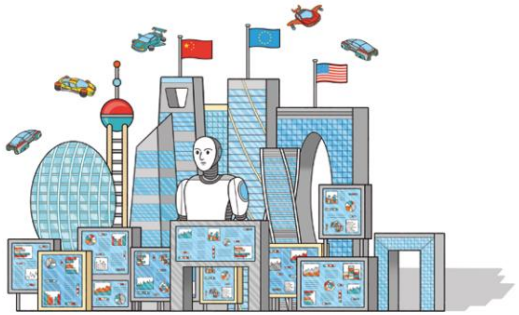


RESEARCH FUTURES 2.0

A new look at the drivers and scenarios that will define the decade

Full data analyses of research results

April 2022

ELSEVIER

Overall Contents

BACKGROUND & APPROACH

Back to contents

Objective

Build on our original study examining the future of research

Back in 2018, with the help of Ipsos MORI, we set out to conduct a study to try to understand how the rapid and profound changes we were witnessing in science, technology and medicine were impacting the research landscape.

- Our goal was straightforward: To equip all of us in the industry with the knowledge we needed to navigate the opportunities and challenges that lay ahead. Drawing on a comprehensive literature review, interviews with 56 technology, research and publishing experts around the globe, and a survey of 2,055 researchers, we attempted to build a blueprint for the coming 10 years. In February 2019, we published the report based on that study - *Research futures: Drivers and scenarios for the next decade*.
- There were two pillars to this study:
  - Pillar one: nineteen key drivers expected to shape developments in the decade ahead were identified during our discovery phase. We grouped these drivers into six themes and explored each of them in essay form.
  - Pillar two: Three scenarios, developed through workshops with internal and external experts based on how the nineteen key drivers might influence research, each envisaging what the future might look like a decade later. We named these scenarios Brave open world, Tech titans and Eastern ascendance.

Fast forward to today

- Since early 2020, the pandemic has transformed every aspect of researchers' work. We felt the time was ripe to revisit our first report and consider how the themes and scenarios we identified were playing out, particularly in light of COVID-19.

Back to contents

Approach

- **Overall:** During 2020 and 2021 we conducted two separate researcher surveys asking questions on a broad range of topics, from collaboration to education and from open science to public engagement. We reviewed the world of research through the changes of the past two years. We also asked researchers to help us understand the impact of the pandemic on their work.
- **Method:** Survey was administered online and was available in English only. Survey took 20 minutes to complete (median average).
- **Fieldwork:** Two waves of fieldwork: August 2020 and August 2021.
- **Audience:** Researchers **2021** n=1,173 and **2020** n=1,066.
- **Results:** During fieldwork, we closely monitored respondents by country and adjusted the sample to ensure results were as representative of the research community as possible. Responses are from a multitude of disciplines and locations. Results have been weighted to be representative of the global researcher population by country (UNESCO/OECD data). Base sizes shown in this report are unweighted, unless otherwise stated. Percentages shown in this report may not add together accurately due to rounding.
- **Statistical Error**: Maximum error margin for 1,173 responses is ± 2.41 percent and for 1,066 response is ± 2.53 percent at 90 percent confidence levels. When comparing the main group and sub-groups we have used a Z-test of proportion to identify differences between the overall average and the sub-group (90 percent confidence levels).

Differences are indicated by a tick or a dot. A green ✓ tick indicates the 2021 result is higher than the 2020 result while a red ✓ tick indicates it is lower. Significant difference 2021 to 2020. A green ● dot indicates the subgroup result is higher than the overall result while a red ● dot indicates it is lower.

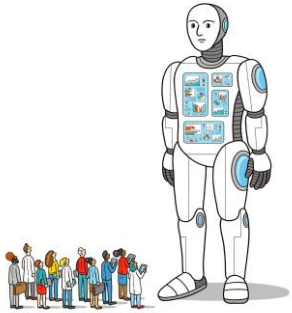
Back to contents

Visualizing the future through scenarios

Brave open world

Globally, state and philanthropic organizations and funders align in their goals, approaches and principles, resulting in open science taking off, especially in Europe, aided by advances in artificial intelligence-enabled technologies. Platforms are interoperable and content is easy to access.

Tech titans



Significant advances in artificial intelligence (AI) products drive innovation, enabling technology companies to support the research ecosystem and become knowledge creators and curators in a world where industry and philanthropic foundations are the key research funders.

Eastern ascendance

China's growing economic power and focus on research and development (R&D) influences the previously Western-dominated research landscape, resulting in a fragmented world.

Back to contents

FUNDING

Funding Contents

FUNDING EXECUTIVE SUMMARY

Half (50%) believe funding in their field is currently insufficient. The proportion stating funding is sufficient has declined from just under a third (30%) in 2020 to around a quarter (24%) in 2021. Researchers are evenly split on whether they expect funding in their field will increase in the next 2-3 years (beyond inflation) with 39% saying it will increase and 36% decrease – but they are more optimistic than a year ago 31% in 2020 stating it would increase.

Half (51%) believe there are more funding requirements compared to 2-3 years ago. The most common new funding requirements are increasing number of research publications and increased progress reporting.

There was a perceived drop in the proportion of funding coming from university/ research institution in 2020, this has increased, back up to the levels experienced in 2019. It currently accounts for just over a third (35%) of funding, behind Government, which accounts for 41% of funding. The contribution from self-funding continues to decline – it has roughly halved from 13% in 2019 to 6% in 2021.

By broad discipline and region:

Chemistry, Environmental Sciences, Engineering and Maths are less likely now than in 2020 to perceive their funding is sufficient. North America was the most pessimistic about the future availability of funding in 2020. Optimism here has increased in 2021 but remains lower than average. Younger researchers are less likely in 2021 than in 2020 to claim there is sufficient funding.

Computer Science is more likely than other fields to expect increased funding in the next 2-3 years. Younger researchers and Heads of Department are both more likely to expect funding to increase in the next 2-3 years (beyond inflation).

Chemistry and Physics rely more on Federal/Government funding. Engineering funding is more likely than other fields to be sourced from Corporate/ commercial/ industrial. University/ Research Institution funding is less prevalent in North America. Self-funding is more likely in the Middle East.

Computer Science and Medicine are more likely, and Physics and Social Sciences less likely, to have more of their funding coming from corporate/ philanthropic versus 2-3 years ago.

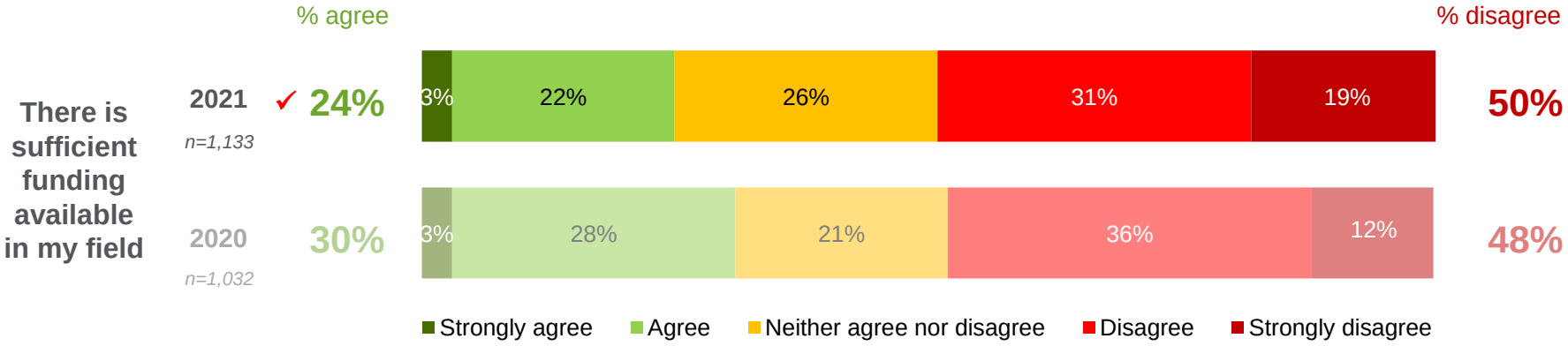
Life Sciences are more likely, and Maths less likely, to have more funding needs compared to 2-3 years ago. Western Europe is less likely than other regions to have more funding requirements than 2-3 years ago. Older researchers are less likely to have more funding requirements now than 2-3 years back.

Evidence of inter-disciplinary collaboration is more likely to be a new funding requirement in Medicine. Open Access publication is more likely to be a common new funding requirement in both Chemistry and Medicine.

OVERVIEW OF FUNDING RESULTS

FUNDING SOURCES:

Half (50%) believe funding in their field is currently insufficient. The proportion stating funding is sufficient has declined from just under a third (30%) to around a quarter (24%).



Reasons for AGREEING:

- **Field of research in-vogue/ of strong interest/ well funded/ a priority area**
- **Sources of funding broad/ abundant/ traditionally sufficient/ continuous**

"My field of research is quite applicated, and I expect strong engagement of states and enterprises to boost the fundings." (Materials Science, France, aged 46-55)

Reasons for DISAGREEING:

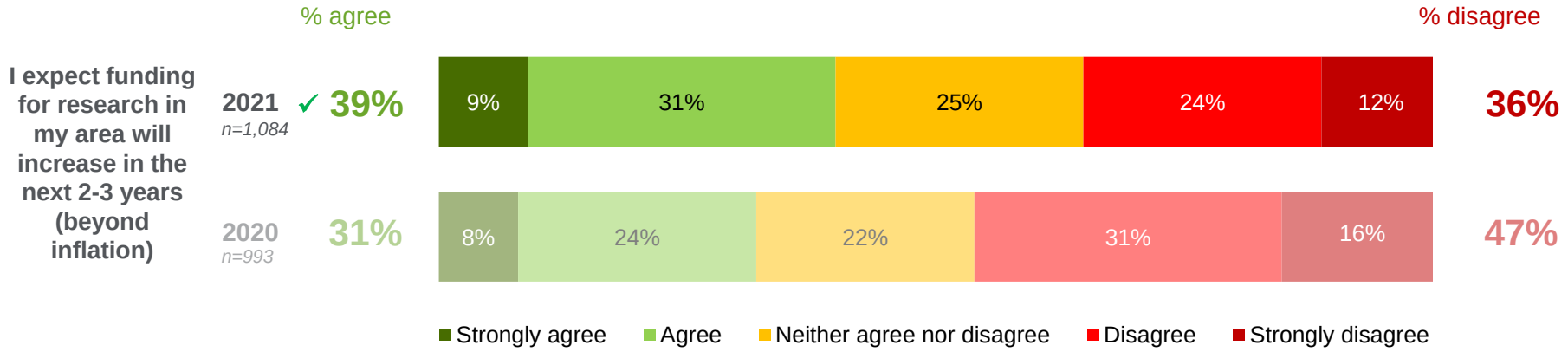
- **Limited/ reducing funding/ grants specific to field**
- **Increased competition for available funding**
- **Other fields take precedence/ prioritised**
- **Impact of/ funds diverted/ reallocated to COVID-19**

"Fewer public agencies providing funding and more competition for the funds; requirements/research topics being funded very narrow." (Social Science, USA, aged 36-45)

✓ Higher
✓ Lower
Significant difference 2021 to 2020

FUNDING SOURCES:

Increase in 2021 in researchers stating that they expect funding in their field will increase in the next 2-3 years – from 31% in 2020 to 39% in 2021.



Reasons for AGREEING:

- **Research field/ topic in-vogue/ more recognized**
- **Government increasing budget/ investment in research**

"I deal with artificial intelligence. It is a developmental field, expansive, with great dynamics and implementation potential. Research in this area will be intensified." (Computer Sciences/ IT, Poland, aged 46-55)

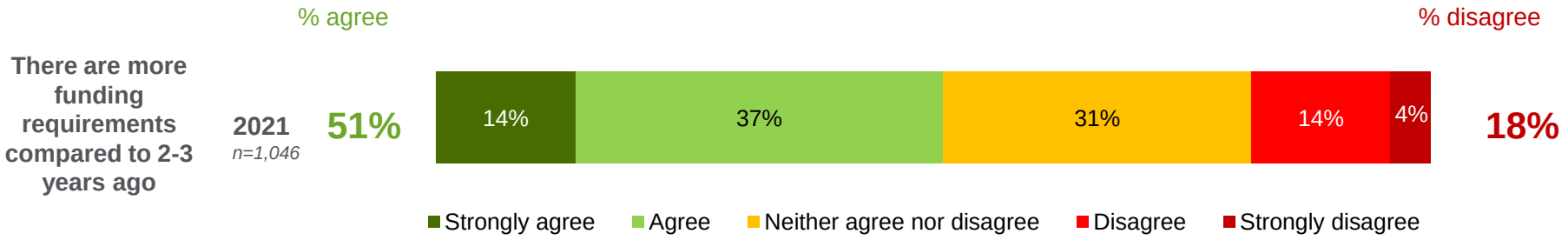
Reasons for DISAGREEING:

- **Field of research being deprioritized by funders relative to other fields**
- **Impact of COVID-19 and weak global economic context resulting in cuts to research budget/ funding**

"All funding is shrinking, and my particular field is one that seems to get cut to prevent decreases in other areas." (Veterinary Medicine/ Science, USA, aged 46-55)

FUNDING REQUIREMENTS:

Half (51%) believe there are more funding requirements compared to 2-3 years ago.



Reasons for AGREEING:

- **Increasing demand/ competition for finite funds**
- **More detail evidence/ information required in submissions**
- **Applications more bureaucratic/ compliance necessities**

"There is less money but the same number of research groups, so more constraints are established to ensure it is distributed to a maximum number of research groups." (Arts/ Humanities, Spain, aged 36-45)

"The bureaucratic burden of writing proposals and reports has increased." (Materials Science, USA, aged 36-45)

Reasons for DISAGREEING:

- **Funding declining in particular field/ area of research**

"Funding has shifted more towards the big labs doing SARS-CoV-2 research. It's harder to get funding for "other" work on infectious disease." (Biochemistry, Genetics, and Molecular Biology, USA, aged 46-55)

"My research field is rather new in our country and does not attract many organizations to fund it." (Medicine and Allied Health, Vietnam, aged 36-45)

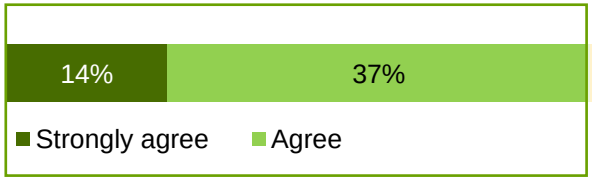
NEW FUNDING REQUIREMENTS:

Most common new funding requirements are increasing volume of publications and increased progress reporting.

There are more funding requirements compared 2-3 years ago

2021
n=1,046

% agree **51%**



% disagree **18%**

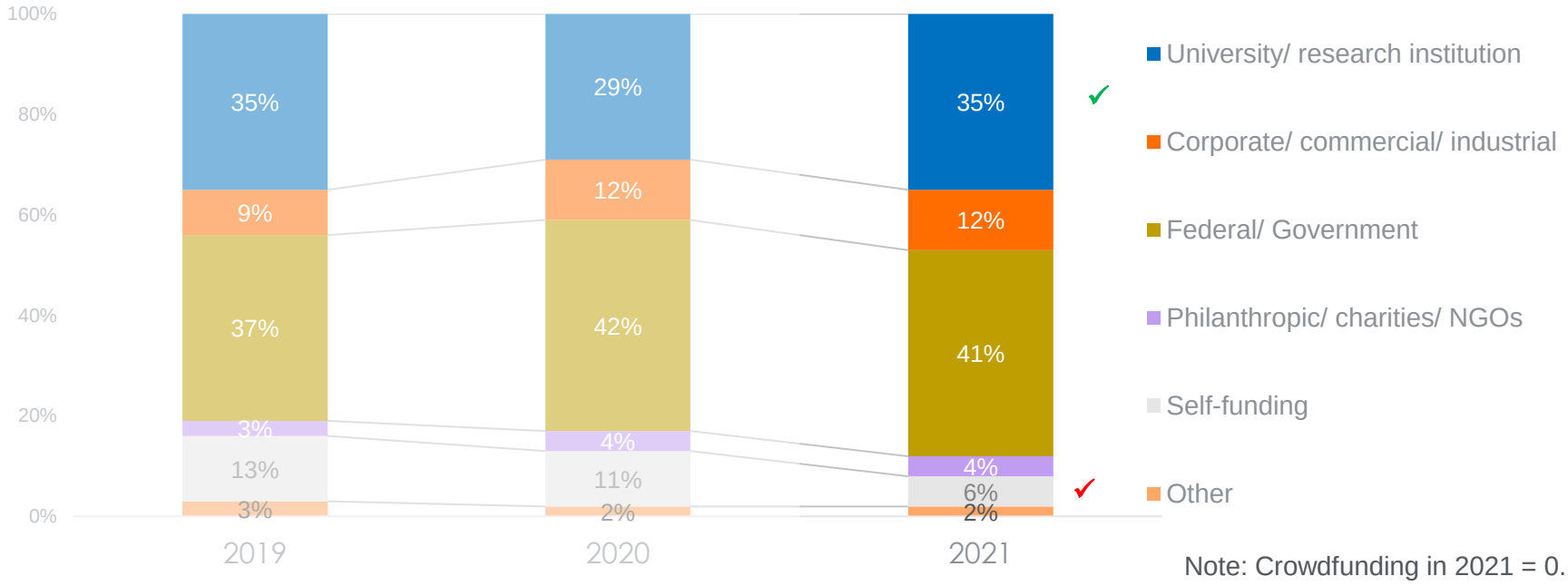
Agreed - What are the most common new requirements?

Base: All researchers who agreed there are more funding requirements (n=539)

FUNDING SOURCES:

The proportion of funding coming from university/ research institution has increased recovering to pre-covid levels. The contribution from self-funding declines.

Q. Thinking about your current funding, what proportion of your funding is from the following sources: Percentage (sums to 100%).



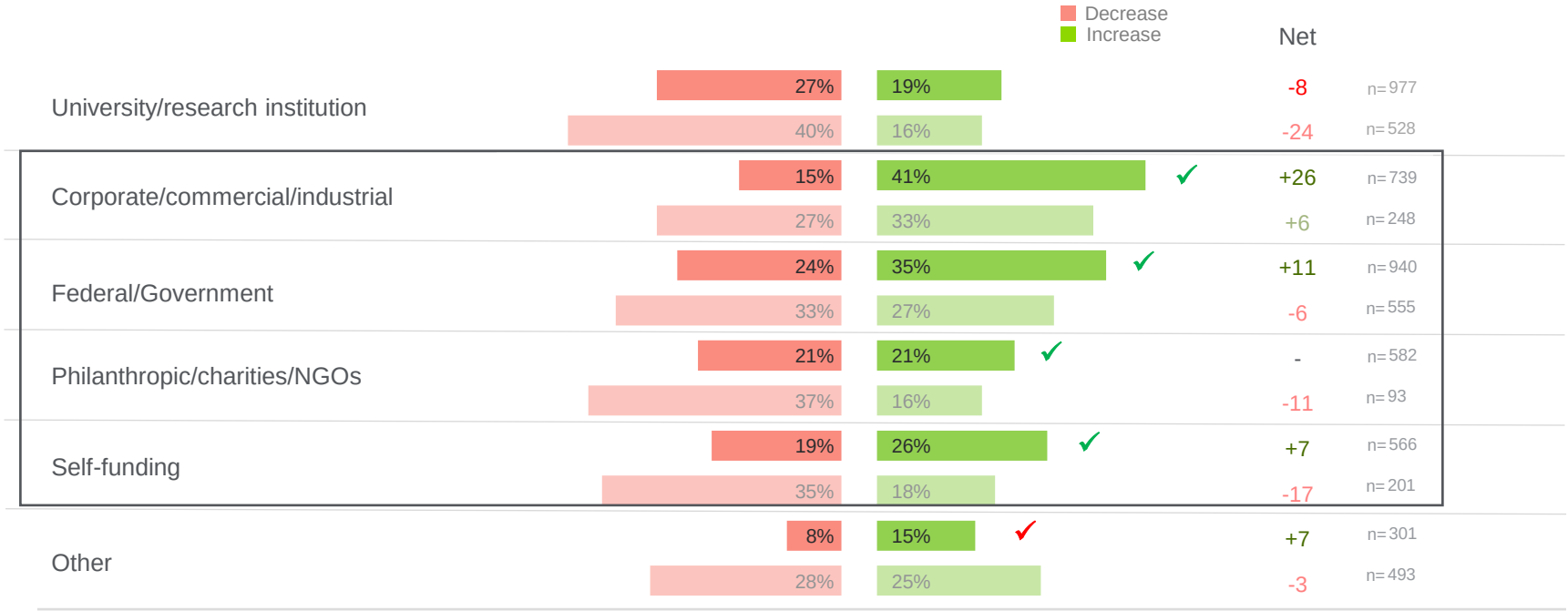
Note: Crowdfunding in 2021 = 0.1%

✓ Higher
✓ Lower
Significant difference 2021 to 2020

Base: All researchers that responded to this question
(2021: n=1024, 2020: n= 891: 2019 n=1,438)

FUNDING: More researchers in 2021 compared to 2020 believe over the next two to three years their research funding will increase from Corporate, Federal, Philanthropic and Self-funding sources.

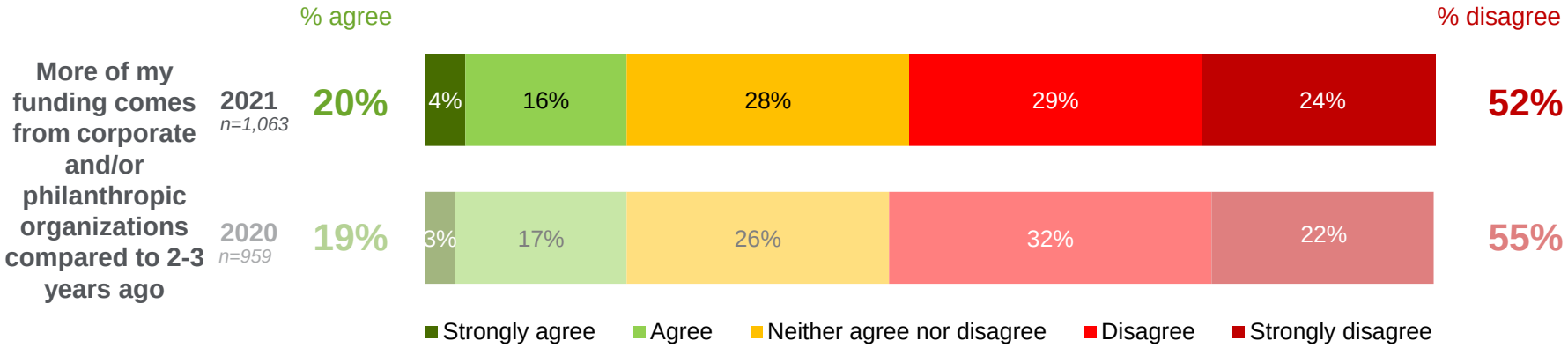
Q:Apart from inflationary increases, do you think over the next two to three years your research funding from the following sources will …



Base 2021: total 1,173, Base 2020: total 1,066 – don't know/ not applicable excluded.
Chart shows figures for increase and decrease

FUNDING SOURCES:

One in five (20%) researchers stated more of their funding comes from corporate and/or philanthropic organizations compared to 2-3 years ago. Half (52%) disagreed.



Reasons for AGREEING:

- Corporate/ private funding availability increasing
- Governmental funding declining

"Philanthropic organizations have a greater role in funding research and recognize the issues with federal funding sources giving more flexibility of the funds and sustainability." (Biological Sciences, USA, aged 46-55)

Reasons for DISAGREEING:

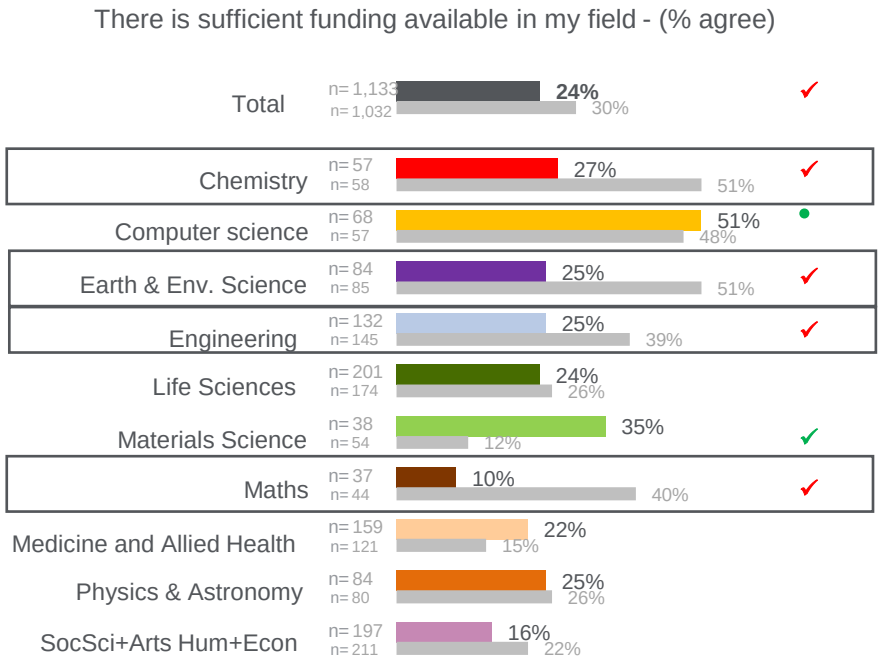
- Funding is from public bodies/ agencies/ government

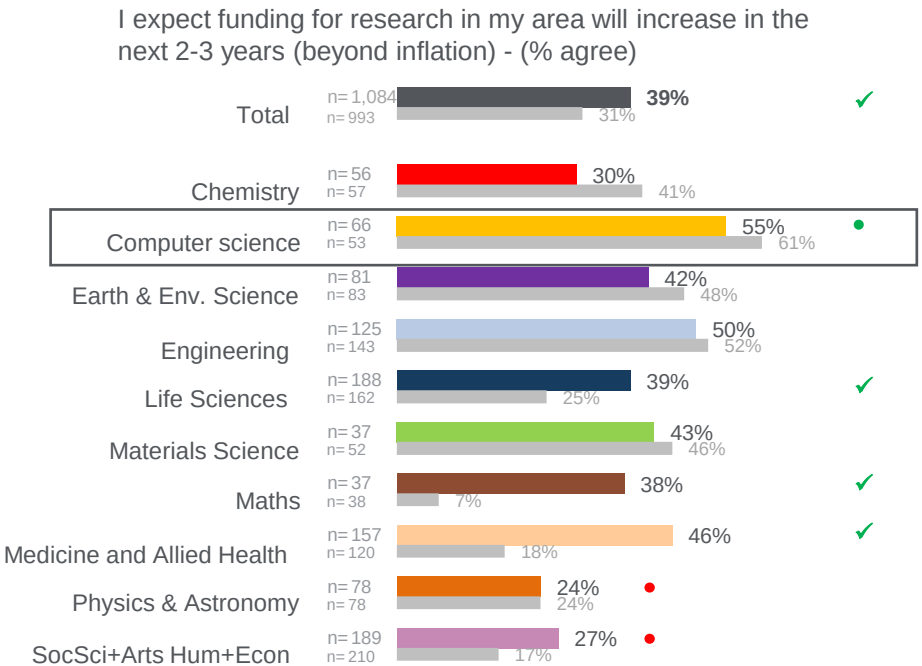
"My funding largely comes from federal funding and that has been consistent." (Psychology, USA, aged 26-35)

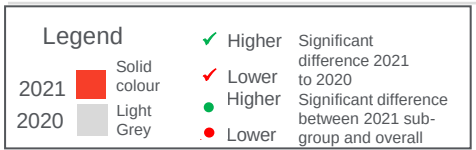
Funding for research

Results by specialty, country, region, age, gender, seniority and country

FUNDING BY SUBJECT: Chemistry, Environmental Sciences, Engineering and Maths are less likely now than in 2020 to perceive their funding is sufficient. Computer Science is more likely than other fields to expect increased funding.

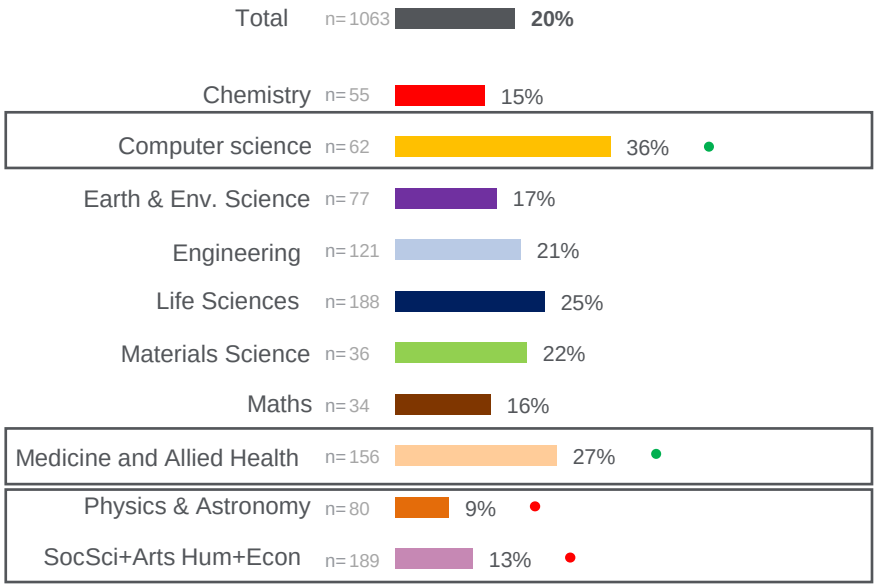




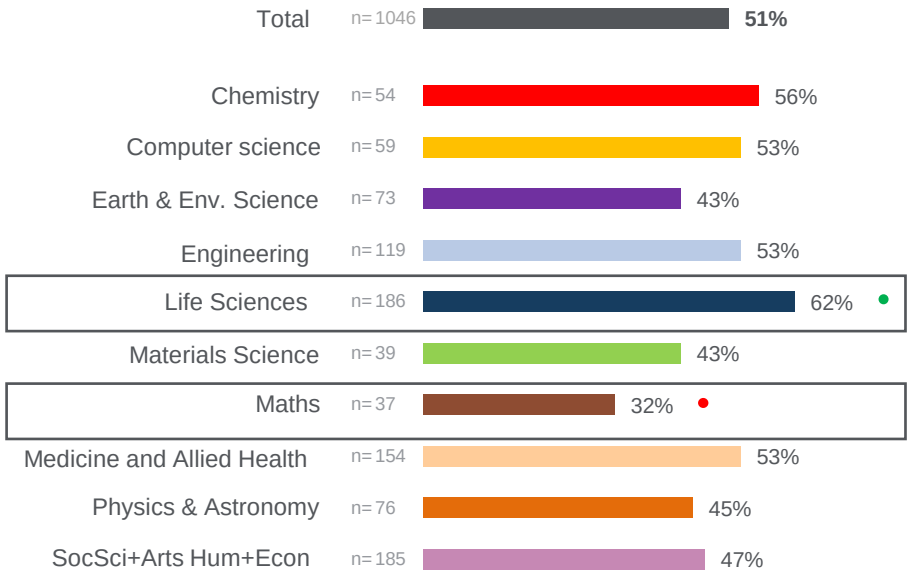


FUNDING BY SUBJECT: Computer Science and Medicine are more likely, and Physics and Social Sciences less likely, to have more corporate/ philanthropic funding versus 2-3 years ago. Life Sciences are more likely, and Maths less likely, to have more funding requirements.

More of my funding comes from corporate and/or philanthropic organisations compared to 2-3 years ago - (% agree)

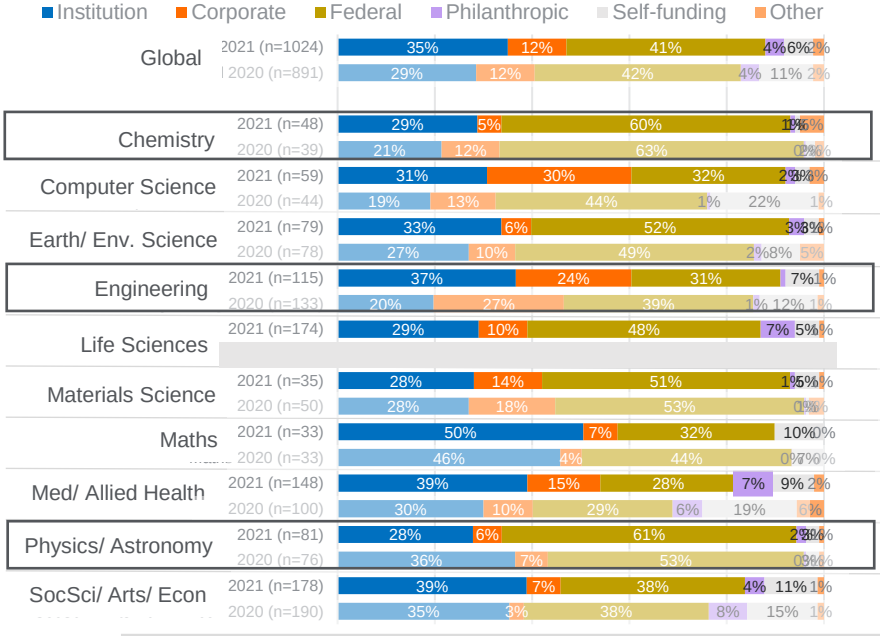


There are more funding requirements compared 2-3 years ago - (% agree)

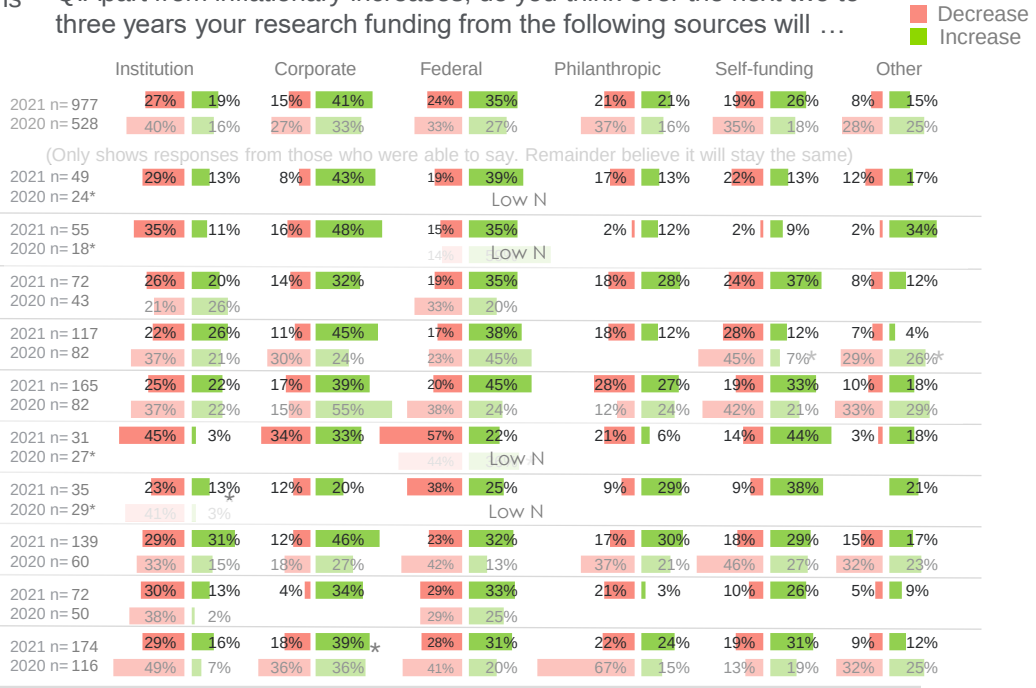


FUNDING BY SUBJECT: Chemistry and Physics rely more on Federal/Government funding. Engineering funding is more likely than other fields to be sourced from Corporate/ commercial/ industrial.

