ethics code but no misconduct policy. See Table 1. GDP ranged from 200 to 16,616 billion U.S. dollars with a mean of 1,947 and standard deviation of 3,392 billion U.S. dollars. R&D funding as a percentage of GDP ranged from 0.2% to 4.2%, with a mean of 1.9% and standard deviation of 1.0%. The year a policy was adopted ranged from 2000 to 2014. See Table 1. Inter-rater agreement for the coding of the policies was high. For four categories inter-rater agreement was 100%. For seven categories, inter-rater agreement was 95.5% (kappa statistic = .78 to .90, all *p*-values < .001). See Table 2.

There was considerable variation in the definitions of research misconduct found in national policies (see Appendix 1 for some examples). All twenty-two countries (100%) with national policies included fabrication, falsification, and plagiarism in the definition of misconduct, but beyond that, there was considerable diversity. Unethical authorship was mentioned in 54.6% of the misconduct definitions, followed by unethical publication practices (36.4%), conflict of interest mismanagement (36.4%), unethical peer review (31.8%), misconduct related to misconduct investigations (27.3%), poor record keeping (27.3%), other deception (27.3%), serious deviations (22.7%), violating confidentiality (22.7%), and human or animal research violations (22.7%). See Table 3.

Having a national research misconduct policy was positively associated with R&D funding rank and R&D funding as a percentage of GDP, but not with GDP. The mean funding ranking of countries with a policy was 16.9 (standard deviation, s.d. = 11.5), while those without a policy had a mean ranking of 24.9 (s.d. = 10.6). The mean R&D as a percentage of GDP was 2.20 (s.d. = .95) for countries with a policy, as compared to 1.47 (s.d. = 1.01) for countries without one. See Table 4.

DISCUSSION

Our most important finding is that there is considerable variation in the definition of research misconduct found in national policies. Although all countries with national policies included fabrication, falsification, and plagiarism in the definition, there was little agreement beyond that. Lack of agreement on the definition of misconduct can lead to problems for promoting integrity in international research, since a type of behavior may be categorized as misconduct by one country but not by another. International collaborators may find it difficult to decide whether to report a type of behavior as misconduct if they are unsure which definition applies to the behavior. While it may be obvious in some cases that one definition applies, in other cases it may not be. For example, if a study takes place in one country but is funded by another, it may not be clear which country's misconduct definition applies. If behavior occurs in cyberspace (e.g., via exchange of information over the Internet), then it may be impossible to determine which country's misconduct policies apply. To promote integrity in international research collaborations, countries should seek to harmonize and clarify misconduct definitions and develop procedures for adjudicating conflicts when harmonization does not occur. While scientists and policymakers have begun to take some steps toward harmonization, more work is needed (Boesz and Lloyd, 2008).

Another important finding is that over half of the countries surveyed have a national research misconduct policy, and that nearly half of those that do not are in the process of developing policies or have a national ethics code. This finding indicates to us that most national governments are taking research misconduct seriously and are attempting to promote research integrity. Furthermore, having a policy probably reflects a national commitment to scientific research, since having a policy was associated with R&D funding rank and R&D intensiveness.

A possible limitation of our study is that eight of the policies needed to be translated into English, and some important meaning may have been lost. While we recognize this as a

potential problem, we do not think it is a significant one, because we only had to translate short passages that contained misconduct definitions and many of the words in these passages are technical terms, such as fabrication, falsification, and plagiarism, which tend to have common meanings across different language communities. Another limitation of our study is that it only included the top forty R&D funding countries and there are nearly 200 countries in the world. However, we do not view this as a significant problem because approximately 95% of the scientific research conducted in the world is sponsored by the top forty R&D countries (Battelle, 2013).

