



Guiding Principles for **Science** **Journalism**

A global perspective **2024**

LUISA MASSARANI

LUIZ FELIPE FERNANDES NEVES

NICOLÁS BUSTAMANTE HERNÁNDEZ

August 2024

Guiding Principles for Science Journalism – A global perspective 2024

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AUTHORS

Luisa Massarani, National Institute of Public Communication of Science and Technology and Casa de Oswaldo Cruz/Oswaldo Cruz Foundation (Brazil)

Luiz Felipe Fernandes Neves, Federal University of Goiás and National Institute of Public Communication of Science and Technology (Brazil)

Nicolás Bustamante Hernández, independent science journalist (Colombia)

Translations

Kossi Balao and Florence Raboisson (French)

Jia Hepeng and Ling Xin (Chinese)

Pakinam Amer and Bothina Osama (Arabic)

Ksenia Spiridonova and Olga Dobrovidova (Russian)

Nicolás Bustamante Hernández (Spanish)

Copyeditor

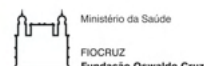
Rosalind Reid

Design image of the cover

Luiz Baltar

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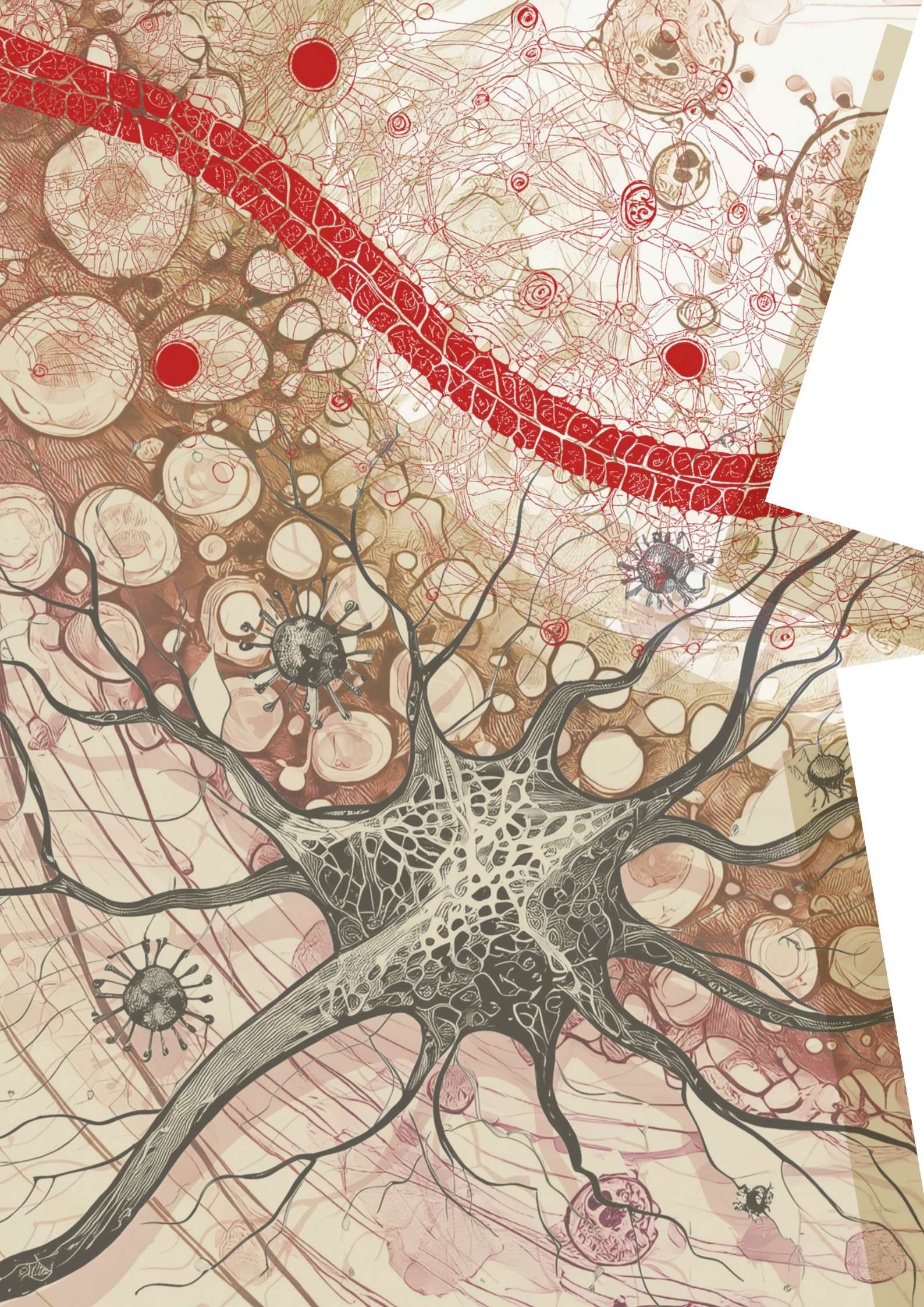
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Executive Summary

In this report, we present the results of a survey that aimed to map the views of science journalists around the globe about which should be the guiding principles for science journalism. It is a joint initiative of the World Federation of Science Journalists and Brazil's National Institute of Public Communication of Science and Technology, hosted at Casa de Oswaldo Cruz/Fiocruz, with the support of The Kavli Foundation. The survey was carried out using an online questionnaire containing 32 questions, from March 7 to July 13, 2022. We obtained 505 responses from professionals in 82 countries representing all world regions.

The questionnaire contained questions about ethical issues, such as the legitimacy of establishing the ethical priorities of science journalism, knowledge of professional associations and codes of ethics, and ethical protections and violations. The responses also provide insights into professionals' attitudes toward topics such as coverage neutrality, scientific controversies, scientific uncertainties, fraud, errors and retractions, and the advantages and disadvantages of the embargo system. We also questioned the participants about their criteria for choosing sources and their relationships with them. At the end, we included questions designed to understand the profile of science journalists, their employment situation and their professional ethos.

A detailed illustration of biological tissue, showing various cells and structures in shades of brown, orange, and red. The style is reminiscent of a microscopic view of a plant or animal tissue, with intricate patterns and textures. The illustration is partially obscured by a white banner containing the title.

Main results

- ▶ Of all science journalists responding, 53% identified as female and 45% as male.
- ▶ There is a balance among age groups: 25 to 54 years old (28%), 45 to 54 years old (25%), 25 to 34 years old (22%), and over 54 years old (22%).
- ▶ Just over half of the participants (52%) have a university degree in journalism/communication. In Asia/Pacific and Europe/Russia¹, there is a predominance of respondents with a university degree in science (57% and 59%, respectively). In Northern Africa and the Middle East, there is a discrete predominance of journalists holding a university degree in other areas (38%).
- ▶ The most common levels of education are master's degree (44%) and first degree (35%). PhD holders comprise 19% of the survey respondents.
- ▶ The proportion of more experienced respondents (more than 16 years of work in science journalism) in the sample is 36%. Next are professionals with six to ten years of experience (26%), less than five years (22%), and 11 to 15 years (17%). In Sub-Saharan and Southern Africa, there is a relative predominance of less experienced professionals (37% with less than five years of work).
- ▶ Science journalism is the main occupation of 55% of survey participants, especially in Asia/Pacific countries (76%).

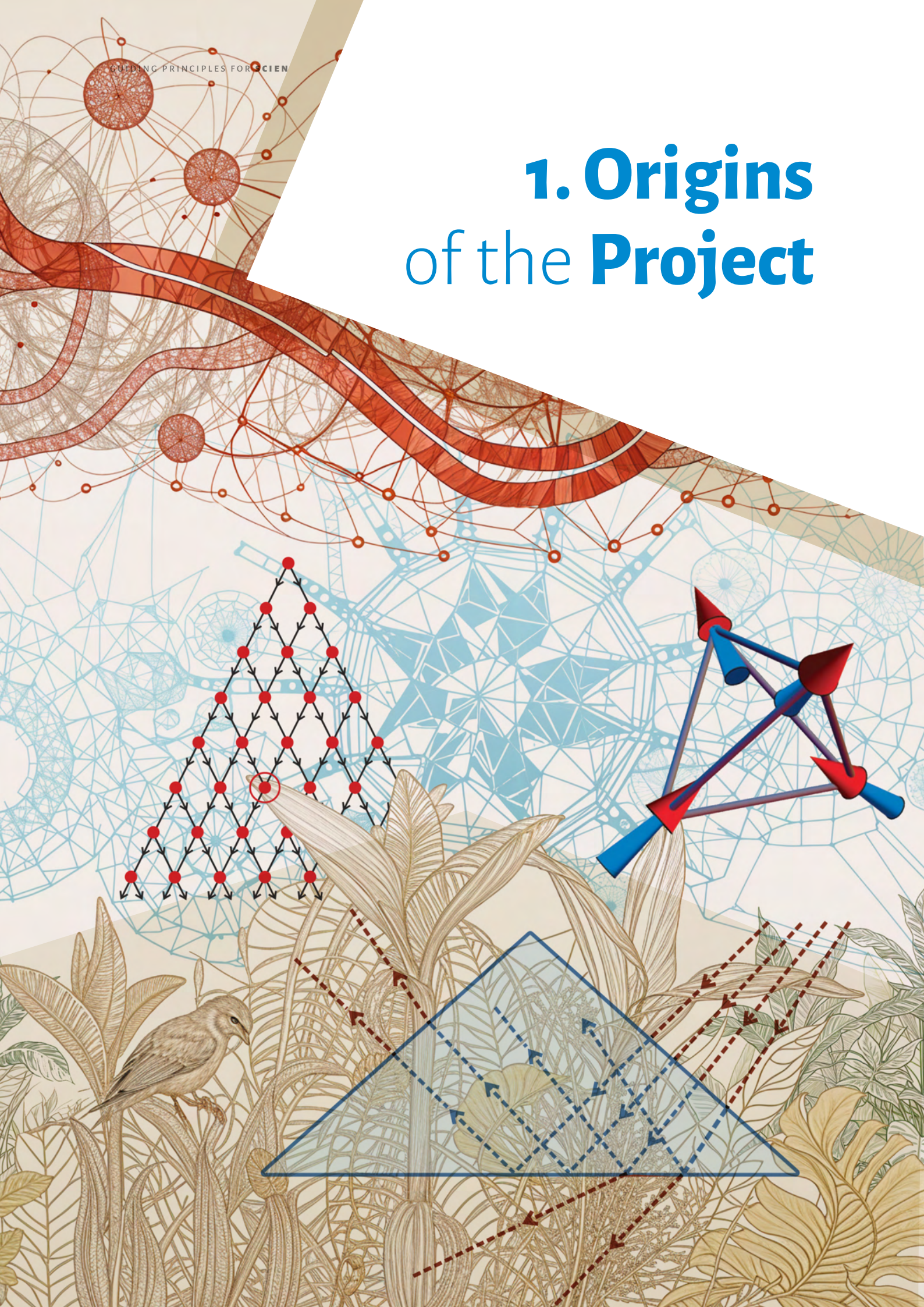
¹ This study started before the current conflict between Russia and Ukraine. Russia is partially in Europe and partially in Asia. We defined Europe/Russia as a region following previous surveys with science journalists (see for example Massarani et al., 2021a). According to the United Nations, Russia is part of Europe (see <<https://unstats.un.org/unsd/methodology/m49/#geo-regions>>). The number of responses from the combined Europe/Russia region was 110, of whom 10 were from Russia

- ▶ The most common employment position is full-time staff (40%). In Sub-Saharan and Southern African countries, the proportion of full-time staff is slightly surpassed by journalists working as full-time freelancers (35%). Northern African and Middle Eastern countries present a very different situation, with more than half (55%) being part-time freelance workers.
- ▶ The work of journalists who responded to the survey is mainly published in online media – 69% in web story/website and 56% in social media. The least frequent media – where the largest number of journalists said their work never appears – are science museum/exhibition/event (43%), television (38%), news agency (34%) and press releases from universities or research institutions (34%).
- ▶ For 38% of respondents, what best defines their role as science journalists is “to inform,” followed by “to explain science” (28%), “to promote science” (15%), and “to be a public watchdog” (8%). The most significant contrast was in Northern Africa and the Middle East, where 59% of respondents said their main role is promoting science.
- ▶ Of survey participants, 57% think science journalists can be neutral about the topics they cover. The pattern was somewhat different in Latin America: 48% think science journalists cannot be neutral, and 44% said they can.
- ▶ The majority of participants (74%) think that scientific findings should not be reported as certainties.
- ▶ Sending material to an interviewee before publication is more acceptable in the case of complex stories (63%). A slight proportion of Asia/Pacific respondents (35%) said they send the material in any situation, while 32% of the USA and Canada respondents said they never send material prior to publication.
- ▶ About 80% of journalists from all regions of the world responded that journalists should cover the follow-up if a scientist accused of fraud were later found innocent.
- ▶ If a journal retracted a scientific paper reported by the journalist, 65% of participants answered that they would report the retraction. This was not the prevailing response in Northern African and Middle Eastern countries, where 42% of journalists said they would report that the paper was retracted only if there were major reasons, such as fraud.

- ▶ Across all regions, 76% of professionals said they would correct errors detected after publishing coverage of a specific science topic.
- ▶ About 80% of science journalists think that the embargo system is useful for allowing journalists to prepare the story in advance. This percentage is high in all regions, except in Northern Africa and the Middle East, where 69% of respondents think that the embargo system limits the ability of journalists to publish the story more quickly than others.
- ▶ When preparing their stories, science journalists tend to privilege the most important scientists in the field (73%, based on a non-mutually exclusive list). A different pattern emerged in the USA and Canada, where the most commonly mentioned step in finding sources was to look for a gender balance (67%).
- ▶ Journalists from Asia/Pacific (48%), Latin America (59%), Europe/Russia (67%), and the USA and Canada (89%) think that a story about the development of a new vaccine should only have sources that support vaccination as a form of disease prevention. In Sub-Saharan and Southern Africa, and in Northern Africa and the Middle East, the proportion of professionals who think there must always be a balance between sources that support and contradict vaccination as a form of disease prevention is higher (88% and 79%, respectively).
- ▶ In the case of climate change coverage, 66% of respondents chose sources that believe there are anthropogenic causes for climate change. Most science journalists from Sub-Saharan and Southern Africa (80%) and Northern Africa and the Middle East (64%) look for a balance between sources who believe that there are anthropogenic causes for climate change and sources who do not believe in climate change.
- ▶ Scientists from their own country (92%) and health professionals (90%) are the main sources the journalists would consider including in a story about a disease outbreak in a local community.
- ▶ In response to a related question, 60% of respondents agreed that a scientist's opinion on a subject should be reported differently than a non-scientist's opinion.
- ▶ For two-thirds of survey participants, it is acceptable for journalists and their scientist sources to become friends.