Q:Thinking about your current funding, what proportion of your funding is from the following sources:



Q:Apart from inflationary increases, do you think over the next two to three years your research funding from the following sources will …



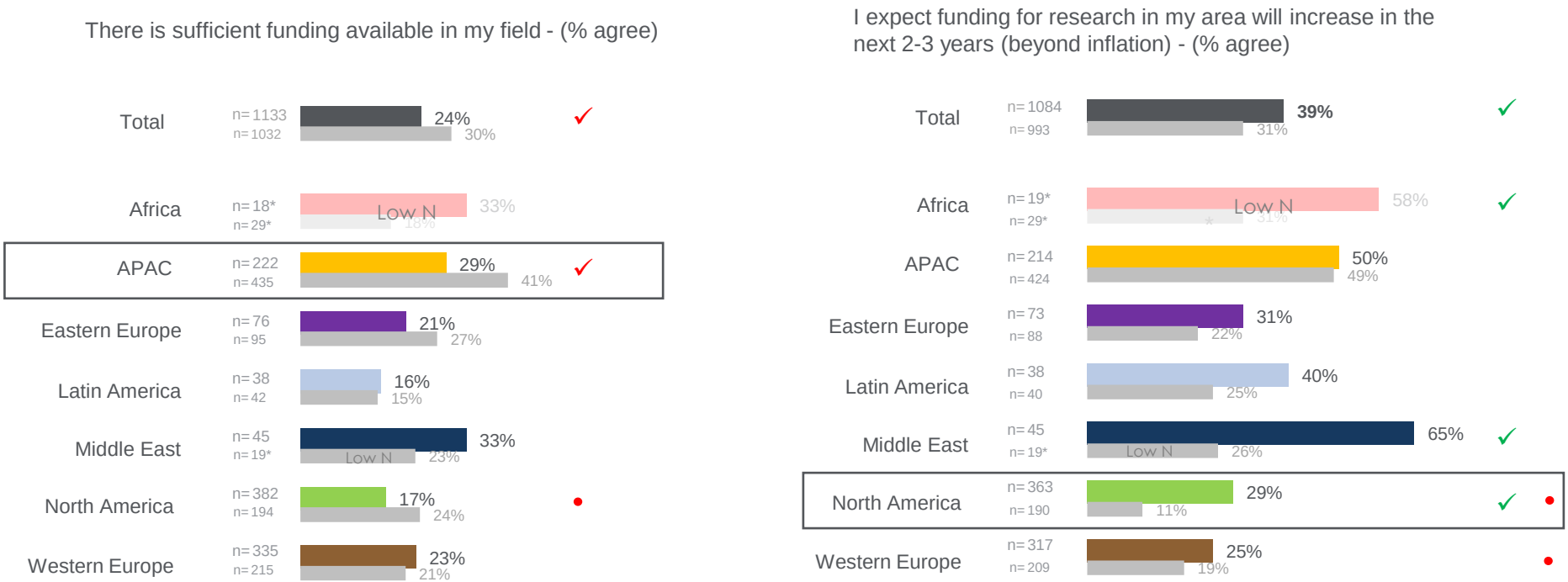
Legend

2021 Solid colour

2020 Light colour

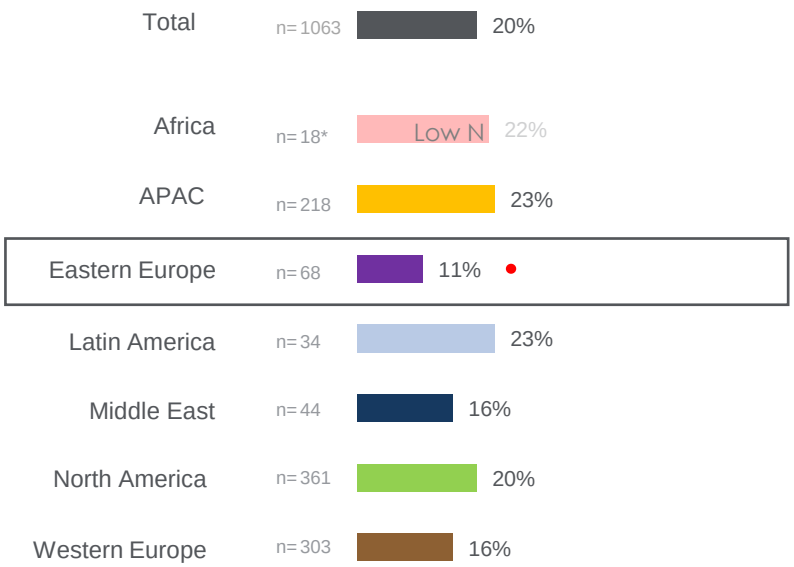
Note: Crowdfunding in 2021 = 0.1%

FUNDING BY REGION: APAC is less likely to agree in 2021 that there is sufficient funding available. North America was the most pessimistic about the future availability of funding in 2020. Optimism here has increased in 2021 but remains lower than average.

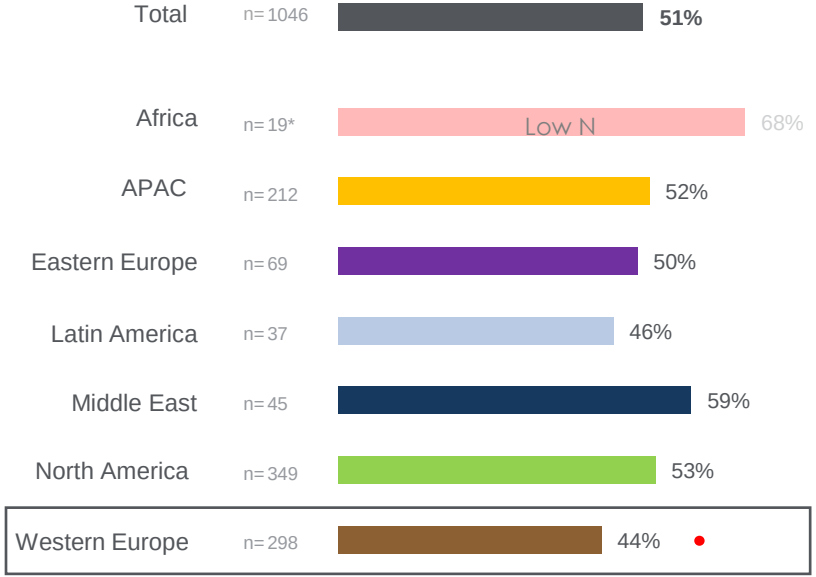


FUNDING BY REGION: Eastern Europe is less likely to have more of their funding coming from corporate and/or philanthropic organisations compared to 2-3 years ago. Western Europe is less likely to have more funding requirements compared 2-3 years ago.

More of my funding comes from corporate and/or philanthropic organisations compared to 2-3 years ago - (% agree)

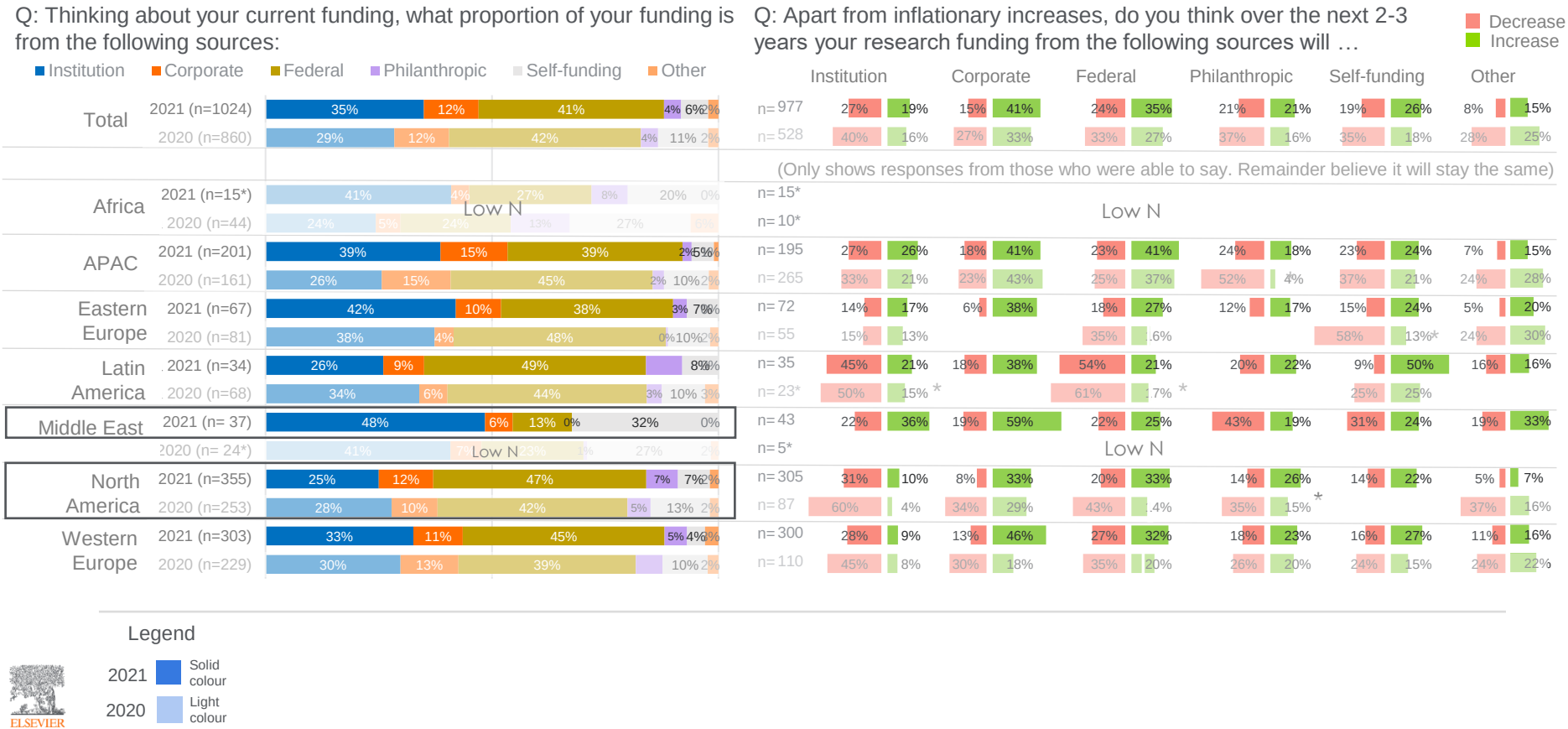


There are more funding requirements compared 2-3 years ago - (% agree)

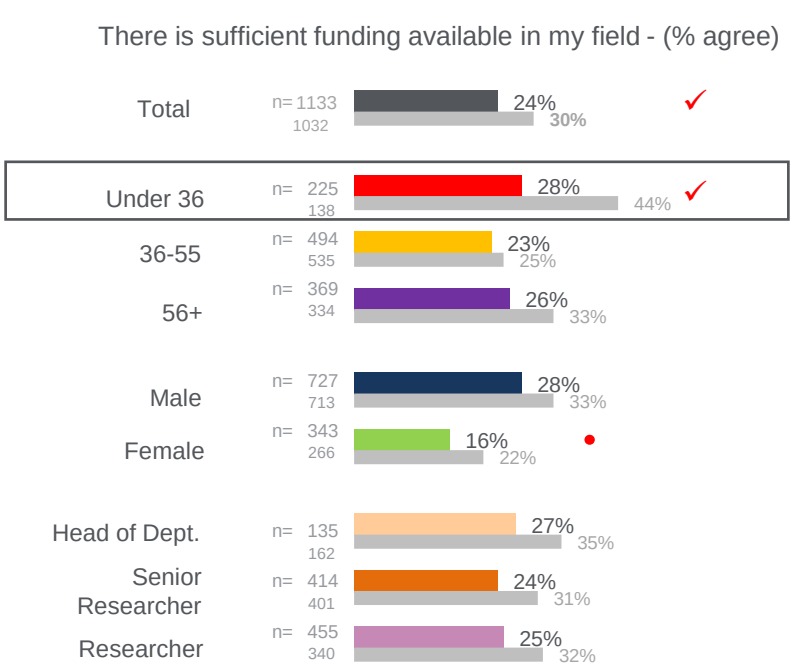


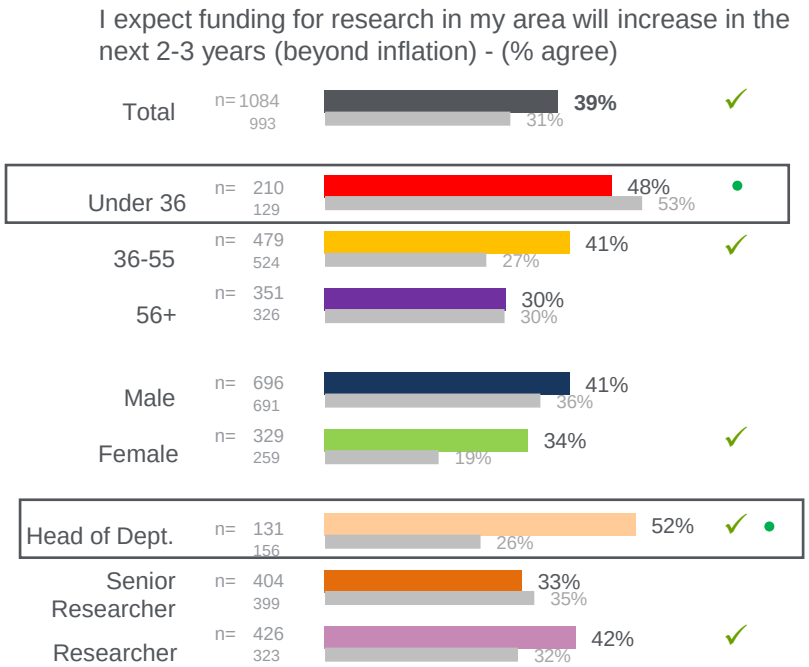
Legend
Higher
Lower
Significant difference between 2021 sub-group and overall

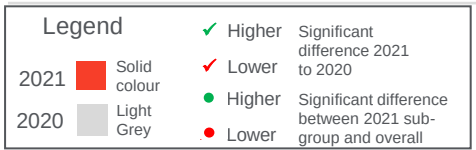
FUNDING BY REGION: University/ Research Institution funding is less prevalent in North America. Self-funding is more likely in the Middle East.



FUNDING BY AGE/GENDER/SENIORITY: Younger researchers are less likely in 2021 than in 2020 to claim there is sufficient funding. Younger researchers and Heads of Department are both more likely to expect funding to increase than average.

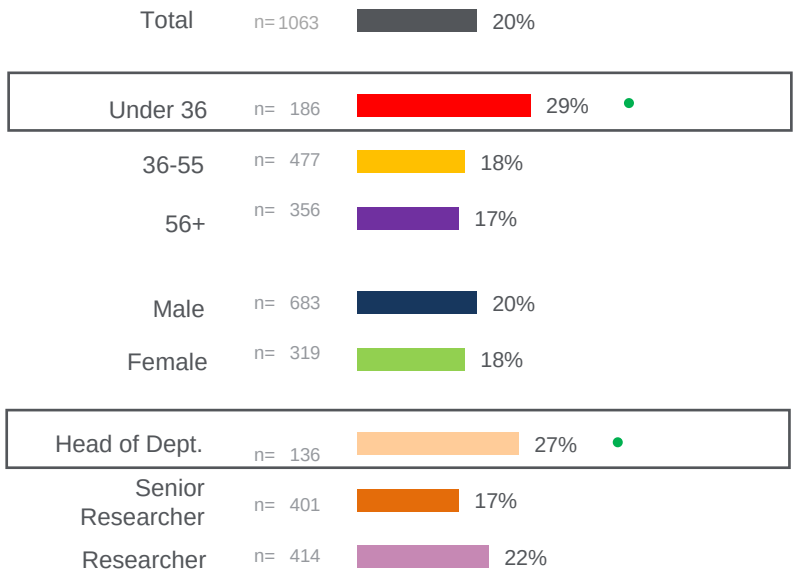




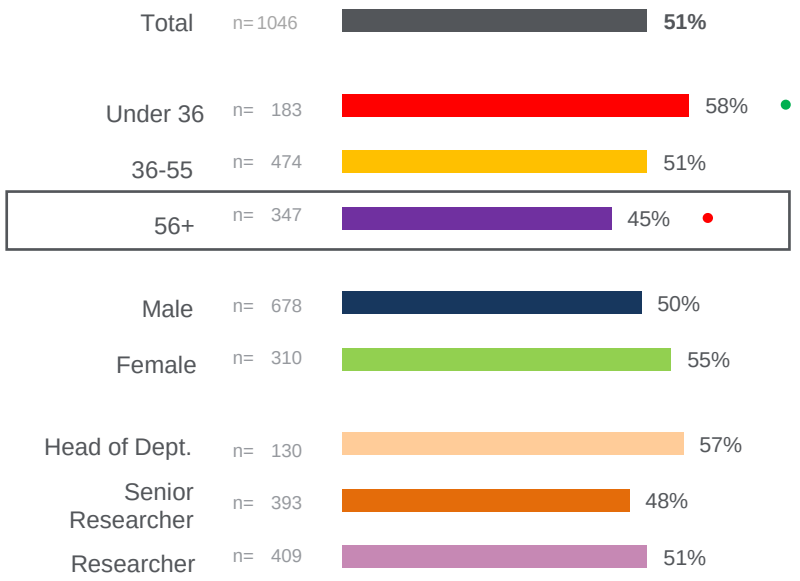


FUNDING BY AGE/GENDER/SENIORITY: Younger researchers and Heads of Dept. more likely to have more of their funding coming from corporate/ philanthropic organisations versus to 2-3 years ago. Older report less likely to have more funding requirements now than 2-3 years back.

More of my funding comes from corporate and/or philanthropic organisations compared to 2-3 years ago - (% agree)



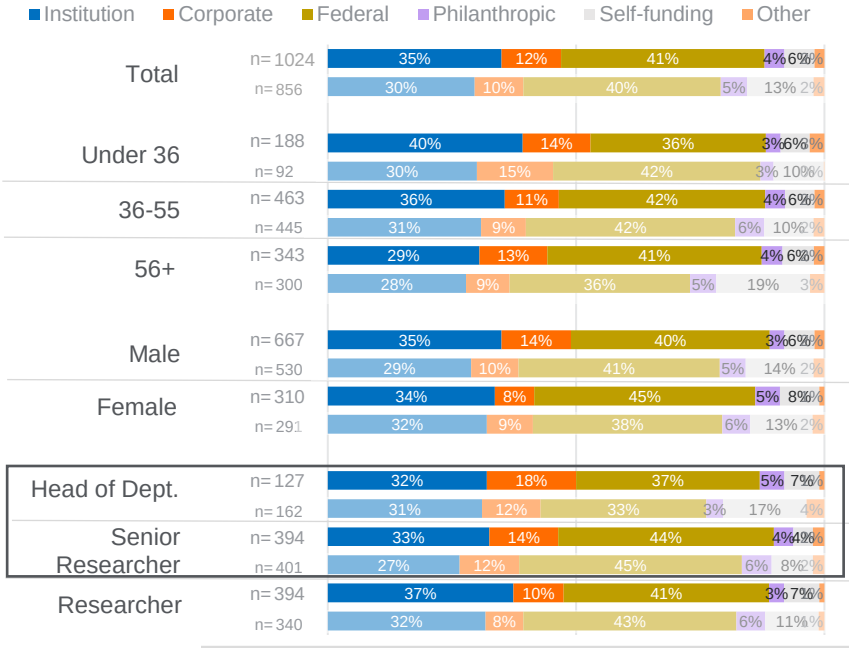
There are more funding requirements compared 2-3 years ago - (% agree)



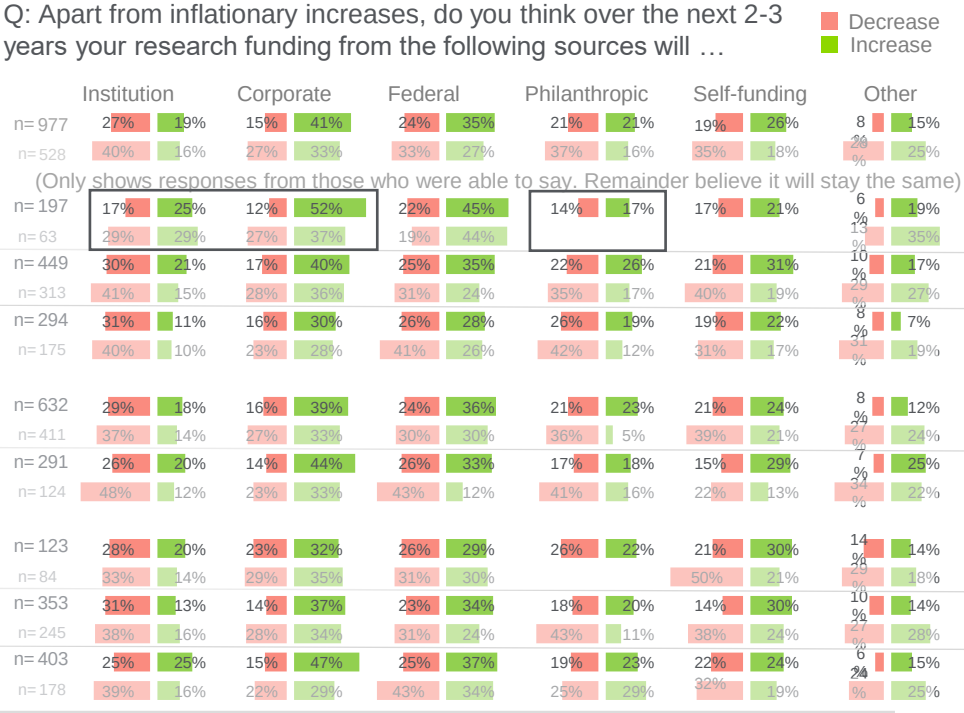
Legend
Higher
Lower
Significant difference between 2021 sub-group and overall

FUNDING BY AGE/GENDER/SENIORITY: Corporate is a greater share of funding as researchers attain more senior levels. Younger researchers are less likely to expect a decrease in funding from institution, corporate and philanthropic sources.

Q: Thinking about your current funding, what proportion of your funding is from the following sources:



Q: Apart from inflationary increases, do you think over the next 2-3 years your research funding from the following sources will …



Legend

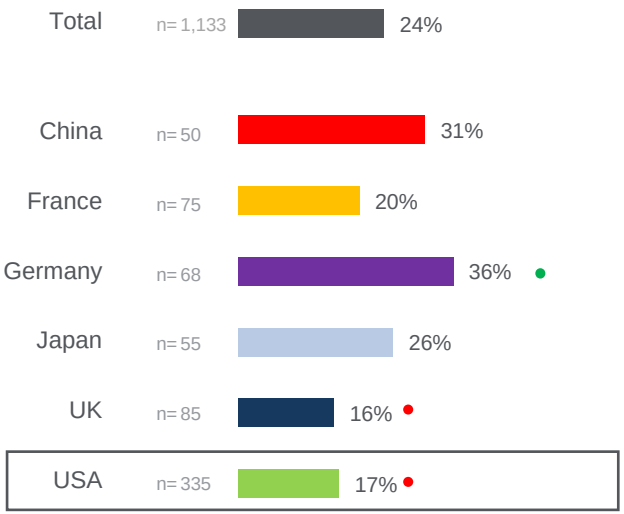
2021 Solid colour

2020 Light colour

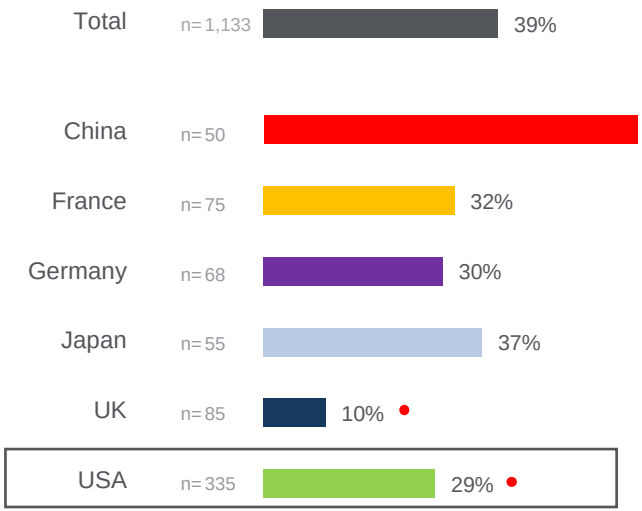
ELSEVIER

FUNDING BY AGE/GENDER/SENIORITY: Researchers in the USA are more pessimistic than the global researcher population on average about the state of their current and future funding.

There is sufficient funding available in my field - (% agree)



I expect funding for research in my area will increase in the next 2-3 years (beyond inflation) - (% agree)

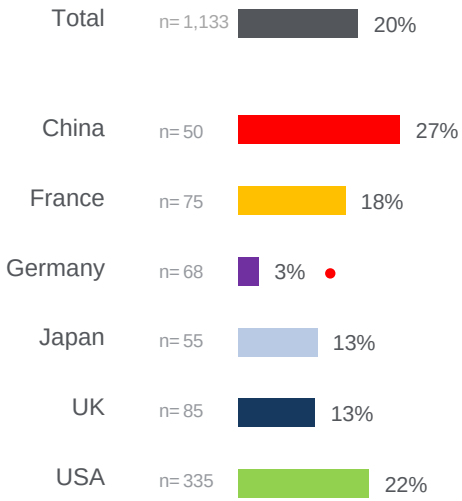


(Don't know answers are included in base size)

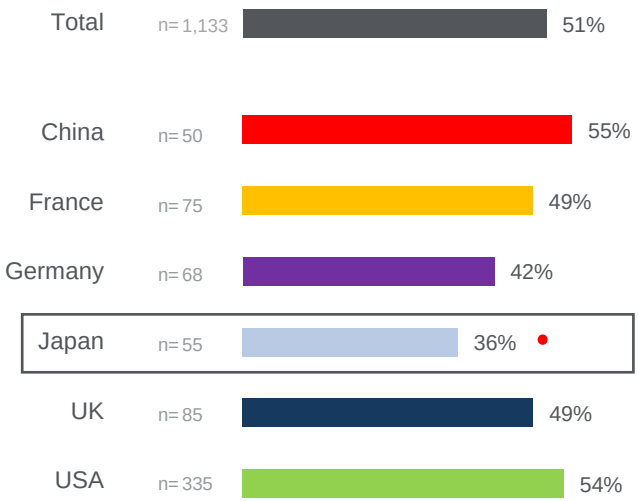
Higher
Lower
Significant difference between 2021 sub-group and overall

RESULTS BY COUNTRY: Researchers in Japan are less likely to say that there are more funding requirements compared to 2-3 years ago.

More of my funding comes from corporate and/or philanthropic organisations compared to 2-3 years ago - (% agree)



There are more funding requirements compared to 2-3 years ago - (% agree)

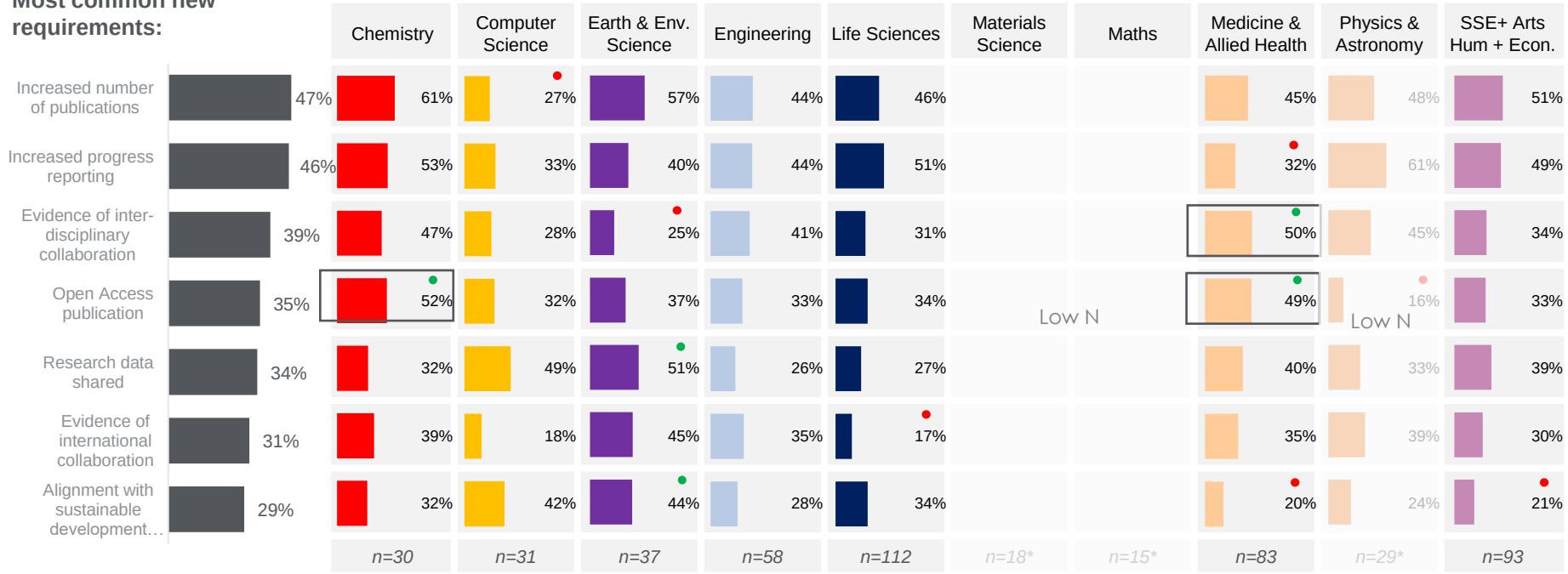


(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

NEW FUNDING REQUIREMENTS: Evidence of inter-disciplinary collaboration is more likely to be a new funding requirement in Medicine. Open Access publication is more likely to be a common new funding requirement in both Chemistry and Medicine.

BY SPECIALTY



Base: All who agreed with the statement "There are more funding requirements compared 2-3 years ago"

Legend

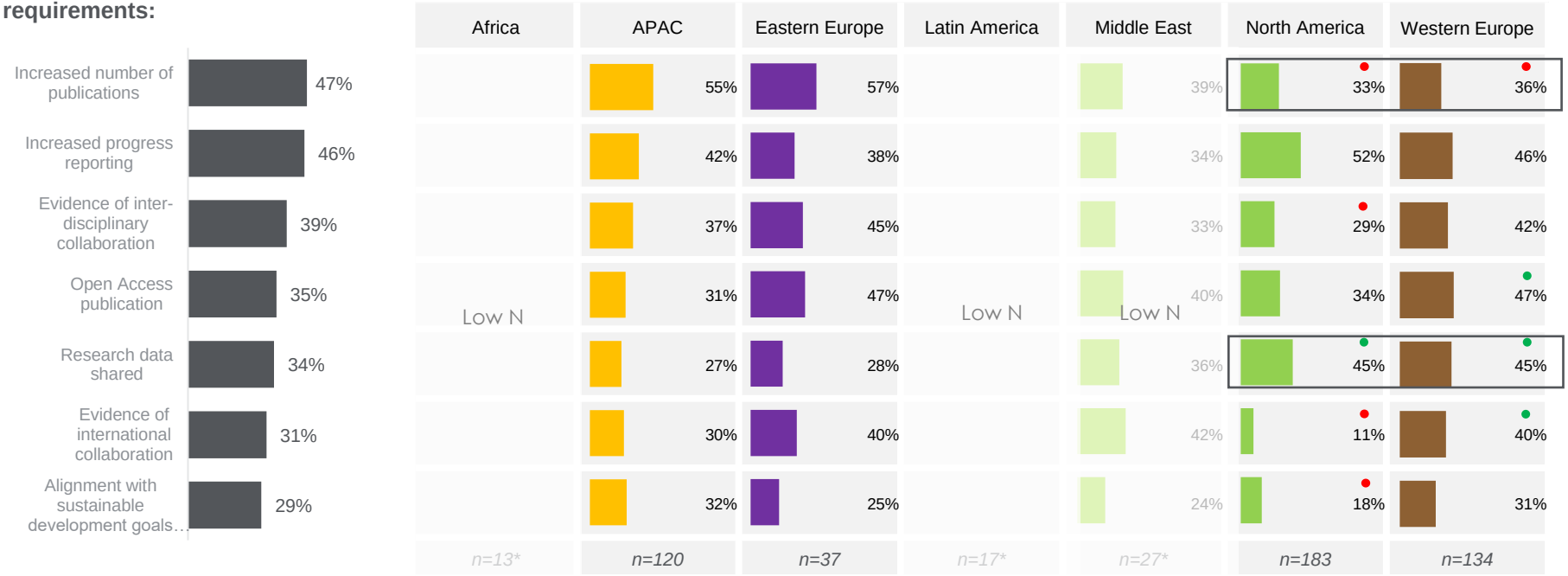
- Higher
- Lower

Significant difference between 2021 sub-group and overall

NEW FUNDING REQUIREMENTS: Research data shared is more likely, but increased number of research publications is less likely to be a common new funding requirement in North America and Western Europe in comparison to other regions.

Most common new requirements:

BY REGION



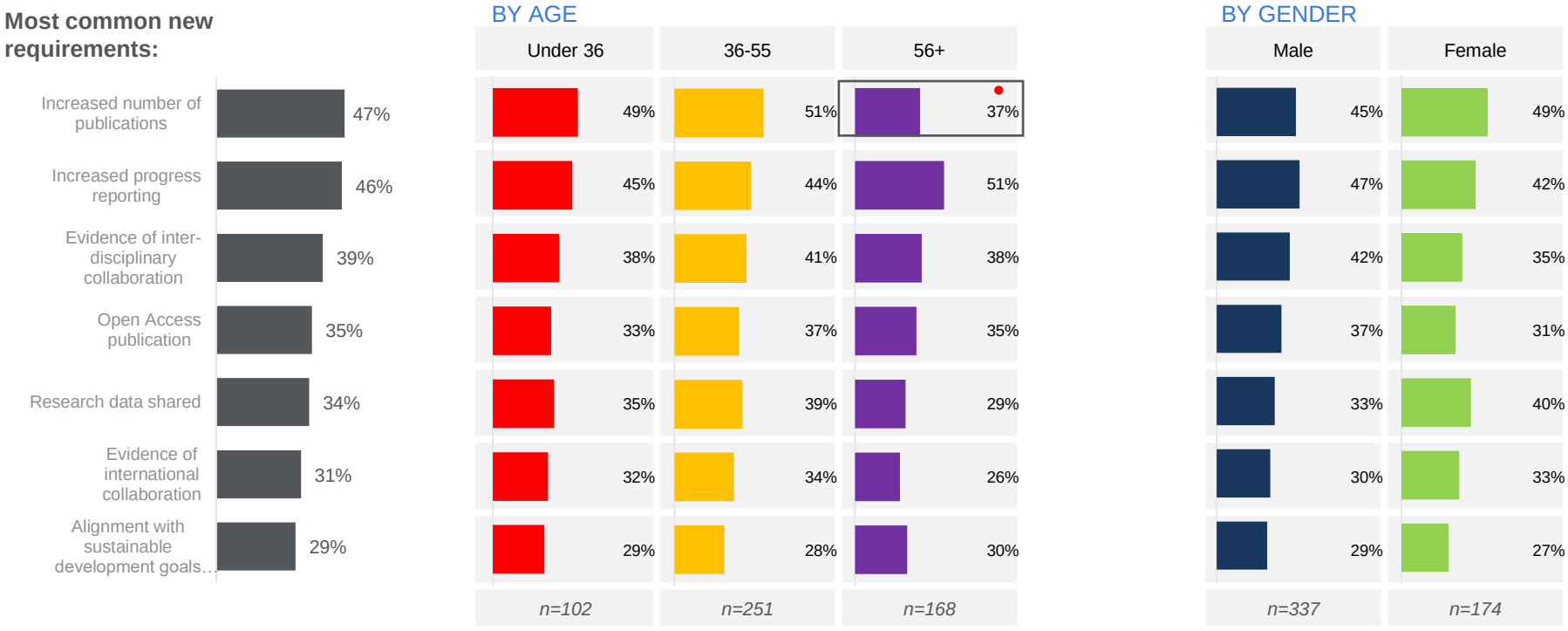
Base: All who agreed with the statement "There are more funding requirements compared 2-3 years ago"

Legend

- Higher
- Lower

Significant difference between 2021 sub-group and overall

NEW FUNDING REQUIREMENTS: Older researchers are less likely to state that increased number of research publications is a common new funding requirement.



Base: All who agreed with the statement "There are more funding requirements compared 2-3 years ago"

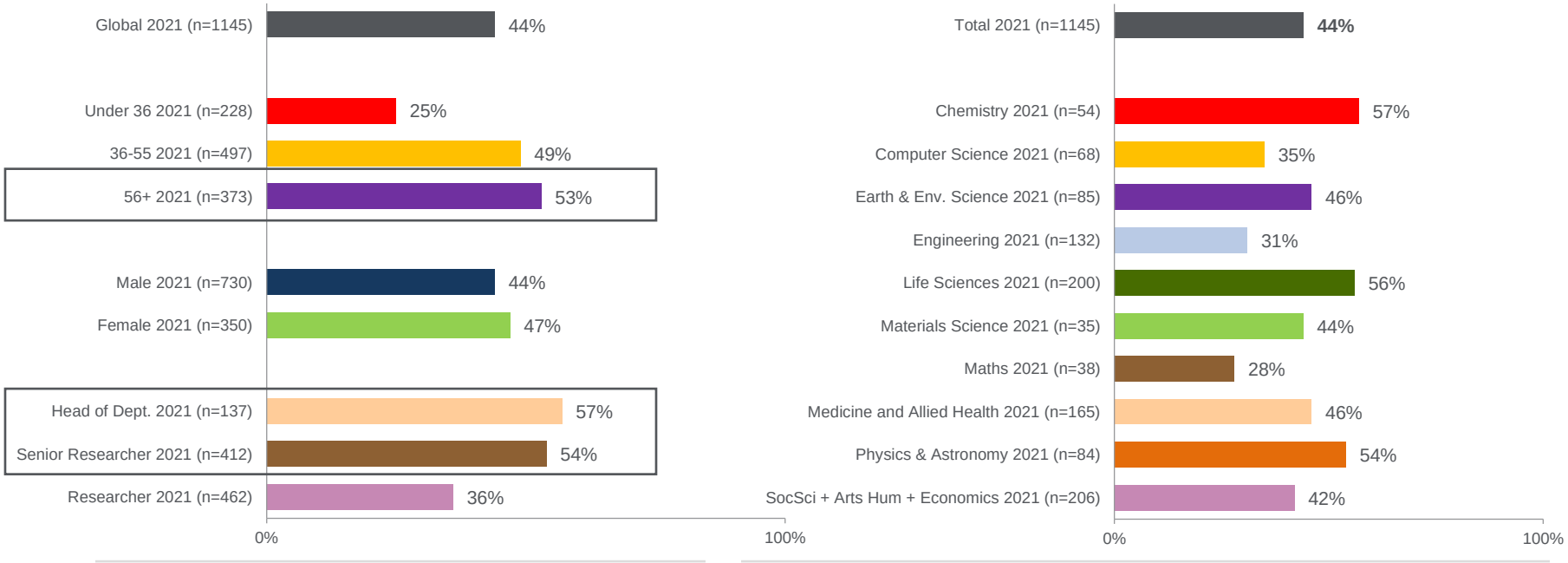
Legend

- Higher
- Lower

Significant difference between 2021 sub-group and overall

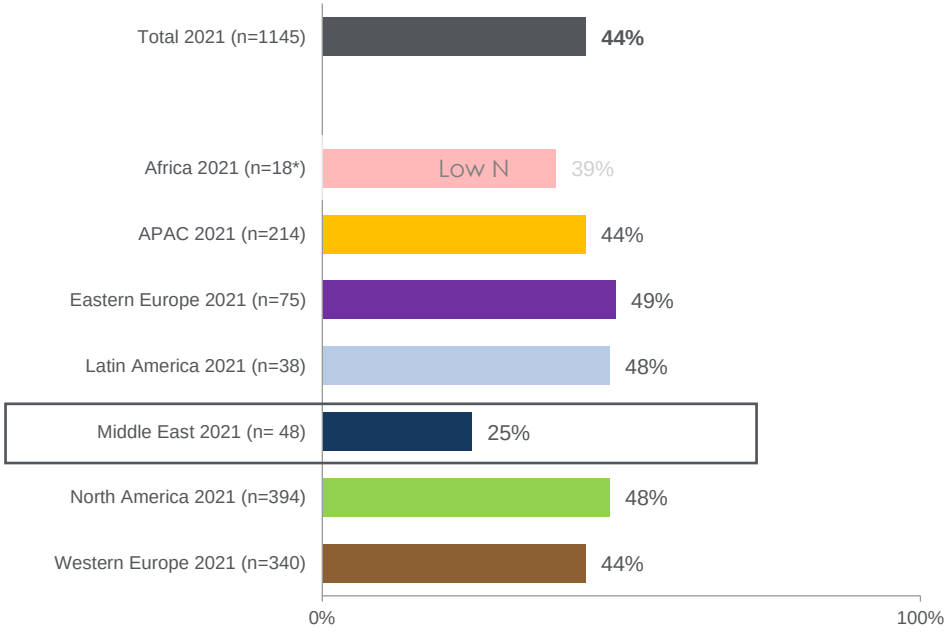
GRANT HOLDER OR PRINCIPLE INVESTIGATOR: Older, more senior level researchers, are more likely to be grant holders or the named lead.