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Singapore Statement on Research Integrity. [Last accessed March 21, 2014] 2011. Available at <http://www.singaporestatement.org/>

APPENDIX 1: SOME EXAMPLES OF MISCONDUCT DEFINITIONS

Australia

A complaint or allegation relates to research misconduct if it involves all of the following: an alleged breach of this Code intent and deliberation, recklessness or gross, and persistent negligence serious consequences, such as false information on the public record, or adverse effects on research participants, animals, or the environment.

Research misconduct includes fabrication, falsification, plagiarism, or deception in proposing, carrying out or reporting the results of research, and failure to declare or manage a serious conflict of interest. It includes avoidable failure to follow research proposals as approved by a research ethics committee, particularly where this failure may result in unreasonable risk or harm to humans, animals, or the environment. It also includes the willful concealment or facilitation of research misconduct by others.

Repeated or continuing breaches of this Code may also constitute research misconduct, and do so where these have been the subject of previous counselling or specific direction. Research misconduct does not include honest differences in judgment in management of the research project, and may not include honest errors that are minor or unintentional. However, breaches of this Code will require specific action by supervisors and responsible officers of the institution.

Brazil

Misconduct is understood as any conduct by a researcher that intentionally or by negligence transgresses the values and principles that define the ethical integrity of scientific research and relationships among researchers, such as those set forth in this code. Scientific misconduct is not to be confused with an honest scientific error committed in good faith or honest differences in scientific judgment ...

The most typical and frequent forms of serious misconduct are as follows:

- a. Fabrication: The claim that data, procedures, or results were obtained or conducted when in fact they were not.
- b. Falsification: The presentation of data, procedures, or results in such a modified, inaccurate, or incomplete way as to interfere in the evaluation of the true scientific merit of the research findings.
- c. Plagiarism or the use of another's ideas or verbal formulations, in an oral or written format, without express and clear credit to the authors, in a way that may reasonably generate the perception that the ideas or formulations are one's own.

Canada

Breaches of Tri-Agency Research Integrity Policy:

Fabrication: Making up data, source material, methodologies, or findings, including graphs and images.

Falsification: Manipulating, changing, or omitting data, source material, methodologies, or findings, including graphs and images, without acknowledgement and which results in inaccurate findings or conclusions.

Destruction of research records: The destruction of one's own or another's research data or records to specifically avoid the detection of wrongdoing or in contravention of the applicable funding agreement, institutional policy, and/or laws, regulations, and professional or disciplinary standards.

Plagiarism: Presenting and using another's published or unpublished work, including theories, concepts, data, source material, methodologies, or findings, including graphs and images, as one's own, without appropriate referencing and, if required, without permission.

Redundant publications: The republication of one's own previously published work or part thereof, or data, in the same or another language, without adequate acknowledgment of the source, or justification.

Invalid authorship: Inaccurate attribution of authorship, including attribution of authorship to persons other than those who have contributed sufficiently to take responsibility for the intellectual content, or agreeing to be listed as author to a publication for which one made little or no material contribution.

Inadequate acknowledgement: Failure to appropriately recognize contributions of others in a manner consistent with their respective contributions and authorship policies of relevant publications.

Mismanagement of Conflict of Interest: Failure to appropriately manage any real, potential, or perceived conflict of interest, in accordance with the Institution's policy on conflict of interest in research, preventing one or more of the objectives of the Framework (Section 1.3) from being met.

China

Research Misconduct is defined as violations against accepted scientific practices of the research community. It includes as follows: (1) providing false information of such aspects as title promotion, resume, and research foundations involving relative people; (2) plagiarizing other people's research achievements; (3) fabricating or falsify research data; (4) violating informed consent and privacy protection and other rules in researches involving human subjects; (5) violating norms involving laboratory animals protection; and (6) other research misconducts.