- ▶ Journalists are more divided on receiving gifts, invitations, or paid trips to cover conferences from their sources: 37% think it is acceptable in some circumstances, 36% think it is acceptable if journalists can maintain independence in their coverage, and 27% consider it unacceptable.
- ▶ For 55% of participants, it is not acceptable that science journalists cover organizations that have paid for their work. This practice is more acceptable to respondents from Latin America (54%), Northern Africa and the Middle East (56%), and Sub-Saharan and Southern Africa (56%).
- ▶ There is general agreement (74%) that science journalists should declare the source of their funding to carry out their work.
- ▶ About half (51%) of participants from the USA/Canada and 38% from Europe/Russia ranked the country where they live/work as good in terms of protecting media ethics. In Asia/Pacific, the situation is divided between good and poor (39% for each option). In the other regions, the situation is considered poor: 51% in Latin America, 48% in Sub-Saharan and Southern Africa, and 42% in Northern Africa and the Middle East.
- ▶ Low pay was cited as the main issue affecting ethical science reporting by 63% of respondents, followed by pressure to provide news that attracts an audience (58%), fake news (56%), and political or corporate spin (52%). In Latin America and Sub-Saharan and Southern Africa, the main issues or violations of ethical reporting are low pay (78% and 75%, respectively), fake news (66% and 64%), and pressure to provide news that attracts an audience (59% and 58%). In Northern Africa and the Middle East, the three main problems are low pay (73%), fake news (55%), and lack of editorial freedom (45%). Pressure to provide news that attracts audience was the most chosen option by participants from Asia/Pacific (55%), Europe/Russia (59%) and the USA and Canada (67%).
- ▶ Half of the participants think that professionals from areas other than journalists should not be allowed to shape the ethical priorities of science journalism.
- ▶ Globally, 72% of respondents said that there is a science journalism association in their country. However, 45% could not say whether the association has codes of ethics for science journalism.

1. Origins of the Project



The Kavli Foundation, established in 2000 by Norwegian-American physicist Fred Kavli to promote science for the benefit of humanity, has regularly partnered with the WFSJ on various projects. The World Federation of Science Journalists (WFSJ), a non-profit Canadian organization incorporated in 2005, is made up of more than 60 member associations in 51 countries and has an extended membership of some 10,000 people who work in various areas of science journalism and science communication. Kavli and the WFSJ share an ongoing interest in the principles and values that guide the practice of science journalism, which in 2020 led to a project dedicated to framing these concepts in a formal statement that could be adopted by the WFSJ on behalf of its members.

This undertaking began with a strategic two-day workshop held in San Jerónimo (Antioquia, Colombia) in November 2021, which included stakeholders in science journalism. Their discussions yielded a document that laid the foundation for a regional survey of science journalists across Latin American countries, with the ultimate aim of expanding this exercise to a global level.

The discussion topics covered in the workshop were divided into the following 12 categories, to facilitate and delimit the debate:

- ▶ Training as a science journalist.
- ▶ Deontology of science journalism.
- ▶ Freedom of expression.
- ▶ Financing.
- ▶ Intellectual property and copyright.
- ▶ Fact-checking.
- ▶ Scientific dissemination versus science journalism.
- ▶ The 'rediscovery' and 'recolonization' of Latin America.
- ▶ Gender.
- ▶ Inclusion and diversity.
- ▶ The role of associations and communities of science journalists.
- ▶ Digital footprint.

In a second step, Brazil's National Institute of Public Communication of Science and Technology was invited by the WFSJ, via Tim Lougheed, to come on board to field the regional survey of Latin American science journalists, based on its 20 years of experience in designing surveys for different sectors of society, including for science journalists (see Massarani et al., 2012, 2013; Bauer et al., 2013; Massarani et al., 2021a, 2021b). The survey was carried out from 7 to 20 February, 2022, with 179 responses from professionals from 18 countries in the region (Massarani et al., 2022).

The questionnaire, then in English, Spanish, and Portuguese versions, was translated into French, Russian, Chinese, and Arabic in order to carry out the survey globally.

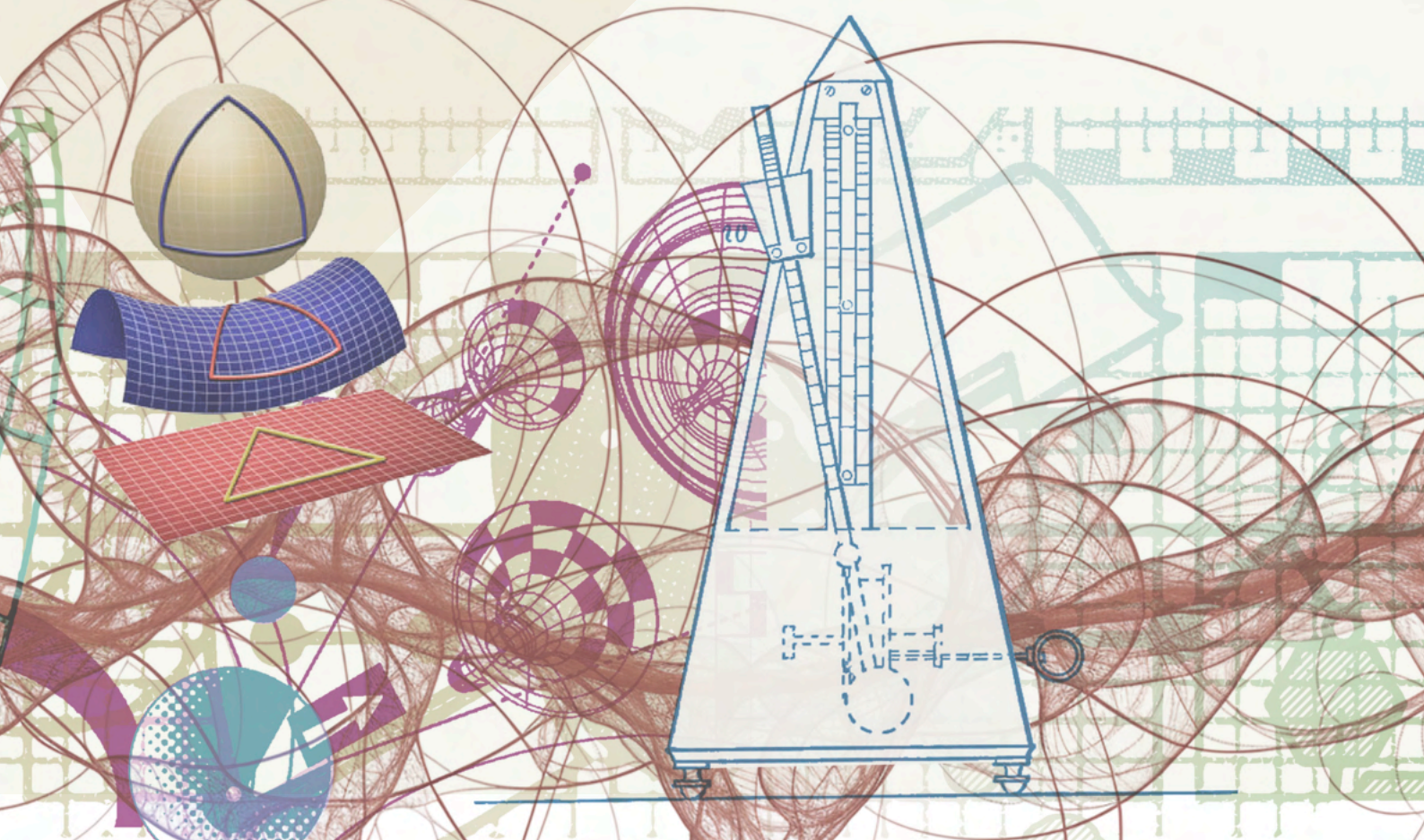


2. Methodology

The questionnaire consisted of 32 questions – seven closed, two open, and 23 mixed. Open and mixed questions allowed the respondent to make a comment. Nineteen of the questions were new, being specifically designed for this survey; these were dedicated to thinking about ethical issues in science journalism. Two other questions related to government protection of media ethics and violations of ethical reporting were adapted from the Media Ethics in the Post-Truth Era survey (CIME, 2018), while six questions related to professional ethos were adapted from the Global Science Journalism Report 2021 (Massarani et al., 2021a), which, in turn, used a revised version of the questionnaire applied in the first edition of that survey, in 2013 (Boltanski & Maldidier, 1977; McGovern et al., 2004; Pew Research Center, 2004, 2007; Brumfiel, 2009; Massarani et al., 2012). The remaining five were demographic questions.

Responses were collected from March 7 to July 20, 2022. The distribution of the questionnaire, available in English, Spanish, French, Portuguese, Arabic, Chinese and Russian, was carried out through the science journalism associations of the countries in each region and through science journalism groups on social media. We also contacted stakeholders and asked them to complete the survey and to share it with other science journalists.

As in the Global Science Journalism Report (Bauer et al., 2013; Massarani et al., 2021a), we emphasize that there is no exact definition of what a science journalist is, in terms of educational qualification, employment situation, or professional practice. In this sense, the survey participants are considered science journalists because they identify themselves that way. Therefore, some questions sought to identify the respondents' relationship with science journalism.



For the same reason, it is difficult to estimate the number of science journalists globally. Hence, it is impossible to define a population and what would be a representative sample. Our survey is based on a random sample consisting of 505 responses, and our results are presented in terms of descriptive statistics. Even so, following previous experience (Bauer et al., 2013; Massarani et al., 2021a), we present the responses grouped according to the participant's countries, divided into six regions: Asia/Pacific, Europe/Russia², Latin America, Northern Africa and the Middle East, Sub-Saharan and Southern Africa, and the USA and Canada. Although the sample composition is a limitation of the survey, we emphasize the survey's valuable contribution to identifying trends and patterns in science journalism worldwide, as well as possible evidence of regional differences.

As it was not mandatory to answer all the questions, some respondents left some questions blank. Therefore, when presenting the results, we always indicate the n value corresponding to the question.

² As mentioned before, this study started before the current conflict between Russia and Ukraine. Russia is partially in Europe and partially in Asia. We defined Europe/Russia as a region following previous surveys with science journalists (see for example Massarani et al., 2021a). According to the United Nations, Russia is part of Europe (see <<https://unstats.un.org/unsd/methodology/m49/#geo-regions>>). The number of responses from the combined Europe/Russia region was 110, of whom 10 were from Russia.



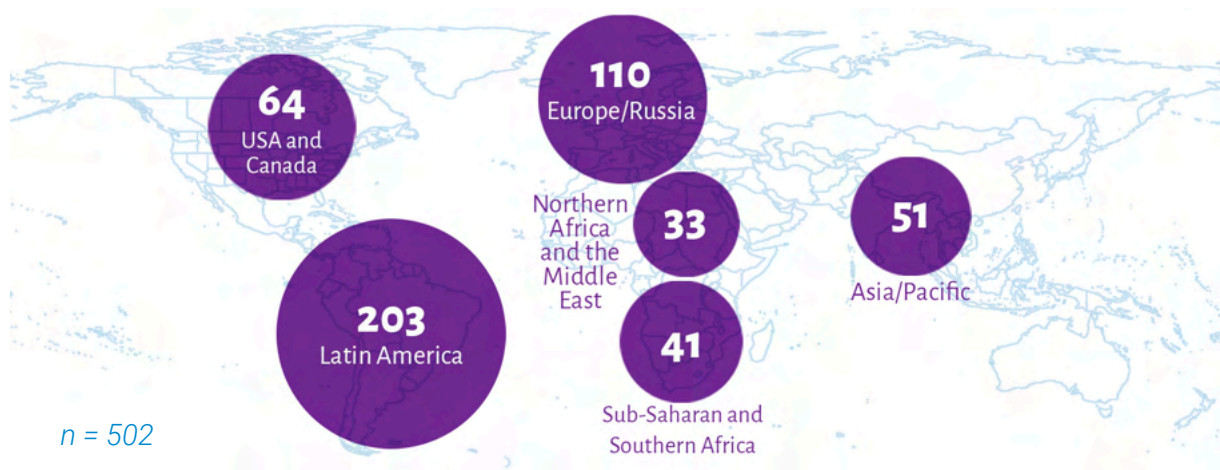
3. Results

3.1. Profile of the respondents

Science journalists from 82 countries participated in the survey. Latin American professionals represent 40% of respondents (Figure 1). Next in number are participants from Europe/Russia (22%), USA and Canada (13%), and Asia/Pacific (10%). Journalists from Sub-Saharan and Southern Africa and Northern Africa and the Middle East account for 8% and 7% of the survey, respectively.

Figure 1:

Respondents, by world region



Just over half of the respondents (53%) identified themselves as female professionals (Figure 2). Male professionals represent 45% of the participants. Almost all regions present this pattern (Figure 2a). Latin America and Europe/Russia had the highest percentage of female professionals (59%) in the sample. The situation is notably different in countries on the African continent and in the Middle East. The proportion of male journalists was 70% in Northern Africa and the Middle East, and 78% in Sub-Saharan and Southern Africa.

Figure 2:
Gender of respondents

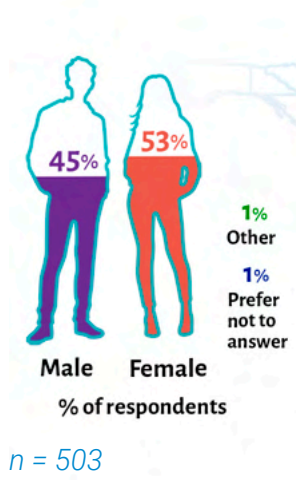
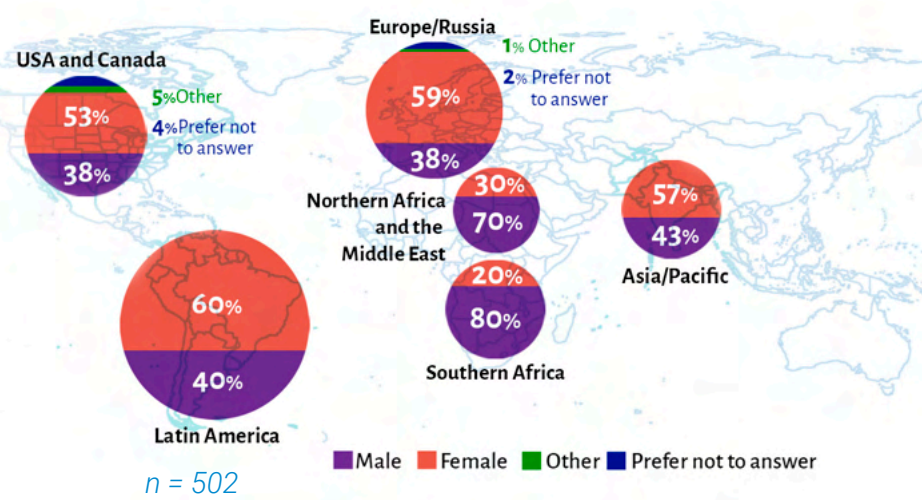


Figure 2a:
Gender of respondents, by world region



Regarding age, there is a relative balance between journalists aged 35 to 44 years (28%) and 45 to 54 years (25%) (Figure 3). The age groups from 25 to 34 years and over 54 years have 22% of respondents each. Only 3% of science journalists are between 18 and 24 years old. There are imbalances in some regions (Figure 3b). In Europe/Russia and the USA and Canada, professionals over 54 years old prevail (32% and 34%, respectively). Sub-Saharan and Southern Africa is the only region where the proportion of participants 24 years old and younger exceeds 10%.