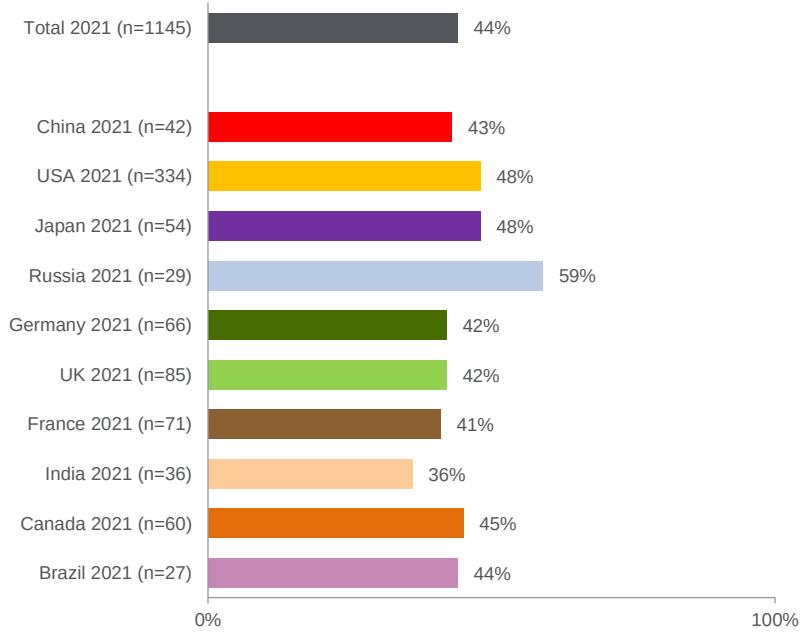
Are you currently a grant holder or Principal Investigator (i.e., named lead on externally-funded research grants)?



GRANT HOLDER OR PRINCIPAL INVESTIGATOR: limited variation by geography; Middle East aside, where less stated that they are a grant holder or named lead.

Are you currently a grant holder or Principal Investigator (i.e., named lead on externally-funded research grants)?





Back to contents

COVID-19 IMPACT

COVID Contents

COVID EXECUTIVE SUMMARY

The majority view overall is that flexible working patterns will become more common longer term as a consequence of COVID-19. Researchers also increasingly think there will be more cross-discipline working and research in new areas (both are up on levels reported in 2020). More open science, teaching being online and dependency on technology are all considered to be longer term impacts of COVID. A general perception is that there will be a greater focus on societal impact of research.

Over half (54%) hold the view that ensuring a good work-life balance has been difficult during Covid.

In terms of types **research output used during the pandemic**, the **use of research articles outside the field of the researcher has increased the most**, followed by pre-prints.

Medicine were more likely to report an increase in use of all types of research outputs, particularly, pre-prints. North America were less likely than other regions to report an increased use of research articles in their field, and statistical data shared but not linked to a published article. Female researchers were more likely to report an increased use of both pre-prints and articles outside their field. Heads of Department experienced more seminars/webinars/conferences than other positions.

The use of all of platforms to access or share research information increased during the pandemic. **Sharing sites/ apps most likely** to have seen increased use in relation to the work of the researcher since the start of the Covid-19 pandemic. However, all types of information media saw increased use, including social media, academic communities, publisher websites, government portals and institutional repositories.

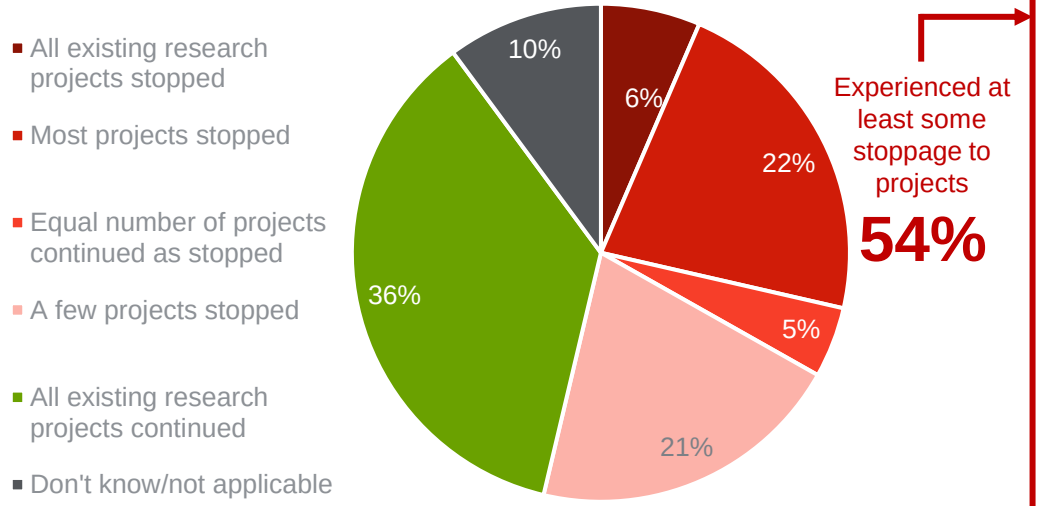
Use of government portals and publisher websites were more likely to have increased in Medicine versus other specialties. Computer Science use of sharing sites has increased more than other specialties. North America were less likely than other regions to have experienced an increase in use of community platforms, social media, institutional repositories, governmental portals and publisher websites. Younger researchers were more likely to report an increase in use of social media. Heads of Department use of government portals and publisher websites increased more than other researcher levels.

OVERVIEW OF IMPACT OF COVID RESULTS

Impact of COVID-19 on research: More than half of researchers had at least some projects stopped; the main reasons were institution closure or inability to get to work/travel.

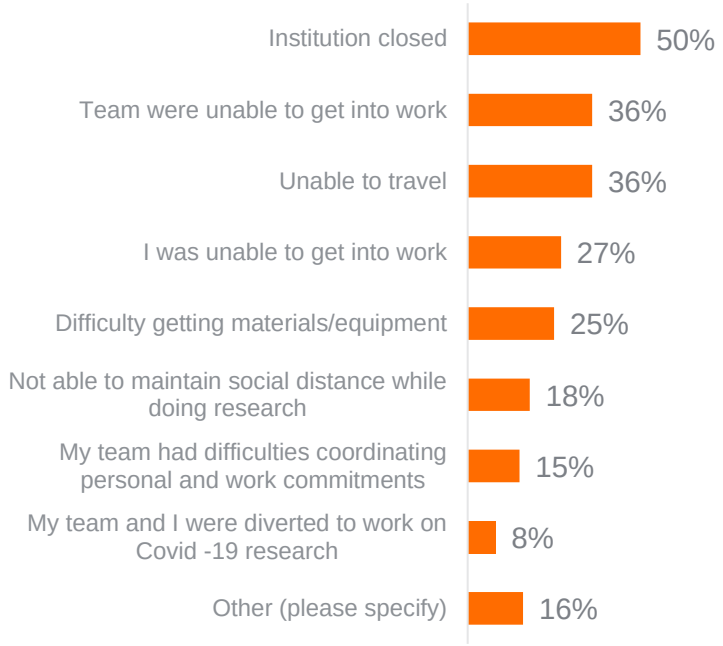
Results from 2020 study

To what extent have you experienced the following since the start of the COVID-19 pandemic?



Base: All researchers (n=1,066)

Why did all/some of your research projects stop?



Base: All researchers that experienced stoppage to projects (n=573)

COVID AND WORK-LIFE BALANCE:
Over half (54%) hold the view that ensuring a good work-life balance has been difficult during Covid.

Ensuring I have a good work-life balance has been difficult during Covid

2021
n=1,159

% disagree **26%**

% agree **54%**

Reasons for DISAGREEING:

- **Working from home facilitated flexibility on scheduling of work/ more time as no commuting/ more time with family**

"Working remotely allows me to flex my hours so that I can find a good work-life balance. No commute also allows me to find time for myself" (Biological Sciences, USA, aged 26-35)

"Working from home has allowed me to decide when I need to work on projects versus focus on home-life. When working in an office, my schedule was much more regimented" (Environmental Sciences, USA, aged over 65)

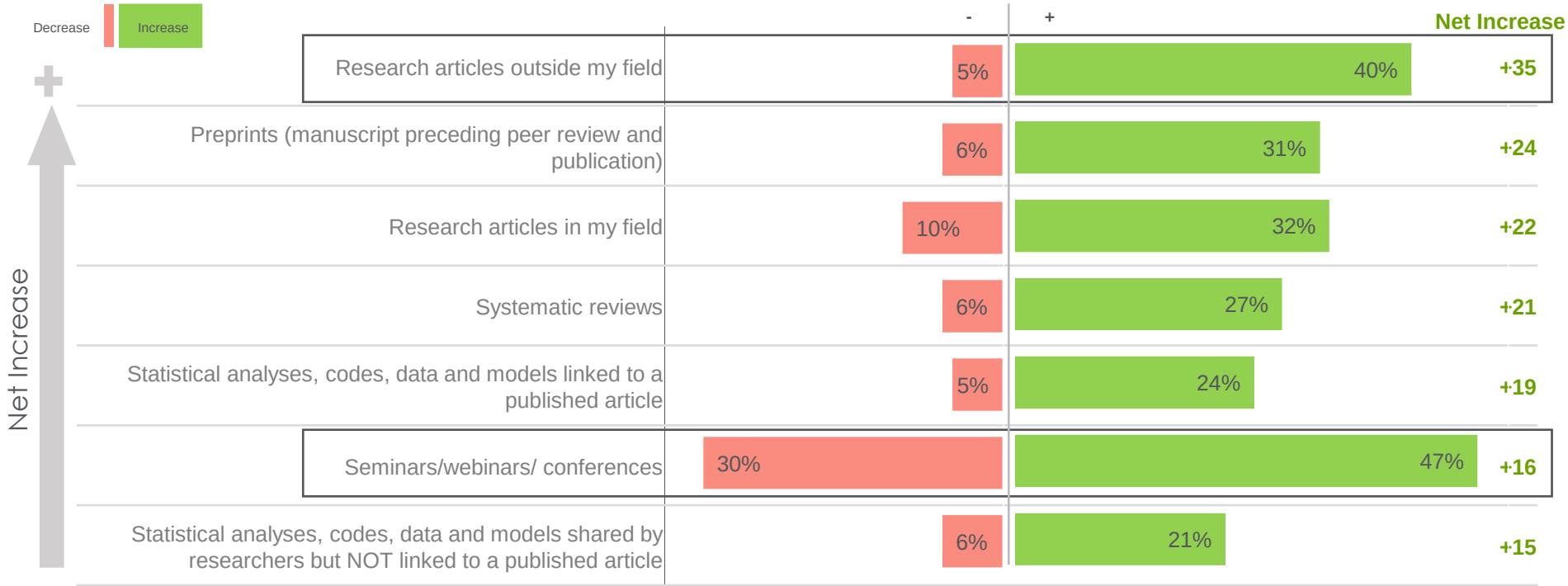
Reasons for AGREEING:

- **Difficulties in working from home (home schooling, childcare) and blurring of home and work life separation**
- **Uncertainty over economic fortunes/ work security/ reduced income**
- **Online teaching, disconnected from students**
- **Loss of social/ personal contact**

"Homes were not planned for whole family (+kids) working there." (Earth and Planetary Sciences, Germany, aged 36-45)

COVID-19 IMPACT ON USE OF RESEARCH OUTPUTS: For all research outputs, a greater proportion reported increased use than who reported decreased use. This was strongest for articles outside of the researchers' fields, and usage decrease/increase was most split for seminars.

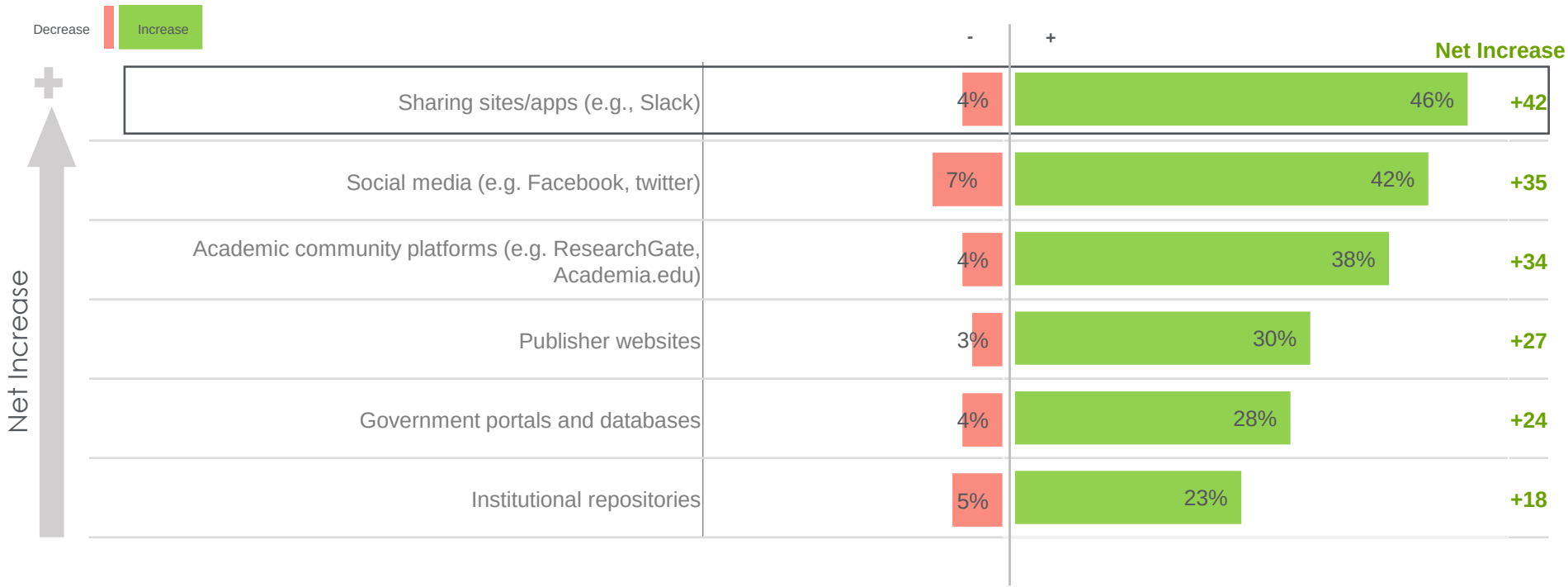
Since the start of the Covid-19 pandemic, has your use of the following types of research output increased, stayed the same or decreased...



Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following types of research output increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased'. Figure shown far right is % increase score - % decrease score. N varies from 850 to 1,135 because respondents were offered a 'not applicable' option and these responses are not reported

COVID-19 IMPACT ON USE OF PLATFORMS: Sharing sites/ apps saw most increased use since the start of the Covid-19 pandemic.

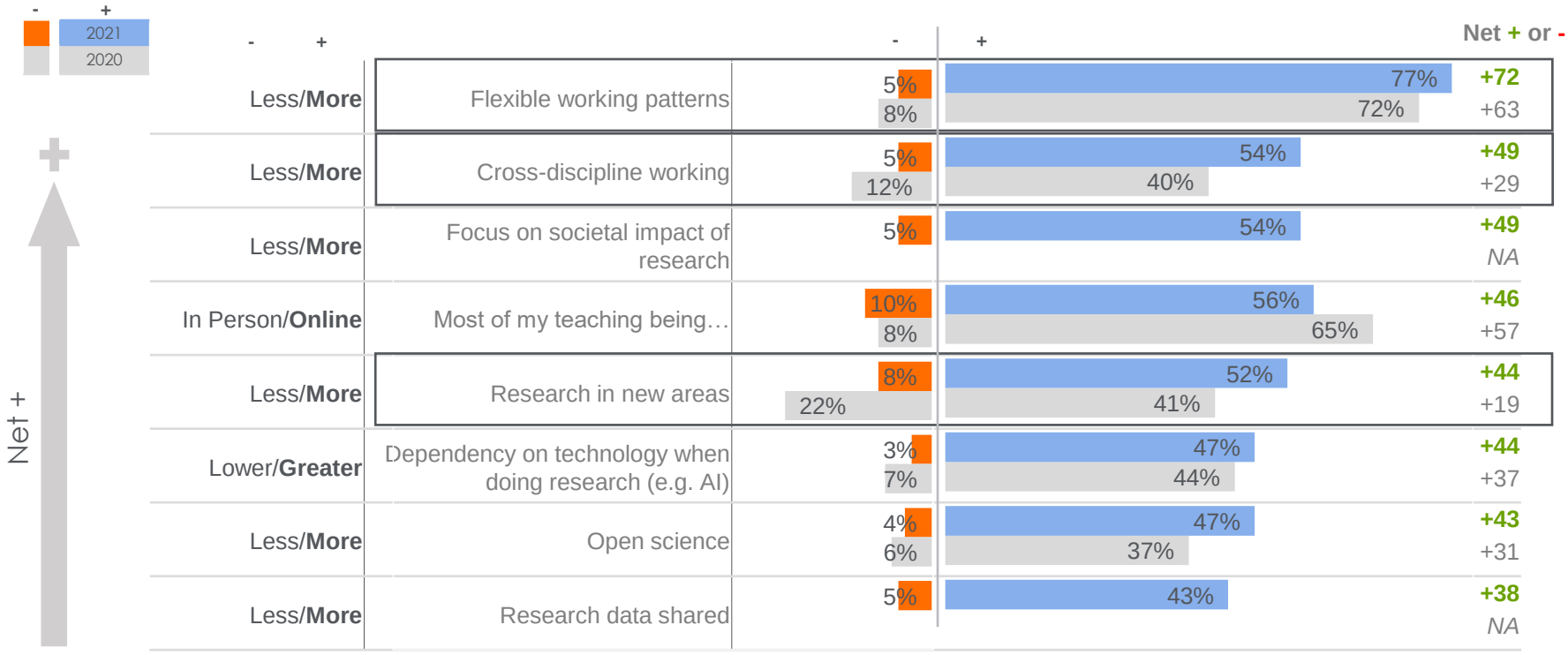
Since the start of the Covid-19 pandemic, has your use of the following in relation to your research increased, stayed the same or decreased...



Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following in relation to your research increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased'. Figure shown far right is % increase score - % decrease score.
N varies from 861 to 1077 because respondents were offered a 'not applicable' option and these responses are not reported

ANTICIPATED LONGER TERM IMPACT OF COVID-19: The majority view overall is that flexible working will become more common. Researchers increasingly think there will be more cross-discipline working and research in new areas (both are up on levels in 2020).

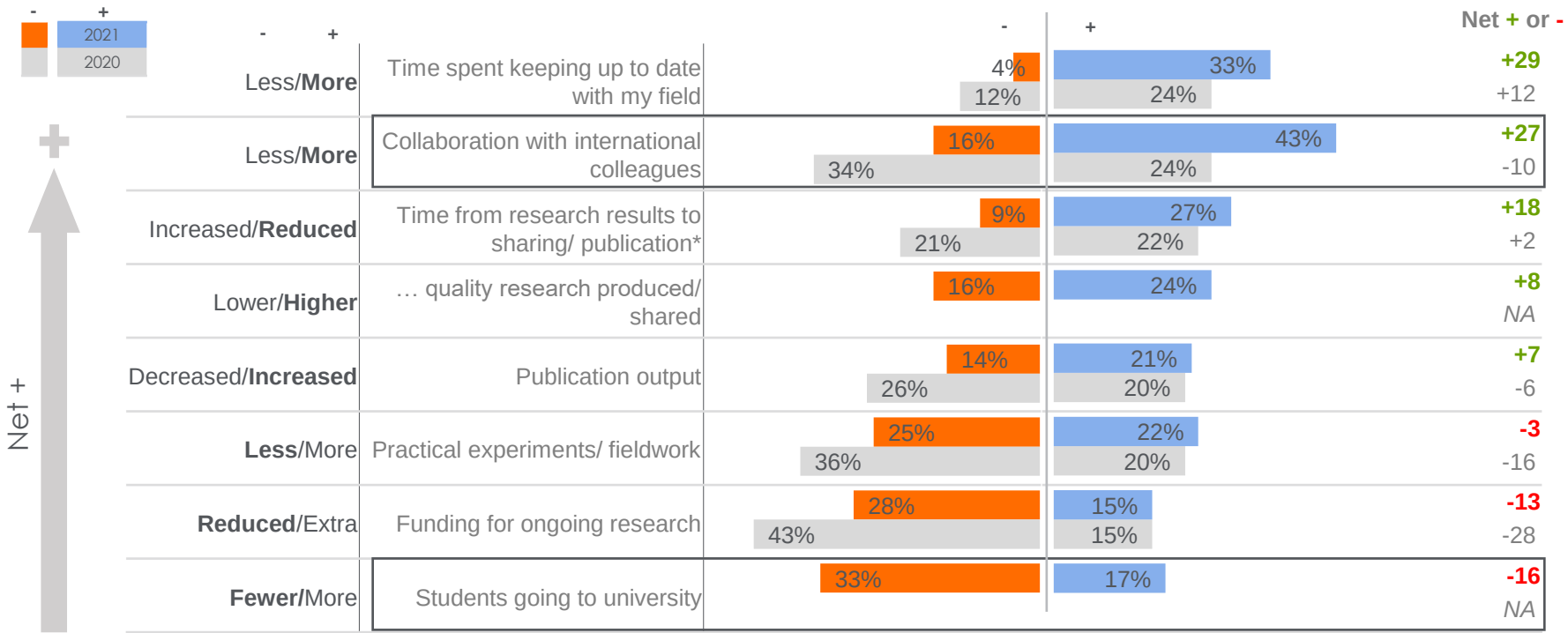
Do you think the longer term impact of COVID-19 will lead to... (Part 1 of 2)



Source: Do you think the longer term impact of COVID-19 will lead to... scale was '+' 'no change' '-', figure shown far right is % positive score - % negative score
N varies from 1035 to 1139 because respondents were offered a 'not applicable' option and these responses are not reported

ANTICIPATED LONGER TERM IMPACT OF COVID-19: COVID overall is no longer perceived as leading to less collaboration with international colleagues, as it was in 2020. It is, however, perceived as leading to fewer students going to university, in the longer-term.

Do you think the longer term impact of COVID-19 will lead to... (Part 2 of 2)



Source: Do you think the longer term impact of COVID-19 will lead to... scale was '+' 'no change' '-', figure shown far right t is % positive score - % negative score
* Shorter time to publication is positive and longer time to publication is negative
N varies from 1035 to 1139 because respondents were offered a 'not applicable' option and these responses are not reported

COVID-19 IMPACT ON RESEARCH WORK

Results by subject, region, age group, gender, position and country

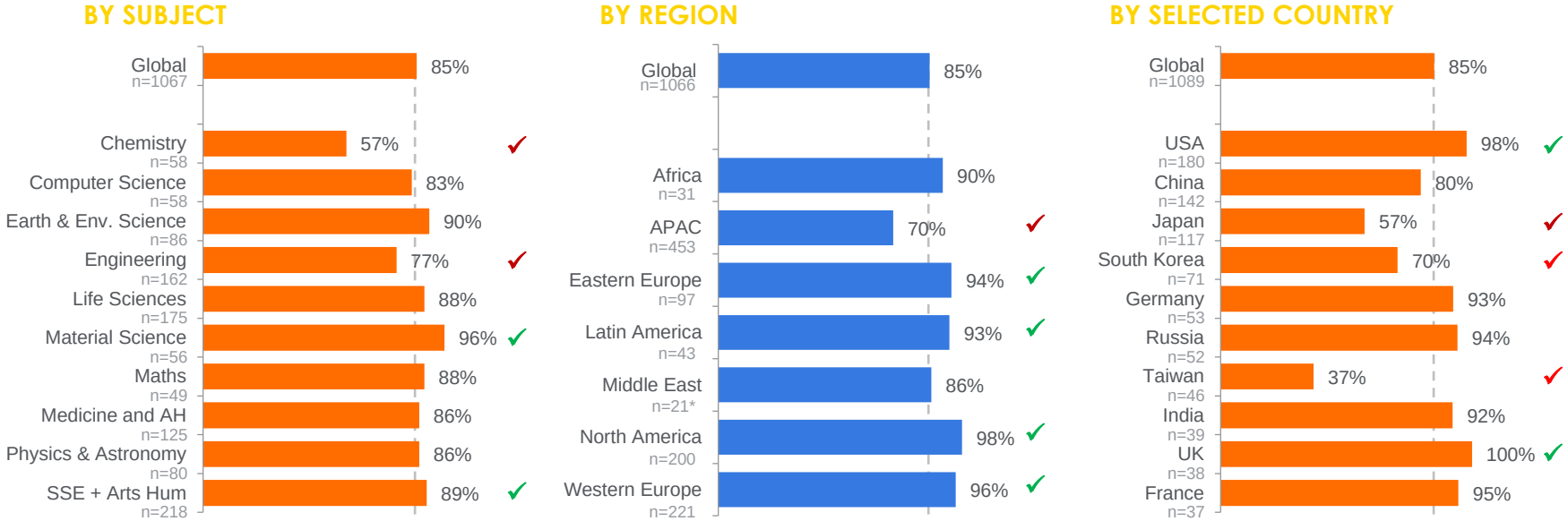
Note results in this section are from 2020 study

Lockdown experiences: These were mainly driven by geography, with countries in the APAC region less likely than average to have experienced lockdown.

Results from 2020 study

✓ Higher
✓ Lower
Significant difference between subset and total (p=90%)

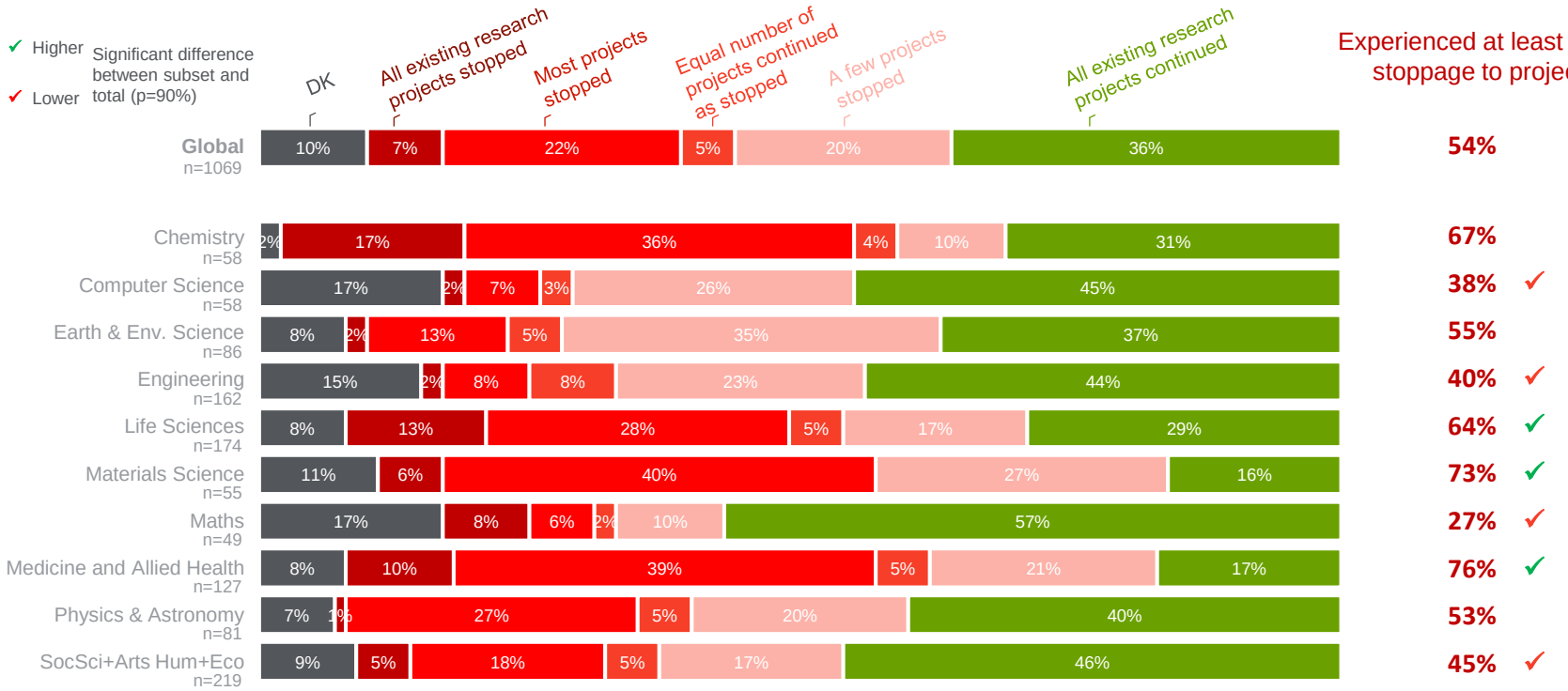
Has the country in which you work experienced a 'lockdown' (e.g. movement restrictions, workplace closures, social distancing) as a result of COVID-19? % YES



*Caution Low Base

Impact of COVID-19 on research by subject (1): Materials Science, Life Sciences and Medicine have been the most disrupted. Maths, Computer Science and SSE less so.

To what extent have you experienced the following since the start of the COVID-19 pandemic?



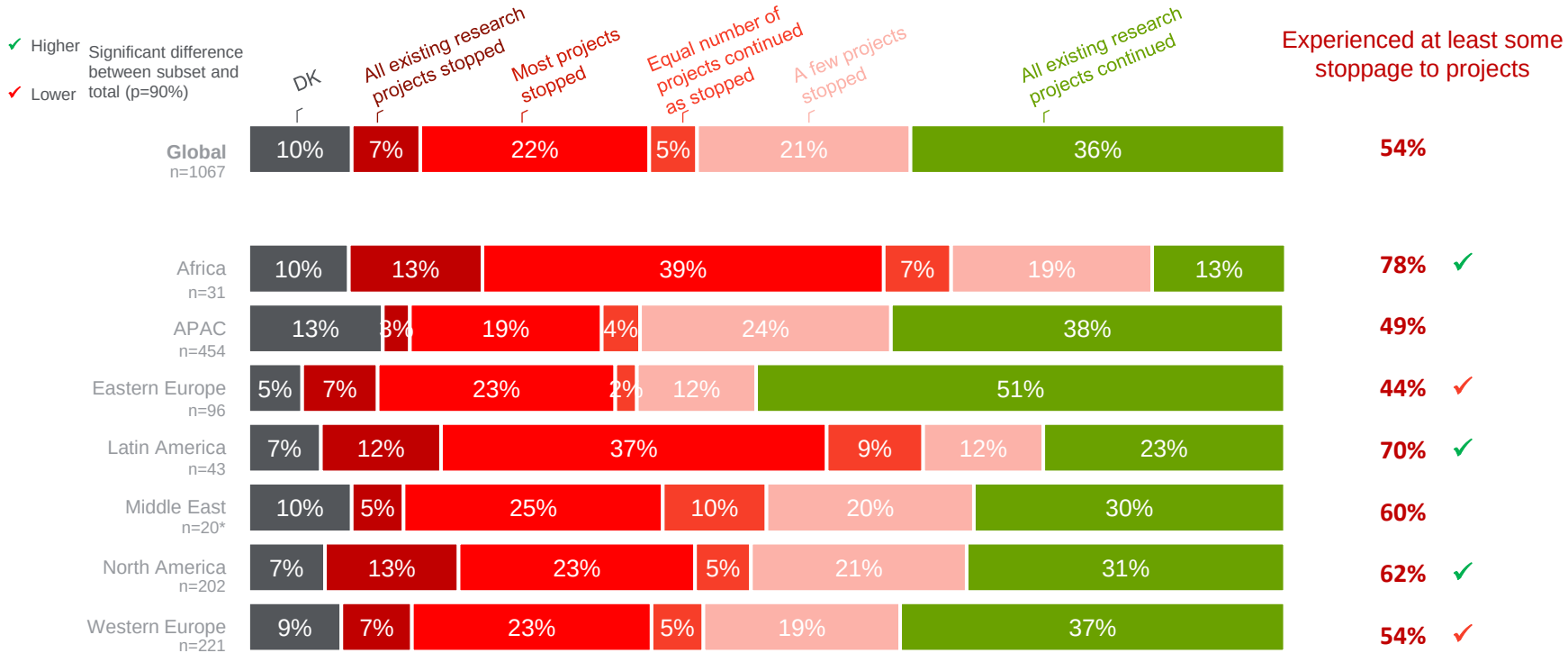
Impact of COVID-19 on research by subject (2): Medicine was more affected by inability to get into work (need to isolate?) and its efforts were redirected to tackling COVID. Materials Science was hampered by difficulties getting equipment.

*Caution Low Base

Q: Why did all/some of your research projects stop?

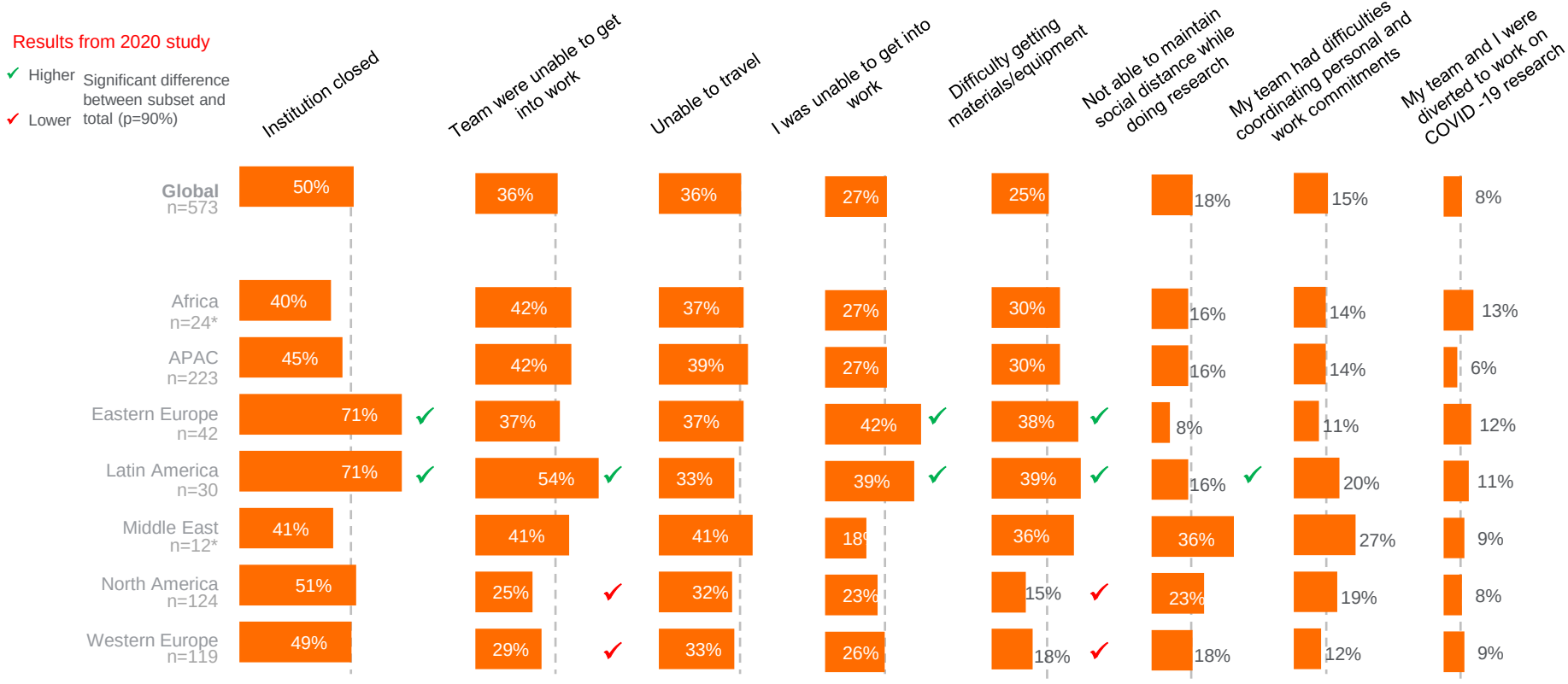
Impact of COVID-19 on research by region (1): More research projects stopped in Africa, Latin and North America. Eastern and Western Europe were less affected.