Japan

Misconduct is none other than an act which is inconsistent with research ethics, that which twists the essence or the intended point, objective, or purpose of the scientific research such that the normal scientific communication among the researcher community is obstructed. Specifically, fabrication and/or falsification of data or results, stealing other researchers' results, as well as duplicate publications of the same results and inappropriate ownership through improper disclosure of authorship are all representative examples of misconduct. These actions can occur at any point during the research planning, design, conducting the research, and data analysis and interpretation (and in the case of research which has been supported by competitive funding, applying for budgetary support, and reporting back to the funding source are also points where ethical misconduct can occur).

Finland

Research misconduct refers to misleading the research community and often also to misleading decision-makers. This includes presenting false data or results to the research community or spreading false data or results in a publication, in a presentation given in a scientific or scholarly meeting, in a manuscript that is intended to be published, in study materials, or in applications for funding. Furthermore, misconduct refers to misappropriating other researchers' work and to representing [sic] other researchers' work as one's own. Research misconduct is further divided into the following four subcategories:

- Fabrication refers to reporting invented observations to the research community. In other words, the fabricated observations have not been made by using the methods as claimed in the research report. Fabrication also means presenting invented results in a research report.
- Plagiarism, or unacknowledged borrowing, refers to representing another person's material as one's own without appropriate references. This includes research plans, manuscripts, articles, other texts or parts of them, visual materials, or translations. Plagiarism includes direct copying as well as adapted copying.
- Misappropriation refers to the unlawful presentation of another person's result, idea, plan, observation, or data as one's own research.

Germany

1. Scientific misconduct by applicants, grant recipients, and other individuals responsible for the use of DFG funds. Scientific misconduct by applicants, grant recipients, and other individuals responsible for the use of DFG funds (such as non-DFG funded individual project leaders) is defined as the intentional or grossly negligent statement of falsehoods in a scientific context, the violation of intellectual property rights, or impeding another person's research work. The circumstances of each case shall be considered on an individual basis. Severe scientific misconduct in this sense includes especially as follows:
 - a. Misrepresentation.

- Fabrication of data and/or research findings;
 - Falsification of data and/or research findings, e.g., through changing or omitting undesirable findings without appropriate disclosure, manipulation of representations, or depictions; inaccurate information in a grant proposal or as part of the reporting requirements (including false statements regarding the publication outlet and concerning publications in press).
- b.** Violation of intellectual property regarding copyrighted works created by others or significant scientific findings, hypotheses, theories, or approaches to research produced by others, including as follows:
- Unauthorized use following a claim of authorship (plagiarism);
 - Exploitation of the research approaches and ideas of others (“theft” of ideas);
 - Unauthorized disclosure of data, theories and findings to third parties;
 - Claiming or accepting unjustified authorship or co-authorship of a scientific work;
 - Falsification of content;
 - Unauthorized publication and unauthorized provision of access to a work, finding, hypothesis, theory, or research approach to third parties before it has been published by its author.
- c.** Claiming authorship or co-authorship of another person’s work without his/her permission.
- d.** Sabotaging research activities (including damaging, destroying or manipulating experiments, equipment, documents, hardware, software, chemicals, or other items needed by another scientist to conduct research).
- e.** Destruction of primary data to the extent that this violates legal provisions or the discipline’s accepted principles of scientific work. This also applies to the illegal non-destruction of data.

Shared responsibility for misconduct may result from, e.g., participation in others’ misconduct, gross neglect of supervisory responsibilities, co-authoring publications which contain falsifications.

2. Scientific misconduct by reviewers and members of committees.

Scientific misconduct by reviewers and committee members may involve unauthorized use, for their own scientific purposes, of data, theories, and findings of which they have acquired knowledge through their activities; violating the confidentiality of the review process through unauthorized disclosure to third parties of proposals or of data, theories, and findings included therein.

South Korea

[Research misconduct is defined as:]

(1) fabrication, (2) falsification, (3) plagiarism, (4) inappropriate authorship, (5) activities that interfere with a research ethics committee's examination of research misconducts, or activities that harm a whistleblower, and (6) activities that go beyond generally acceptable norms in scientific community.