Figure 3:
Age of respondents

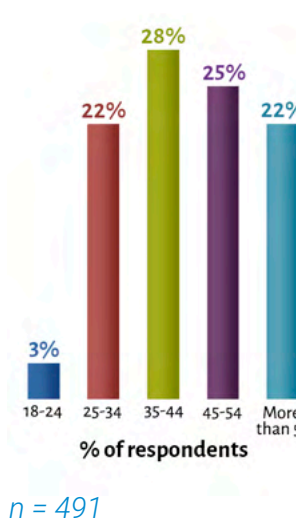
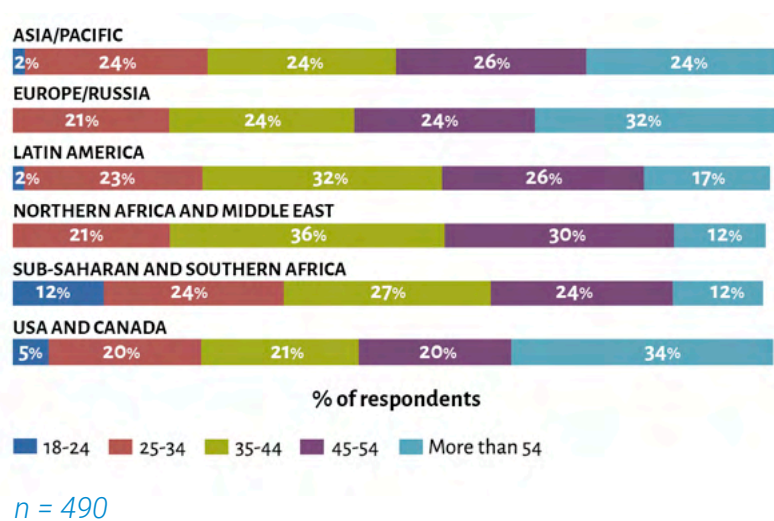


Figure 3a:
Age of respondents, by world region

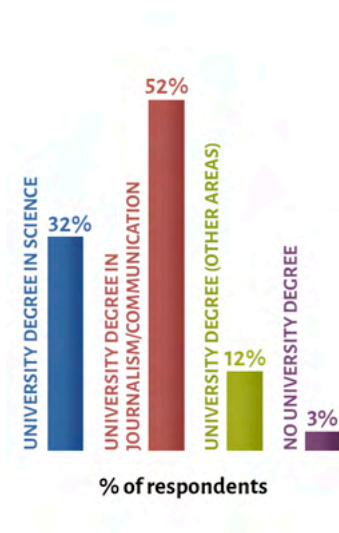


About half of the respondents (52%) have a university degree in journalism/communication (Figure 4). The next most common types of training are a university degree in science (32%), a university degree in another area (12%), and no university degree (3%). The proportion of participants with a university degree in journalism/communication is slightly higher in Sub-

Saharan and Southern Africa (45%) and the USA and Canada (47%) and highest in Latin America (74%) (Figure 4a).

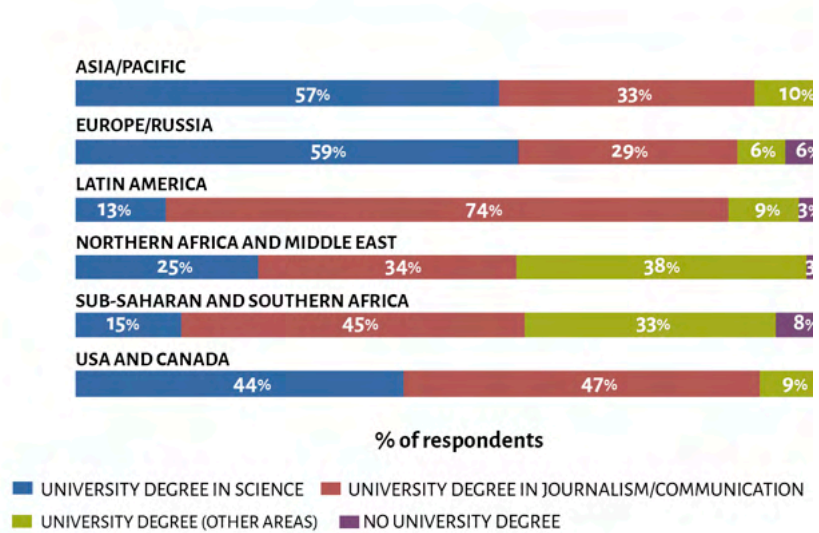
In Asia/Pacific and Europe/Russia, there is a predominance of respondents with a university degree in science (57% and 59%, respectively). In Northern Africa and the Middle East, there is a distinct predominance of journalists holding a university degree in other areas (38%). Participants without a university degree represent a small portion of the survey and are absent in Asia/Pacific and the USA and Canada.

Figure 4:
Training background



n = 500

Figure 4a:
Training background, by world region

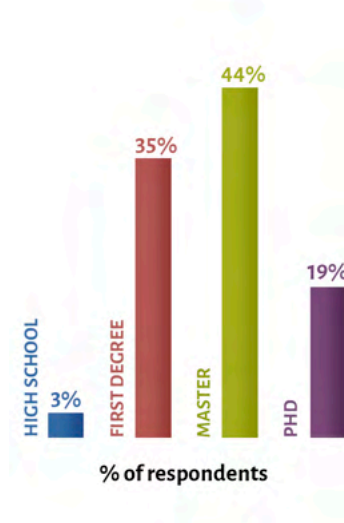


n = 499

As for the level of education, the highest percentages are master's degree (44%) and first degree (35%) (Figure 5). Nineteen percent of science journalists who responded to the survey have a PhD, and only 3% have just a high school degree. The first degree predominates in Sub-Saharan and Southern Africa (60%) and Northern Africa and the Middle East (48%) (Figure 5a).

In Latin America, similar proportions hold a first degree (43%) and a master's degree (42%). The latter is the educational level of the highest proportion of respondents from Asia/Pacific (57%), Europe/Russia (48%) and the USA and Canada (45%). Professionals with PhDs represent 33% of respondents in Europe/Russia – the highest proportion of this educational level among the regions.

Figure 5:
Level of education

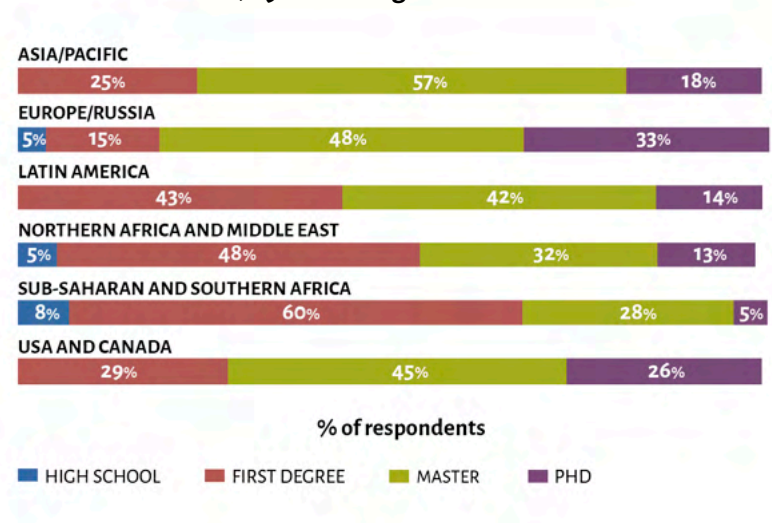


n = 498

The proportion of more experienced respondents is 36% (more than 16 years of work in science journalism) (Figure 6). Next are professionals with six to ten years of experience (26%), less than five years (22%), and 11 to 15 years (17%).

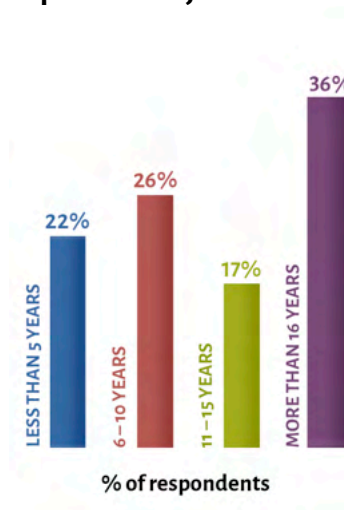
The proportion of more experienced journalists exceeds 30% in Latin America and Europe/Russia and 40% in Asia/Pacific and the USA and Canada (Figure 6). In Sub-Saharan and Southern Africa, there is a relative predominance of less experienced professionals (37% with less than five years of work). In Northern Africa and the Middle East, 30% of journalists have less than five years of experience or have between 11 and 15 years of experience.

Figure 5a:
Level of education, by world region



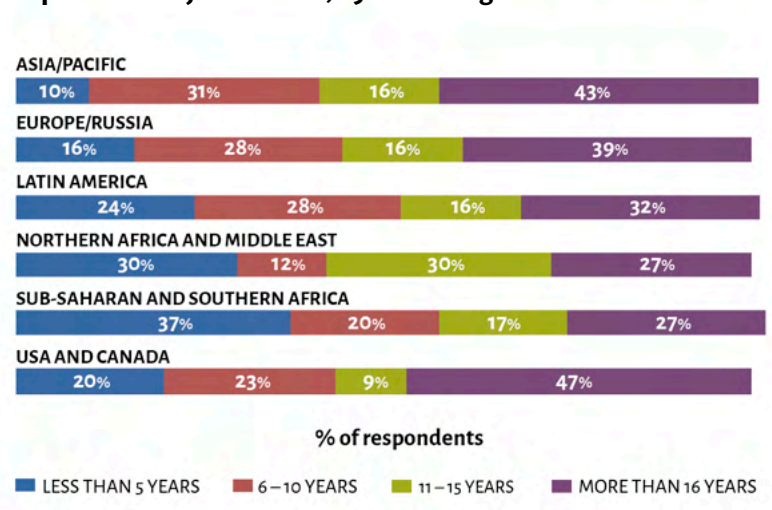
n = 497

Figure 6:
Experience in journalism



n = 502

Figure 6a:
Experience in journalism, by world region



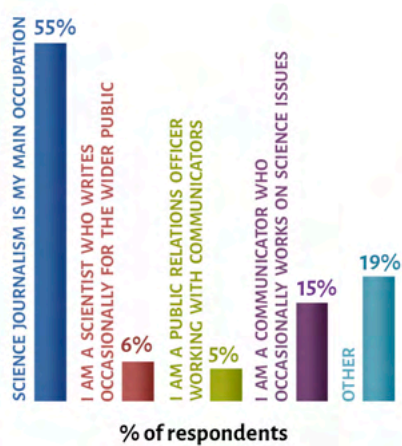
n = 501

3.2. Professional area and employment situation

Just over half of the survey participants (55%) have science journalism as their main occupation (Figure 7). The remaining respondents said they are communicators who occasionally work on science issues (15%), scientists who occasionally write for the wider public (6%), and public relations officers working with communicators (5%). Nineteen percent of participants declared other occupations, such as science writer, teacher, researcher, or government employee.

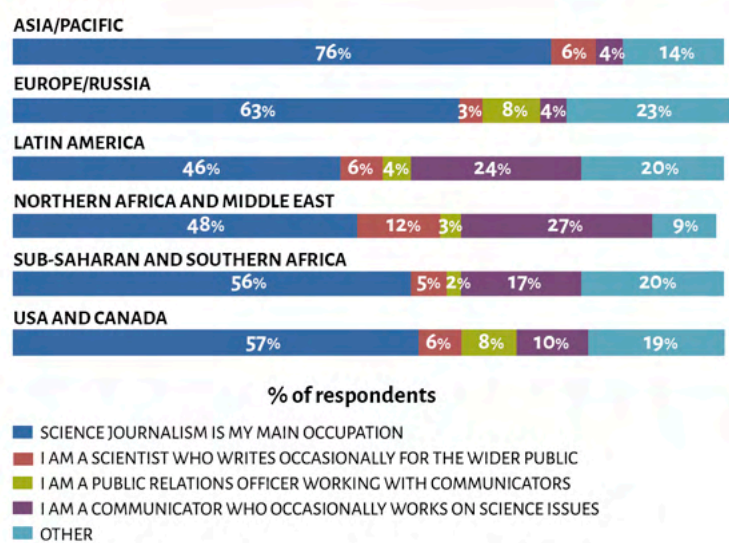
Regionally, science journalism is the main occupation among respondents from Asia/Pacific (76%) and Europe/Russia (63%) (Figure 7a). The proportion is smaller, but still prevalent, in the USA and Canada (57%), Sub-Saharan and Southern Africa (56%), Northern Africa and the Middle East (48%), and Latin America (46%). In the last two, a slight percentage of respondents said they are communicators who occasionally work on science issues (24% and 27%, respectively).

Figure 7:
Main activity



n = 501

Figure 7a:
Main activity, by world region

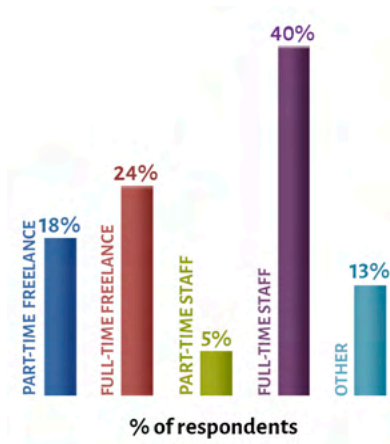


n = 500

Full-time staff is the employment position of 40% of respondents (Figure 8). Full-time freelance (24%) and part-time freelance (18%) appear with lower percentages. A small number of participants (5%) declared working as part-time staff. Other employment roles were reported by the remaining 13%: entrepreneur, retiree, student, and independent professional.