To what extent have you experienced the following since the start of the COVID-19 pandemic?



*Caution Low Base

Impact of COVID-19 on research by region (2): North America and Western Europe were less impacted by team not being able to get to work (remote work in place?) and also less impacted by difficulties in getting equipment.

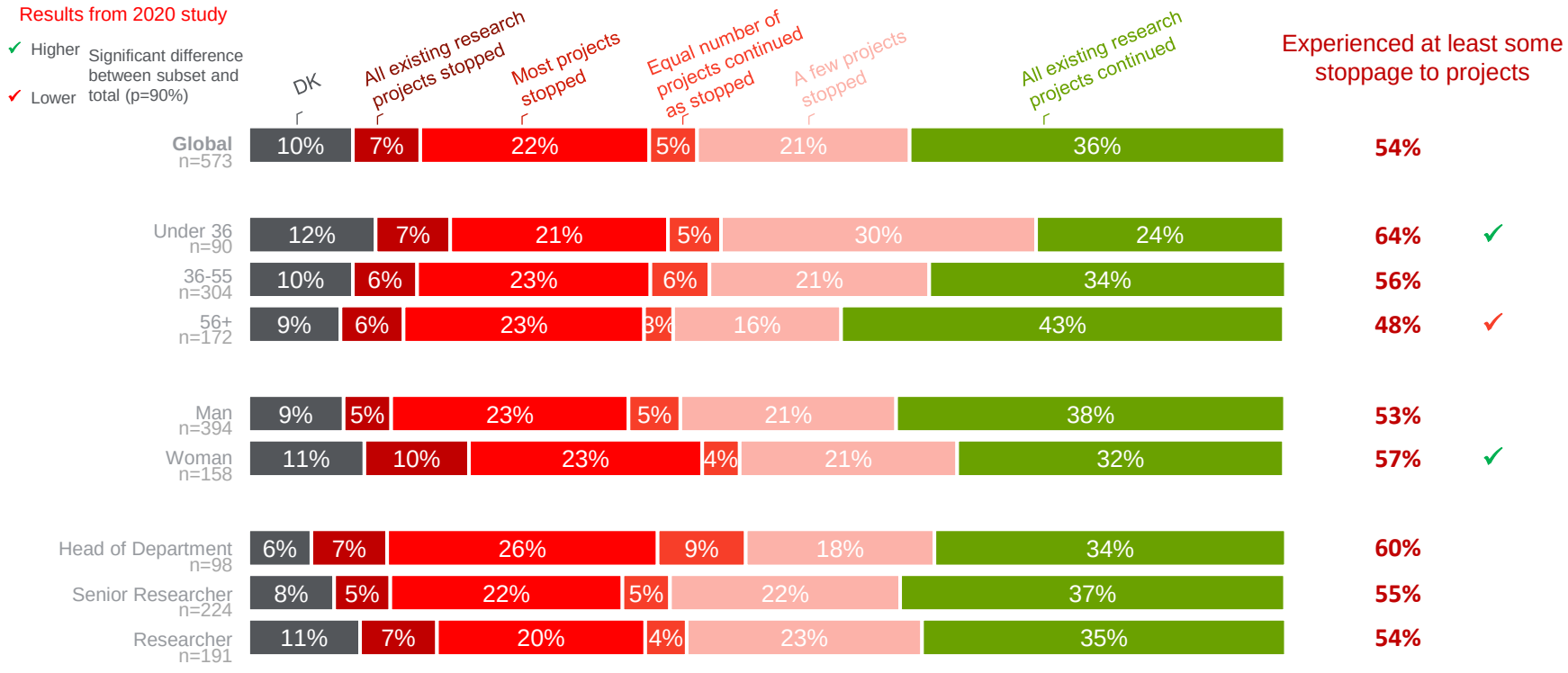


*Caution Low Base

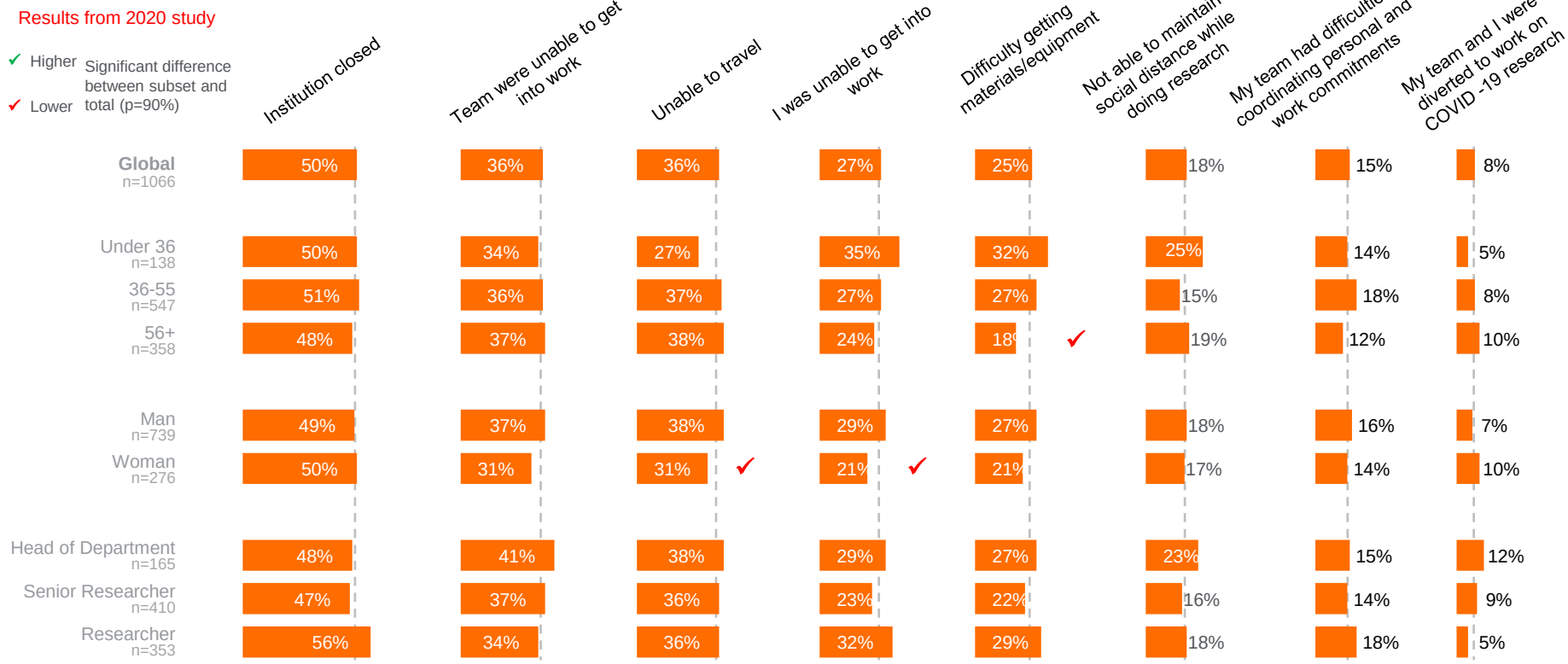
Q: Why did all/some of your research projects stop?

Impact of COVID-19 on research by age, gender and position (1): Younger groups and female researchers reported more project stoppages than average.

To what extent have you experienced the following since the start of the COVID-19 pandemic?



Impact of COVID-19 on research by age, gender and position (2): The reasons for stopping projects were fairly uniform by age, gender and position. Women were slightly less impacted by an inability to travel or get into work.



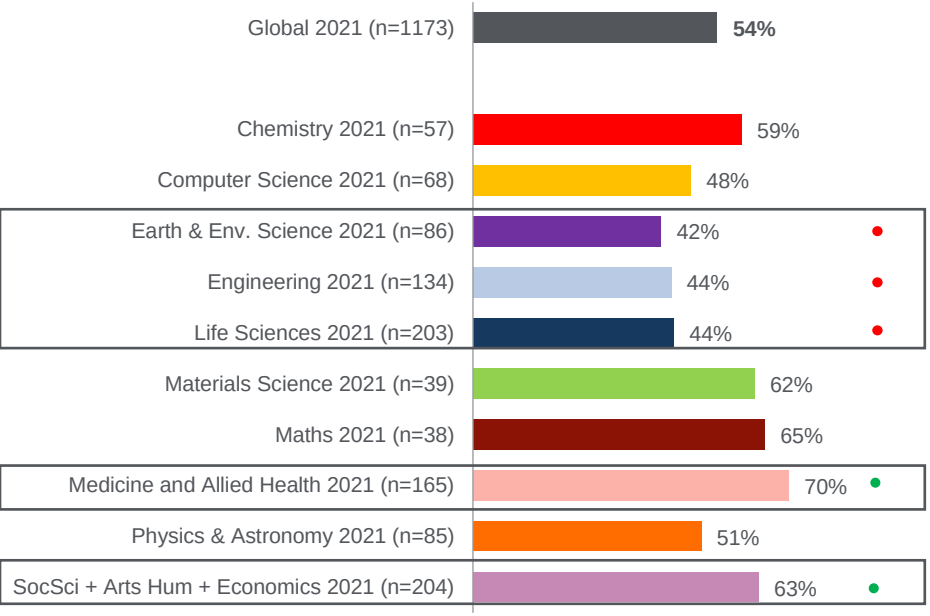
Q: Why did all/some of your research projects stop?

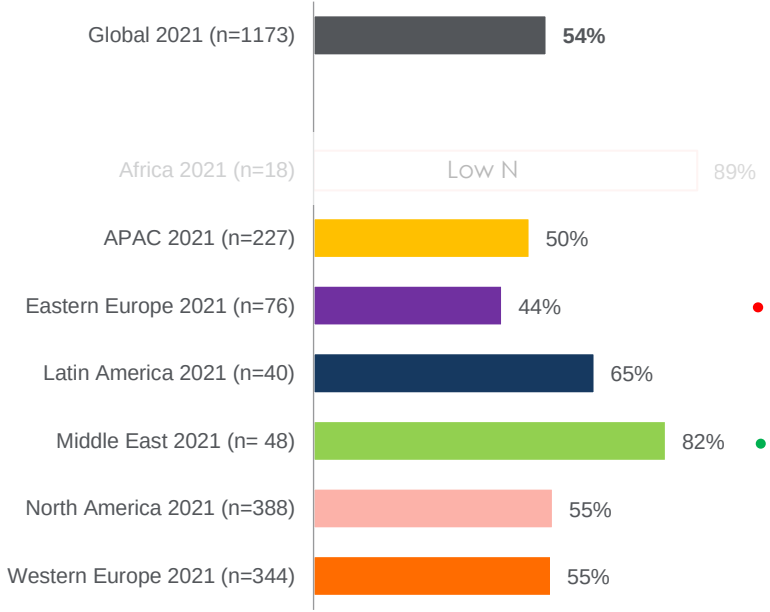
COVID-19 IMPACT ON WORK-LIFE BALANCE

Results by subject, region, age group, gender, position and country

WORK-LIFE BALANCE: Ensuring a good work-life balance has been more likely to be difficult in Medicine and SocSci + Arts Hum + Economics, but less difficult in Earth & Env., Engineering and Life Sciences.

Ensuring I have a good work-life balance has been difficult during Covid - (% agree)





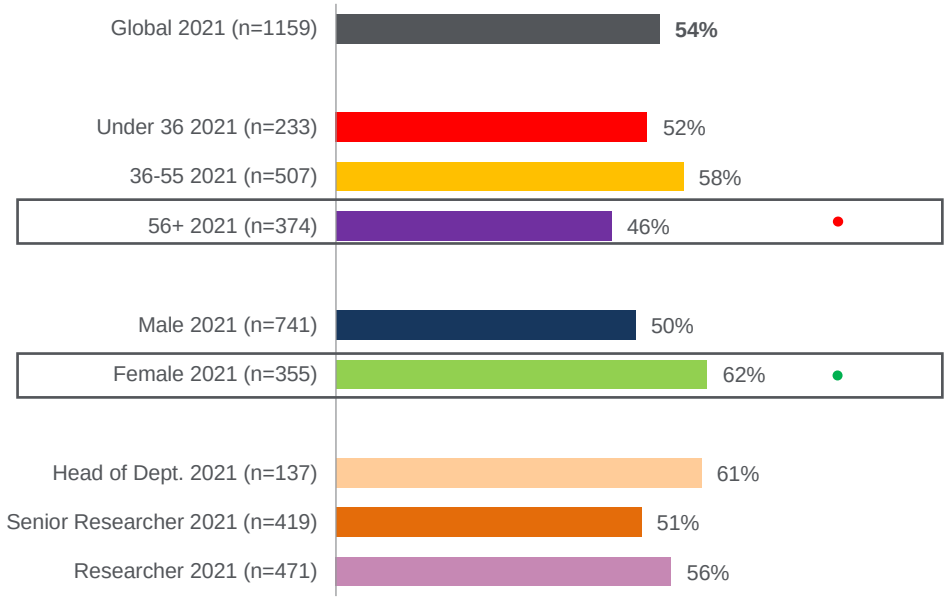
Legend

- Higher
- Lower

Significant difference between 2021 sub-group and overall

WORK-LIFE BALANCE: Ensuring a good work-life balance has been more likely to be difficult for females, but less difficult for those aged 56+.

Ensuring I have a good work-life balance has been difficult during Covid - (% agree)

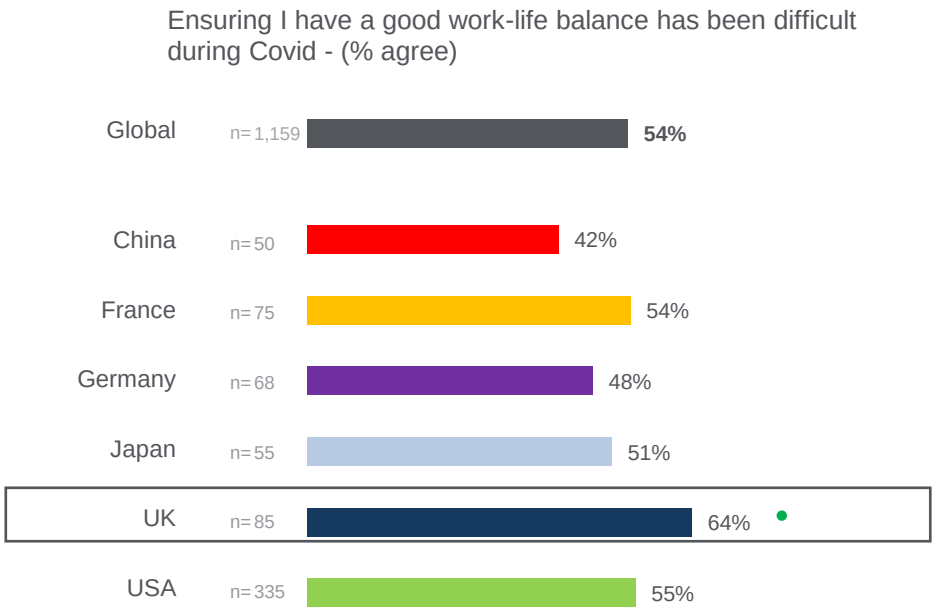


Legend

- Higher
- Lower

Significant difference between 2021 sub-group and overall

RESULTS BY COUNTRY: Researchers in the UK were more likely to struggle with work-life balance with 64% finding this difficult, vs. 54% globally.



(Don't know answers are included in base size)

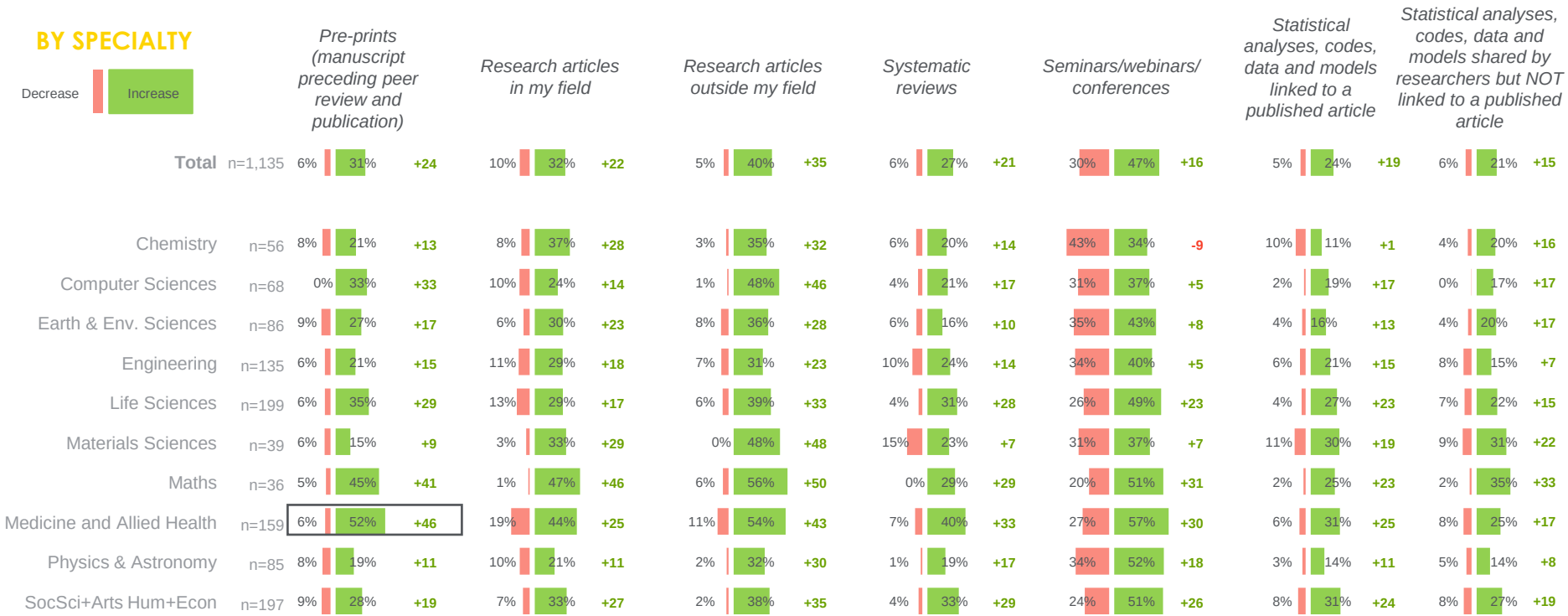
Legend

- Higher — Significant difference between 2021 sub-group and overall
- Lower

COVID-19 IMPACT ON USE OF RESEARCH OUTPUTS

Results by subject, region, age group, gender, position and country

COVID-19 IMPACT ON USE OF RESEARCH OUTPUTS BY SPECIALITY:
Medicine were more likely to report an increase in use of all types of research outputs, particularly, pre-prints.



Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following types of research output increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased', figure shown in chart is % increase score - % decrease score. N varies from 850 to 1,135 because respondents were offered a 'not applicable' option and these responses are not reported

COVID-19 IMPACT ON USE OF RESEARCH OUTPUTS BY REGION: North America were less likely than other regions to report an increased use in research articles in their field and statistical data shared but NOT linked to a published article.

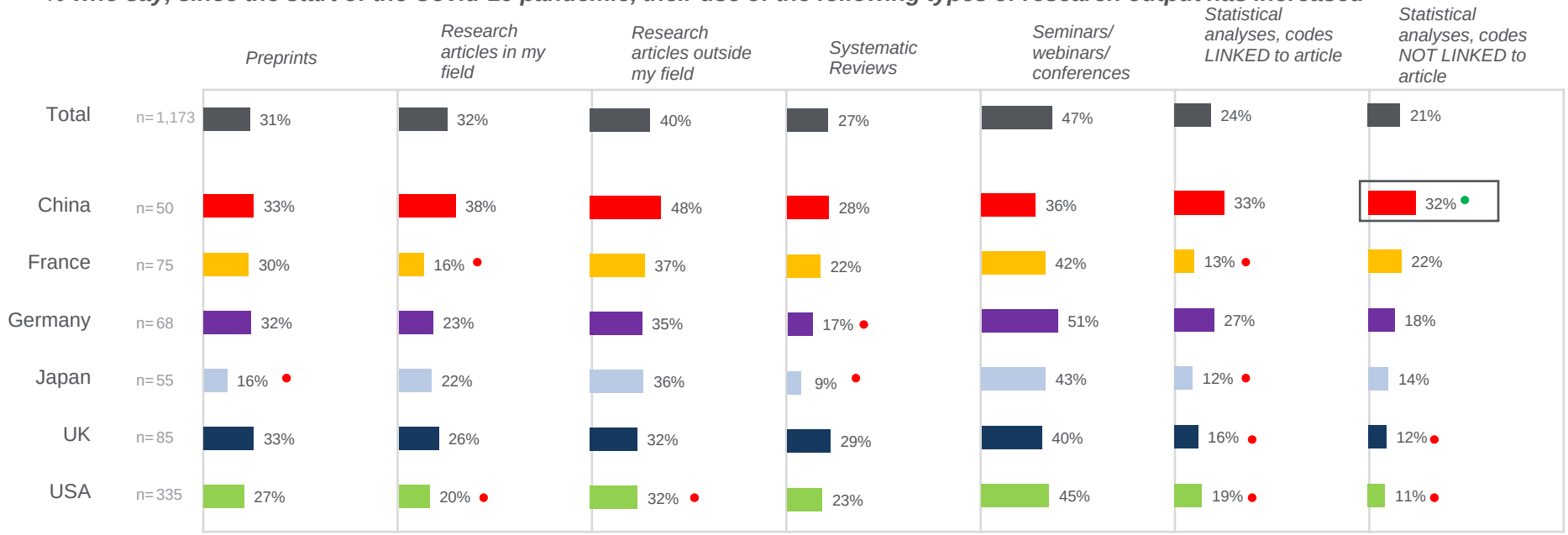
Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following types of research output increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased', figure shown in chart is % increase score - % decrease score. N varies from 850 to 1,135 because respondents were offered a 'not applicable' option and these responses are not reported

COVID-19 IMPACT ON USE OF RESEARCH OUTPUTS BY AGE, GENDER AND POSITION: Female researchers were more likely to report increased use of both pre-prints and articles outside their field. Heads of Depart. experienced more seminars/webinars/conferences than other positions.

Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following types of research output increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased', figure shown in chart is % increase score - % decrease score. N varies from 850 to 1,135 because respondents were offered a 'not applicable' option and these responses are not reported

COVID-19 IMPACT ON USE OF RESEARCH OUTPUTS BY COUNTRY: A greater proportion of researchers in China reported increased use of statistical analyses not linked to their field than researchers worldwide.

% who say, since the start of the Covid-19 pandemic, their use of the following types of research output has increased



(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following types of research output increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased'.

COVID-19 IMPACT ON USE OF RESEARCH PLATFORMS

Results by subject, region, age group, gender, position, country

COVID-19 IMPACT ON USE OF PLATFORMS BY SPECIALTY: Use of government portals and publisher websites more likely to have increased in Medicine versus other specialties. Earth and Env. use of publisher websites less likely to have increased. Computer Science use of sharing sites has increased more than other specialties.

Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following in relation to your research increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased', figure shown in chart is % increase score - % decrease score. N varies from 861 to 1,077 because respondents were offered a 'not applicable' option and these responses are not reported

COVID-19 IMPACT ON USE OF PLATFORMS BY REGION: North America were less likely than other regions to have experienced an increase in use of community platforms, social media, institutional repositories, governmental portals and publisher websites.

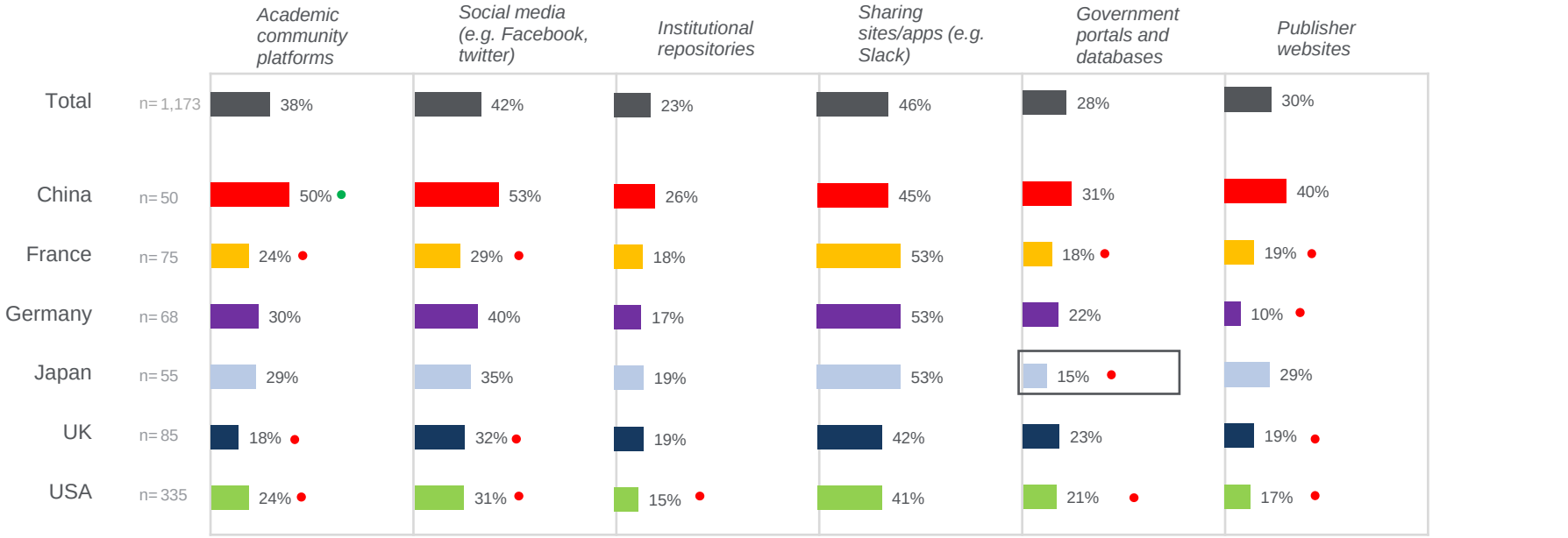
Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following in relation to your research increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased', figure shown in chart is % increase score - % decrease score. N varies from 861 to 1,077 because respondents were offered a 'not applicable' option and these responses are not reported

COVID-19 IMPACT ON USE OF PLATFORMS BY AGE, GENDER AND POSITION: The younger age groups were more likely to report an increase in use of social media. Heads of Department use of government portals and publisher websites increased more than other researcher levels.

Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following in relation to your research increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased', figure shown in chart is % increase score - % decrease score. N varies from 861 to 1,077 because respondents were offered a 'not applicable' option and these responses are not reported

COVID-19 IMPACT ON USE OF PLATFORMS BY COUNTRY: A smaller proportion of researchers in Japan (15%) than globally (28%) reported increased use of government portals and databases.

% who say, since the start of the Covid-19 pandemic, their use of the following in relation to their research has increased



(Don't know answers are included in base size)

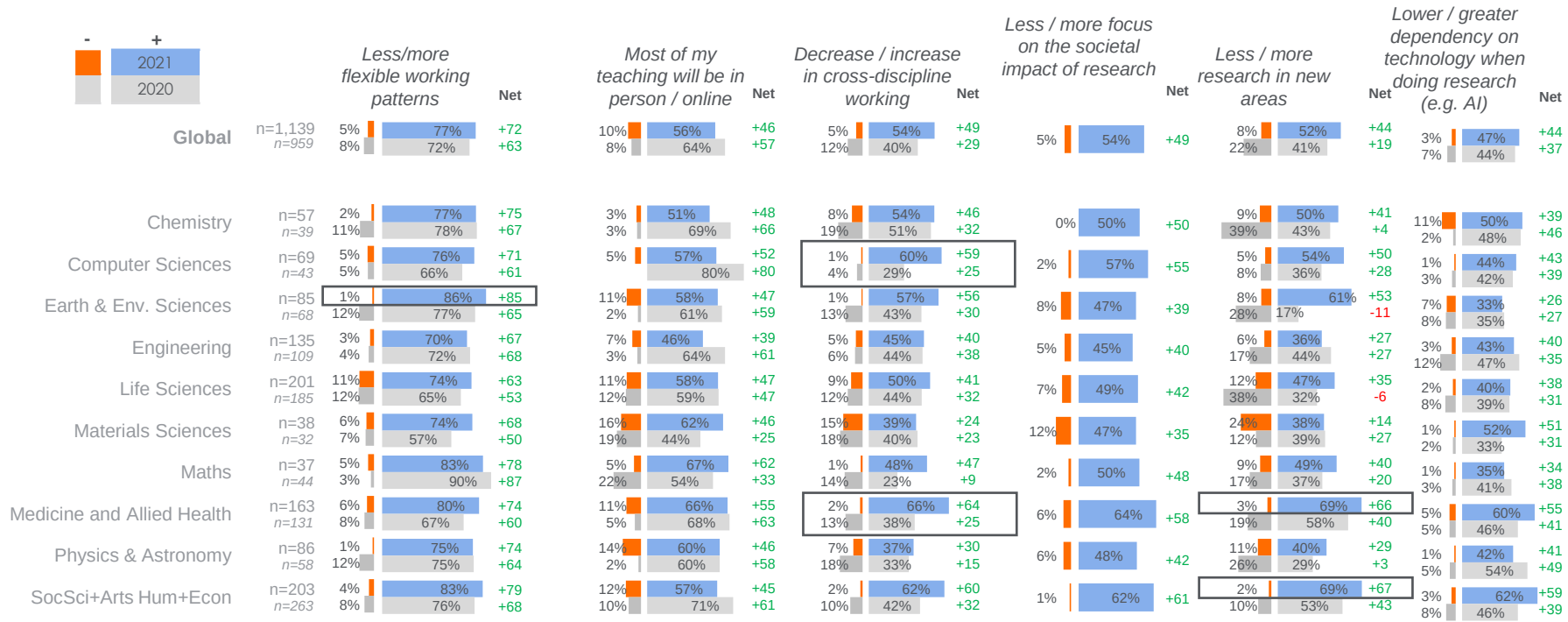
Higher
Lower
Significant difference between 2021 sub-group and overall

Source: Since the start of the Covid-19 pandemic (approx. 18 months) has your use of the following in relation to your research increased, stayed the same or decreased. Scale was 'Increased' 'Stayed the same' 'Decreased'.

LONGER TERM IMPACT OF COVID-19 ON RESEARCH

Results by subject, region, age group, gender and position

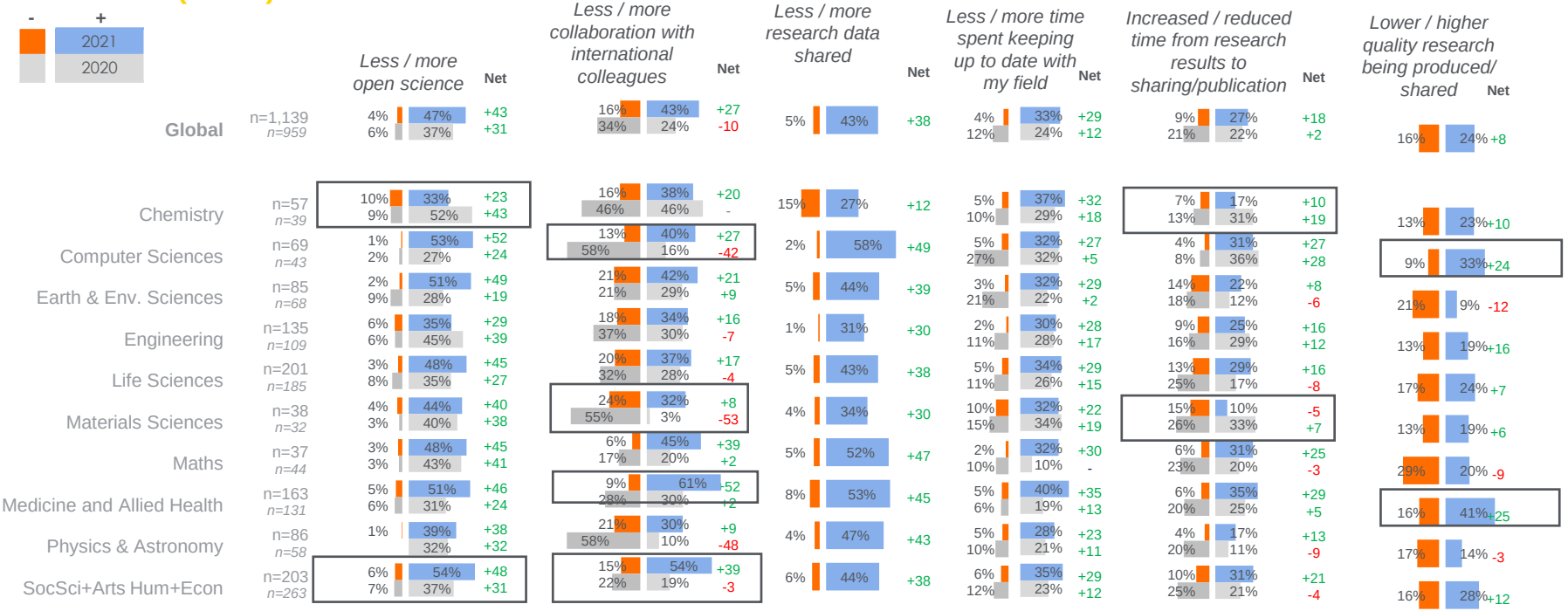
LONGER TERM IMPACT OF COVID-19 BY SPECIALITY: Expectation that there will be more flexible working patterns is highest in Earth & Env. Cross-discipline working expected to increase across specialties, particularly in Computer Science and Medicine, the latter sees a big lot more indicate it will increase compared to 2020. Medicine and SSE expect to explore new research areas more than other specialties.



Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
N varies from 1,035 to 1,139 in 2021, and from 637 to 959 in 2020, respondents were offered a 'not applicable' option these responses are not part of % reported

LONGER TERM IMPACT OF COVID-19 BY SPECIALITY: Those in Social Sciences and Economics expect more open science. Chemistry and Materials Science are less likely in 2021 to expect a reduction in the time to sharing/publication compared to 2020. Those in Computer, Materials and Social Sciences, Maths and Medicine are much more optimistic that international collaboration will increase over the next 2 to 3 years than in 2020. Medicine believe collaboration will increase the most.

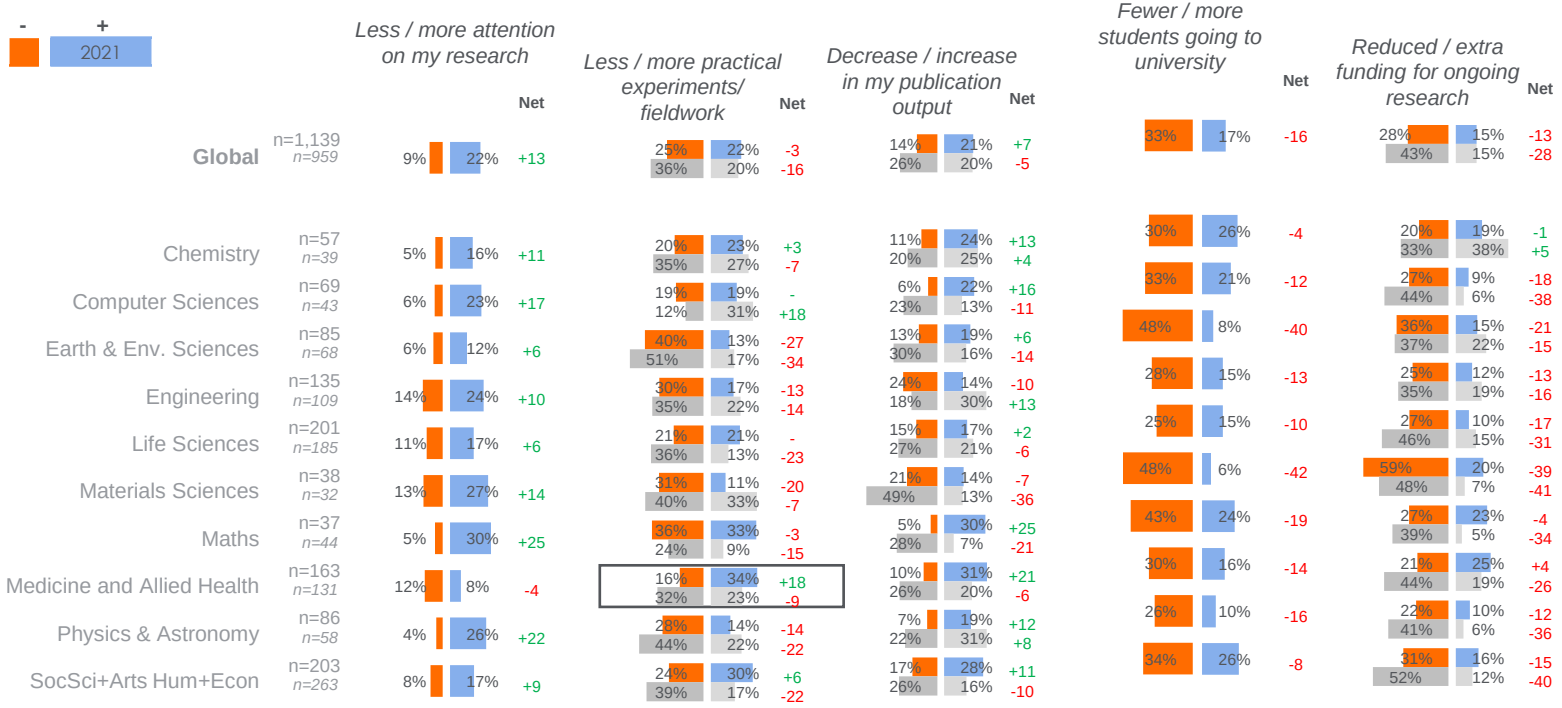
BY SPECIALTY (2 OF 3)



Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
* Shorter time to publication is positive and longer time to publication is negative
N varies from 1,035 to 1,139 in 2021, and from 637 to 959 in 2020, respondents were offered a 'not applicable' option these responses are not part of % reported

LONGER TERM IMPACT OF COVID-19 BY SPECIALITY: Medicine and Allied Health are more likely to expect more practical experiments/fieldwork.