United Kingdom

[Research misconduct is defined as:]

1. Fabrication: Including the creation of false data or other aspects of research, including documentation and participant consent.
2. Falsification: Including the inappropriate manipulation and/or selection of data, imagery and/or consents.
3. Plagiarism: This includes the general misappropriation or use of others' ideas, intellectual property, or work (written or otherwise), without acknowledgement or permission.
4. Misrepresentation: This relates to misrepresentation of data and thus includes dissemination activities (e.g., suppression or deliberate or negligent misrepresentation of findings and/or data), as well as issues such as inappropriate claims to authorship or denial of authorship.
5. Mismanagement or inadequate preservation of data and/or primary materials: This including failure to keep clear and accurate records of the research procedures and results, as well as the requirement to make relevant primary data and research evidence accessible to others for 'reasonable periods' after the completion of the research. Guidance states that data should normally be preserved and accessible for ten years, but for projects of clinical or major social, environmental or heritage importance, for 20 years or longer, and that, wherever possible, data should be archived.
6. Breach of duty of care: This requirement relates to a number of considerations, including:
 - a. breaches of confidentiality;
 - b. placing participants or 'associated individuals' in danger (including reputational danger) without their prior consent or without appropriate safeguards;
 - c. a requirement to take 'all reasonable care' to ensure that 'appropriate informed consent is obtained properly, explicitly and transparently';
 - d. legal and reasonable ethical requirements or obligations of care for animal subjects, human organs or tissue used in research, or for the protection of the environment; and

- e. improper conduct in peer review of research proposals or results (including manuscripts submitted for publication)—for example, failure to disclose conflicts of interest.

United States

Research misconduct is defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results.

APPENDIX 2: NATIONAL MISCONDUCT POLICY SOURCES FROM DIFFERENT COUNTRIES

Australia

Australian Government. National Health and Medical Research Council. Australian Research Council. (2007). Australian Code for the Responsible Conduct of Research. Available at https://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/r39.pdf. Last accessed March 21, 2014.

Brazil

S o Paulo Research Foundation—FAPESP. (2012). Code of Good Scientific Practice. Available at http://www.fapesp.br/boaspraticas/FAPESP-Code_of_Good_Scientific_Practice_jun2012.pdf. Last accessed March 21, 2014.

Canada

Tri-Council Agency Framework: Responsible Conduct of Research. (2011). Available at <http://www.rcr.ethics.gc.ca/eng/policy-politique/framework-cadre/#311>. Last accessed March 21, 2014.

China

Regulation No. 11 of the Ministry of Science and Technology (MOST). (2006). Provisional Measures on Dealing with Research Misconducts in Implementing National Science and Technology Programmes. Available at http://www.most.gov.cn/fggw/bmgz/200611/t20061110_53413.htm. Last accessed March 21, 2014.

Denmark

Danish Committees on Scientific Dishonesty. (2009). Guidelines for Good Scientific Practice with Special Focus on Health Science, Natural Science and Technical Science. Available at <http://fivu.dk/en/publications/2009/files-2009/guidelines-for-good-scientific-practice.pdf>. Last accessed March 21, 2014.

Finland

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Germany

Deutsche Forschungsgemeinschaft (DFG). (2011). Rules of Procedure for Dealing with Scientific Misconduct. Available at http://www.dfg.de/formulare/80_01/80_01_en.pdf. Last accessed March 21, 2014.

Indonesia

Ministry of Research and Technology, Republic Indonesia. (2013). No. 25 /M/Kp/III/2013: Guidelines of Ethics Code in Conducting Research. Available at <http://jdih.ristek.go.id/?q=perundangan/konten/10083>. Last accessed March 21, 2014.

Iran

The National Guideline for Biomedical Publication Ethics. (2011).