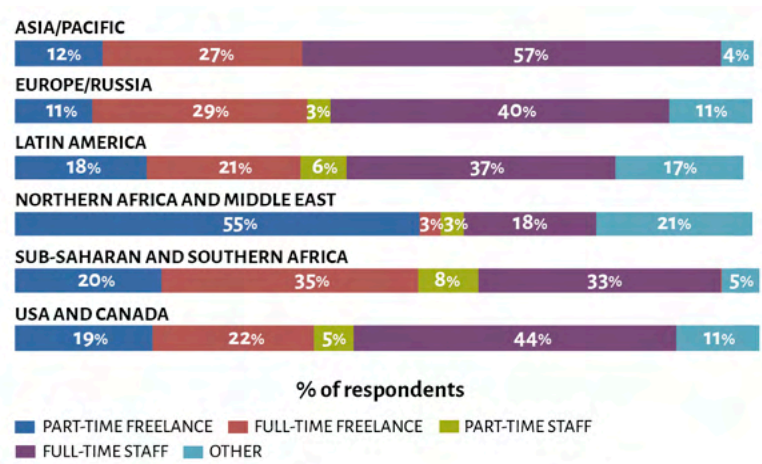
In Sub-Saharan and Southern African countries, there is a slightly higher proportion of journalists working as full-time freelancers (35%) (Figure 8a). Northern African and Middle Eastern countries present a very different situation – 55% of participants from this region declared that they work as part-time freelancers.

Figure 8:
Employment position



n = 500

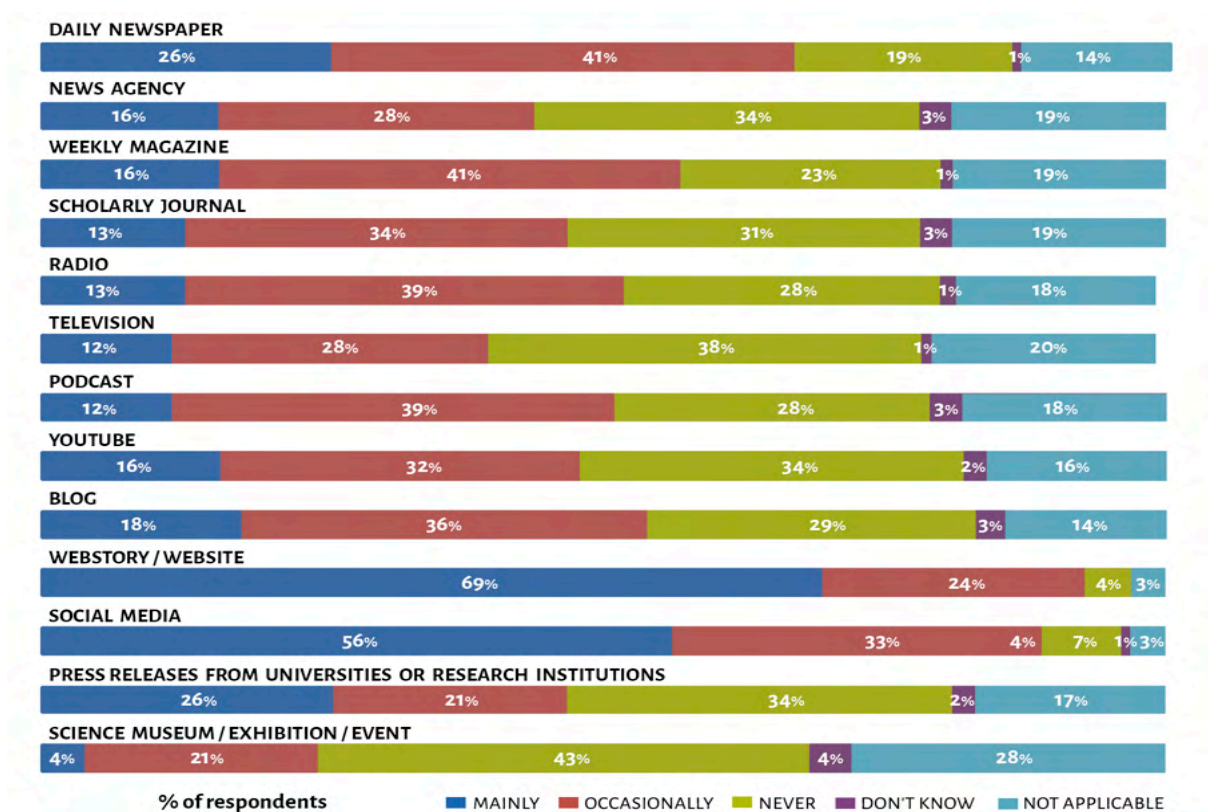
Figure 8a:
Employment position, by world region



n = 499

The work of journalists who responded to the survey is mainly published in online media – 69% in web story/website and 56% in social media (Figure 9). Among the media in which the work appears occasionally are daily newspaper (41%), weekly magazine (41%), radio (39%), podcast (39%), blog (36%), scholarly newspaper (34%) and YouTube (32%). In contrast, the media where many journalists said their work never appears are science museum/exhibition/event (43%), television (38%), news agency (34%), and press releases from universities or research institutions (34%).

Figure 9: Media in which the work appears



n = 496

3.3. Reporting science: roles, neutrality and uncertainties

For 38% of respondents, the role that best defines their work as science journalists is “to inform” (Figure 17). “To explain science” (28%), “to promote science” (15%), and “to be a public watchdog” (8%) appear next. Furthermore, participants pointed to other roles (8%), such as educating, explaining the impact of science and technology on everyday life, connecting science to society, promoting citizenship and democracy, raising awareness, and producing media products that are entertaining, approachable, valuable, and relevant.

The proportion of those who chose “to inform” was higher among professionals from the USA and Canada (62%) (Figure 10). This role dominated to a lesser extent in Sub-Saharan and Southern Africa (49%) and Europe/Russia (45%). The survey shows a more balanced situation in Latin America (33% chose “to inform” and 31% “to explain science”) and Asia/Pacific (27% chose “to explain science,” 25% “to inform,” and 22% “to promote science”). The most significant contrast was in Northern Africa and the Middle East, where 59% of respondents said that what best describes their role as a science journalist is promoting science.

Figure 10:
Science journalist roles

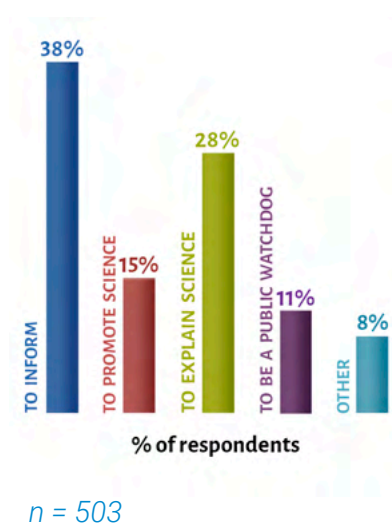
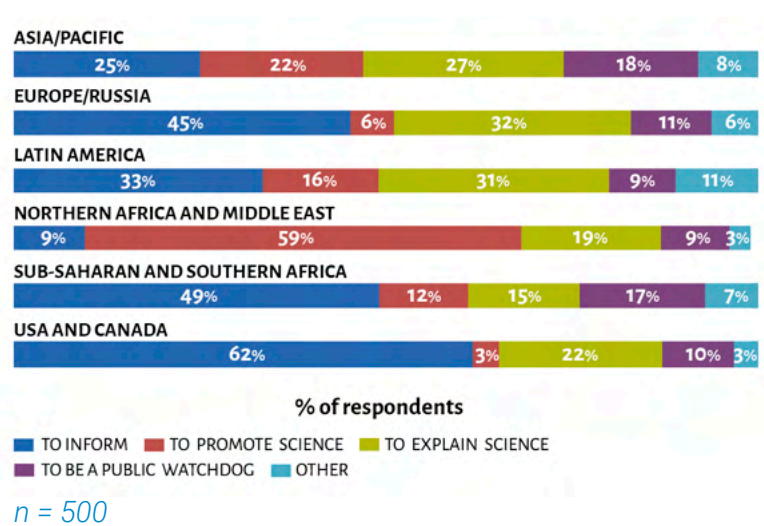


Figure 10a:
Science journalist roles, by world region



Note: The question was worded as follows: “How would you define your role as science journalist? (Please select only the one that best describes your role).”

Asked whether science journalists can be neutral about the subjects they cover, 57% of survey participants answered no, and 35% answered yes (Figure 19). Nine percent said they don’t know.

The highest proportions of respondents who think that science journalists can be neutral were seen in Sub-Saharan and Southern Africa (80%) and Northern Africa and the Middle East (82%) (Figure 20). This percentage reached 65% in the USA and Canada, 60% in Europe/Russia,

and 53% in Asia/Pacific. Latin America was the only region with a different pattern: 48% said science journalists cannot be neutral, and 44% said they can.

The following comments illustrate the range of viewpoints.

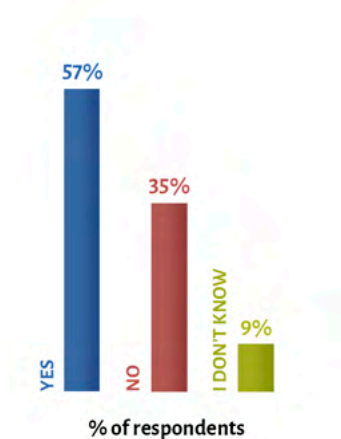
“Neutrality could be an ideal goal to set for someone, but then we have to deal with sources, culture, opinions, aims, beliefs... independence and transparency are the necessary qualities, not neutrality.” (Respondent from Italy)

“It’s incredibly challenging but it can be done. I think journalists with a scientific background are more likely to write well-balanced pieces, although this is not always the case.” (Respondent from Canada)

“I would argue that no journalism is ever actually neutral or objective, and science journalism is no different in this regard. However, journalism (science or general) can strive to be neutral, though in my experience that’s rarely ever the case.” (Respondent from Finland)

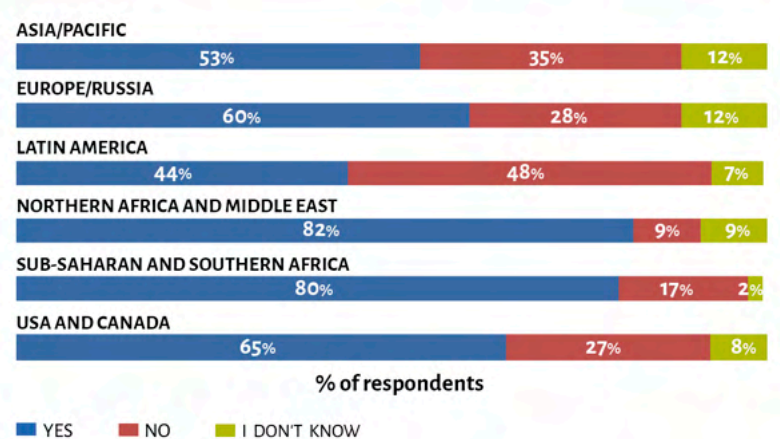
“Journalism, like any social activity, has a political component. Denying that is denying existence itself. The so-called ‘neutrality’ cannot avoid being functional to certain interests.” (Respondent from Peru)

Figure 11:
The possibility of neutrality in science journalism coverage



n = 503

Figure 11a:
The possibility of neutrality in science journalism coverage, by world region



n = 500

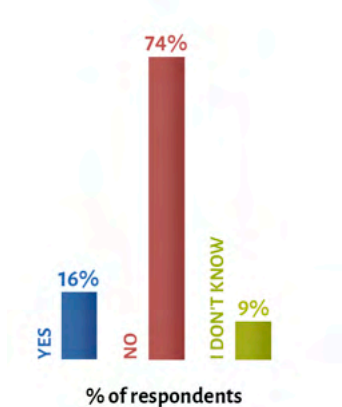
Note: The question was worded as follows: “In your opinion, can science journalists be neutral about the subjects they cover?”

Most participants (74%) agree that scientific findings should not be reported as certainties (Figure 12). For 16% of respondents, findings should be reported as certainties. Another 9% did not know how to respond. This scenario played out in all regions (Figure 22).

“The laws of physics exist and do not have to be discussed as if they are uncertain. Many scientific findings can be reported in a straightforward way. What was observed, was observed and adds to the world’s knowledge. In order to help audiences interpret scientific results, every story should convey the level of certainty and uncertainty around reported findings, the existence and nature of contradictory evidence, and questions about methods, context, scale, and applicability.” (Respondent from the United States)

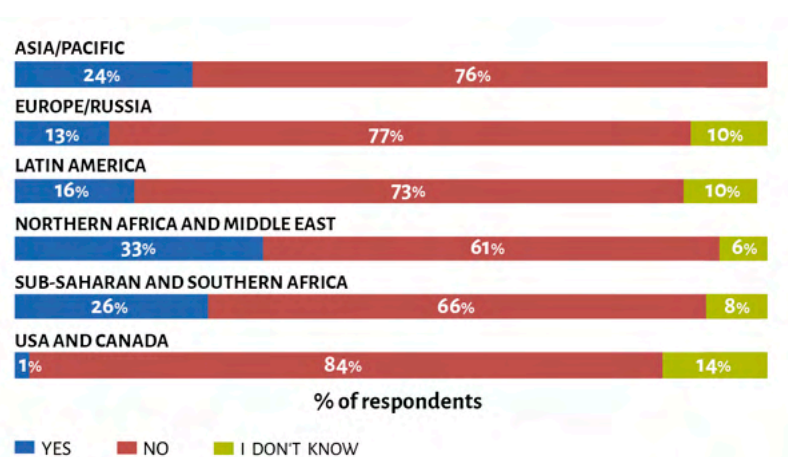
“Science presupposes discussion and controversy. There is no official truth in science; the search for any conceivable approach to truth demands a context of free inquiry. Official truths led Giordano Bruno to the stake and Galileo to a reluctant retraction (‘eppur si muove’); nevertheless, official truths continue to thrive, like undesirable weeds, in the most unsuspected cultivars.” (Respondent from Brazil).

Figure 12:
Reporting scientific findings as certainties



n = 499

Figure 12a:
Reporting scientific findings as certainties, by world region



n = 496

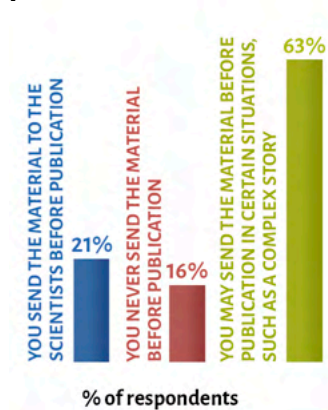
Note: The question was worded as follows: “Should scientific findings be reported as certainties?”