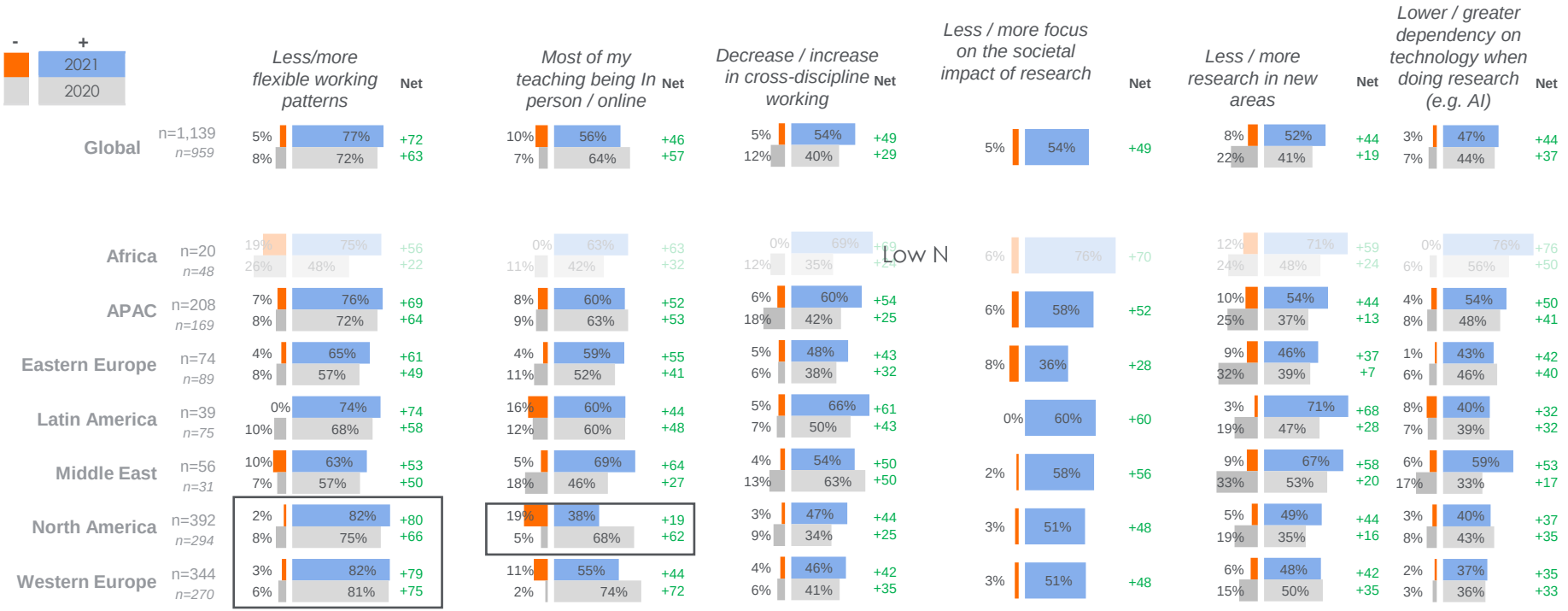
BY SPECIALTY (3 OF 3)



Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
N varies from 1035 to 1,139 in 2021, and from 637 to 959 in 2020. Respondents were offered a 'not applicable' option these responses are not part of % reported

LONGER TERM IMPACT OF COVID-19 BY REGION: N. America is least likely to believe there will more online teaching in the future. N. America and Europe are most likely to think there will be more flexible working in the future.

BY REGION (1 OF 3)



Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
N varies from 1,035 to 1,139 in 2021, and from 637 to 959 in 2020, respondents were offered a 'not applicable' option these responses are not part of % reported

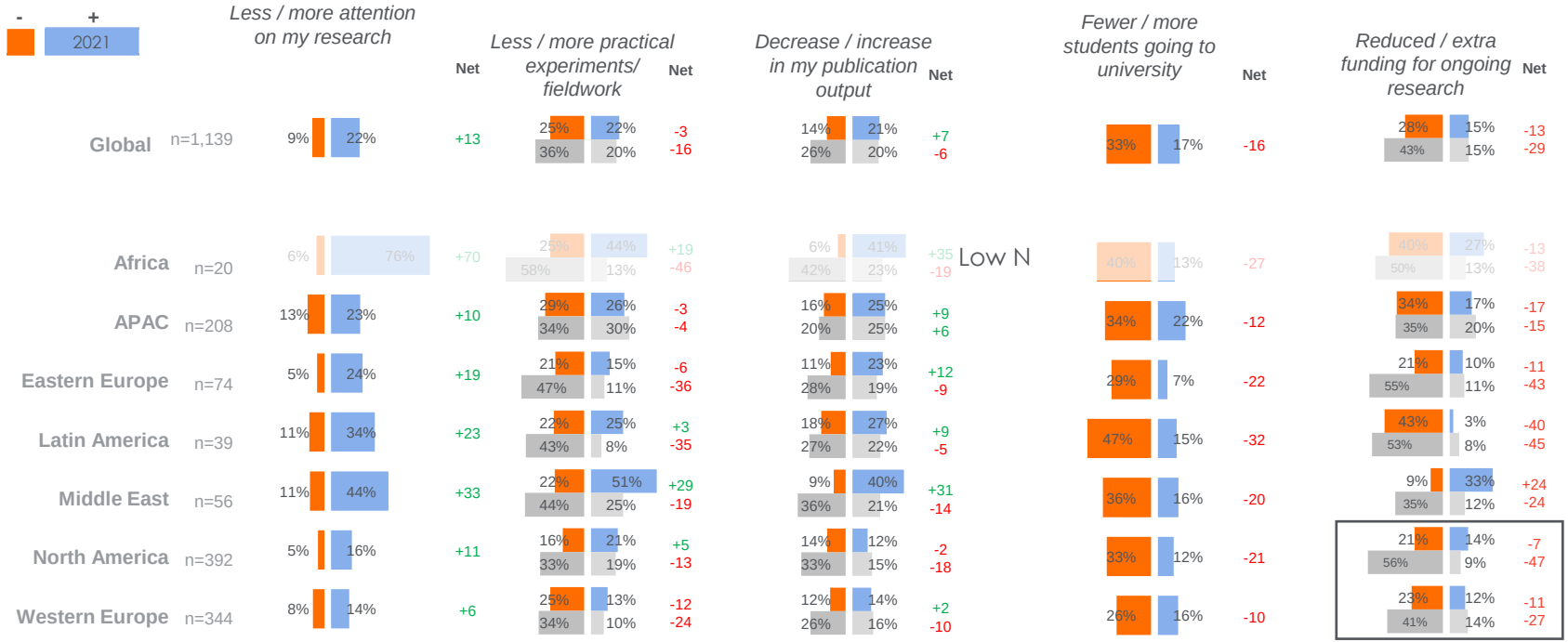
LONGER TERM IMPACT OF COVID-19 BY REGION: Expectation for more international collaboration across all regions compared to 2020. APAC more likely and North America and Western Europe less likely to believe there will be higher quality research being produced/ shared over the next 2 to 5 years.

BY REGION (2 OF 3)

Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
* Shorter time to publication is positive and longer time to publication is negative
N varies from 1,035 to 1,139 in 2021, and from 637 to 959 in 2020, respondents were offered a 'not applicable' option these responses are not part of % reported

LONGER TERM IMPACT OF COVID-19 BY REGION: More researchers believe future funding will reduce than increase, although North America and W. Europe are much less negative than last year.

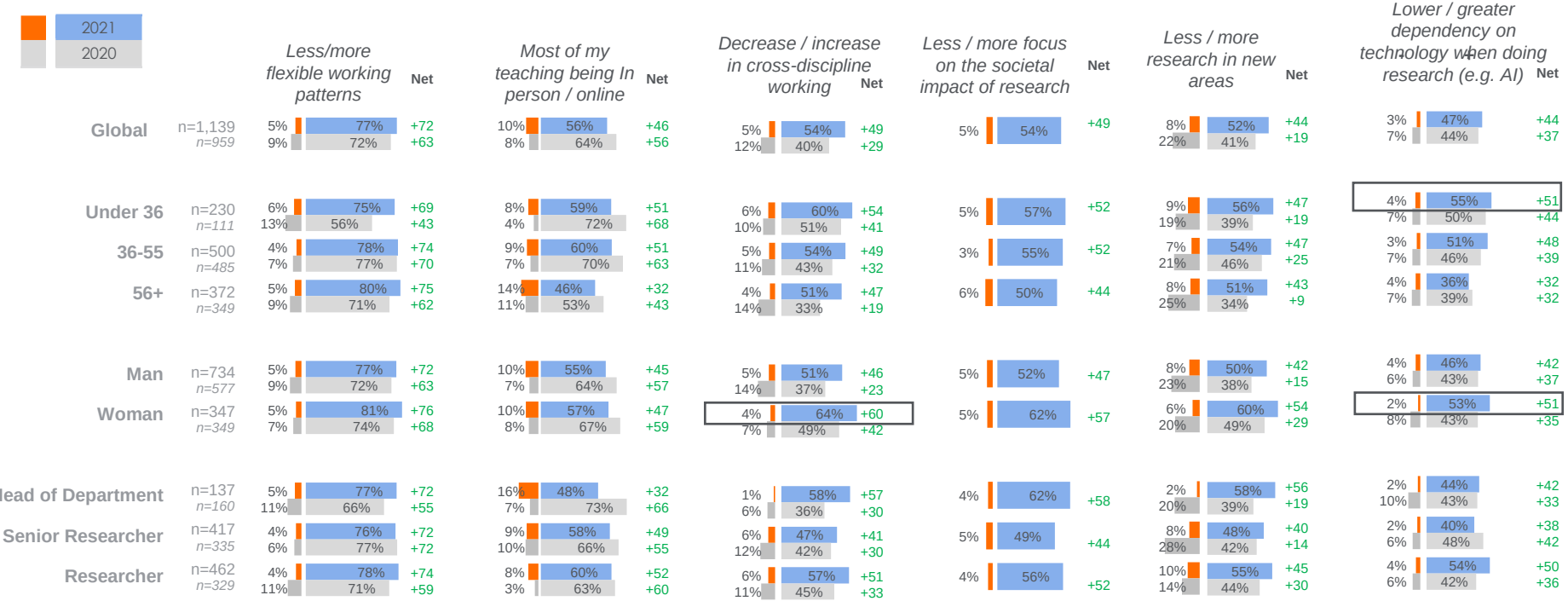
BY REGION (3 OF 3)



Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
N varies from 1,035 to 1,139 in 2021, and from 637 to 959 in 2020. Respondents were offered a 'not applicable' option these responses are not part of % reported

LONGER TERM IMPACT OF COVID-19 BY AGE, GENDER AND POSITION: Under 36 age group and female researchers more likely to believe there will greater dependency on technology when doing research. Female researchers also believe there will more cross-discipline working.

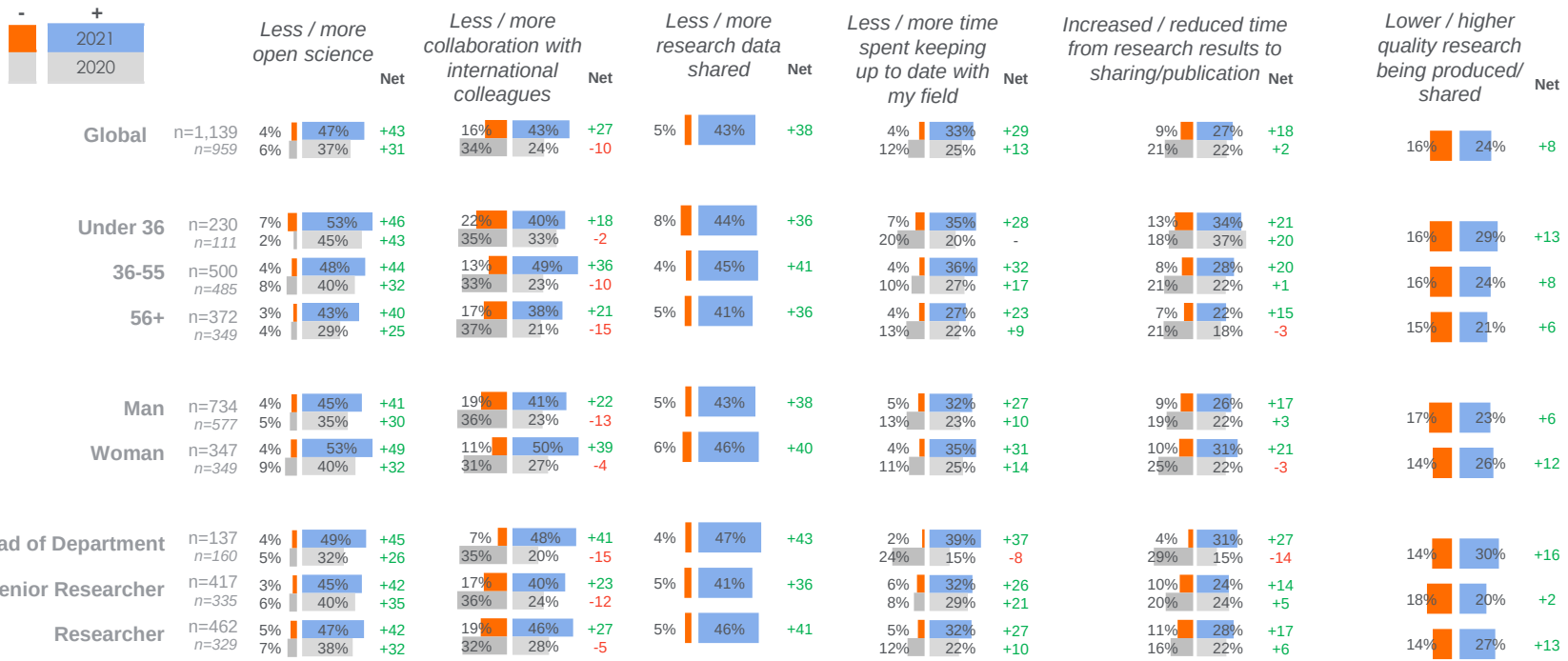
BY AGE, GENDER AND POSITION (1 OF 3)



Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
N varies from 1,035 to 1,139 in 2021, and from 637 to 959 in 2020, respondents were offered a 'not applicable' option these responses are not part of % reported

LONGER TERM IMPACT OF COVID-19 BY AGE, GENDER AND POSITION:

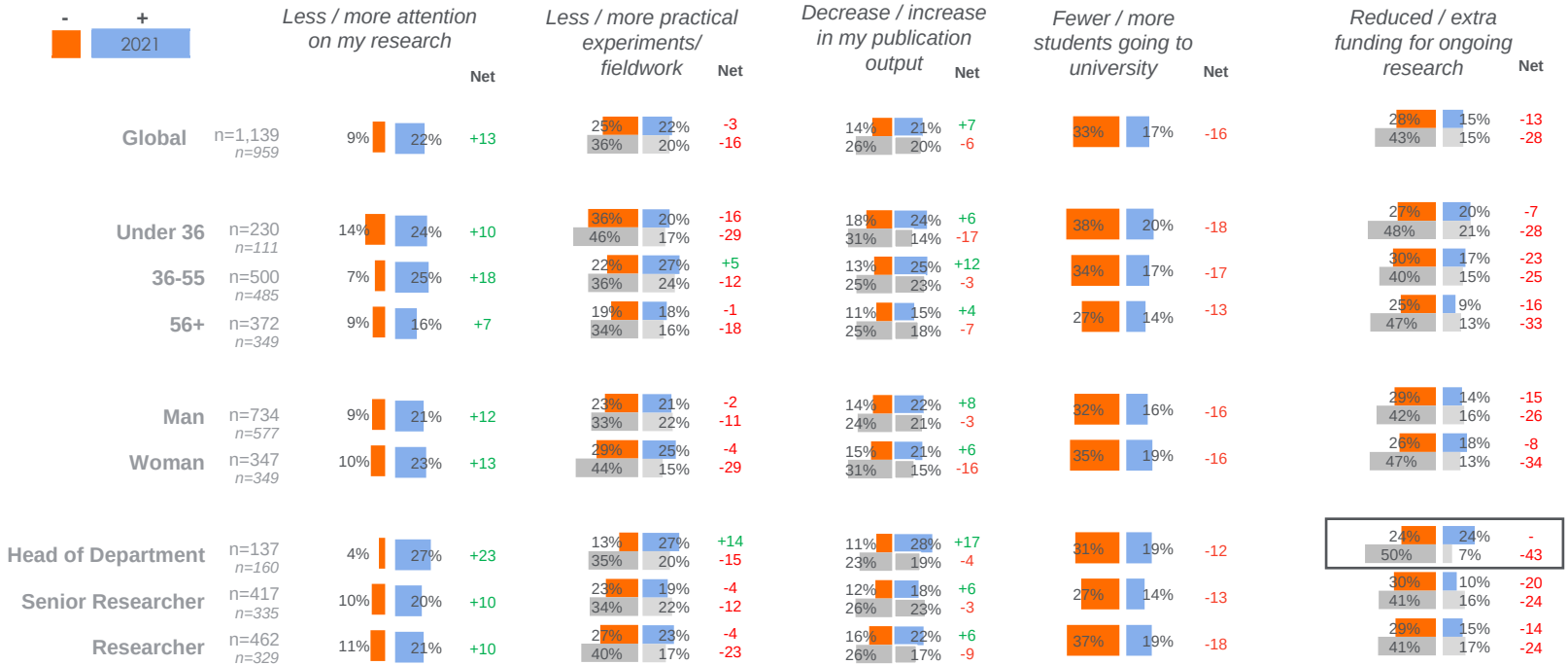
BY AGE, GENDER AND POSITION (2 OF 3)



Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
* Shorter time to publication is positive and longer time to publication is negative
N varies from 1,035 to 1,139 in 2021, and from 637 to 959 in 2020, respondents were offered a 'not applicable' option these responses are not part of % reported

LONGER TERM IMPACT OF COVID-19 BY AGE, GENDER AND POSITION:
Heads of department are much less negative about the future funding of research in comparison to 2020 (and versus other, less senior, researchers).

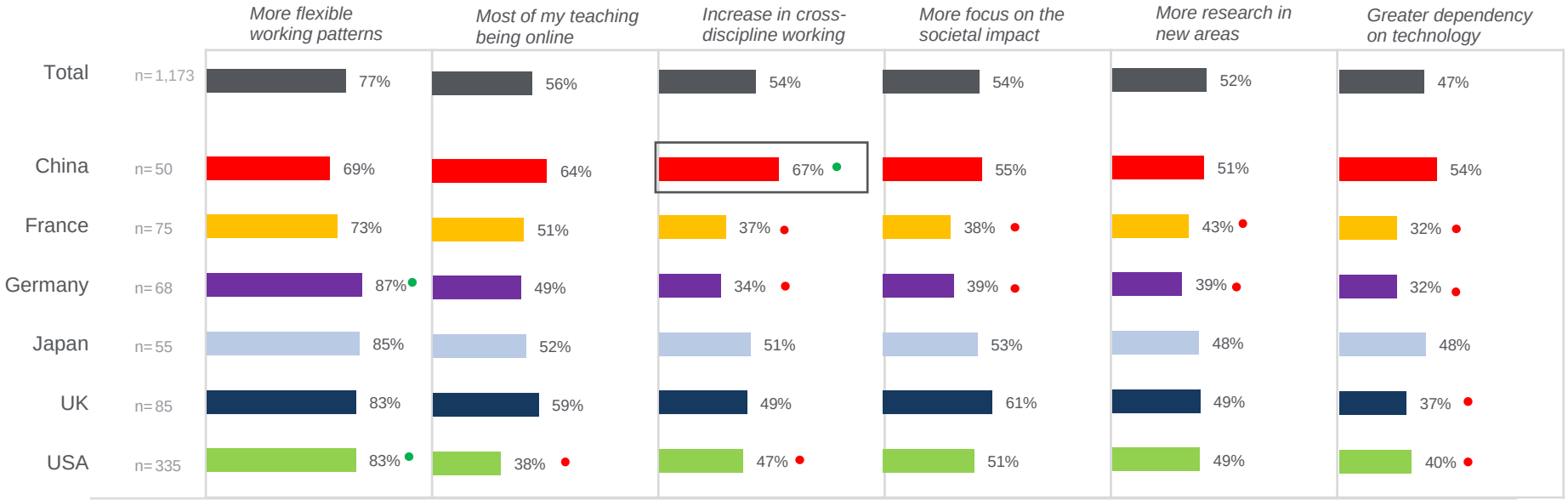
BY AGE, GENDER AND POSITION (3 OF 3)



Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... scale was '+' 'no change' '-'
N varies from 1,035 to 1,139 in 2021, and from 637 to 959 in 2020, respondents were offered a 'not applicable' option these responses are not part of % reported

LONGER TERM IMPACT OF COVID-19 BY COUNTRY: Researchers in China are more likely to think that a longer term impact of COVID-19 will lead to an increase in cross-discipline working (67%) than on average globally (54%).

% who think the longer term impact of COVID-19 will lead to...



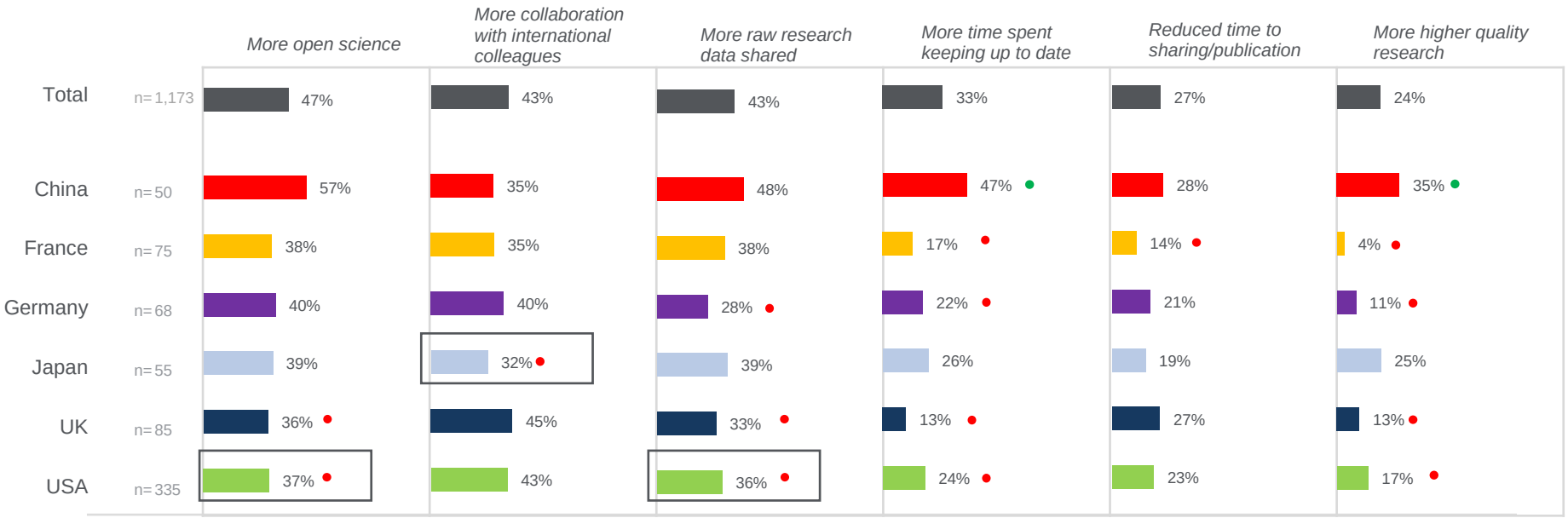
(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... Scale was '+' 'no change' '-'.

LONGER TERM IMPACT OF COVID-19 BY COUNTRY: Researchers in Japan are less likely to believe a longer-term impact of COVID-19 is that it will lead to their research gaining a higher profile or more collaboration with international colleagues.

% who think the longer term impact of COVID-19 will lead to...



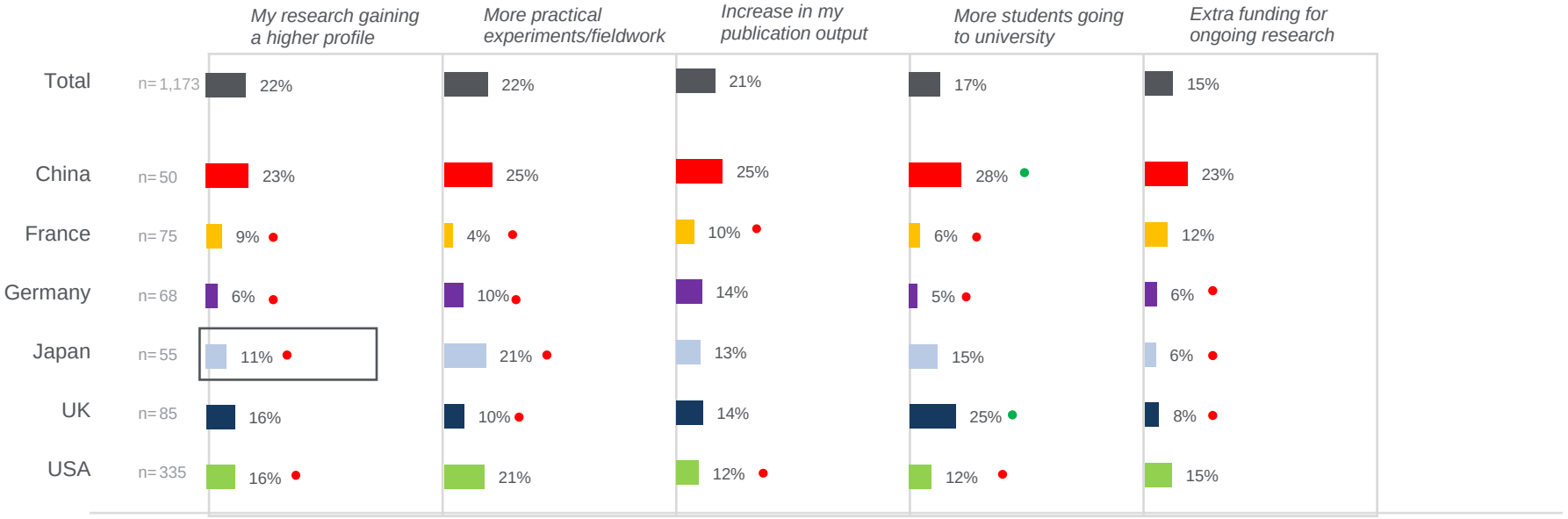
(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... Scale was '+' 'no change' '-'.

LONGER TERM IMPACT OF COVID-19 BY COUNTRY: US researchers are less likely to predict a longer-term impact of COVID-19 will be more raw research data shared. They are also less likely to predict it will lead to more open science.

% who think the longer term impact of COVID-19 will lead to...



(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

Source: Do you think the longer term (next 2 -5 years) impact of COVID-19 will lead to... Scale was '+' 'no change' '-'.

Back to contents

ELSEVIER

HOW RESEARCHERS WORK

HOW RESEARCHERS WORK

- Collaboration
  - Collaboration Executive Summary
  - Overview of Collaboration Results
  - Collaboration Results by specialty, country, region, age, gender, seniority and country
- Mobility
  - Mobility Executive Summary
  - Overview of Mobility Results
  - Mobility Results by specialty, country, region, age, gender and seniority
- Publishing Intentions
  - Publishing Intentions Executive Summary
  - Summary of Publishing Intentions Results

Back to contents

COLLABORATION

COLLABORATION EXECUTIVE SUMMARY

This year we see a sizeable increase in the proportion of researchers that agree there is an increase in collaboration, from 48% in 2020 to 63% in 2021. Collaboration has become easier, more prevalent, in the last year as digital communication has intensified, and collaboration is ever-increasingly a prerequisite of research.

Those who take the view (13%) that there is now less collaboration cite COVID and loss of in-person contact as factors for this reduced collaboration experienced.

This year, collaboration has increased, but the pattern of types of this increased collaboration has not changed. Increased collaboration with other areas of research (interdisciplinary) remains most prevalent. However, increased collaboration within other domestic institutions has dropped this year versus 2020.

Computer Science and Medicine are more likely than other disciplines to state collaboration has increased. Most disciplines are more likely than last year to believe collaboration has increased. Within Chemistry year on year, the increased collaboration is more strongly attributed to international collaboration, and less to domestic.

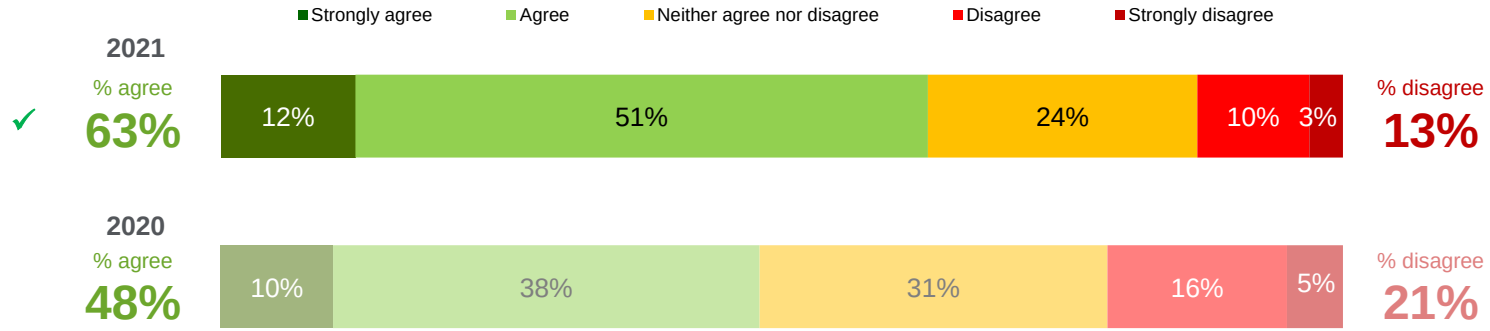
Increased collaboration experienced is significantly up in APAC, Eastern Europe, Middle East, North America and Western Europe.

Increased collaboration is more likely than last year to have been seen across ages, genders and roles.

OVERVIEW OF COLLABORATION RESULTS

COLLABORATION: There has been a sizeable increase in the view that there is more collaboration on their research project(s) than previously – 63% hold this view, up from 48%.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: There is more collaboration on my research project(s) than previously



Reasons for AGREEING:

- International collaboration easier/ increasingly prevalent
- Multi-disciplinary research/ expertise a necessity/ prerequisite
- Requited/ valued by funders
- Digital/ online communications intensified

"I've always done a lot of interdisciplinary/global collaboration, but it now seems to be becoming a standard." (Medicine/ Allied Health, USA, aged 36-45)

Reasons for DISAGREEING:

- COVID and loss of in-person contact
- Always collaborated/ interdisciplinary
- Lack of funding
- Conduct research alone

"Virtual meetings cannot replace in-person networking and collaboration." (Computer Sciences/ IT, Austria, aged 26-35)

Legend
✓ Higher
✓ Lower
Significant difference 2021 to 2020

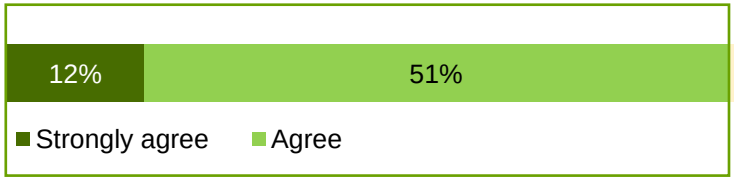
Base 2021: All researchers (n=1,173). Chart excludes don't knows (n=1,141)
Base 2020: All researchers (n=1,041). Chart excludes don't knows (n=1,041)

COLLABORATION: This year, collaboration has increased, but the pattern of types of this increased collaboration has not changed. Increased collaboration with other areas of research (interdisciplinary) remains most prevalent. Collaboration within other domestic institutions has dropped.