Ireland

Royal Irish Academy. (2013). Consultation on Policy Statement on Ensuring Research Integrity in Ireland. Available at <http://www.iua.ie/wp-content/uploads/2013/01/Ireland-Research-Integrity-statement-Draft-2-03.pdf>. Last accessed March 21, 2014.

Japan

The Council for Science and Technology Policy, the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Special Committee on Scientific Misconduct. (2006). Guidelines for Responding to Misconduct in Research Activities: Report from the Special Committee on Scientific Misconduct.

Netherlands

Association of Universities in the Netherlands. (2012). The Netherlands Code of Conduct for Scientific Practice: Principles of Good Scientific Teaching and Research. Available at http://www.vsnu.nl/files/documenten/Domeinen/Onderzoek/The_Netherlands_Code_of_Conduct_for_Scientific_Practice_2012.pdf. Last accessed March 21, 2014.

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Norway

Act of 30 June 2006 No. 56 on Ethics and Integrity in Research Norway: The Norwegian Law on Research Ethics. Available at <https://www.etikkom.no/In-English/Act-on-ethics-and-integrity-in-research/>. Last accessed March 21, 2014.

Poland

Polish Academy of Sciences, Committee on Ethics in Science. (2012). Code of Ethics for the Scientist. Available at http://www.instytutja.pan.pl/images/2013/Komisja_Etyki/Kodeks_etyki_pracownika_naukowego_.pdf. Last accessed March 21, 2014.

Singapore

Agency for Science, Technology, and Research (A*STAR). (2013). Code of Practice and Procedure Relating to Integrity in Research.

South Korea

Ministry of Science and Technology. (2007). Government Order Number 236: Guides for Securing Research Ethics.

Spain

Government of Spain, Ministry of Science and Innovation, CSIC (Consejo Superior de Investigaciones Científicas). (2011). Code of Good Scientific Practices of the CSIC.

Sweden

Ministry of Education. (2006). Proposal for Handling Suspected Science Misconduct. Stockholm: Ministry of Education, Dnr 312-2006-2542.

Switzerland

Swiss Academy of Arts and Sciences. (2008). Scientific Integrity: Procedures and Principles. Available at http://www.akademien-schweiz.ch/dms/E/Publications/Guidelines-and-Recommendations/integrity/Guidelines-in-German-_SI/Guidelines%20%28in%20German%29_SI.pdf. Last accessed March 21, 2014.

Taiwan

National Science Council. (1999). Academic Ethics Case Processing and Consideration of the Elements.

United Kingdom

U.K. Research Council. (2012). The Research Ethics Guidebook. The RCUK (Research Council UK) Code of Conduct. Available at <http://www.ethicsguidebook.ac.uk/Research-Council-funding-122>. Last accessed March 21, 2014.

United States

Office of Science and Technology Policy, Federal Research Misconduct Policy. Federal Register: December 6, 2000 (Volume 65, Number 235); pp. 76260–76264. Available at <http://ori.hhs.gov/federal-research-misconduct-policy>. Last accessed March 21, 2014.

Table 1

National Misconduct Policies of Top 2014 R&D Funding Countries

Country	National policy (Y/N)	Year policy adopted or revised	2014 R&D funding rank	2014 GDP (billions of US\$)	2014 R&D as percentage of GDP
United States	Yes	2000	1	16,616	2.8
China	Yes	2006	2	14,559	2
Japan	Yes	2006	3	4,856	3.4
Germany	Yes	2011	4	3,312	2.9
South Korea	Yes	2012	5	1,748	3.6
France	No*		6	2,319	2.3
United Kingdom	Yes	2012	7	2,454	1.8
India	No		8	5,194	.9
Russia	No		9	2,671	1.5
Brazil	Yes	2012	10	2,515	1.3
Canada	Yes	2011	11	1,571	1.9
Australia	Yes	2007	12	1,040	2.3
Taiwan	Yes	2000	13	974	2.4
Italy	No**		14	1,842	1.2
Spain	Yes	2011	15	1,418	1.3
Netherlands	Yes	2014	16	712	2.1
Sweden	Yes	2006	17	412	3.4
Israel	No		18	271	4.2
Switzerland	Yes	2008	19	382	2.9
Turkey	No		20	1,227	.9
Austria	No*		21	372	2.8
Singapore	Yes	2013	22	355	2.7
Belgium	No**		23	432	2
Iran	Yes	2011	24	1,014	.8
Mexico	No*		25	1,864	.5
Finland	Yes	2012	26	202	3.5
Poland	Yes	2012	27	844	.8
Denmark	Yes	2008	28	217	2.9