If a scientist asks the journalist to send material before publication, 63% of survey respondents said they may do it, but only in certain situations, such as a complex story (Figure 13). The remaining participants were divided: 21% send the material before publication in any situation, and 16% never do it.

In all regions, sending the material before publication in situations such as a complex story

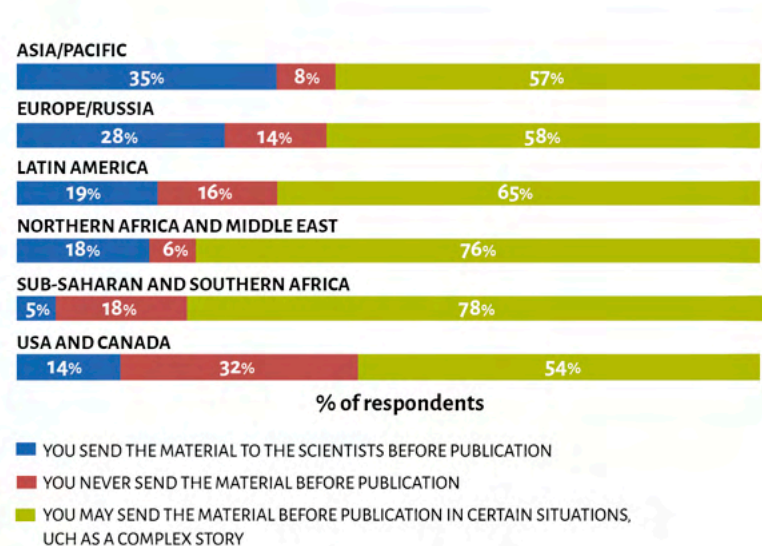
was the most common option (Figure 13a). However, a slightly higher proportion of Asia/Pacific respondents (35%) said they send the material in any situation, while 32% of the USA and Canada respondents said they never send the material prior to publication.

Figure 13:
Sending material before publication



n = 502

Figure 13a:
Sending material before publication, by world region

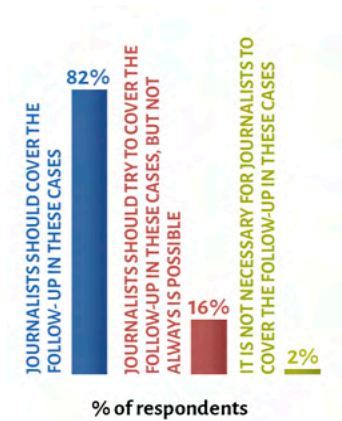


n = 499

Note: The question was worded as follows: “Some interviewees ask science journalists to send them the material before publication. What do you do when a scientist asks you to send the material before publication? (Please select only one answer).”

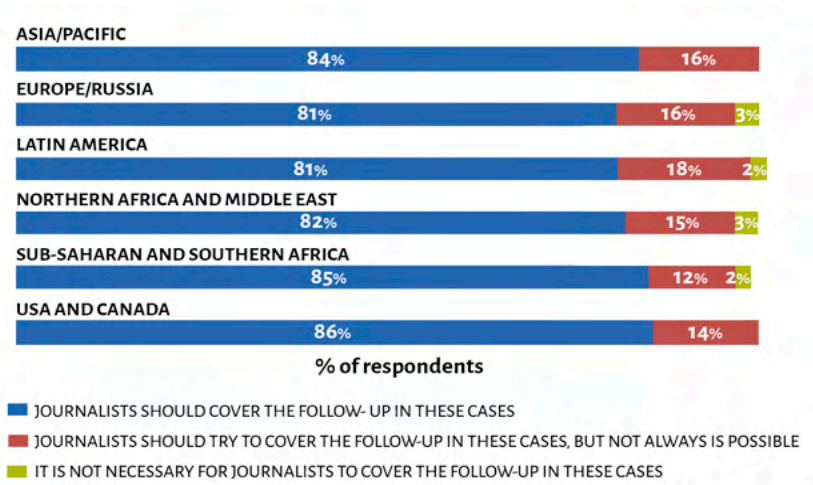
In a hypothetical situation where the media reported a fraud involving a scientist, we asked what action journalists should take if that scientist were later found to be innocent. The majority of respondents (82%) answered that journalists should cover the follow-up in these cases (Figure 14). Sixteen percent responded that, although journalists should cover the follow-up, this is not always possible. Only 2% said that it is not necessary to cover it. All regions showed a similar pattern (Figure 14a).

Figure 14:
Coverage of fraud



n = 500

Figure 14a:
Coverage of fraud, by world region



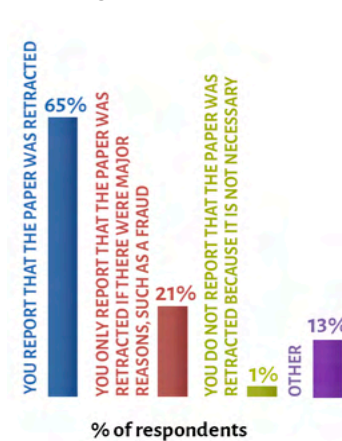
n = 498

Note: The question was worded as follows: “Imagine a situation in which a fraud involving a scientist has been reported in the media. However, it is later discovered that this scientist was innocent. Given this new situation, what should journalists do?”

We also asked what should be done if a journal later retracted a scientific paper the journalist reported. About two-thirds (65%) responded that they would report the retraction, while 21% answered they only report it if there were major reasons, such as fraud (Figure 15). Among regions, the exception was Northern Africa and the Middle East, where the latter option prevails, albeit with a moderate percentage of 42% (Figure 15a).

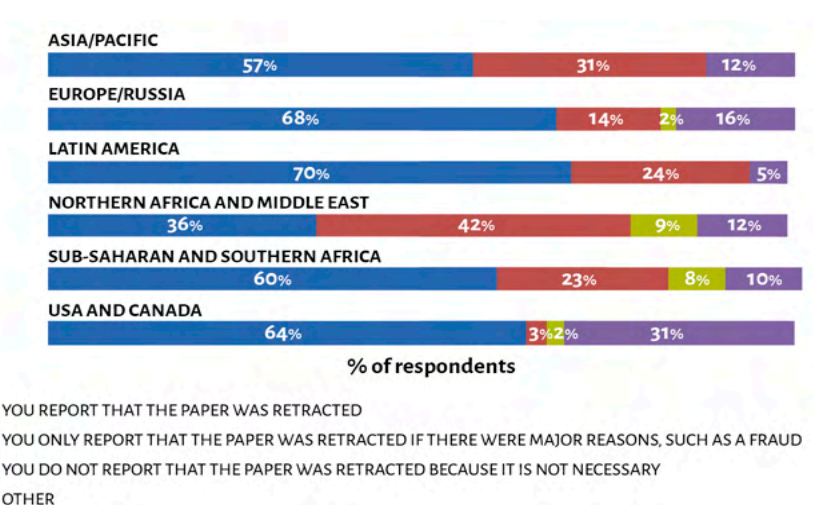
Participants could point out other actions to be taken in such a situation, including evaluating on a case-by-case basis, consulting the editors, updating the original story or adding an editor’s note.

Figure 15:
Coverage of retracted papers



n = 502

Figure 15a:
Coverage of retracted papers, by world region



n = 500

Note: The question was worded as follows: “Imagine a situation in which a scientific paper you reported on was retracted by the journal. What do you do?”

A more decisive stance was taken when the error comes from the journalists themselves. We asked what the participants would do if they realized there were errors after publishing coverage on a specific science topic. Most professionals (76%) said they would correct the errors (Figure 16). Seventeen percent considered correction necessary only in the case of major errors. Unconditional error correction achieved high rates in all sets of countries (Figure 16a).

Commenting on the response, some journalists added that a disclaimer or apology should accompany the correction. The following comments illustrate the answers to the questions about retractions and errors:

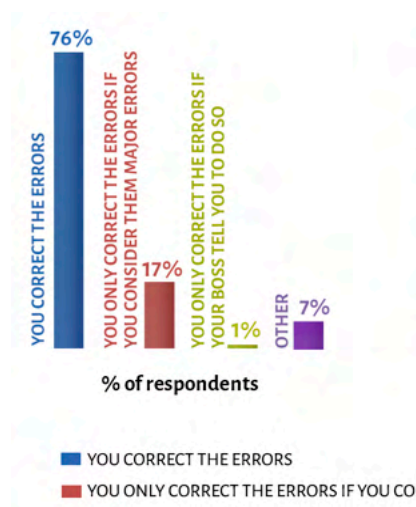
“Whoever reported the fraud in the first place should follow it up and inform their audience about the development. Journalism is not Twitter, where it seems that there is no responsibility for what is said. The journalist must be responsible for what he says, be honest in order to be fair to those who are being judged.” (Respondent from Spain)

“How and why the claims of fraud were made then refuted provides an interesting informative story. If findings have been questioned in a trial and found to be genuine, they could be very important, and reporting this can prevent misinformation.” (Respondent from the United Kingdom)

“If a scientist is wrongly accused and I reported the story, it is my ethical obligation to put the record straight when the scientist is found innocent. It is an obligation.” (Respondent from Uganda)

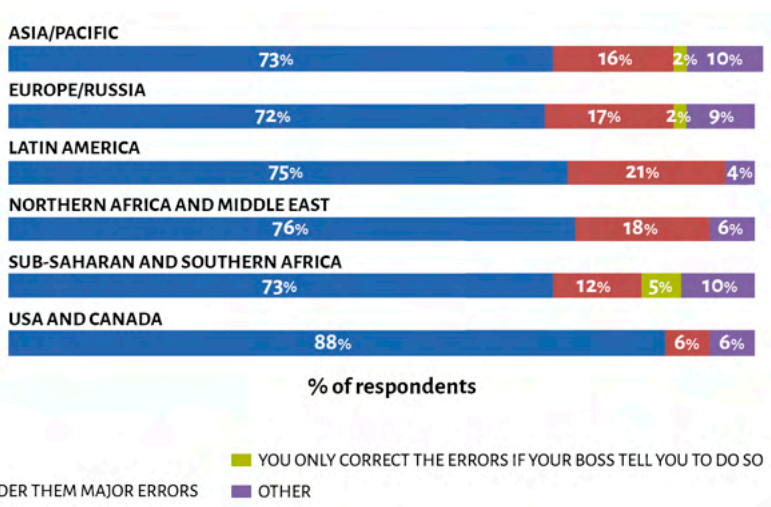
“If they are errors such as misspelled names or positions, it can be evaluated. But if they are errors that can modify the objective and the outcome of the story itself, such as false statements, the corresponding clarification should be published or disseminated. Maintaining professional journalistic credibility and respect is essential.” (Respondent from Chile)

Figure 16:
Correction of errors in coverage



n = 503

Figure 16a:
Correction of errors in coverage, by world region

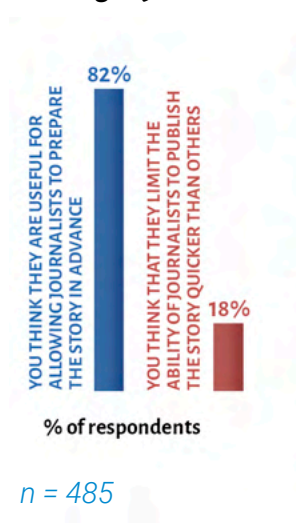


n = 501

Note: The question was worded as follows: “You realize that there are some errors after publishing coverage on a specific science topic. What do you do?”

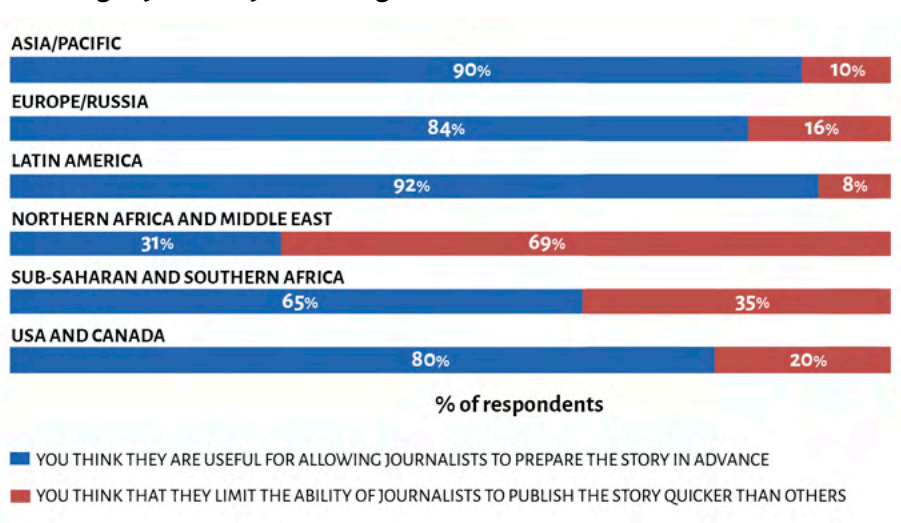
About 80% of respondents think that the embargo system is useful for allowing journalists to prepare the story in advance (Figure 17). This proportion reaches 92% in Latin America, 90% in Asia/Pacific, 84% in Europe/Russia, and 80% in the USA and Canada (Figure 17a). The proportion is smaller, but still predominant, in Sub-Saharan and Southern Africa (65%). However, for 69% of Northern African and Middle Eastern journalists, the embargo system is seen as limiting the ability of journalists to publish the story quicker than others.

Figure 17:
Embargo system



n = 485

Figure 17a:
Embargo system, by world region



n = 483

Note: The question was worded as follows: “About the embargo system... (Please select only one answer).”

3.4. Sources

When selecting sources for their stories, 73% of science journalists tend to privilege the most important scientists in the field (Figure 18; this question allowed choosing more than one option). The other criteria were: a balance of gender (45%); scientists who are more accessible, even if they are not the most prominent expert in the subject (37%); a balance in terms of age and time of experience in science (32%).

Among the regions, the pattern was different the USA and Canada, where 67% of respondents said they look to have a gender balance (Figure 18a). This option was also chosen by 51% of professionals in Latin America. The other two options were selected by lower percentages in those regions.

In detailing their responses, some journalists raised other interesting points.