There is more collaboration on my research project(s) than previously

2021 *n=1,141*

% agree **63%**



% disagree **13%**

Agreed - In which of the following ways has collaboration increased? I am collaborating more …

✓ Higher
✓ Lower
Significant difference 2021 to 2020

Base: All researchers who agreed “there is more collaboration” (2021 n=705, 2020 n= 502)

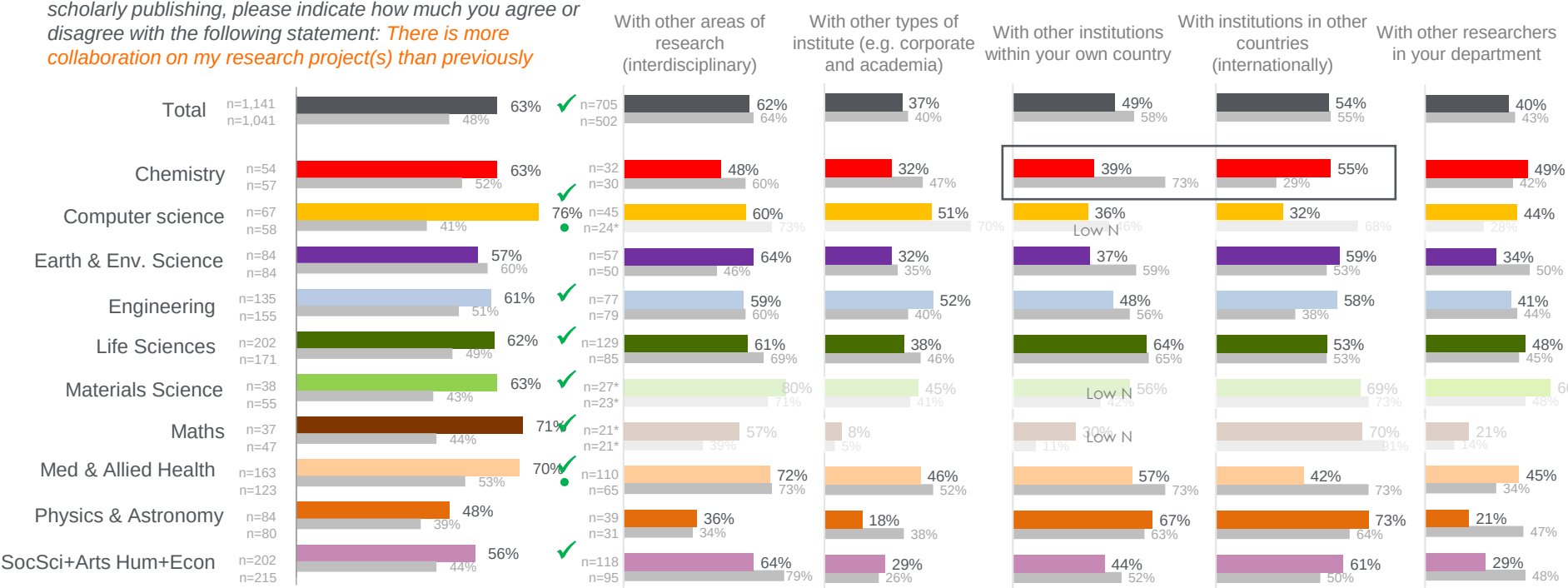
Collaboration

Results by specialty, region, age, gender, seniority, and country

COLLABORATION BY SUBJECT: Computer Science and Medicine are more likely than other disciplines to state collaboration has increased. Most disciplines are more likely than last year to believe collaboration has increased. Amongst Chemistry, collaboration increase within own country has decreased but internationally has increased.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: There is more collaboration on my research project(s) than previously

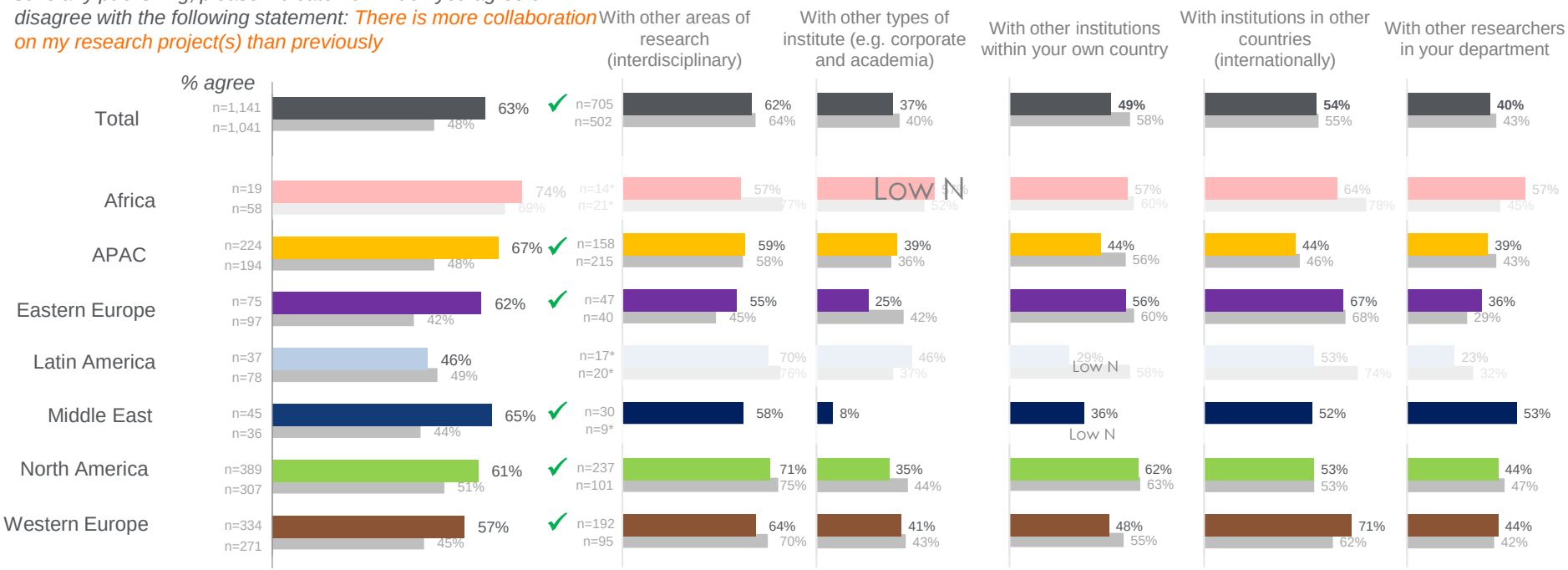
In which of the following ways has collaboration increased? I am collaborating more …



COLLABORATION BY REGION: Increased collaboration is significantly up in APAC, Eastern Europe, Middle East, North America and Western Europe.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: There is more collaboration on my research project(s) than previously

In which of the following ways has collaboration increased? I am collaborating more …



Legend

2021 Solid colour

2020 Light Grey

✓ Higher Significant difference 2021 to 2020

✓ Lower

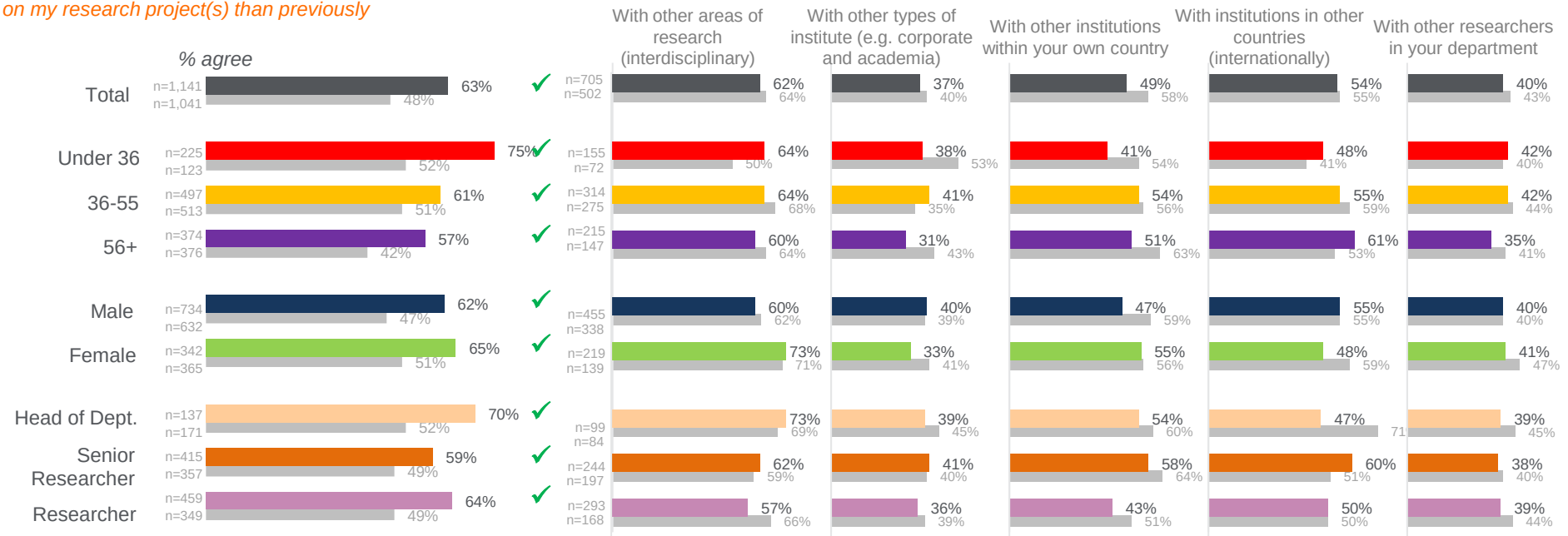
Higher Significant difference between 2021 sub-group and overall

Lower

COLLABORATION BY AGE, GENDER AND SENIORITY: Increased collaboration is more likely than last year across ages, genders and roles.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: There is more collaboration on my research project(s) than previously

In which of the following ways has collaboration increased? I am collaborating more …



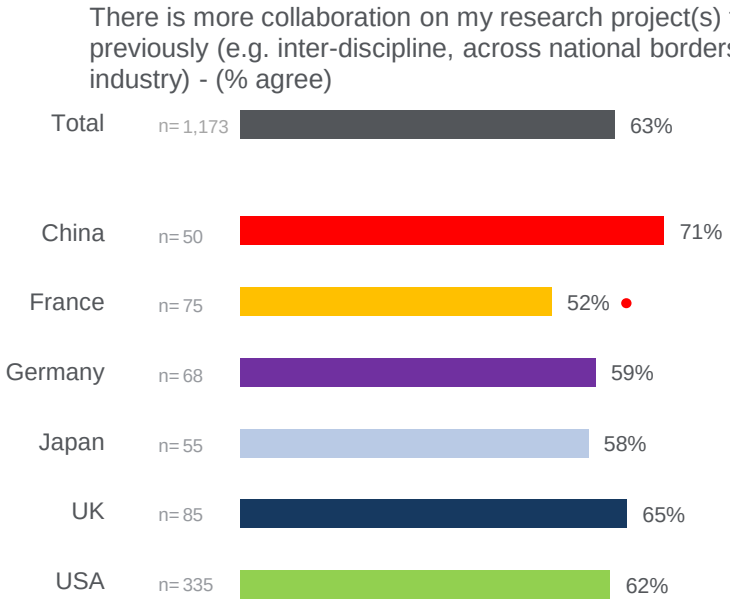
Legend

2021 Solid colour
2020 Light Grey

✓ Higher
✓ Lower
Significant difference 2021 to 2020

Higher
Lower
Significant difference between 2021 sub-group and overall

COLLABORATION BY COUNTRY: 52% of researchers in France believe there is more collaboration on their research project(s) than previously against 63% of researchers worldwide.



(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

Back to contents

MOBILITY

MOBILITY EXECUTIVE SUMMARY

International relocation consideration has increased, with just over a third of researchers willing to consider moving to another country to further their career (up from just over a quarter in 2020).

The US, UK and Canada have increased in favour as top destination for researcher relocation.

Researchers from China are more inclined to relocate compared to 2020 (when consideration declined markedly). Notable drop in propensity to relocate amongst researchers in Germany versus 2020.

M. East and Lat. Am researchers are more interested in relocating overall and increasingly so since 2020.

Younger, at researcher/ staff level, more likely to be considering relocation and increasingly so since 2020.

The main reasons given for wanting to move to another country were better facilities/equipment, funding and salary. All these drivers have increased in prominence in 2021, as has more job vacancies.

Those in Medical and Allied Health were less likely to be aspired by better salary or chance of getting a permanent position.

Interest in relocating amongst Chemistry and Earth & Environmental Science researchers has increased, after a drop in 2020.

Researchers in US are less likely to state better salary, better funding or more job vacancies as a reason to relocate abroad.

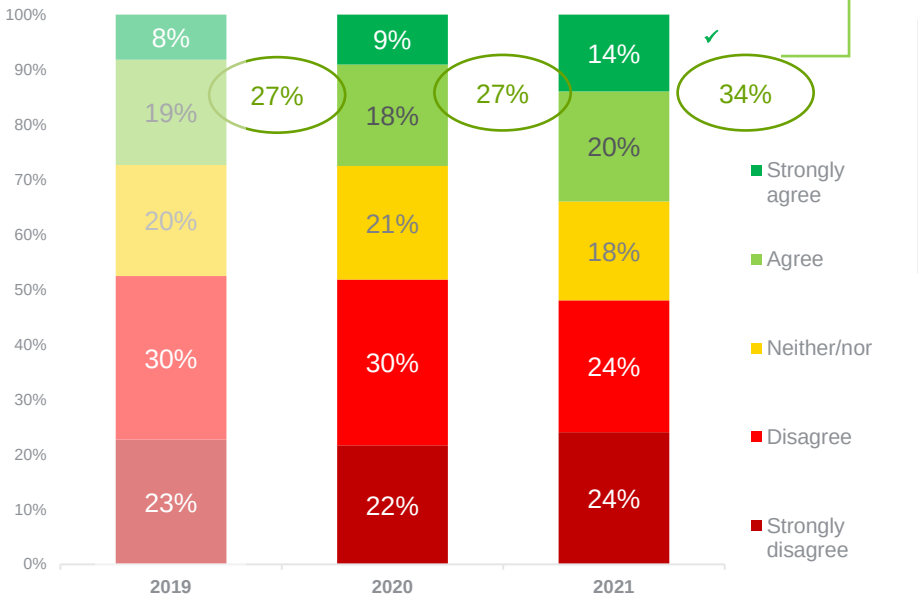
W. Europe are more likely than other regions to state a want to move back home as a reason for relocation.

RESEARCHER MOBILITY

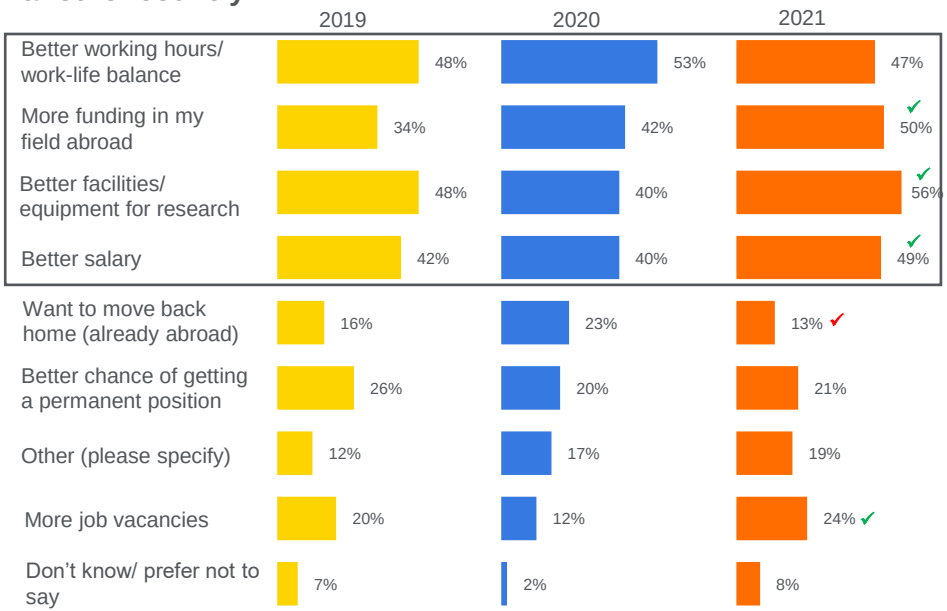
OVERVIEW OF RESULTS

REASONS FOR CONSIDERING RELOCATION: Researchers who would consider relocating has increased to just over a third (34%) from . Better facilities, funding, salary and work-life balance are the key drivers.

"I would consider moving to another country to further my career in research (in the next 2 years)"



What are the main reasons you would consider relocating to another country?



Legend

2021	Solid colour	✓ Higher	Significant difference 2021 to 2020
2020	Shaded colour	✓ Lower	
		● Higher	Significant difference between 2021 sub-group and overall
		● Lower	

Base: All researchers 2019 n=1,450, 2020 n=1,031, 2021 n=1,127

Base: Researchers that agreed with 'I am considering moving to another country to further my career in research' n= 392 in 2019, n=284 in 2020 and n=355 in 2021

Typical comments:
I would consider moving to another country to further my career in research.

Reasons for AGREEING:

- Move needed to further career / science
- More opportunities / funding in another country
- Political situation in country creates an unfavourable climate for research

"I am unhappy with the political climate towards higher education in the US." (Social Science, USA, aged 36-45)

"Despite loving France, I think other countries have more to offer in terms of scientific excellence." (Biochemistry/ Genetics/ Molecular Biology, France, aged 36-45)

"More funding is available abroad for carrying out impactful research." (Computer Science/ IT, India, aged 36-45)

"Mainly because research infrastructure and access to bigger funds." (Psychology, Chile, aged 36-45)

"I am concerned with the scientific-political enmeshment evolving in the US." (Neuroscience, USA, aged over 65)

Reasons for DISAGREEING:

- Family commitments/ considerations
- Satisfied with/ better opportunities in home country
- Too late in career to consider moving abroad
- Content with existing/ established position/ career
- Able to collaborate globally from home country

"From what I know about work in academia in all countries where I could imagine myself living, UK offers the best balance of research and teaching, at least in my field." (Economics, UK, aged 56-65)

"I have a permanent position in my research center and good infrastructure to carry out research." (Chemistry, Spain, aged 56-65)

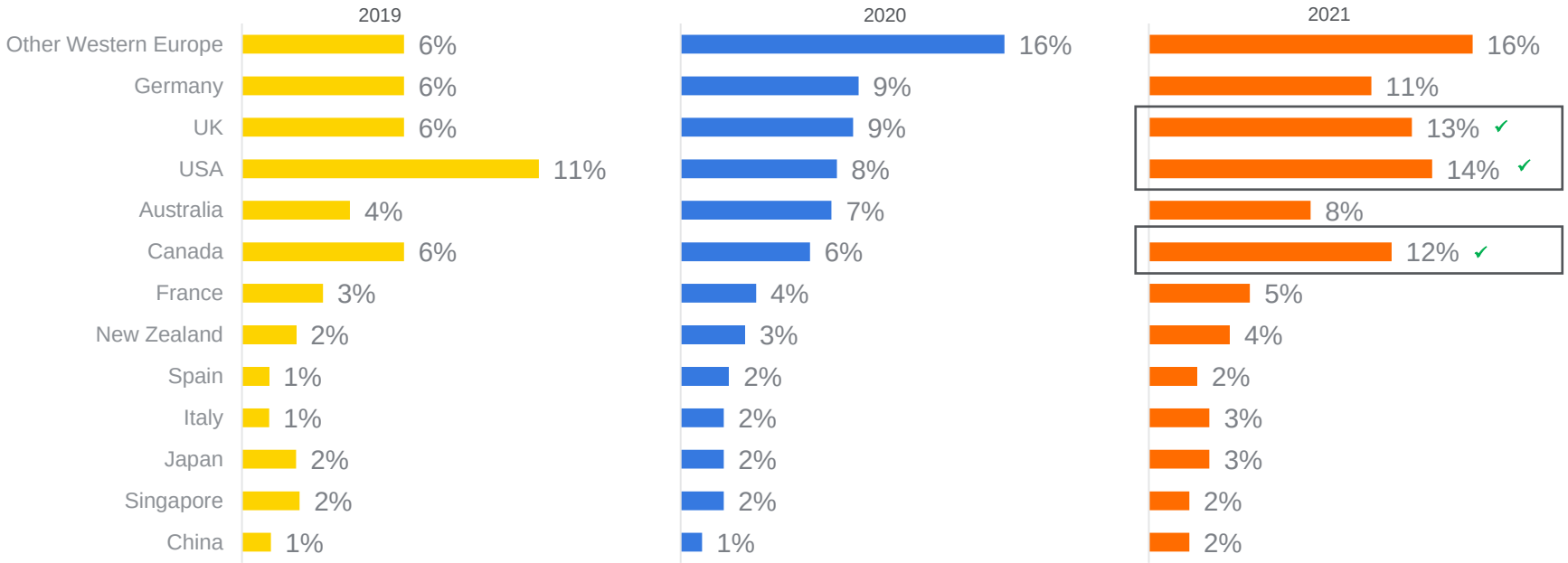
"The topic field of my investigations is correctly investigated in my university. Moreover, I have important scientific contacts with colleagues investigating in the same topic all through the world." (Chemical Eng., France, aged over 65)

"Family concerns." (Social Science, USA, aged 36-45)

Base: All researchers 2021 n=1,127
Chart excludes don't knows (n=1,127)

WHERE RESEARCHERS WOULD RELOCATE: There has been an increase in researchers' willingness to relocate to US, Canada and UK since 2020.

Which countries would you consider moving to:



Legend

2021 Solid colour
2020 Light Grey

✓ Higher Significant difference 2021 to 2020
✓ Lower
● Higher Significant difference between 2021 sub-group and overall
● Lower

Base: Researchers that agreed with 'I am considering moving to another country to further my career in research' n=392 I 2019, n=284 in 2020 and n=355 in 2021

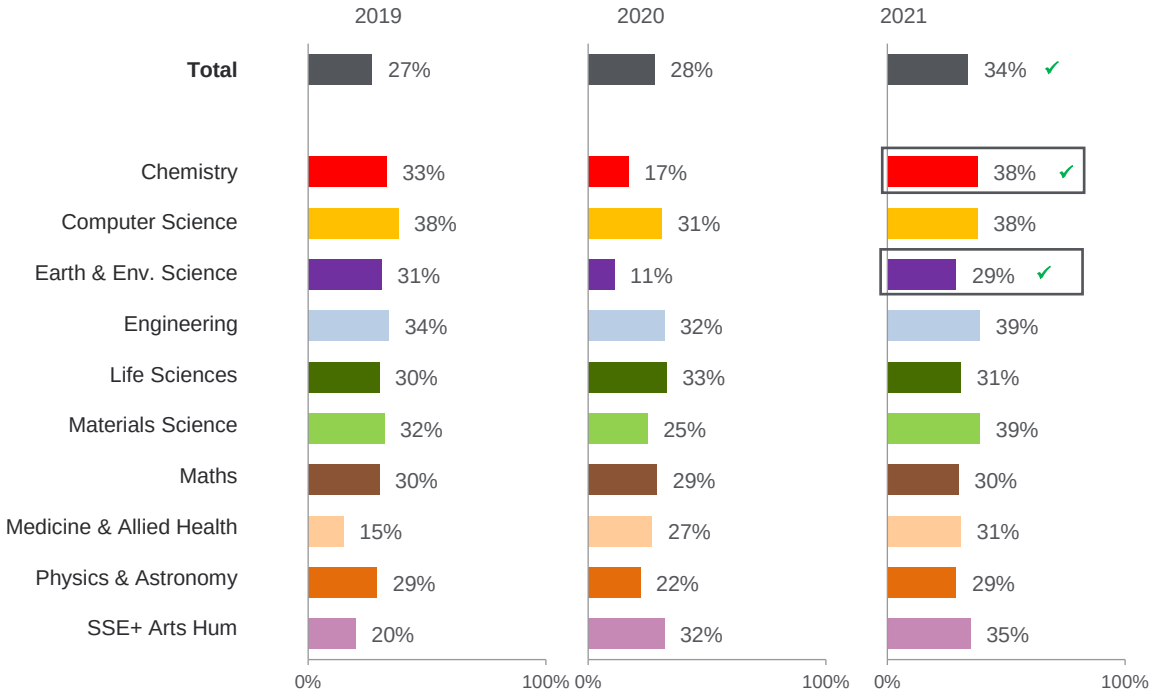
MOBILITY

Results by specialty, country, region, age, gender, seniority

INTERNATIONAL MOBILITY: Those in Chemistry and Earth & Env. Science are more willing to relocate than they were in 2020 (when, in 2020, for these cohorts, there was a dip in willingness to relocate).

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statements:
I am considering moving to another country to further my career in research *% agree*

BY SPECIALTY



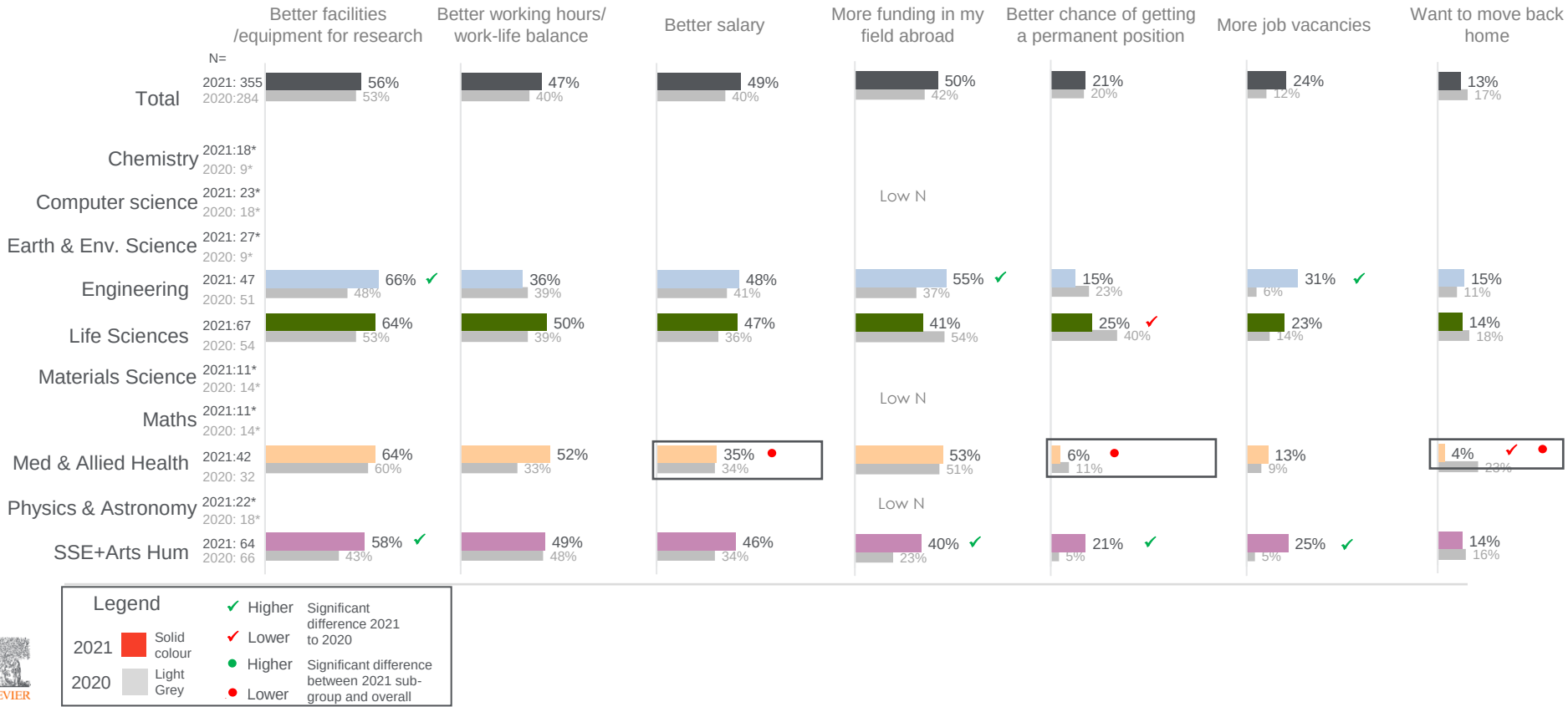
Legend
2021 Solid colour
2020 Light Grey
✓ Higher ✓ Lower Significant difference 2021 to 2020
● Higher ● Lower Significant difference between 2021 sub-group and overall

Base: All researchers (1,127), Chemistry (54); Computer Science (68); Earth & Env. Science (85); Engineering (133); Life Sciences (196); Materials Science (36); Maths (36); Medicine & Allied Health (162); Physics & Astronomy (85); SSE+ Arts Hum (196)

Base: All researchers 2019 n=1,450, 2020 n=1,031

INTERNATIONAL MOBILITY: Those in Medicine & Allied Health are less likely to cite better salary, chance of a permanent position and want to move back home as reasons to relocate.

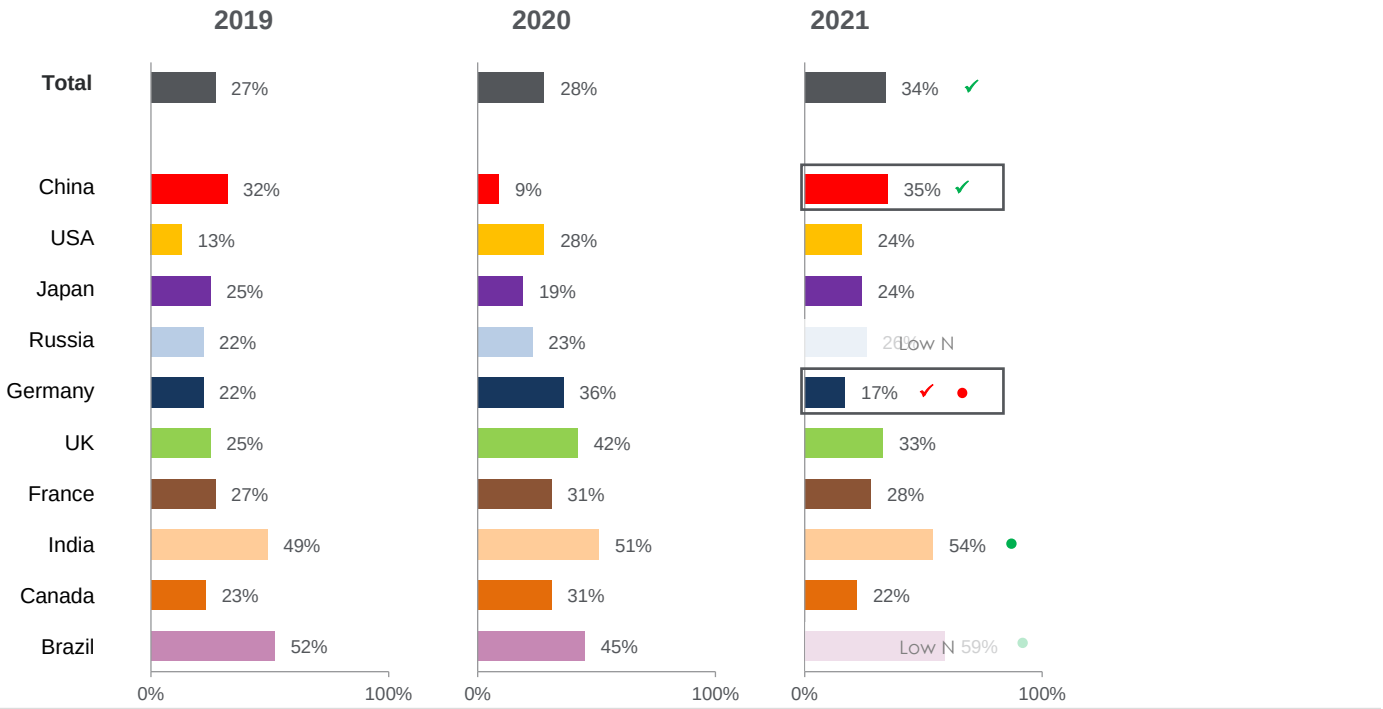
What are the main reasons you would consider relocating to another country?



INTERNATIONAL MOBILITY: Researchers from China are more inclined to relocate compared to 2020 (when consideration declined markedly). Notable drop in propensity to relocate amongst researchers in Germany.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statements:
I am considering moving to another country to further my career in research *% agree*

BY COUNTRY

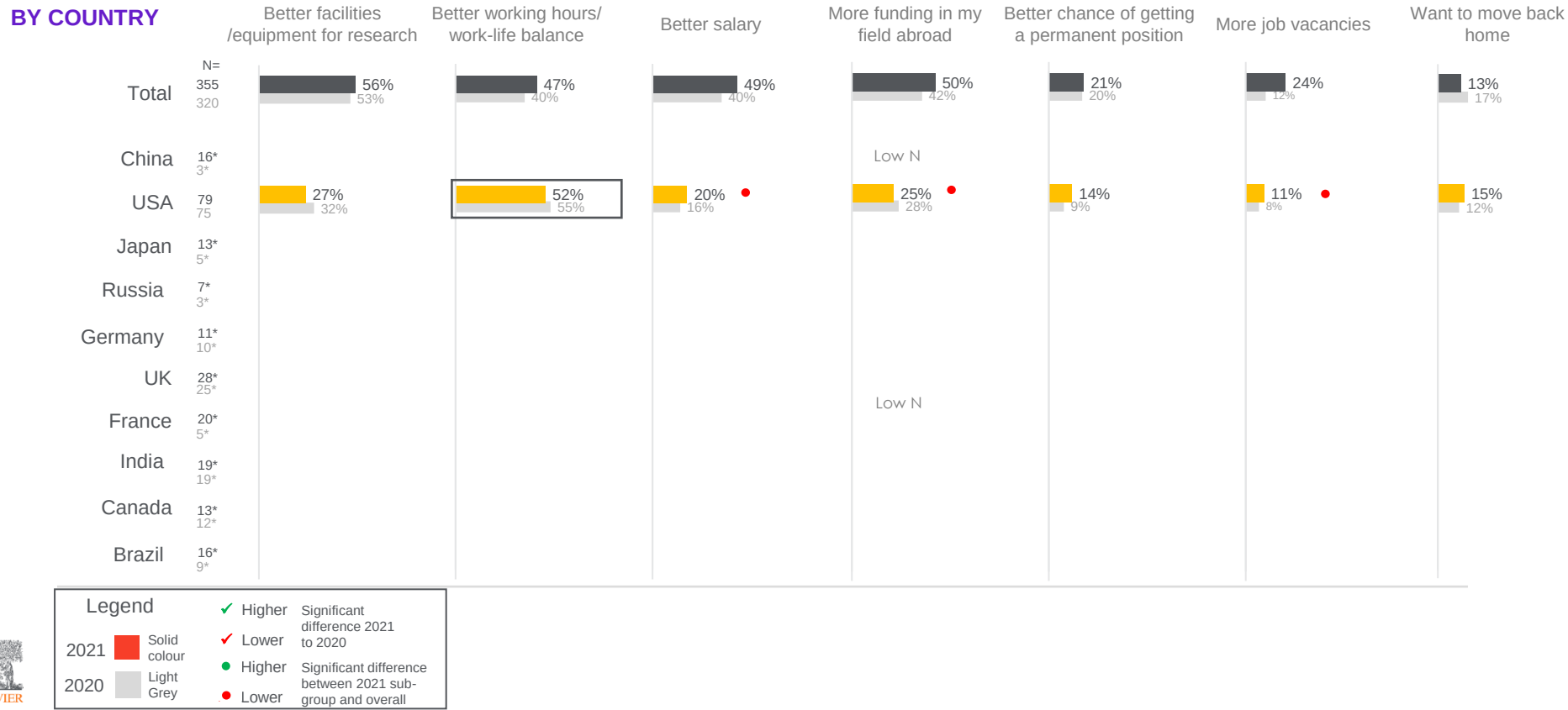


Base: Total (1,127), China (46); USA (322); Japan (54); Russia (27*); Germany (65); UK (84); France (71); India (35); Canada (60); Brazil (27*)

Base: Total 2019 n=1,450, 2020 n=1,031

INTERNATIONAL MOBILITY: Researchers from US are most likely to cite better working hours/ work-life balance as a driver of relocation.

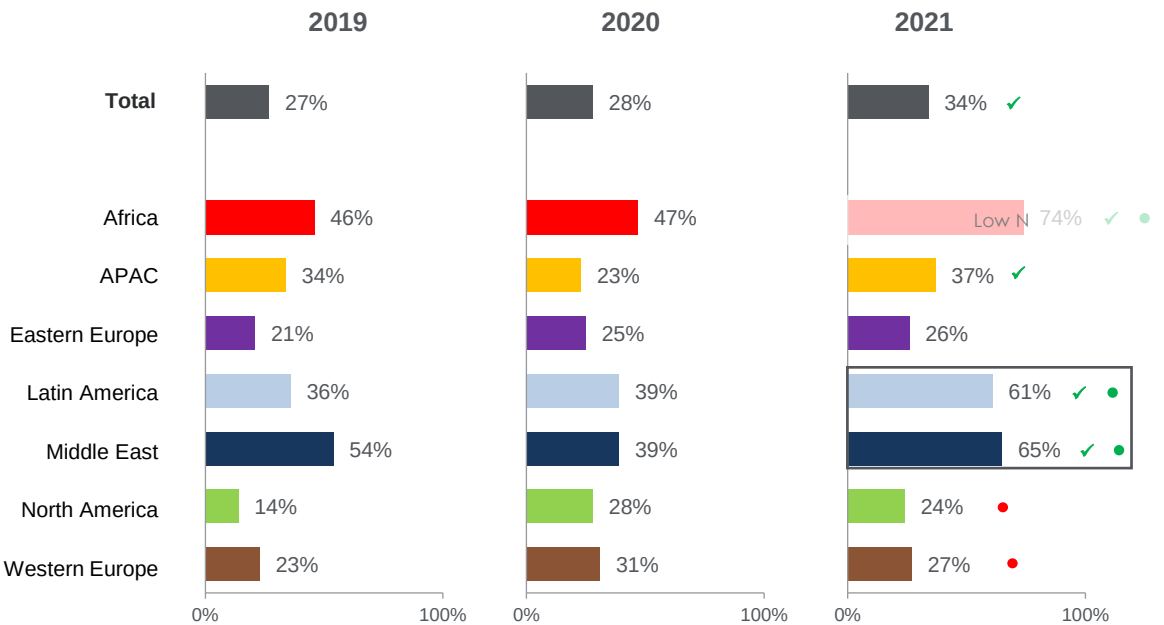
What are the main reasons you would consider relocating to another country?



INTERNATIONAL MOBILITY: M. East and Lat. Am researchers are more interested in relocating overall and increasingly so since 2020.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statements:
I am considering moving to another country to further my career in research *% agree*

BY REGION



Base: Total (1,127), Africa (19*); APAC (217); Eastern Europe (73); Latin America (38); Middle East (44); North America (382); Western Europe (338)

Base: Total 2019 n=1,450, 2020 n=1,031

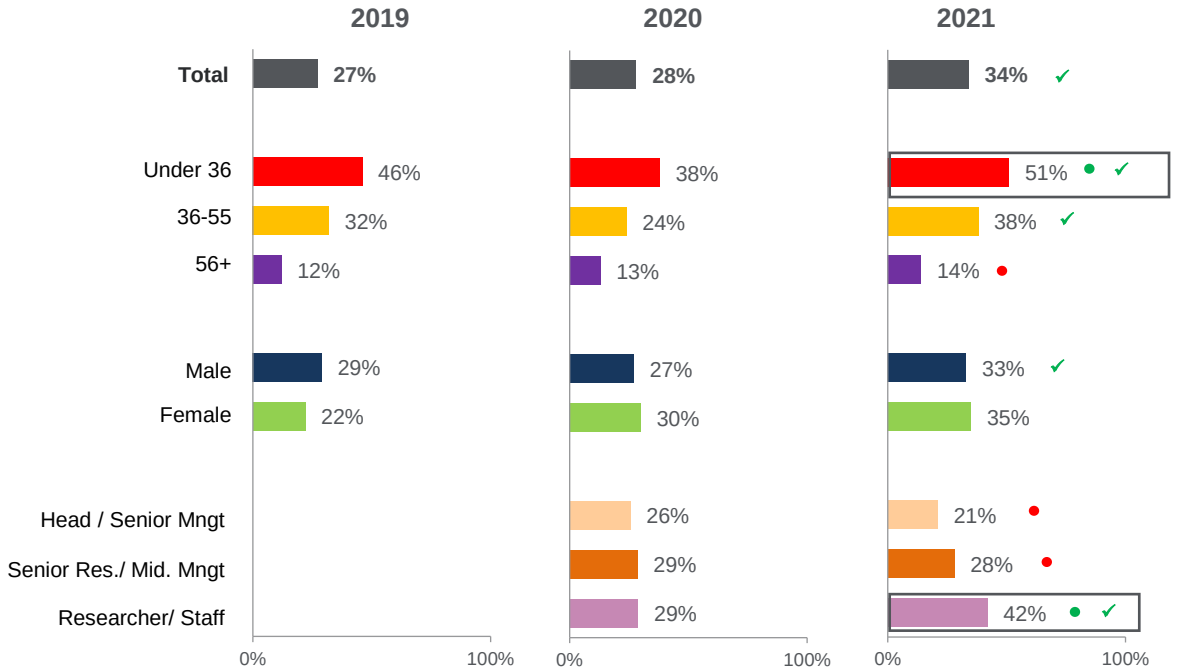
INTERNATIONAL MOBILITY: Those in North America are less likely to state better facilities, salary, funding, and vacancies as reasons to consider relocating. Western Europe more likely to be motivated by a move back home.

What are the main reasons you would consider relocating to another country?

INTERNATIONAL MOBILITY: Younger, at researcher/ staff level, more likely to be considering relocation (and increasingly so since 2020).