Country	National policy (Y/N)	Year policy adopted or revised	2014 R&D funding rank	2014 GDP (billions of US\$)	2014 R&D as percentage of GDP
South Africa	No		29	621	1
Qatar	No *		30	211	2.7
Czech Republic	No **		31	295	1.8
Argentina	No		32	803	.6
Norway	Yes	2007	33	293	1.7
Malaysia	No		34	557	.8
Pakistan	No		35	556	.7
Portugal	No		36	248	1.4
Ireland	Yes	2013	37	200	1.7
Saudi Arabia	No		38	997	.3
Ukraine	No **		39	348	.9
Indonesia	Yes	2013	40	1,374	.2

* In the process of developing a national policy.

** National research ethics code but no national misconduct policy.

Table 2

Inter-Rater Agreement for Coding of Misconduct Definitions

Behavior category	Percentage of Agreement	Kappa	p-Value
Fabrication	100.0	1.00	<.001
Falsification	100.0	1.00	<.001
Plagiarism	100.0	1.00	<.001
Unethical Peer Review	100.0	1.00	<.001
Unethical Publication Practices	95.5	.90	<.001
Misconduct Related to Misconduct Investigations	95.5	.88	<.001
Violating Confidentiality	95.5	.88	<.001
Human or Animal Research Violations	95.5	.86	<.001
Unethical Publication Practices	95.5	.90	<.001
Interfering with Research	95.5	.78	<.001
Conflict of Interest Mismanagement	95.5	.90	<.001
Poor Record Keeping	95.5	.88	<.001
Misrepresenting Credentials	86.4	.49	.032
Misappropriating Funds	86.4	.23	.207
Theft of Physical Property	86.4	.49	.032
Unethical Authorship (not Plagiarism)	86.4	.73	<.001
Other Deception	77.3	.46	.019
Serious Deviations	72.7	.23	.159

Table 3**Behaviors Defined as Misconduct in National Policies**

Behavior	Number	* Percentage
Fabrication	22	100.0
Falsification	22	100.0
Plagiarism	22	100.0
Unethical Authorship (not Plagiarism)	12	54.6
Unethical Publication Practices	8	36.4
Conflict of Interest Mismanagement	8	36.4
Unethical Peer Review	7	31.8
Misconduct Related to Misconduct Investigations	6	27.3
Poor Record Keeping	6	27.3
Other Deception	6	27.3
Serious Deviations	5	22.7
Violating Confidentiality	5	22.7
Human or Animal Research Violations	5	22.7
Misappropriating Funds	3	13.6
Misrepresenting Credentials	3	13.6
Theft of Physical Property	2	9.1
Interfering with Research	2	9.1
Other	9	40.9

*
 $n = 22$ countries with misconduct policies.

Table 4

Having a National Research Misconduct Policy Associated with R&D Funding Rank and R&D Funding as Percentage of GDP

	Have a policy (<i>n</i> = 22)	No policy (<i>n</i> = 18)	<i>p</i> -Value	Test used
2014 R&D funding rank	16.9 (± 11.5)	24.9 (± 10.6)	.030	<i>t</i> -test
2014 R&D as percentage of GDP	2.20 (± .95)	1.47 (± 1.01)	.024	<i>t</i> -test

Mean (± standard deviation).