“I look for diverse sources not only on the basis of gender. I try to include as many BIPOC³ scientists as possible in my stories. I try to avoid stories that only feature straight white males.”
(Respondent from Canada)

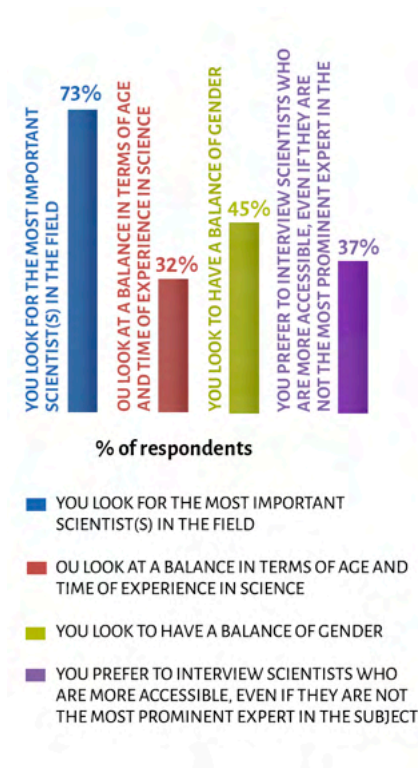
“In Pakistan, most of the scientists are not prepared to discuss even the basic science with media. Therefore, we are left with very little or no options to contact a suitable/relevant scientist.” (Respondent from Pakistan)

“It is always important to search for sources from groups underrepresented in science and also to find scientists with independent and up-to-date perspectives. The ‘most important scientist’ in a field sometimes is resistant to new types and sources of evidence that contravene long-held dogma.” (Respondent from the United States)

“I seek recommendations from scientists, and from other colleagues in the press. I do not limit myself to language or country, but it is a reality that the rush of publication makes it more difficult to locate sources in places with other hours.” (Respondent from Costa Rica)

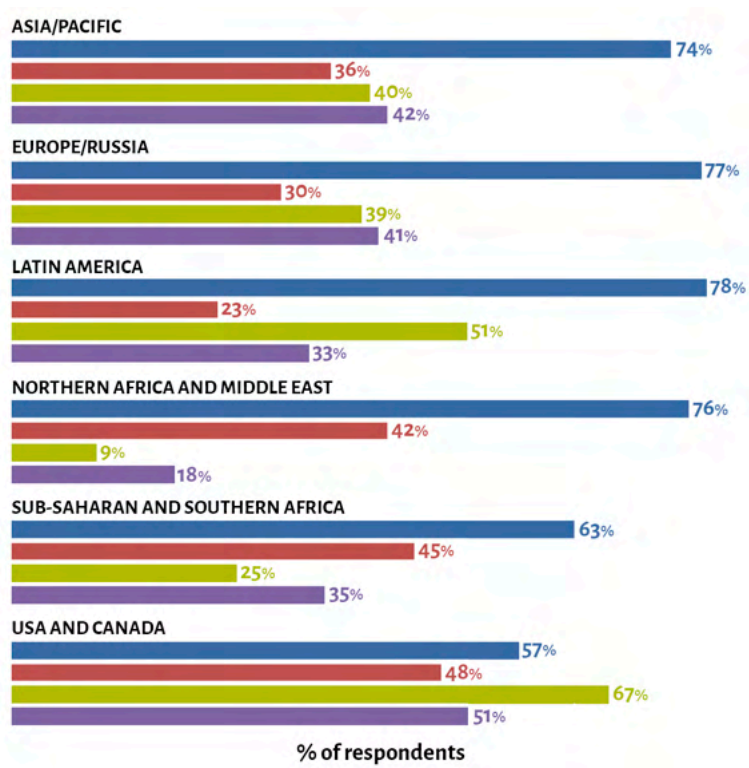
³ Black, Indigenous, People of Color.

Figure 18:
Selection of sources



n = 496

Figure 18a:
Selection of sources, by world region



n = 494

Note: The question was worded as follows: “When you are preparing a story, how do you choose your sources? (Select all the options that apply).”

Two questions related to topics that are often the focus of denialists. First, 56% of participants said that a story about the development of a new vaccine should only have sources that support vaccination as a form of disease prevention (Figure 19). For 44%, there must always have a balance between sources that support and contradict vaccination as a form of disease prevention. One participant said that a story should only have sources that contradict vaccination as a form of disease prevention, which can be considered null in percentage terms.

The highest percentages of the first option were seen among journalists from the USA and Canada (89%), Europe/Russia (67%), and Latin America (59%) (Figure 19). By contrast, in Sub-Saharan and Southern Africa (88%) and Northern Africa and the Middle East (79%), more professionals think that there must always be a balance between sources that support and contradict vaccination as a form of disease prevention.

Figure 19:
Selection of sources in vaccine coverage

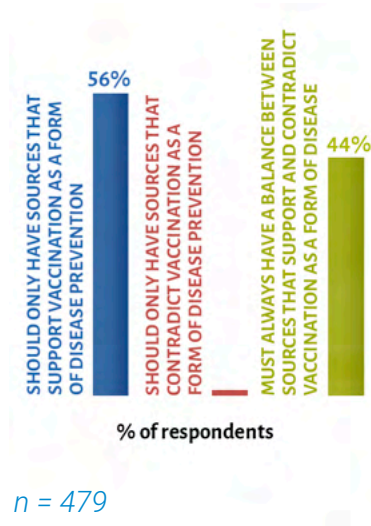
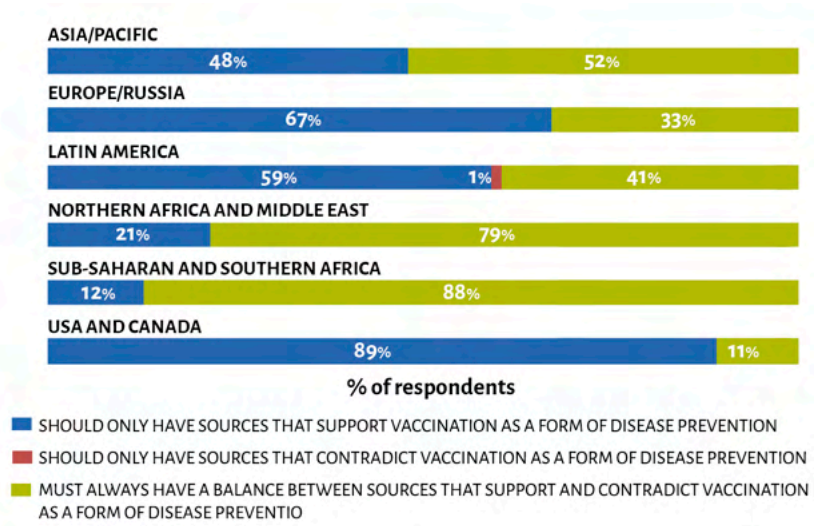


Figure 19a:
Selection of sources in vaccine coverage, by world region



Note: The question was worded as follows: “Do you think a story about the development of a new vaccine... (Please select only one answer).”

In the second case, climate change coverage, 66% of respondents choose sources who believe there are anthropogenic causes for climate change, and 34% look for a balance between these sources and sources who do not believe in climate change (Figure 20).

The proportion of participants who responded that they choose sources that believe there are anthropogenic causes for climate change is 93% in the USA and Canada, 75% in Europe/Russia, 70% in Latin America and 56% in Asia/Pacific. A more significant proportion of science journalists from Sub-Saharan and Southern Africa (80%) and Northern Africa and the Middle East (64%) look for a balance between sources who believe that there are anthropogenic causes for climate change and sources who do not believe in climate change.

Figure 20:
Selection of sources in vaccine coverage

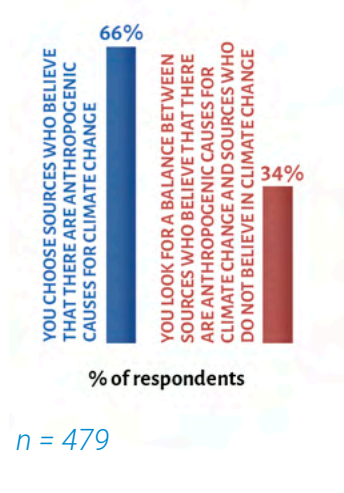
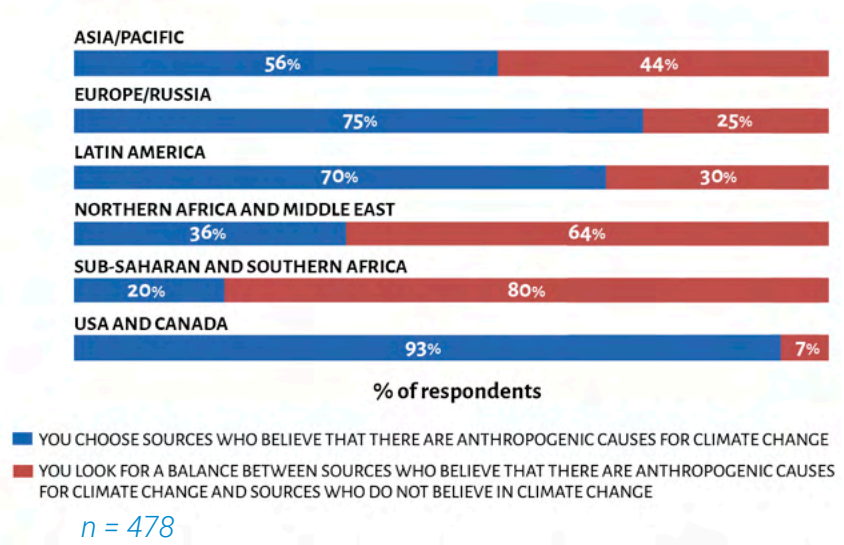


Figure 20a:
Selection of sources in vaccine coverage, by world region



Note: The question was worded as follows: “You are covering a story about climate change... (Please select only one answer).”

Regarding the topics addressed in the questions above, here are some comments from the respondents:

“Journalism (as a profession) teaches you that you should see both sides of the subject, but science journalism doesn’t work like that. This is a very careful issue because, as always, there is a whole spectrum to evaluate. If there is adequate space to show that science is not a point of view, but a series of proven results, the anti-vaccine version could be included. But it depends on the context, the space and the freedom of the science journalist to deal with the subject. Never to make fun of anti-science positions.” (Respondent from Colombia)

“Vaccination for disease prevention is so effective that to cast doubt on that overall effectiveness is irresponsible. That said, science journalists should report responsibly on individual vaccines, including address the balance of efficacy vs side effects and risks.” (Respondent from Australia)

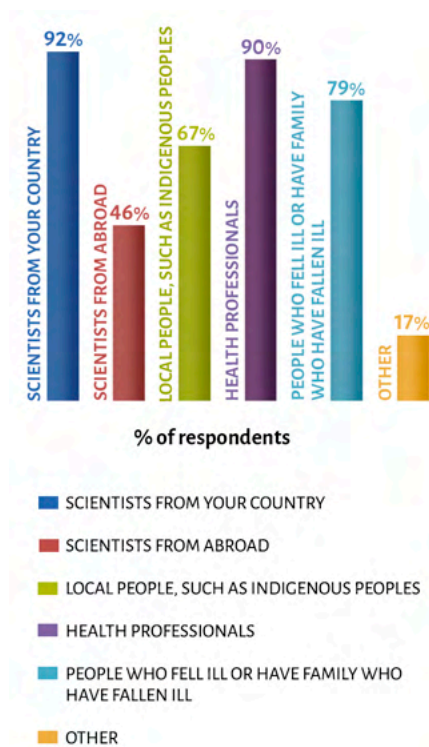
“The causes for our current climate change crisis are anthropogenic, that is a fact. Alternate voices that advocate conspiracy theories which cause confusion and create false equivalencies do not have a home in this conversation.” (Respondent from South Africa)

“Well, it depends. Sometimes it is quite thrilling to tell how science proceeds and how scientists communicate among themselves. Science is to ask questions, to exchange arguments and counterarguments. This way science develops, and a journalist should be able to understand this and describe it to his/her audience.” (Respondent from Germany)

We also asked what sources journalists would consider including in a story about a disease outbreak in a local community in their country. A large proportion of respondents indicated scientists from their countries (92%) and health professionals (90%) (Figure 21; this question allowed choosing more than one option). People who fell ill or have family who has fallen ill (79%) and local people, such as Indigenous people (67%), were also mentioned as sources by some of the participants. Scientists from abroad were chosen by 46% of the participants.

The distribution was similar among regions (Figure 21a). Those respondents who also chose the “other” option indicated governmental and political authorities, non-governmental organizations, and international organizations as possible sources.

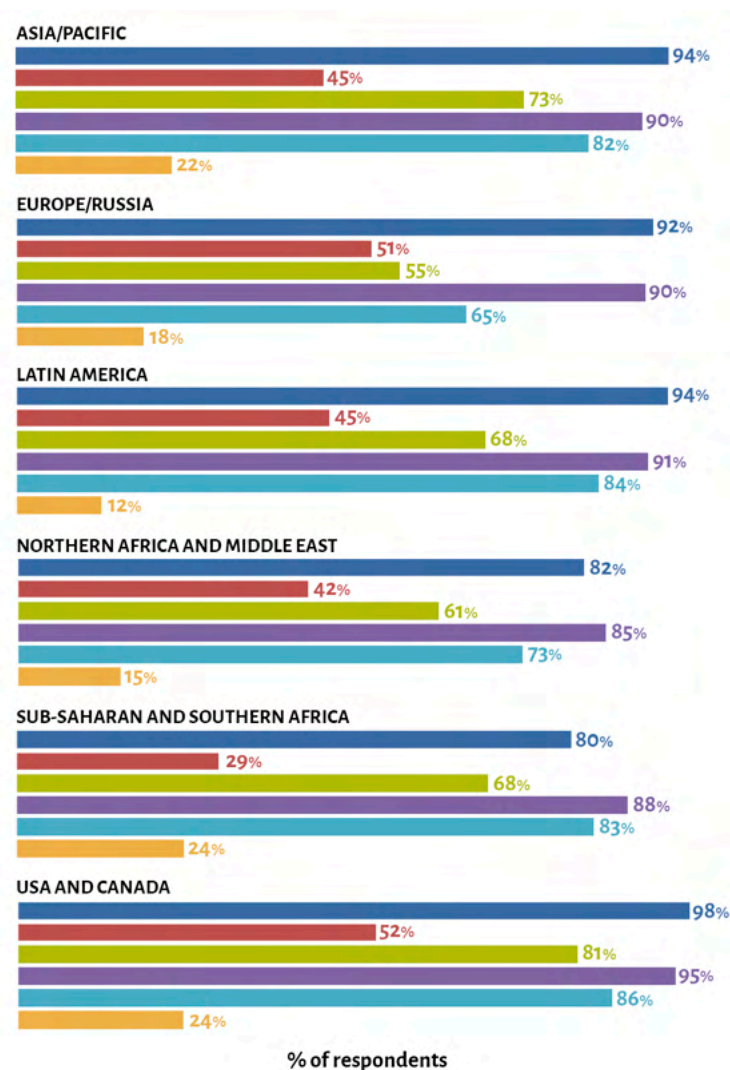
Figure 21:
Selection of sources in coverage of a local disease outbreak



n = 503

Note: The question was worded as follows: “You are preparing a story about a disease outbreak in a local community in your country. Which sources do you consider to include in your story? (Select all the options that apply).”