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statements:
I am considering moving to another country to further my career in research *% agree*

BY AGE, GENDER AND SENIORITY



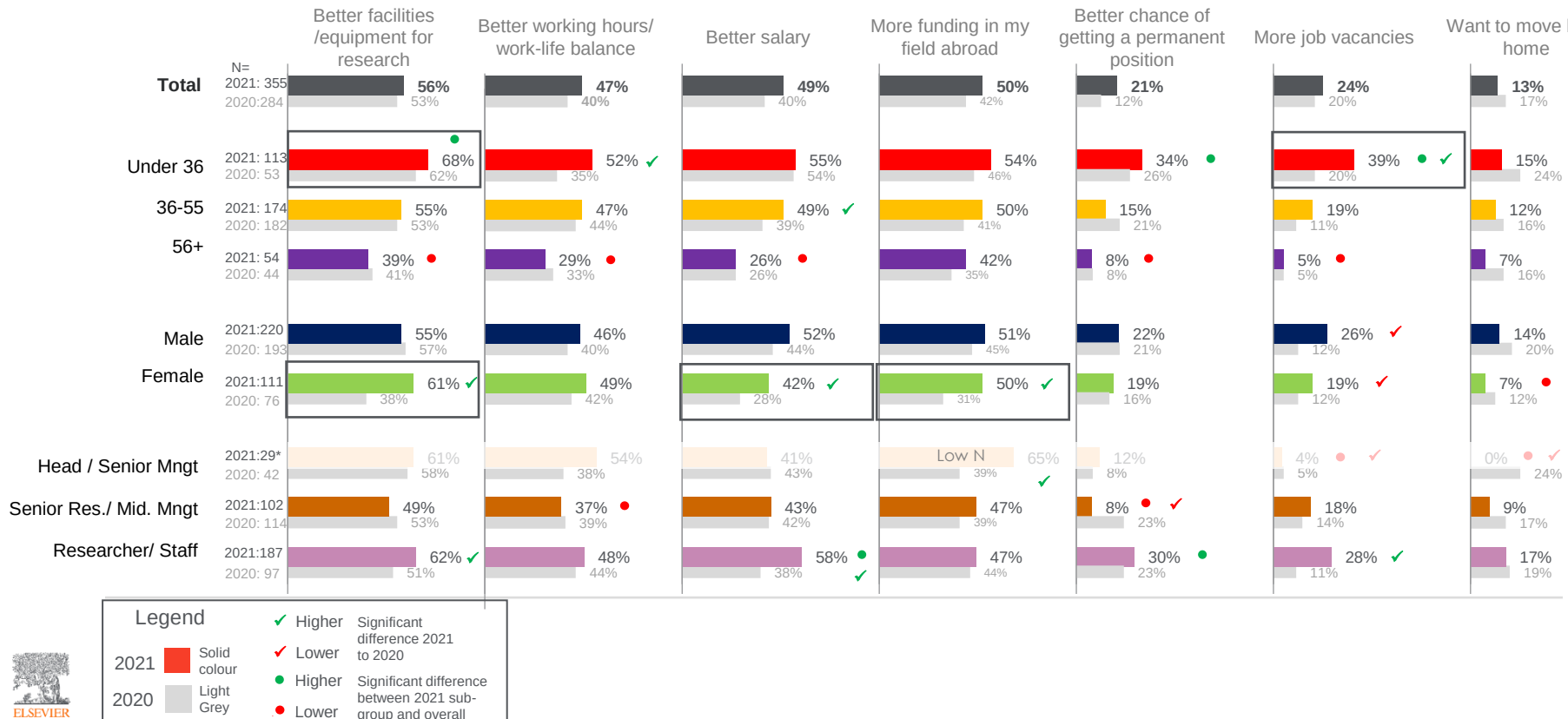
Base: Total (1,127), Under 36 (223), 36-55 (496), 56+ (363), Male (724), Female (340), Head / Senior Mngt (132), Senior Res./ Mid. Mngt (409), Researcher/ Staff (455)

Base: Total 2019 n=1,450, 2020 n=1,031

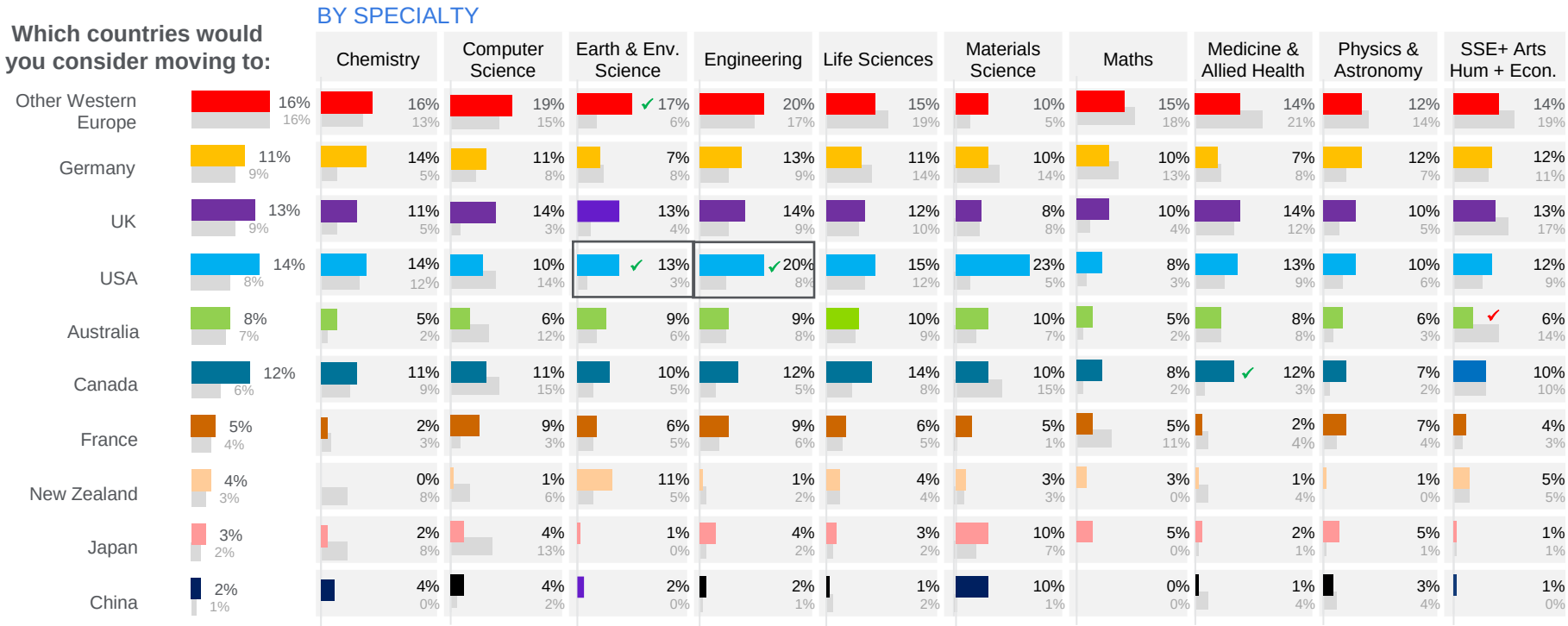
INTERNATIONAL MOBILITY: Better facilities and vacancies are attractive reasons for younger researchers. Females are more likely in 2021 to be driven by better facilities, salary and funding versus 2020.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statements:
I am considering moving to another country to further my career in research *% agree*

BY AGE, GENDER AND SENIORITY

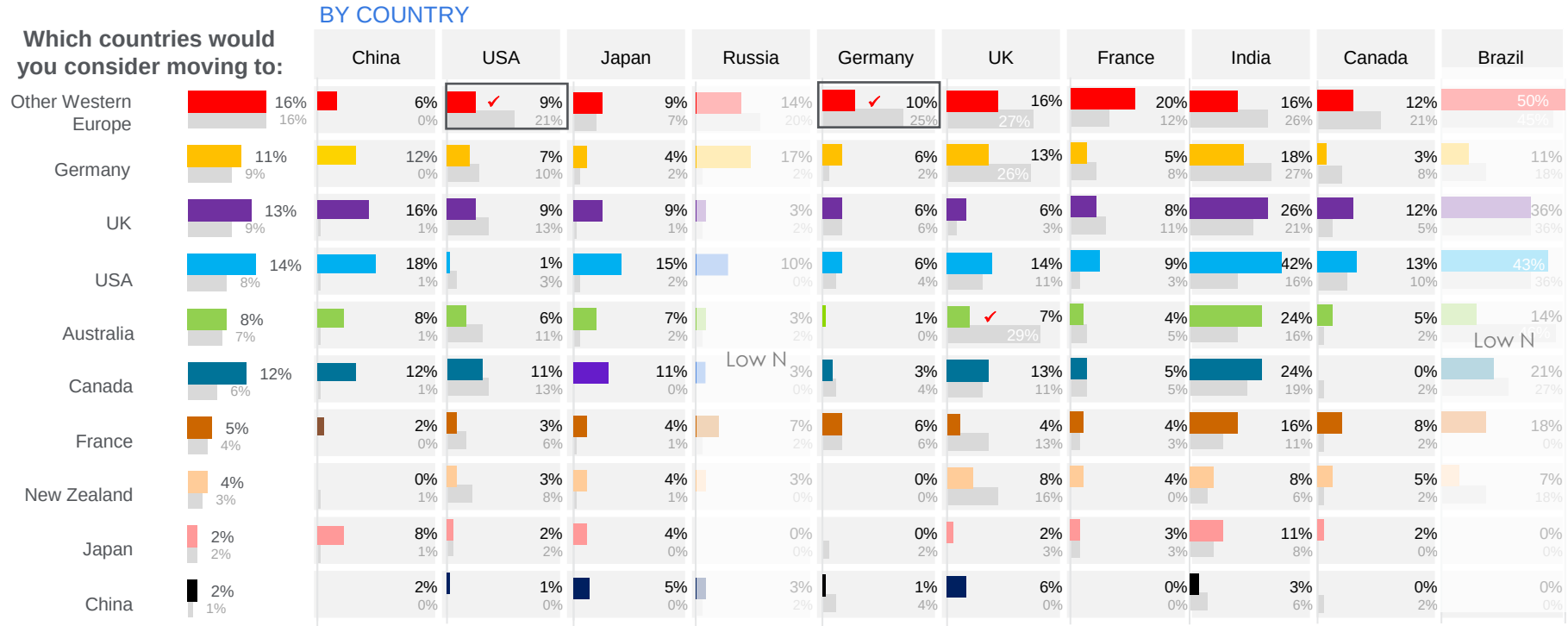


WHERE RESEARCHERS WOULD RELOCATE: USA is increasingly attractive to Earth & Env Science and Engineering.



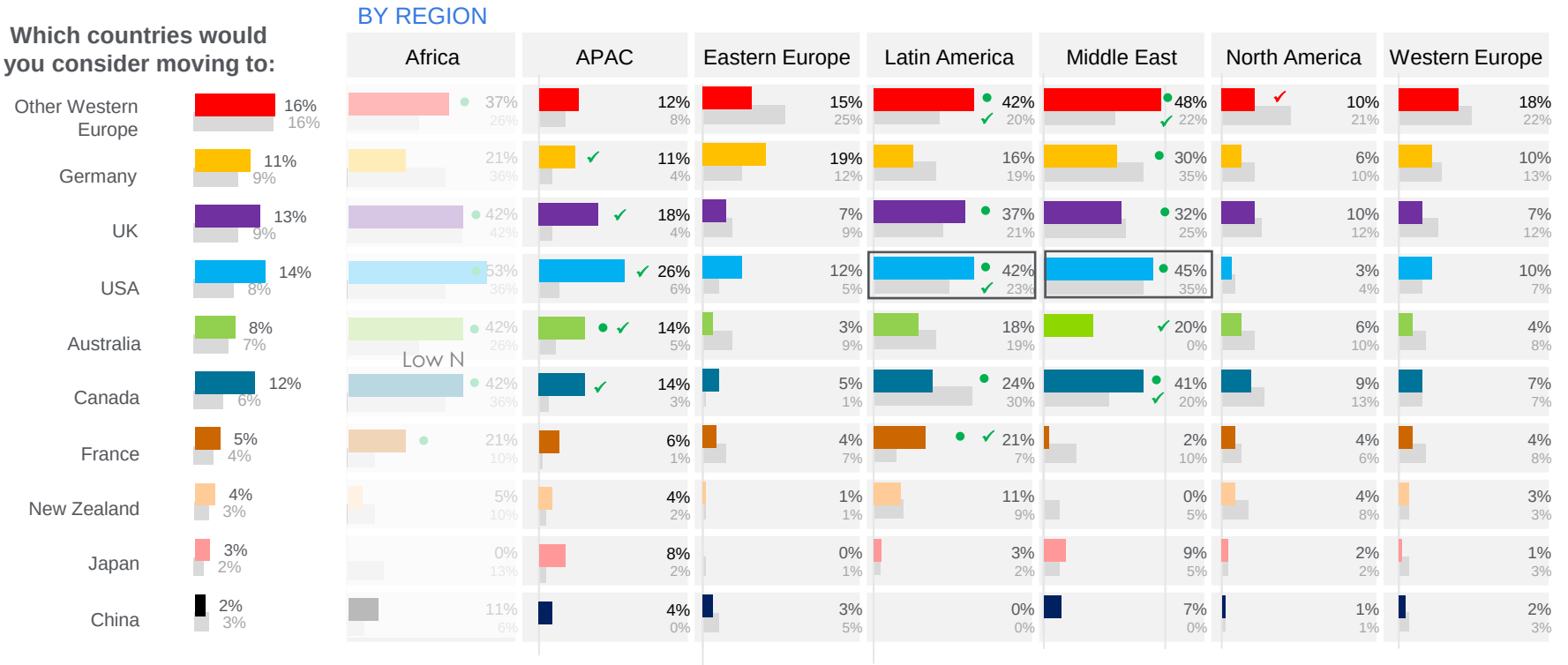
Base: Total (1,127), Chemistry (54); Computer Science (68); Earth & Env. Science (85); Engineering (133); Life Sciences (196); Materials Science (36); Maths (36); Medicine & Allied Health (162); Physics & Astronomy (85); SSE+ Arts Hum (196)

WHERE RESEARCHERS WOULD RELOCATE: Researchers in US are less attracted by EU countries in 2021 versus 2020, as are researchers in Germany.



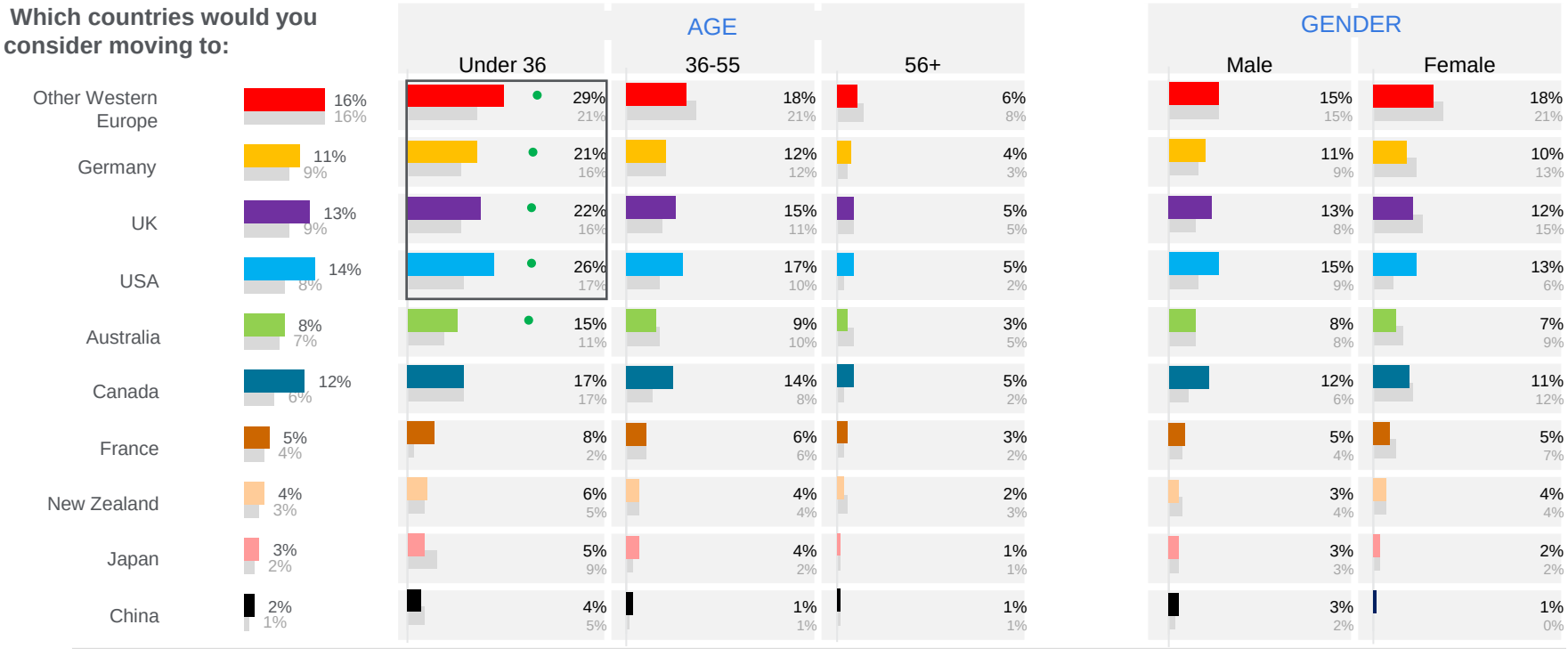
Base: Total (1,127), China (46); USA (322); Japan (54); Russia (27*); Germany (65); UK (84); France (71); India (35); Canada (60); Brazil (27*)

WHERE RESEARCHERS WOULD RELOCATE: Middle Eastern and Lat. Am researchers are particularly more interested in relocating to the US.



Base: Total (1,127), Africa (19*); APAC (217); Eastern Europe (73); Latin America (38); Middle East (44); North America (382); Western Europe (338)

WHERE RESEARCHERS WOULD RELOCATE: USA, Germany, UK, and other Western Europe are popular relocation targets for younger researchers.



Base: Total (1,127), Under 36 (223), 36-55 (496), 56+ (363), Male (724), Female (340)

Back to contents

PUBLISHING INTENTIONS

Publishing Intentions Contents

PUBLISHING INTENTIONS EXECUTIVE SUMMARY

Acceptance of AI in the peer review process remains low. Only a minority of researchers (around one in six) are heavily using AI in their research. To analyse research results was the most cited reason for using AI in research.

The value attached to pre-prints has increased in the last year; around two-thirds (67%) consider pre-prints a valued source of communication (up from 43% in 2020). Speed of dissemination of research and ease of accessibility (free) were the most widely cited reasons for pre-prints being valued. Not peer reviewed was the most cited disadvantage of pre-prints as a source of communication in research.

Computer Science, Maths and Physics are most likely to value pre-prints. Chemistry are the least likely to value pre-prints. All fields of science, regions, age groups, genders and levels of seniority are now more likely to value pre-prints than was reported back in 2020. North America is slightly less likely than other regions to value pre-prints as a source of communication.

Preprints being linked to the associated journal article(s) was considered the most beneficial possible development (51%), followed by pre-prints are quality assured in some way - basic scientific assessment (45%).

Just over half (52%) state that they are sharing more research data now than 2-3 years ago. Just under a quarter of researchers (24%) report that during the period of the pandemic they have submitted more research papers than they would have done otherwise (44% disagree that this is their experience). Almost four in ten researchers (38%) believe the amount of research papers they write will be more than prior to the pandemic (or stable) against 29% who expect the amount of research papers they write to be less than prior to the pandemic.

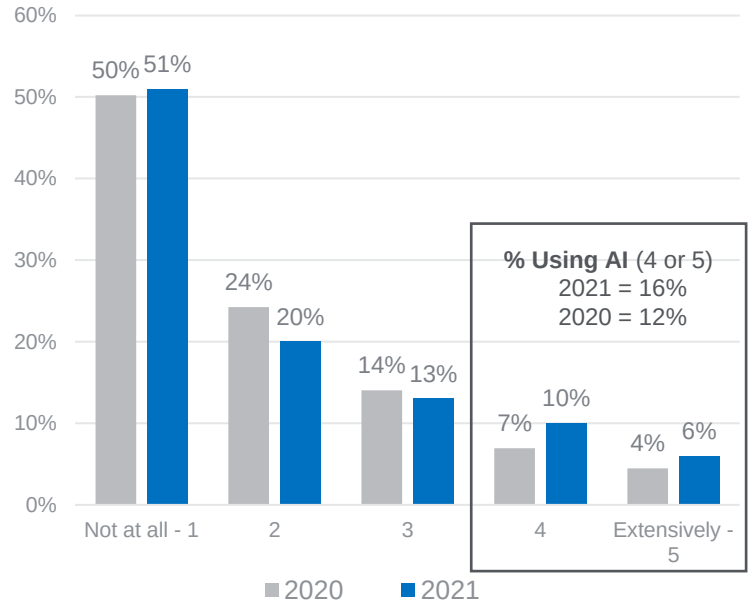
The most cited ‘red flags’ to engaging with research were source of data unclear, journal of low quality and not peer reviewed. \the most stated challenges to effective communication of research were pressure to publish, volume of articles being published and an emphasis on novelty for publication.

SUMMARY OF PUBLISHING INTENTIONS

RESULTS

AI IN RESEARCH: Although just over half of researchers do not use AI in their research, those who could be considered heavier users of AI represent around one in six researchers, this proportion has increased since 2020.

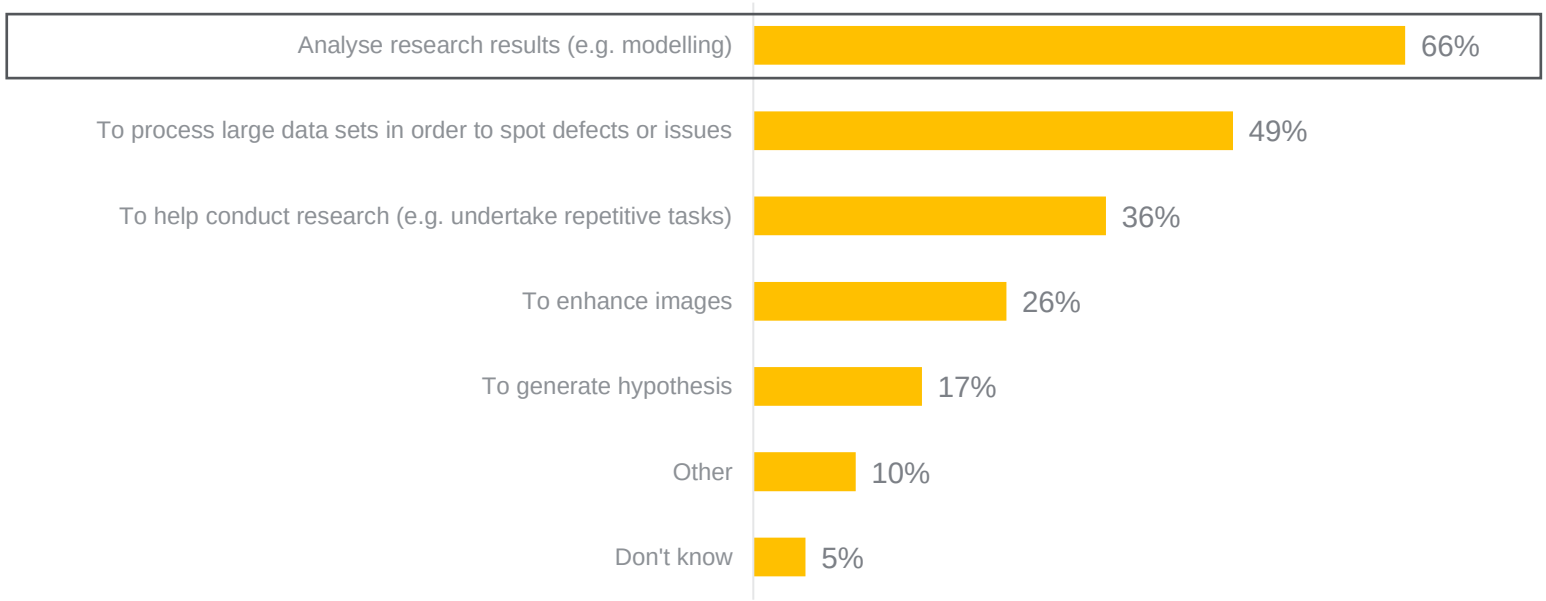
To what extent do you use Artificial Intelligence (AI) in your research? Please indicate your response on a five-point scale where 5 is extensively and 1 is not at all.



Base: All researchers 2020 (n=1066), 2021 (n=1040). Due to rounding some figures will not add up.

HOW USE AI: Among those who use AI, to analyse research results (e.g. modelling) was the most cited reason for using AI.

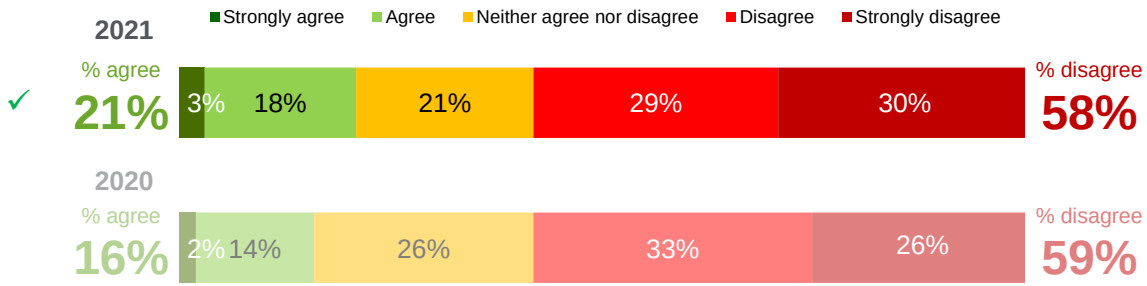
How do you use Artificial Intelligence (AI) in your research?



Base: All researchers who use AI n=479

AI IN PEER REVIEW: Although researchers question the capability of AI as a substitute for human understanding and intellect, more are willing to read articles reliant on AI for peer review than in 2020.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: I would be willing to read articles in a journal that relies on artificial intelligence (AI) instead of human peer review



Reasons for AGREEING:

- Reduces subjectivity/ biases – more objectivity
- Reviews not always currently of an acceptable standard

"Artificial intelligence (AI) is fairer than human peer review, human peer review is not a good thing because reviews are biased by the subjective view of the reviewers, reviewers are not balanced in comparison to AI." (Psychology, Germany, aged 36-45)

Reasons for DISAGREEING:

- Human insight/ intellect/ understanding/ analysis superior
- Limited trust, AI currently incapable of quality peer review

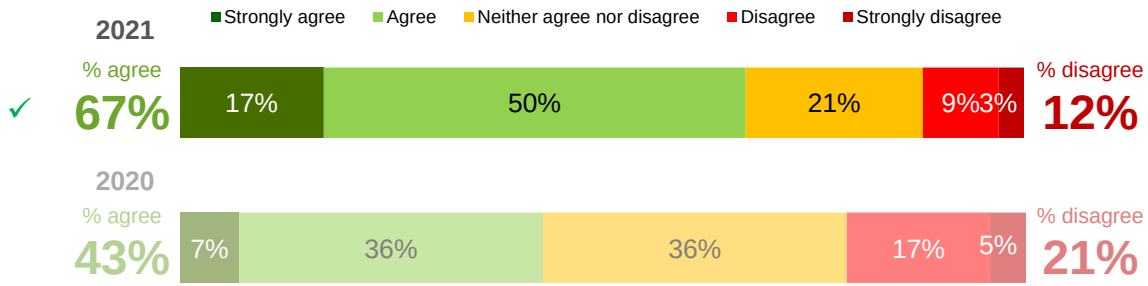
"Peer review is very complex, and requires deep knowledge and critical thinking to assess the value and innovation of a given research work, and to identify possible confounding factors or biases. It is already very complicated for humans, and is far beyond the capabilities of (current) AI systems" (Computer Sciences / IT, France, aged 36-45)

✓ Higher
✓ Lower
Significant difference 2021 to 2020

Base: 2021 All researchers (n=1,173) Chart excludes don't knows (n=1,110)
Base: 2020 All researchers (n=1,066) Chart excludes don't knows (n=1,000)

VALUE OF PREPRINTS: The value of pre-prints has increased in the last year – around two-thirds (67%) consider pre-prints a valued source of communication (up from 43%).

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: Preprints are a valued source of communication in research



Reasons for AGREEING:

- Valuable to see prior publication/ earlier accessibility/ sharing of research
- More timely, up-to-date communication of the information
- Easier to access/ feely accessible

"I want to be able to read good research results quickly and not after one or two years, which is sometimes the time it takes to be published." (Astronomy, France, aged 56-65)

Reasons for DISAGREEING:

- Lacks peer review/ revision/ validation
- Limited value in getting access earlier/ before formal/ full publication

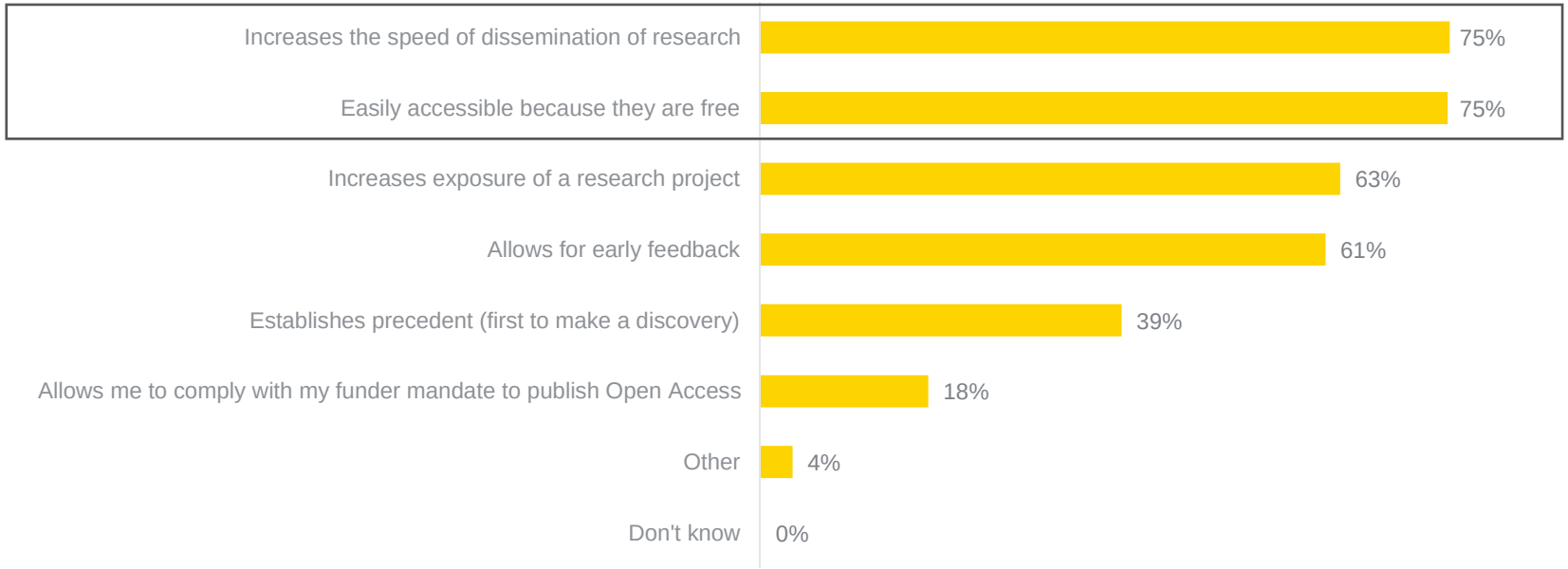
"I strongly believe in peer review. Most preprints do not successfully pass through the preprint stage without revision. These revisions can be important to the interpretation of the results" (Medicine and Allied Health, USA, aged 46-55)

✓ Higher
✓ Lower
Significant difference 2021 to 2020

Base: 2021 All researchers (n=1,173) Chart excludes don't knows (n=1,134)
Base: 2020 All researchers (n=1,066) Chart excludes don't knows (n=993)

VALUE OF PREPRINTS: The most widely cited reasons for pre-prints being valued as a source of communication in research were increases the speed of dissemination of research and ease of accessibility (free).

You agreed with the statement 'Preprints are a valued source of communication in research'. In which of the following ways are they valuable?



Base: All researchers who AGREED pre-prints are a valued source of communication in research n=746

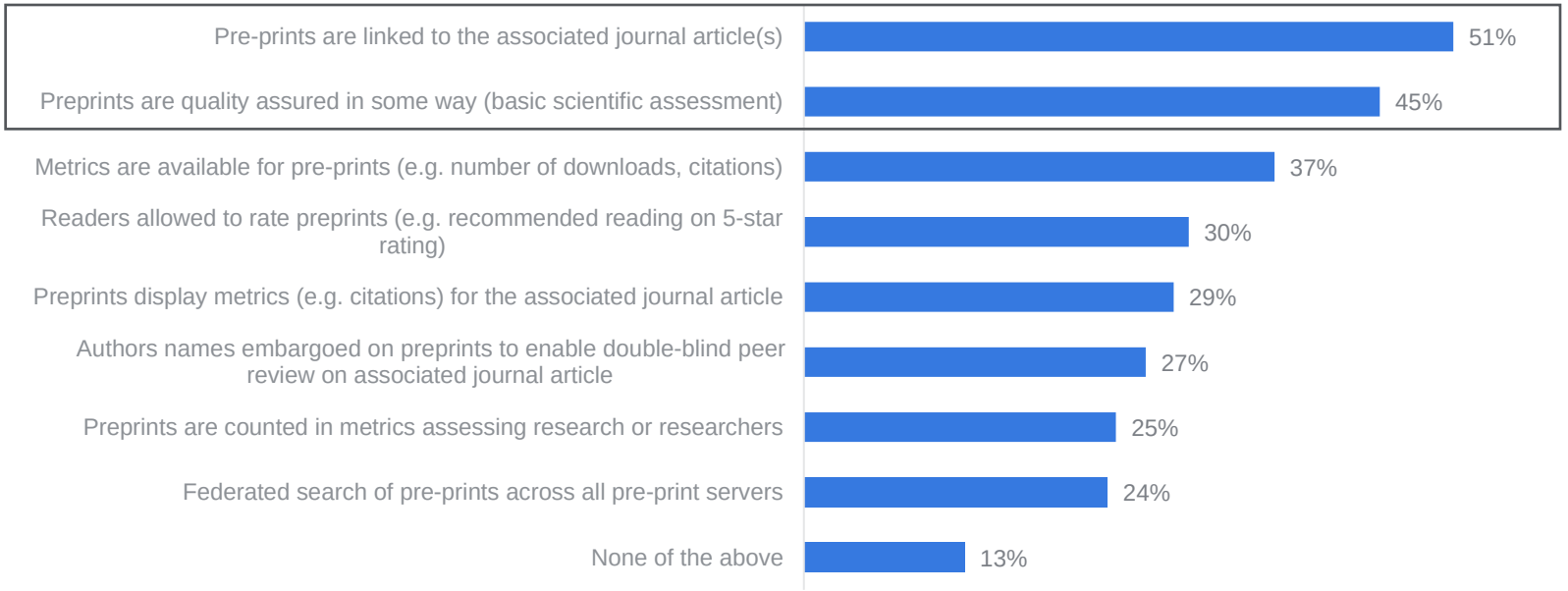
DISADVANTAGES OF PREPRINTS: Not peer reviewed was the most cited disadvantage of pre-prints as a source of communication in research.

You disagreed or were neutral with the statement 'Preprints are a valued source of communication in research'. What do you see as some of the disadvantages of preprints?

Base: All researchers who disagreed or were neutral with the statement pre-prints are a valued source of communication in research n=388

DEVELOPMENT OF PREPRINTS: Preprints being linked to the associated journal article(s) was considered the most beneficial potential development followed by pre-prints are quality assured in some way (basic scientific assessment).

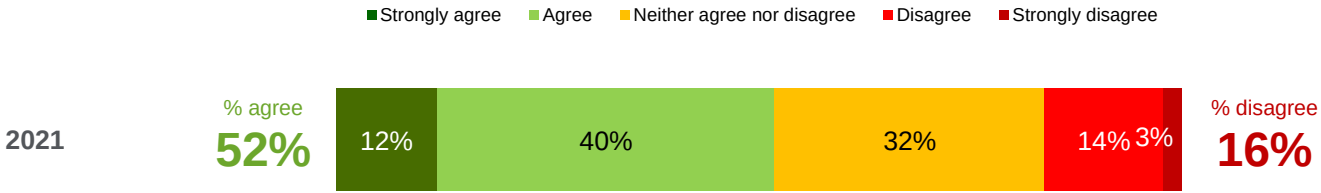
Thinking about preprints and their role in research, do you believe any of the following would be beneficial?



Base: All researchers who disagreed or were neutral with the statement pre-prints are a valued source of communication in research n=388

SHARING DATA: Just over half (52%) state that they are sharing more research data now than 2-3 years ago.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: I am sharing more research data now than 2-3 years ago



Reasons for AGREEING:

- Increased means/ practices/ databases/ technology outlets for sharing data/ open science/ source
- More productive/ data to share
- Sharing now a necessity/ even more encouraged/ a requirement

"Increased awareness of necessity and possibilities for sharing research data due to development of data repositories." (Physics, Germany, aged 56-65)

Reasons for DISAGREEING:

- Approach to/ level of sharing of research data unchanged
- Conducting less research currently

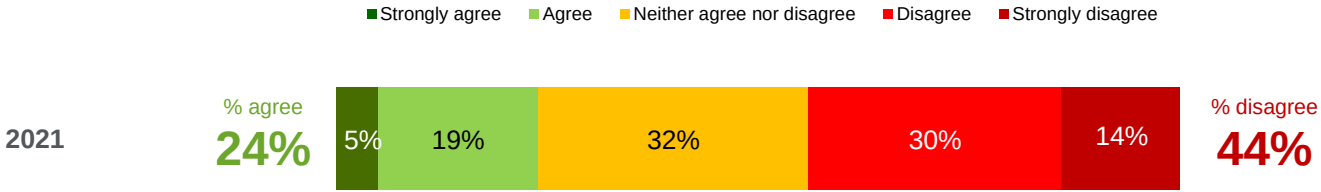
"I share the same amount of research data as before. There is no change I have seen" (Materials Science, India, aged 56-65)

"I have always shared all my research data" (Computer Sciences / IT, Germany, aged 56-65)

Base: All researchers (n=1,173)
Chart excludes don't knows (n=1,159)

SUBMITTED: Just under a quarter of researchers (24%) report that during the period of the pandemic they have submitted more research papers than they would have done otherwise (44% disagree that this is their experience).