Figure 21a:
Selection of sources in coverage of a local disease outbreak, by world region



n = 501

Continuing from the previous question, 60% of survey participants agree that a scientist’s opinion on a subject should be reported differently than a non-scientist’s (Figure 22). For 27%, it should not. Another 12% didn’t know how to respond. Regionally, the affirmative response ranged from 49% in Latin America to 94% in Northern Africa (Figure 22a).

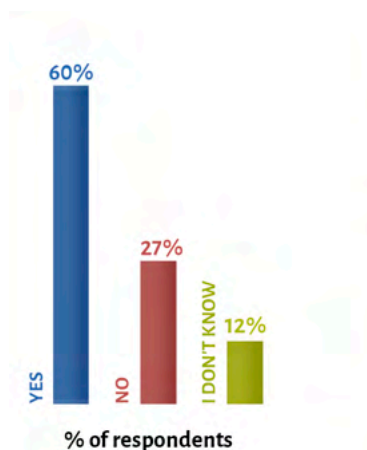
“A scientist who is an expert in the field in question would know more about it than a layman or outsider. That said, we shouldn’t outright discount non-experts because they represent questions and anxieties that most of the general public has.” (Respondent from the Philippines)

“It is expected that the two opinions have different bases. Usually, reasons or consequences of disease outbreak are things scientists know best, unless there is something the non-scientist brings in, usually factual, which the scientist was not aware of.” (Respondent from India)

“They should have a different perspective and should be able to back up their opinion with evidence – statistics, papers, official reports etc.” (Respondent from Belgium)

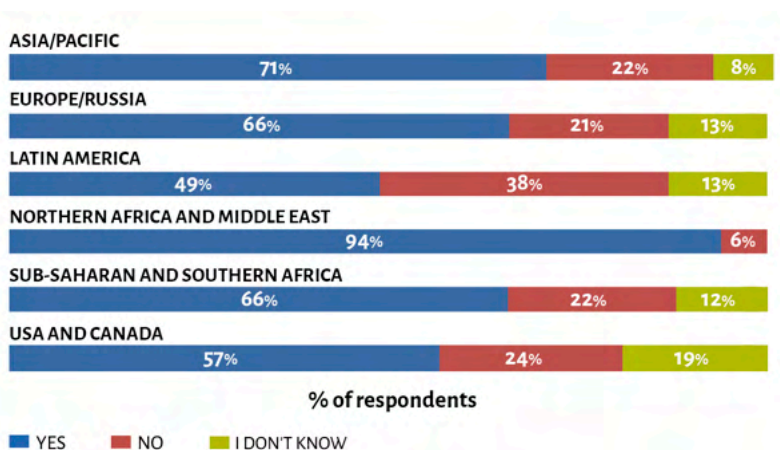
“In developing countries, non-scientist people may have different world view than scientists. But when it comes to new diseases, interviewing the ill people is certainly important to know about the symptoms and chronology.” (Respondent from Indonesia)

Figure 22:
Reporting the opinions of scientists and non-scientists



n = 496

Figure 22a:
Reporting the opinions of scientists and non-scientists, by world region

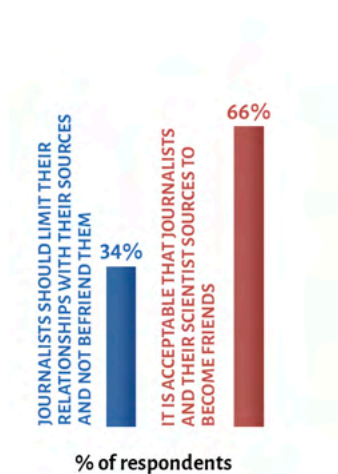


n = 494

Note: The question was worded as follows: “Continuing from the previous question, should a scientist’s opinion on a subject be reported differently than a non-scientist’s opinion?”

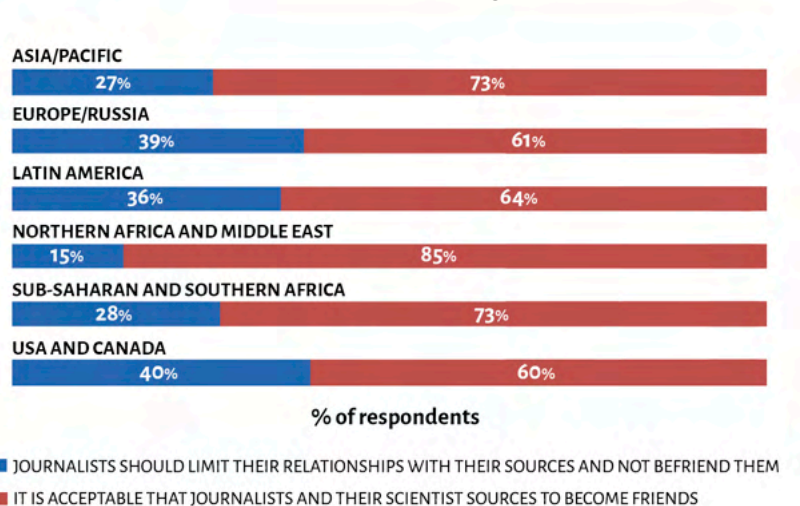
Two-thirds of survey participants (66%) consider it acceptable for journalists and their scientist sources to become friends (Figure 23). The highest proportion of this response was observed in Northern Africa and the Middle East (85%); the lowest was in the USA and Canada (60%) (Figure 23a). The remaining 34% of respondents said journalists should limit their relationships with their sources and not befriend them.

Figure 23:
Relationship with sources



n = 495

Figure 23a:
Relationship with sources, by world region



n = 493

Note: The question was worded as follows: “Many journalists become friends with scientists they interview. What is your opinion on this matter? (Please select only one answer).”

Journalists are more divided on the question of receiving gifts, invitations, or paid trips to cover conferences from their sources (Figure 24). For 37%, this is acceptable in some circumstances. This was the response of 45% of professionals from Latin America and 38% from Europe/Russia (Figure 24a).

For 36% of survey respondents, receiving gifts, invitations, or paid trips is acceptable if journalists can maintain independence in their coverage. This was the option chosen by 53% of respondents from Northern Africa and the Middle East, 50% of those from Sub-Saharan and Southern Africa, and 39% of those from Asia/Pacific. Finally, for 27% of survey participants, this is not acceptable in any circumstance. This was the response of 50% of professionals in the USA and Canada.

Regarding the two previous questions, journalists made the following comments.

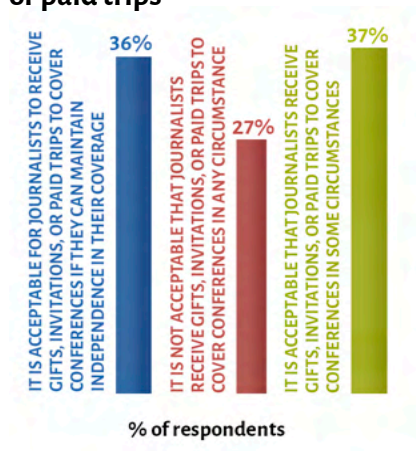
“I don’t see a problem in journalists having relationships with people they know by profession. But if the relationship could jeopardize specific news coverage, the journalist must forgo the story because of the potential conflict of interest.” (Respondent from Brazil)

“The source of science, technology, health and innovation very rarely receives resources from its media to make coverage. And invitations to congresses or conferences are accepted without conditioning to cover or give the note as the company that invites indicates.” (Respondent from Mexico)

“Scientist will provide you with more information if you have developed a closer and good working relations with as they will develop a trust in you.” (Respondent from Zimbabwe)

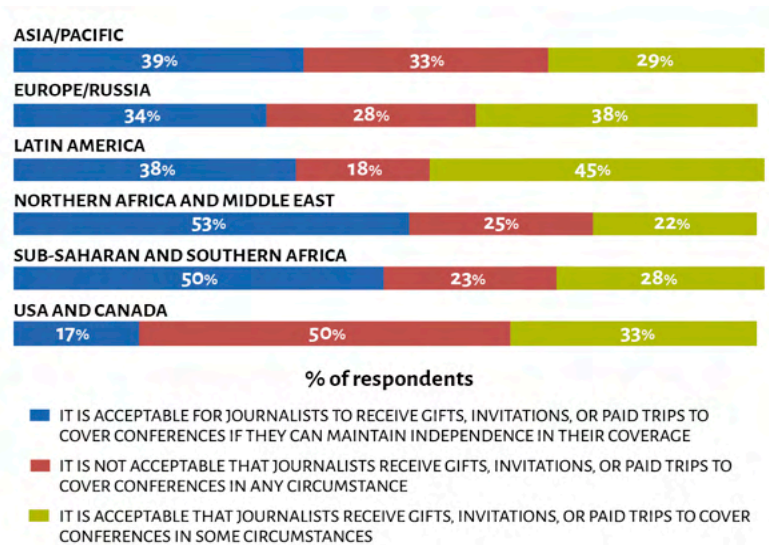
“It’s not always clear up. Some exceptions I can think of: (1) If the journalist in question is invited to give a talk on science communication, then it’d be okay for him/her to cover the conference even though her/his travel and hotel might be covered by the conference organizer. It’d a borderline scenario. (2) The conference organizer has fellowships to support journalists to cover the meeting. Then such support needs to be declared in work that coming out of it.” (Respondent from China)

Figure 24:
Receiving gifts, invitations, or paid trips



n = 497

Figure 24a:
Receiving gifts, invitations, or paid trips, by world region



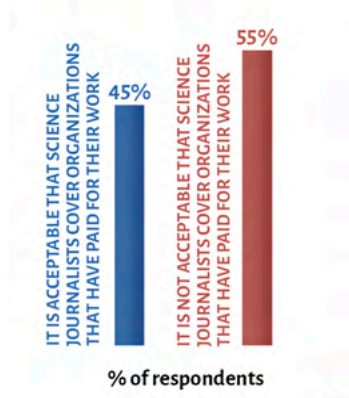
n = 496

Note: The question was worded as follows: “Some journalists receive gifts, invitations, or paid trips to cover conferences from their sources. What is your opinion on this matter? (Please select only one answer).”

We also observed a divided opinion from journalists regarding covering organizations that paid for their work (Figure 25). Just over half (55%) consider this not acceptable, against 45% who think it is acceptable. The latter option was chosen by 56% of respondents from Northern Africa and the Middle East and Sub-Saharan and Southern Africa, and by 54% of respondents from Latin America (Figure 25a).

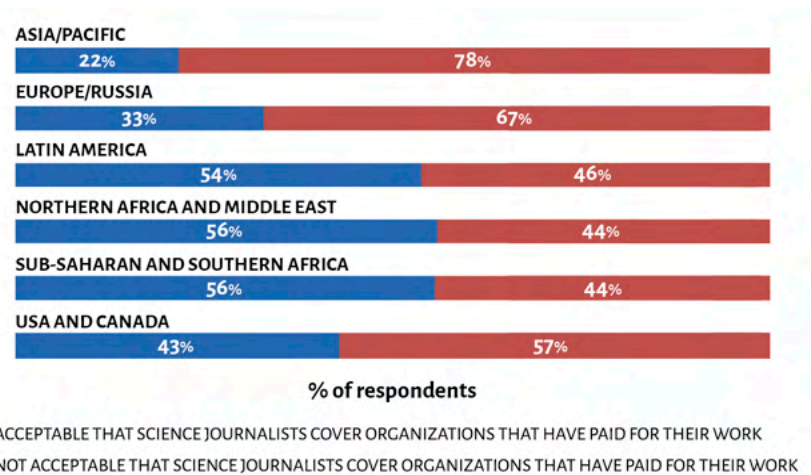
In the other regions, the proportion of respondents who consider it unacceptable that science journalists cover organizations that have paid for their work is higher: 78% in Asia/Pacific, 67% in Europe/Russia, and 57% in the USA and Canada.

Figure 25:
Covering organizations that have paid for the work



n = 488

Figure 25a:
Covering organizations that have paid for the work, by world region

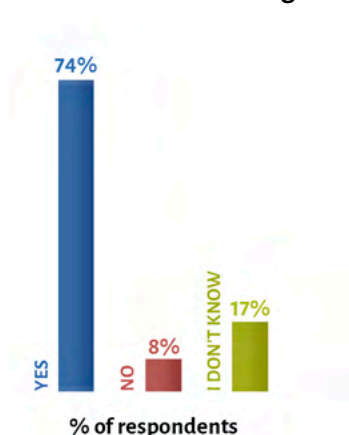


n = 487

Note: The question was worded as follows: "In your opinion: (Please select only one answer)."

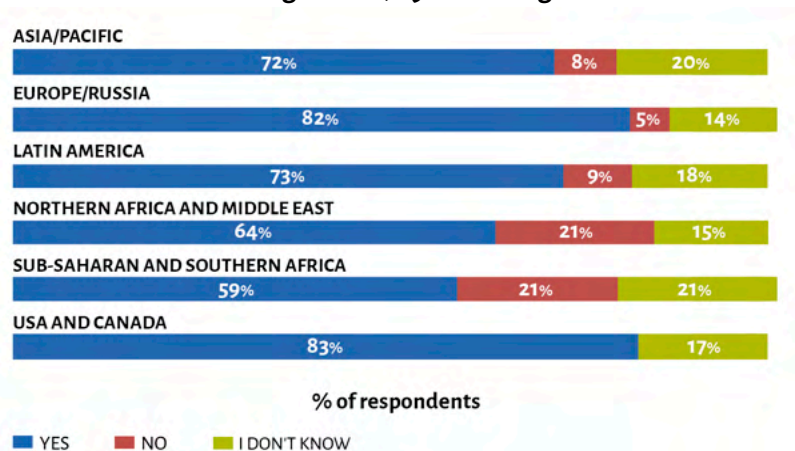
However, there is general agreement that science journalists should declare the source of their funding to carry out their work (Figure 26). This statement was supported by 74% of respondents. The highest proportions were found in the USA and Canada (83%), Europe/Russia (82%), Latin America (73%) and Asia/Pacific (72%) (Figure 26a). Eight percent of survey participants answered no, and 17% did not know how to respond.

Figure 26:
Declaration of funding source



n = 497

Figure 26a:
Declaration of funding source, by world region



n = 496

Note: The question was worded as follows: "Do you think science journalists should declare the source of their funding to carry out their work?"

3.5. Other ethical issues

We asked survey participants to rate the country where they live/work in terms of protecting media ethics (Figure 27). The overall result was as follows: 40% poor, 35% good, 16% very poor, and 10% very good. Nevertheless, the regional results show an uneven situation globally (Figure 27a).

Media ethics protection is considered good by 51% of science journalists in the USA and Canada. This is also the most common response of professionals from Europe/Russia, although in a smaller proportion (38%). In Asia/Pacific, the situation is divided between good and poor – each option was chosen by 39% of the participants.

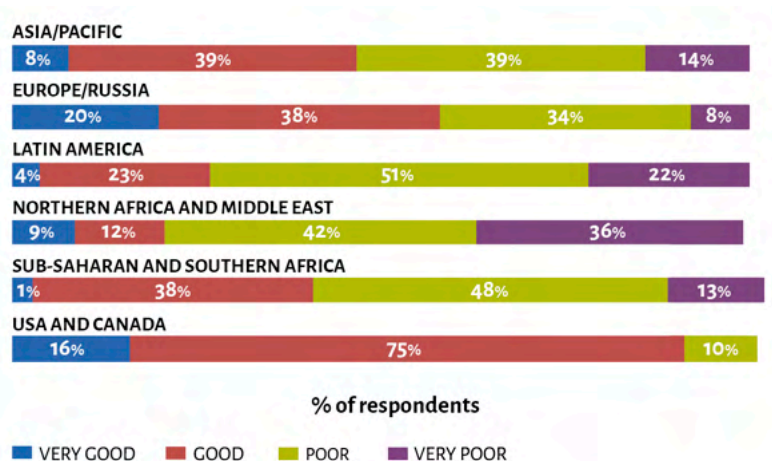
In the other regions, the poor rating prevails: 51% in Latin America, 48% in Sub-Saharan and Southern Africa, and 42% in Northern Africa and the Middle East. The last region also includes a considerable proportion of respondents who rated the protection of media ethics in their country very poor (36%).

Figure 27:
Protection of media ethics



n = 499

Figure 27a:
rotection of media ethics, by world region



n = 498

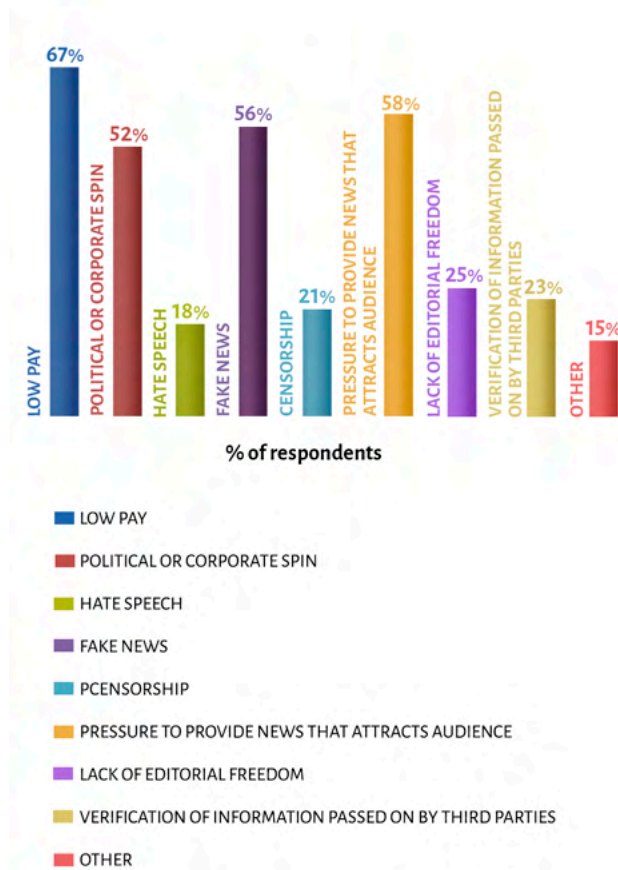
Note: The question was worded as follows: “How would you rank the country in which you live/work in terms of protecting media ethics?”

Participants were asked to indicate the main issues or current violations of ethical reporting that they, as science journalists, face in order to carry out their work (Figure 28; this question allowed choosing more than one option). Low pay was pointed out by 63% of respondents, followed by pressure to provide news that attracts audience (58%), fake news (56%), and political or corporate spin (52%). Lack of editorial freedom (25%), verification of information passed on by third parties (23%), censorship (21%), and hate speech (18%) were responses chosen by a smaller portion of journalists.

In Latin America and Sub-Saharan and Southern Africa, the main problems are low pay, fake news, and pressure to provide news that attracts audience (Figure 28a). In these places, political or corporate spin was also chosen by some respondents. In Northern African and Middle Eastern countries, the three main problems are low pay, fake news and lack of editorial freedom.

Pressure to provide news that attracts audience was the most chosen option by participants from Asia/Pacific, Europe/Russia, and the USA and Canada. In the first two regions, political or corporate spin and low pay also stand out. In the last one, fake news is among the top three issues.

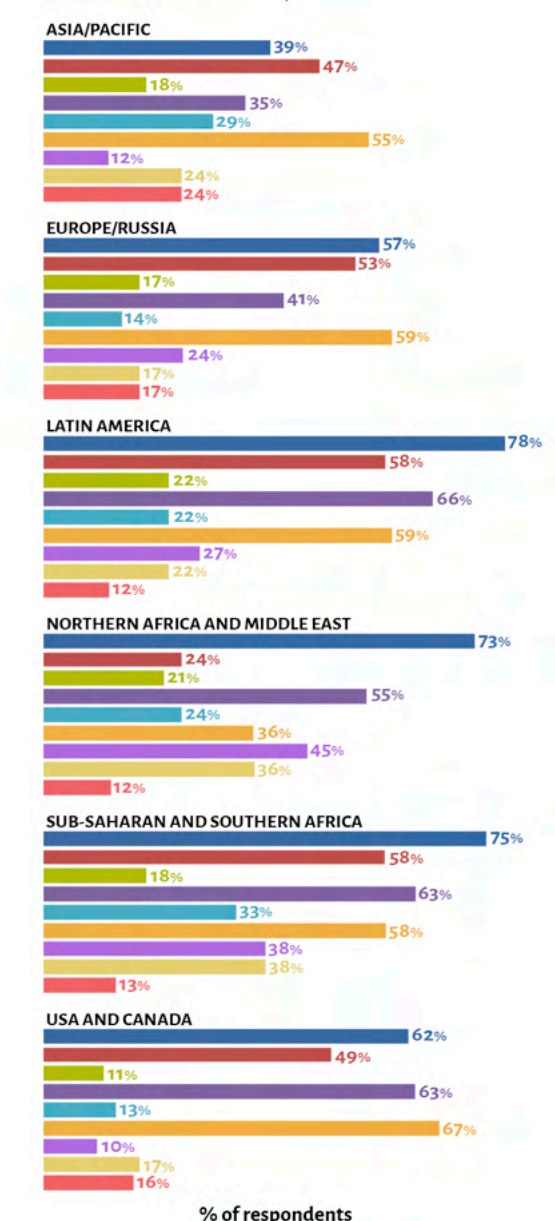
Figure 28:
Main issues or current violations of ethical reporting



n = 496

Note: The question was worded as follows: “What are the main issues or current violations of ethical reporting that you, as a science journalist, face in order to carry out your work? (Select all the options that apply).”

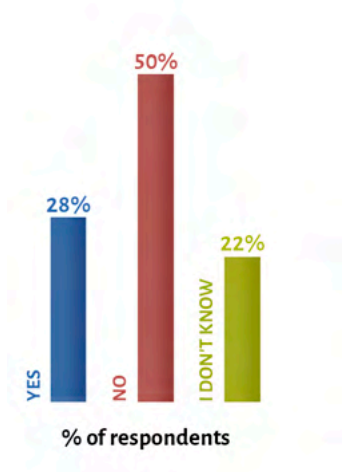
Figure 28a:
Main issues or current violations of ethical reporting, by world region



n = 495

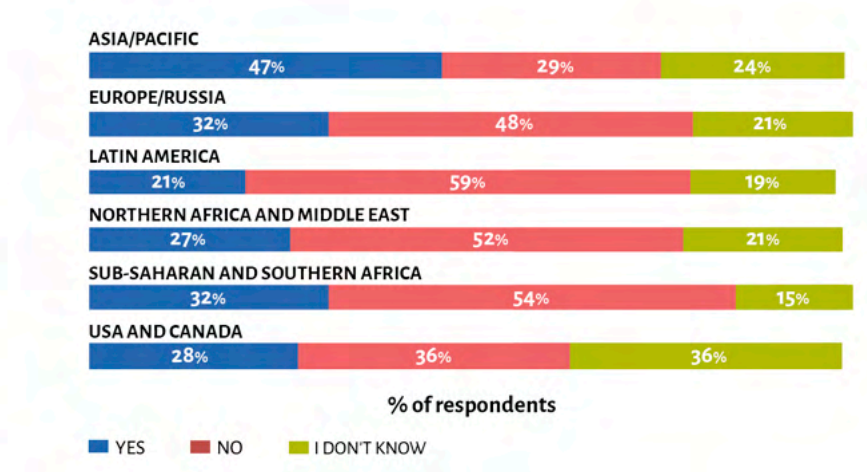
Half of the participants think that professionals from areas other than journalism should not be allowed to shape the ethical priorities of science journalism (Figure 29). The remainder was divided: 28% answered yes, and 22% “I don’t know.” This pattern is relatively similar across regions (Figure 29a). The exceptions are the USA and Canada, where the percentage of people who answered “no” and “I don’t know” is the same (36%), and Asia/Pacific, where 47% of the participants consider that professionals from other areas should be allowed to shape the ethical priorities of science journalism.

Figure 29:
Shaping the ethical priorities of science journalism



n = 498

Figure 29a:
Shaping the ethical priorities of science journalism, by world region

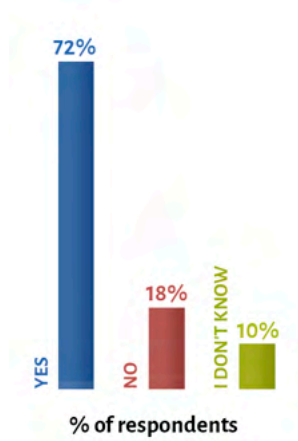


n = 497

Note: The question was worded as follows: “Do you think that professionals from areas other than journalists should be allowed to shape the ethical priorities of science journalism?”

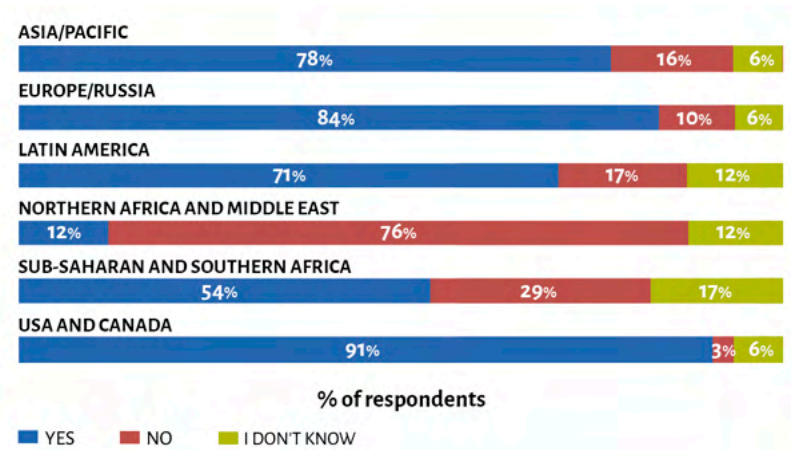
Most respondents (72%) stated that there is a science journalism association in their country (Figure 30). However, this percentage is not so high in Sub-Saharan and Southern Africa (54%) (Figure 30a). An opposite pattern was observed in Northern Africa and the Middle East, where 76% of professionals stated that there is no science journalism association.

Figure 30:
Existence of a science journalism association



n = 502

Figure 30a:
Existence of a science journalism association, by world region

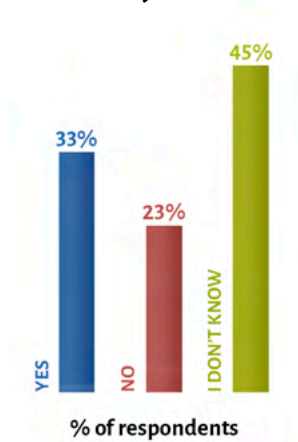


n = 501

Note: The question was worded as follows: "Is there a science journalism association in your country?"

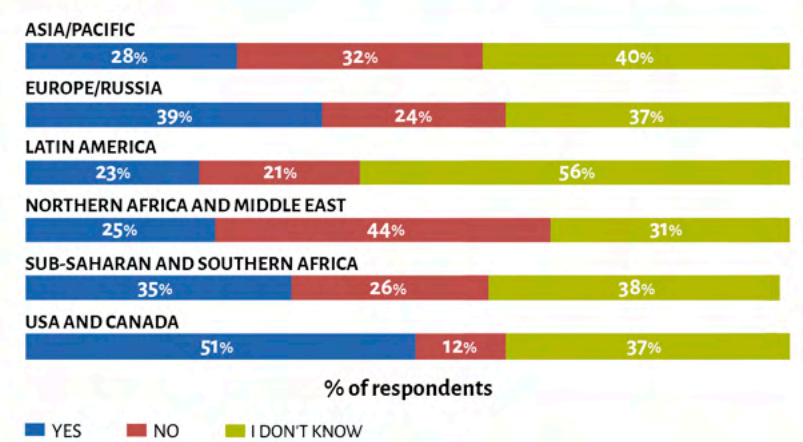
To those who answered yes to this question, we asked if their country's journalism association has a code of ethics for science journalism (Figure 31). In this case, 45% of journalists said they did not know. Another 33% answered yes, and 23% said no. Slightly different responses were observed among participants from the USA and Canada and Europe/Russia (51% and 39% affirmative responses, respectively) (Figure 31a). In Northern Africa and the Middle East, 44% of professionals responded that there is no code of ethics for science journalism.

Figure 31:
Existence of a code of ethics for science journalism



n = 420

Figure 31a:
Existence of a code of ethics for science journalism, by world region



n = 419

Note: The question was worded as follows: "If you answered yes, does the science journalism association in your country have codes of ethics for science journalism?"

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Ximena Serrano Gil

Yves Sciama

Zoraida Portillo

CONTACT

Luisa Massarani

National Institute of Public Communication of Science and Technology

Casa de Oswaldo Cruz/Fundação Oswaldo Cruz

Brazil

luisa.massarani@fiocruz.br