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: During the period of the pandemic I have submitted more research papers than I would have done otherwise



Reasons for AGREEING:

- Remote working facilitated more time to focus on producing papers
- Online teaching/ events facilitated more time to focus on producing papers
- Less time in/ being away from labs enabled more time for producing papers
- Less administrative meetings/ colleague distractions freed-up time

"By working largely remotely, I have had more time to focus on the research results I have obtained and gather them into more scientific publications." (Pharmacology/ Toxicology/ Pharmaceutics, Poland, aged 56-65)

Reasons for DISAGREEING:

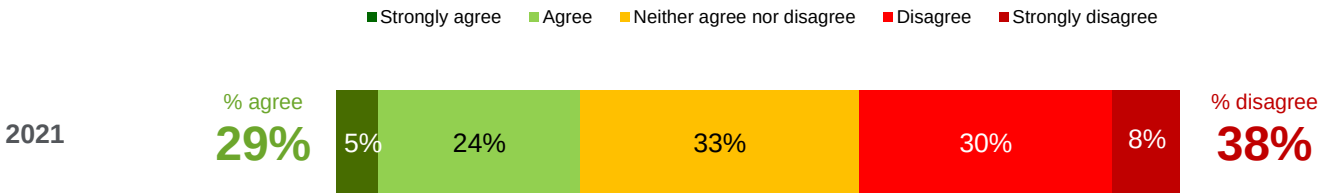
- Pandemic negatively impacted on work typically would have been doing/ submitting papers on
- Experimental work at facilities/ labs suspended during lockdowns
- Pandemic resulted in additional family/ children schooling commitments
- Additional student teaching/ support commitments (shift to online teaching)

"Many of my experiments are done at facilities that have been partly or completely closed during the pandemic" (Physics, USA, aged over 65)

Base: All researchers (n=1,173)
Chart excludes don't knows (n=1,160)

EXPECTED PAPERS: Almost four in ten researchers (38%) believe the amount of research papers they write will be more than prior to the pandemic against 29% who expect the amount of research papers they write to be less than prior to the pandemic.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: Over the next 12 months I expect the amount of research papers I write to be less than prior to the pandemic



Reasons for AGREEING:

- Pandemic restricted/ halted/ suspended research projects
- Experimental work reduced as a result of the pandemic
- Funding declined

"Data collection was challenging during the pandemic."
(Neuroscience, Canada, aged 36-45)

Reasons for DISAGREEING:

- Remote/ online working enabled more time for producing papers
- Restrictions easing will allow more in-person research to be conducted
- Pandemic had limited impact on research output/ producing papers

"During pandemic, work has gone on, with almost no delay"
(Materials Science, France, aged 56-65)

Base: All researchers (n=1,173)
Chart excludes don't knows (n=1,121)

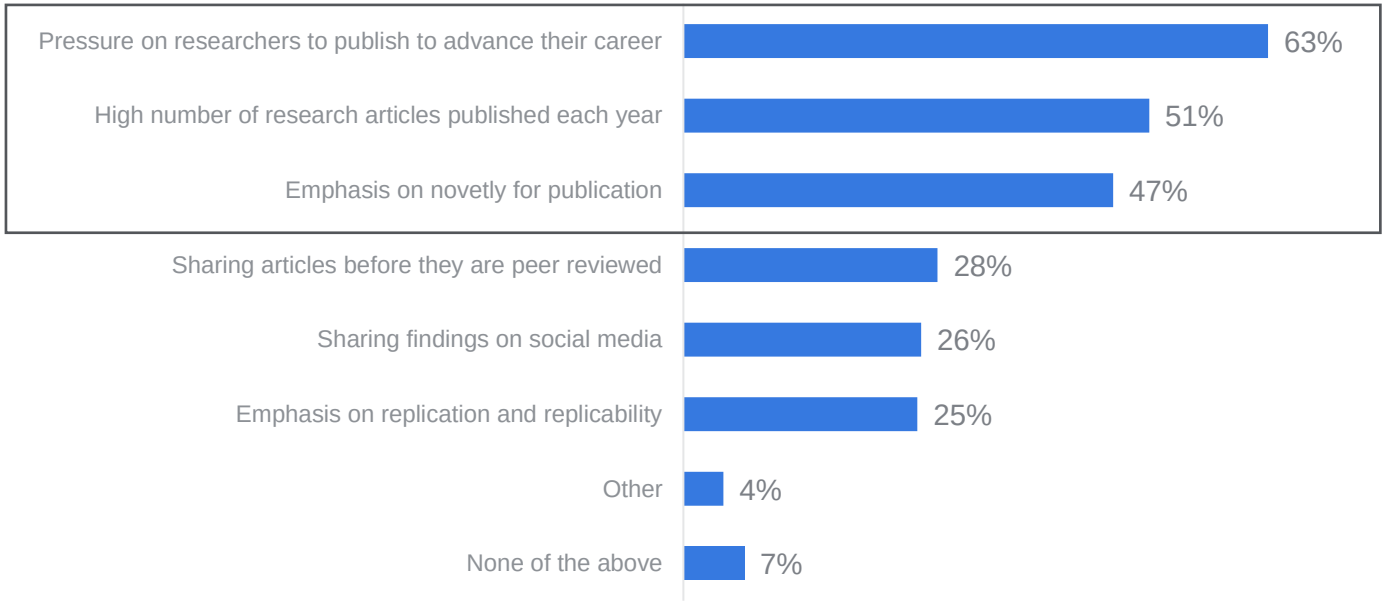
RED FLAGS TO ENGAGEMENT: The most cited ‘red flags’ to engaging with research were source of data unclear, journal of low quality and not peer reviewed.

When you encounter research findings, which of the following if any, are ‘red flags’ that make it unlikely you will engage with the research?

Base: All researchers n=1,173

CHALLENGES: Most stated challenges to effective communication were pressure to publish, volume of articles being published and a focus on novelty.

Which, if any, of the following do you see as trends which are challenges to the effective communication and use of research?



Base: All researchers n=1,173

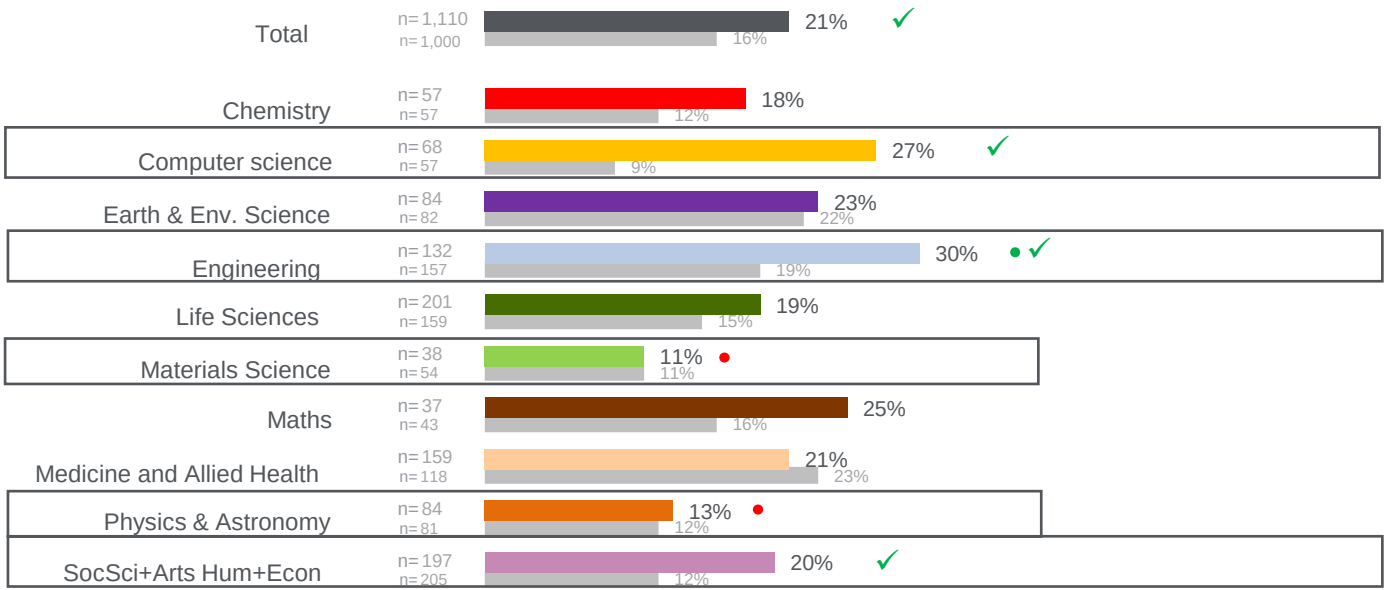
ELSEVIER

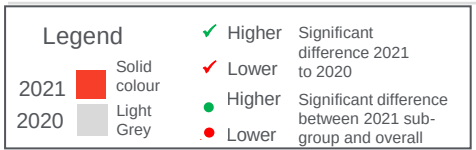
ROLE OF AI IN PEER REVIEW AND IN RESEARCH

Results by subject, region, age group, gender, position and country

ATTITUDE TO AI PEER REVIEW: Acceptance of AI peer review has increased, particularly in Computer Science, Engineering and Social Sciences. Materials Science and Physics are more resistant to AI peer review.

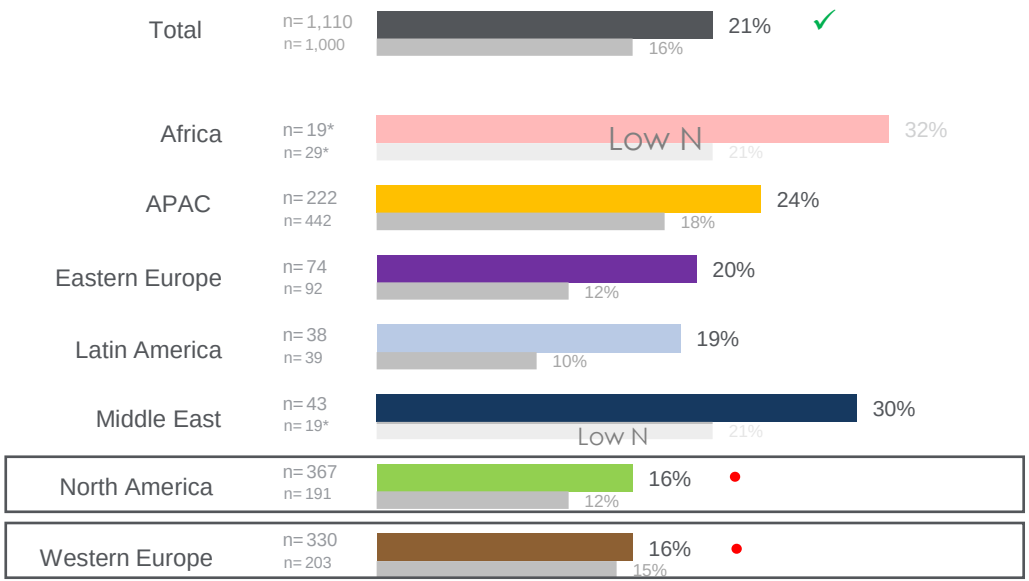
I would be willing to read articles in a journal that relies on artificial intelligence (AI) instead of human peer review? - (% agree. Note in 2020 it was not % agree BUT % likely)





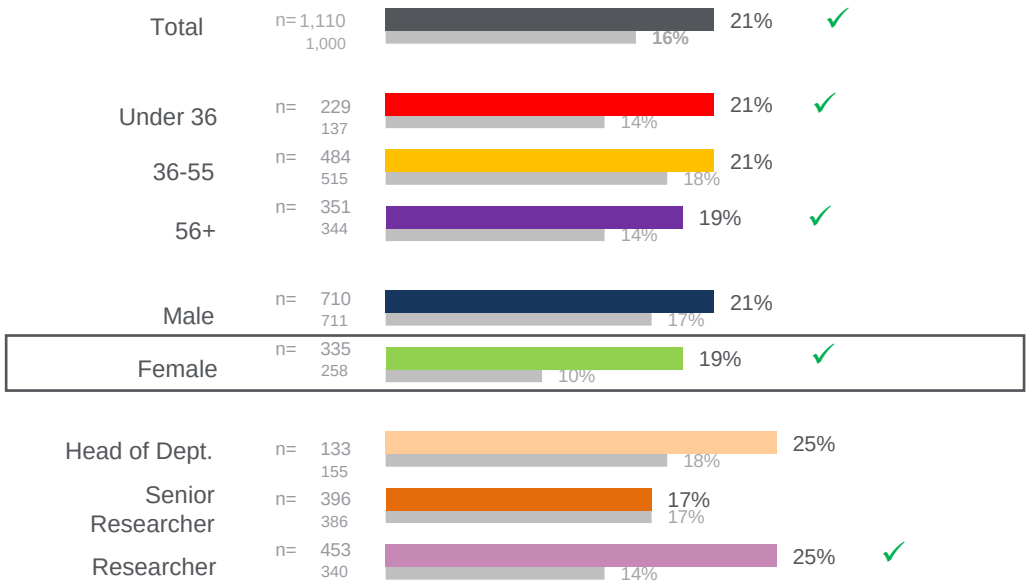
ATTITUDE TO AI PEER REVIEW: North America and Western Europe are the least likely regions to accept AI peer review.

I would be willing to read articles in a journal that relies on artificial intelligence (AI) instead of human peer review? - (% agree. Note in 2020 it was not % agree BUT % likely)



ATTITUDE TO AI PEER REVIEW: Acceptance of AI assisted peer review has increased amongst females – almost one in five of this cohort (19%) are willing to read articles in a journal relying on AI review (up from 10% in 2020).

I would be willing to read articles in a journal that relies on artificial intelligence (AI) instead of human peer review? - (% agree. Note in 2020 it was not % agree BUT % likely)



Legend

2021 Solid colour

2020 Light Grey

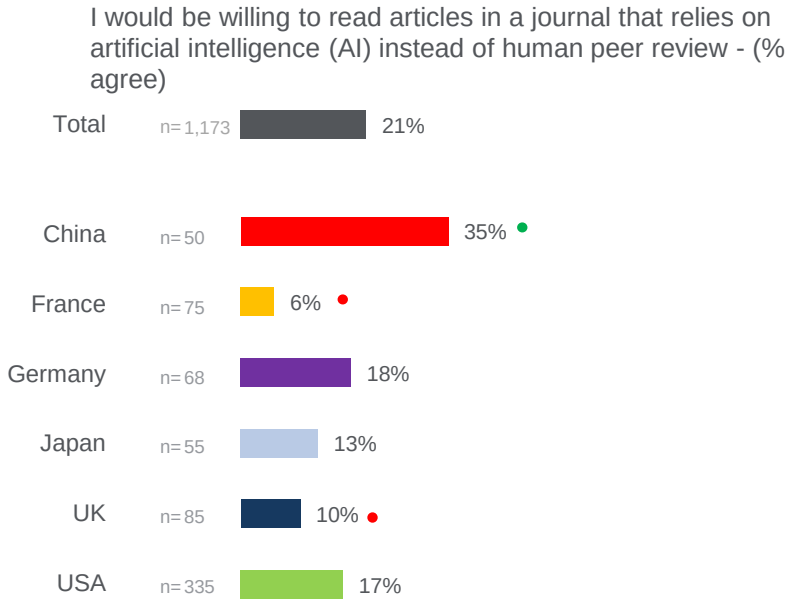
✓ Higher — Significant difference 2021 to 2020

✓ Lower

● Higher — Significant difference between 2021 sub-group and overall

● Lower

ATTITUDE TO AI PEER REVIEW: Over a third of researchers in China (35%) would be willing to read articles in a journal that relies on artificial intelligence (AI) instead of human peer review, versus only a fifth of researchers worldwide (21%).

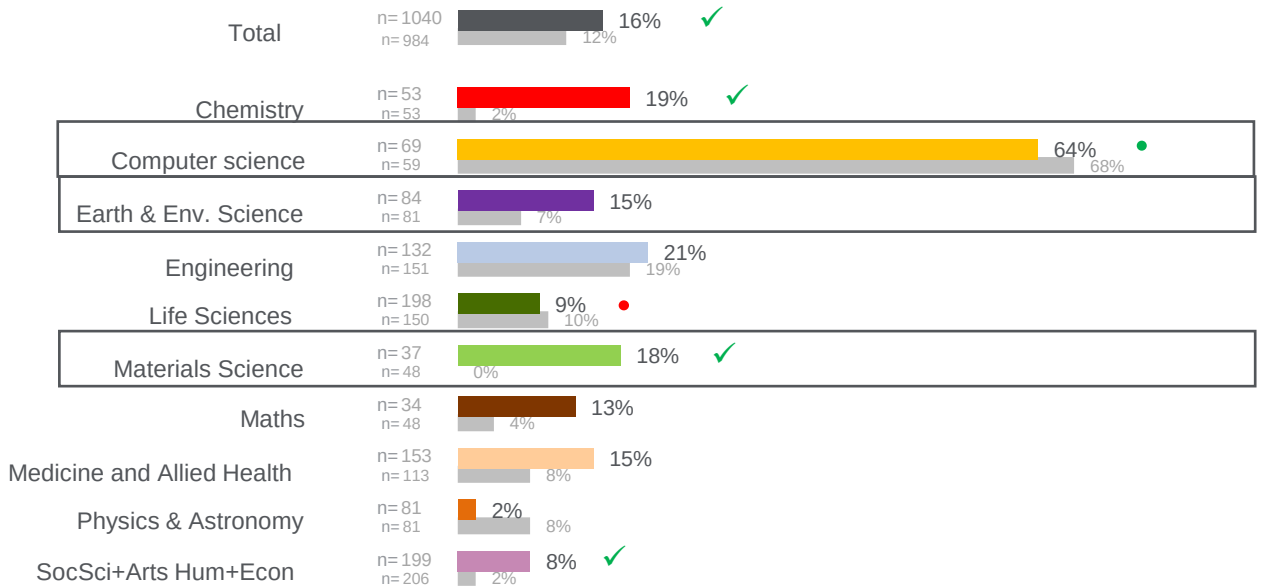


(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

USE AI: Computer Science are significantly more likely and Life Sciences significantly less likely to use AI heavily in their research. Heavy use of AI has increased amongst Chemistry.

Q. To what extent do you use Artificial Intelligence (AI) in your research? Please indicate your response on a five-point scale where 5 is extensively and 1 is not at all. % shows sum of those rating a 4 or a 5



Legend

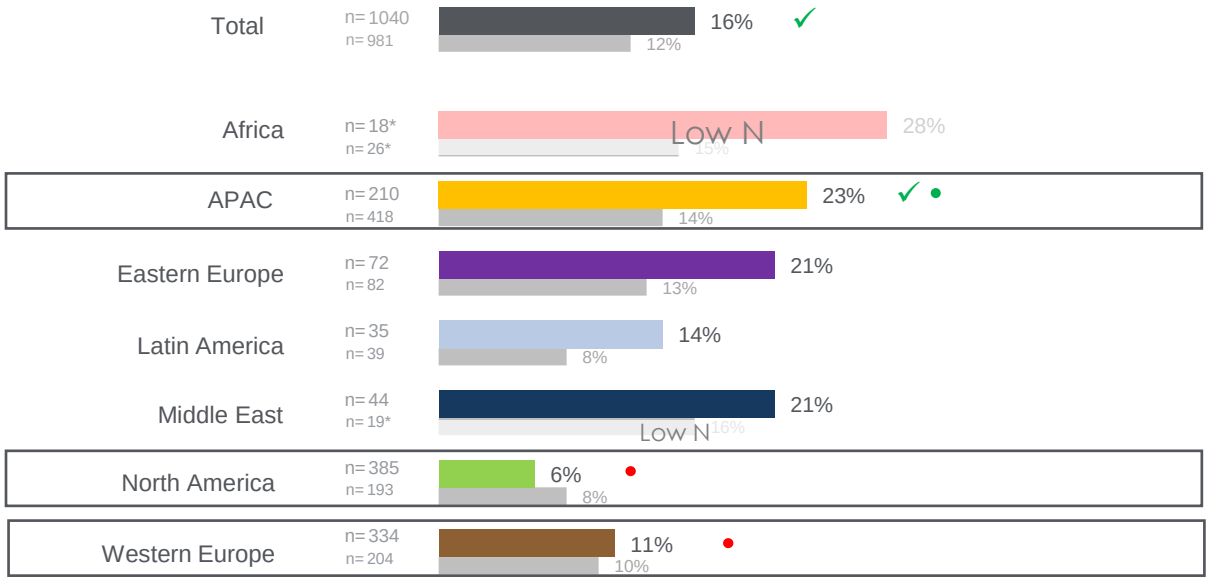
2021 Solid colour
2020 Light Grey

✓ Higher
✓ Lower
Significant difference 2021 to 2020

● Higher
● Lower
Significant difference between 2021 sub-group and overall

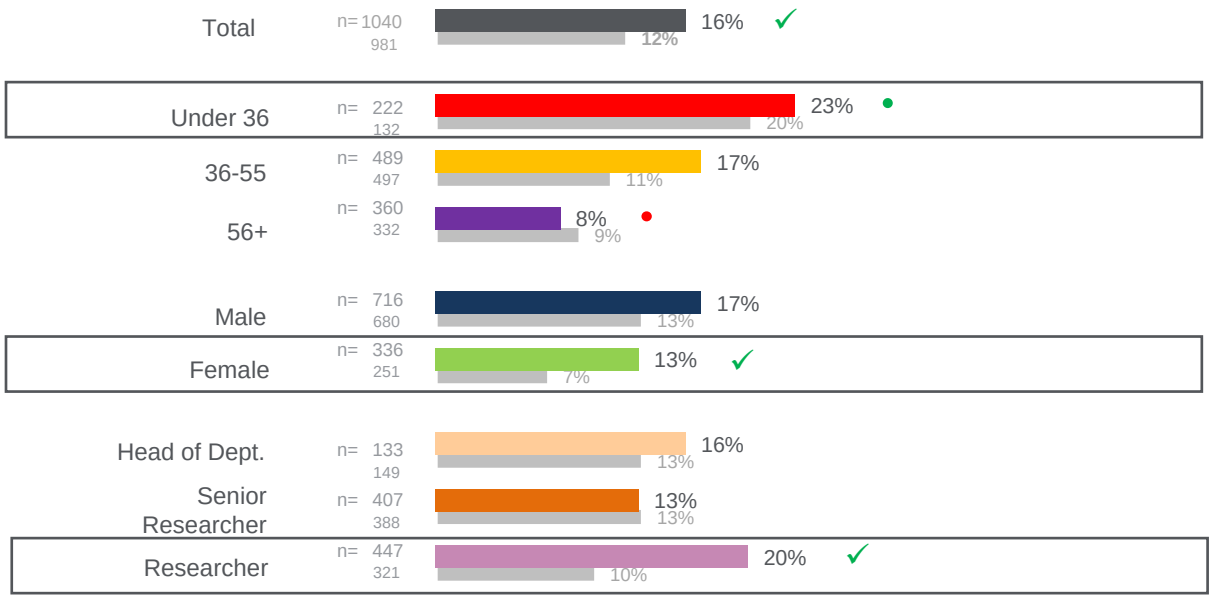
USE AI: APAC is significantly more likely and North America and Western Europe are significantly less likely to heavily use AI in their research.

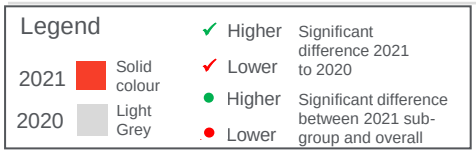
Q. To what extent do you use Artificial Intelligence (AI) in your research? Please indicate your response on a five-point scale where 5 is extensively and 1 is not at all. % shows sum of those rating a 4 or a 5



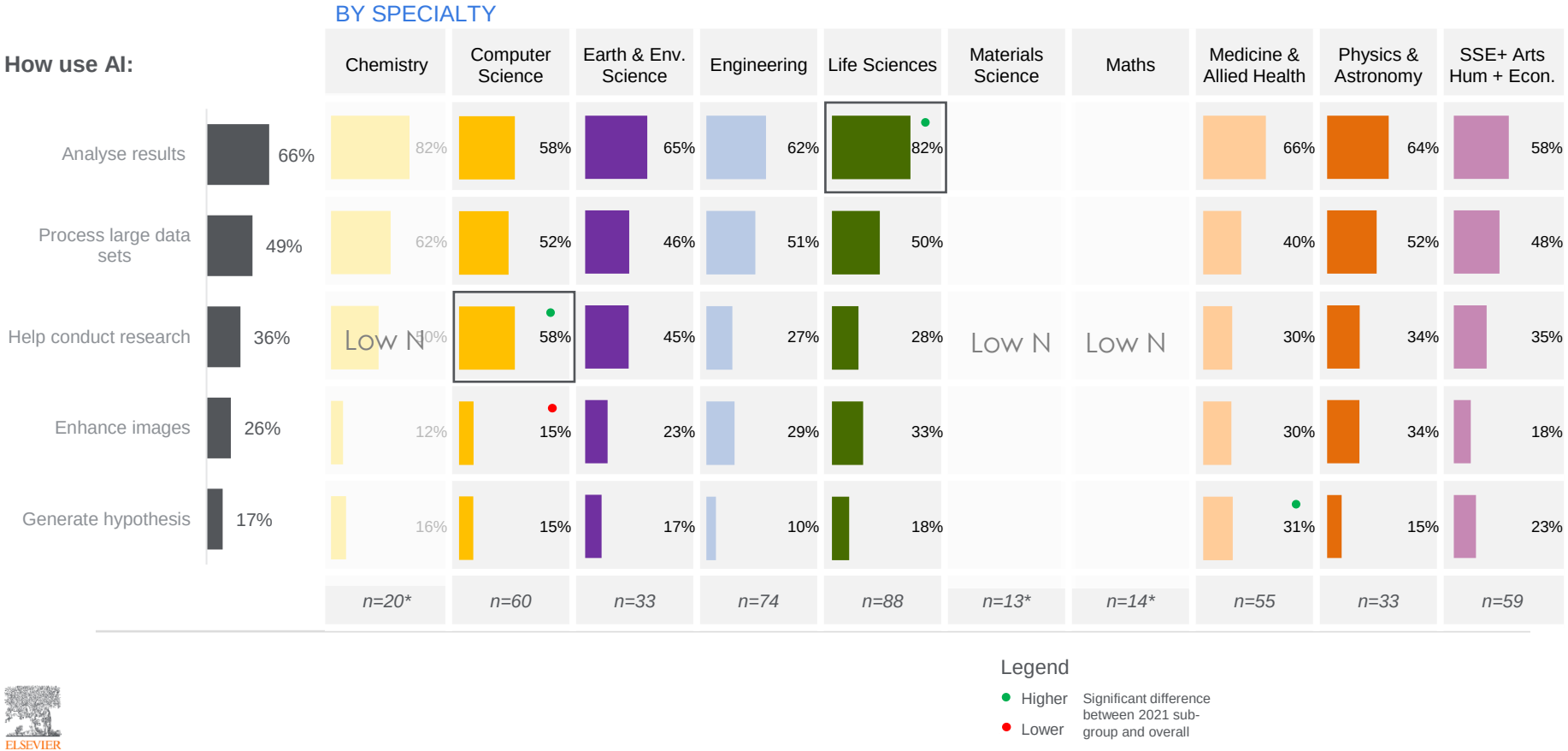
USE AI: Younger researchers are significantly more likely to heavily use AI in their research. Female and those at research level are more likely to be heavily using AI now than last year.

Q. To what extent do you use Artificial Intelligence (AI) in your research? Please indicate your response on a five-point scale where 5 is extensively and 1 is not at all. % shows sum of those rating a 4 or a 5

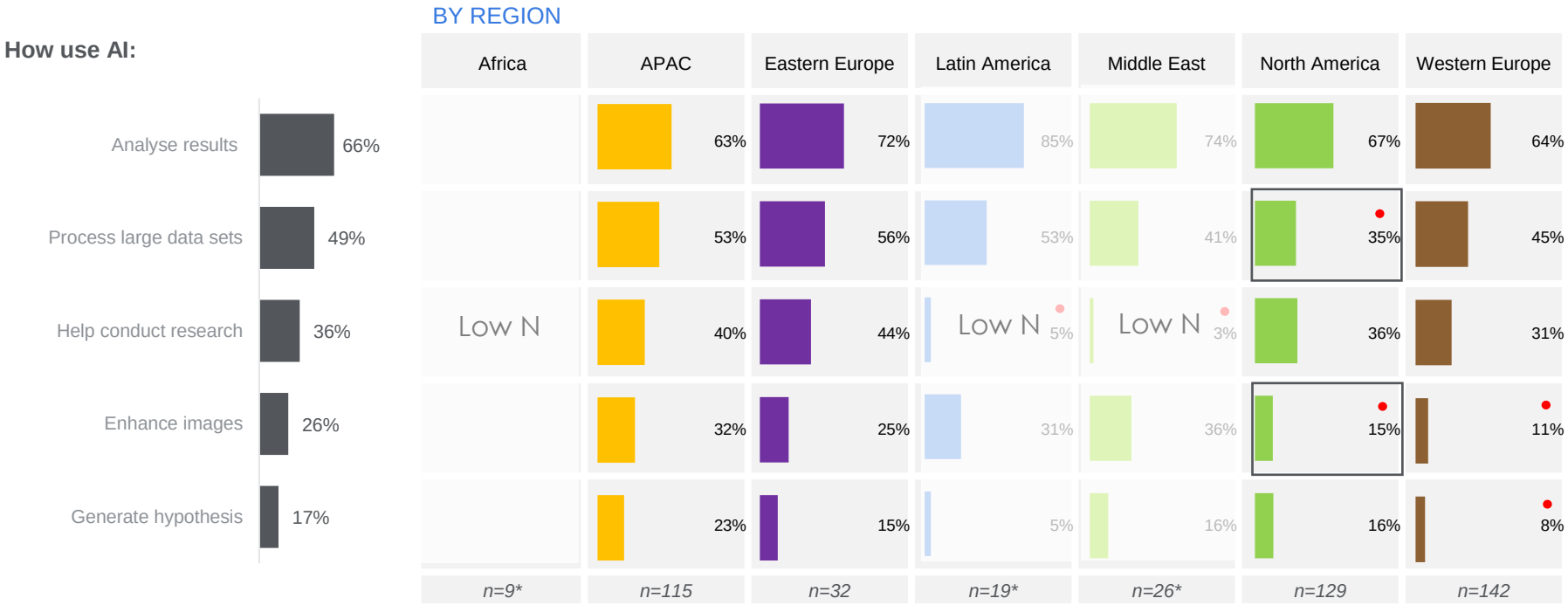




HOW USE AI: Life Sciences are more likely than other specialties to use AI to analyse results whilst Computer Science are more likely than other specialties to use AI to help conduct research.



HOW USE AI: North America less likely than other regions to use AI to process large data sets and to enhance images.

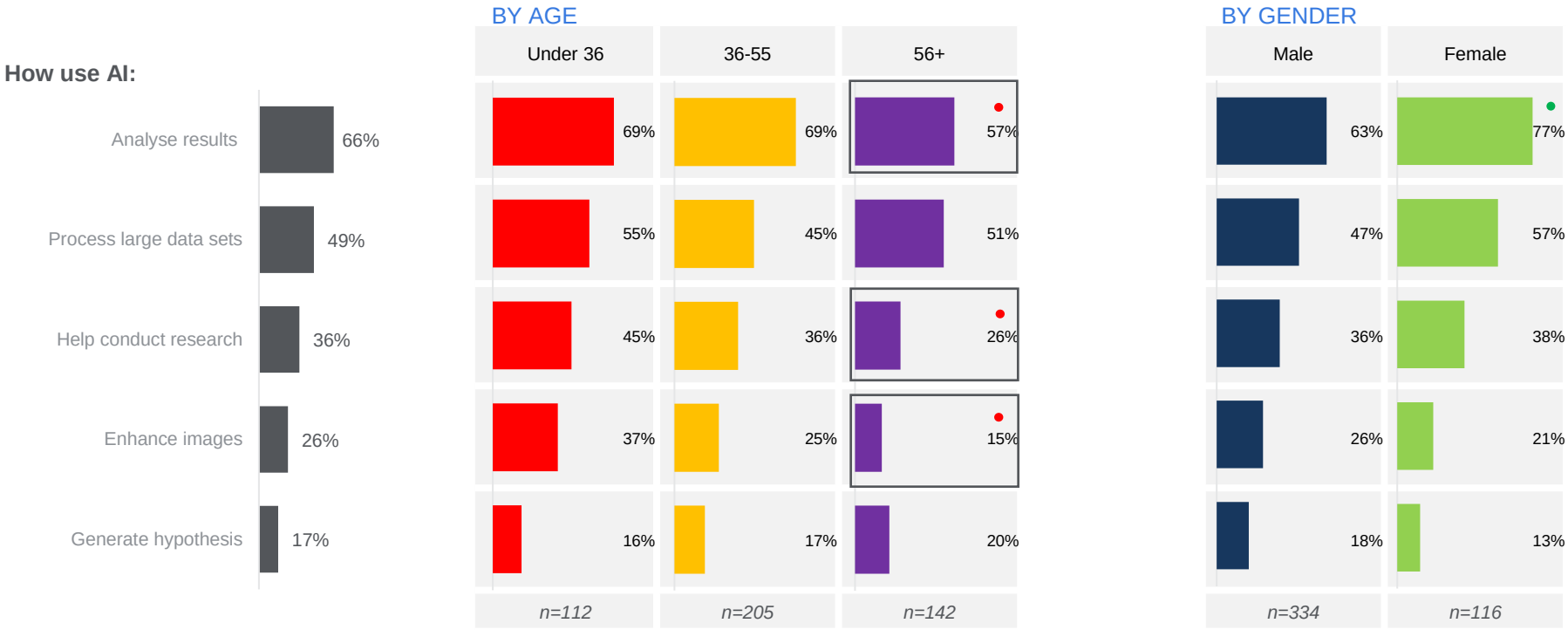


Legend

- Higher
- Lower

Significant difference between 2021 sub-group and overall

HOW USE AI: Older researchers are less likely to use AI to analyse research results, to help conduct research and to enhance images.



Legend

- Higher
- Lower

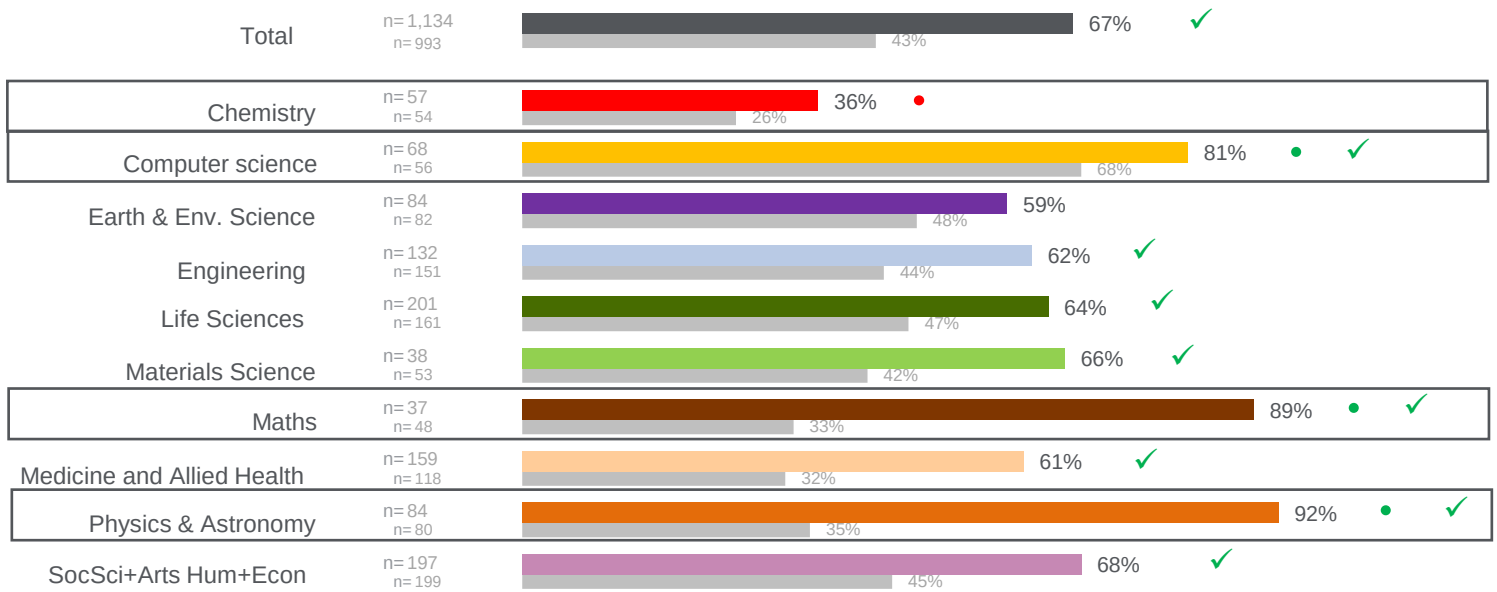
Significant difference between 2021 sub-group and overall

THE VALUE OF PREPRINTS

Results by subject, region, age group, gender, position and country

VALUE OF PREPRINTS: Computer Science, Maths and Physics are most likely to value pre-prints. Chemistry are the least likely to value pre-prints. All fields of science are more likely this year to value pre-prints than a year ago.

Preprints are a valued source of communication in research - (% agree)



Legend

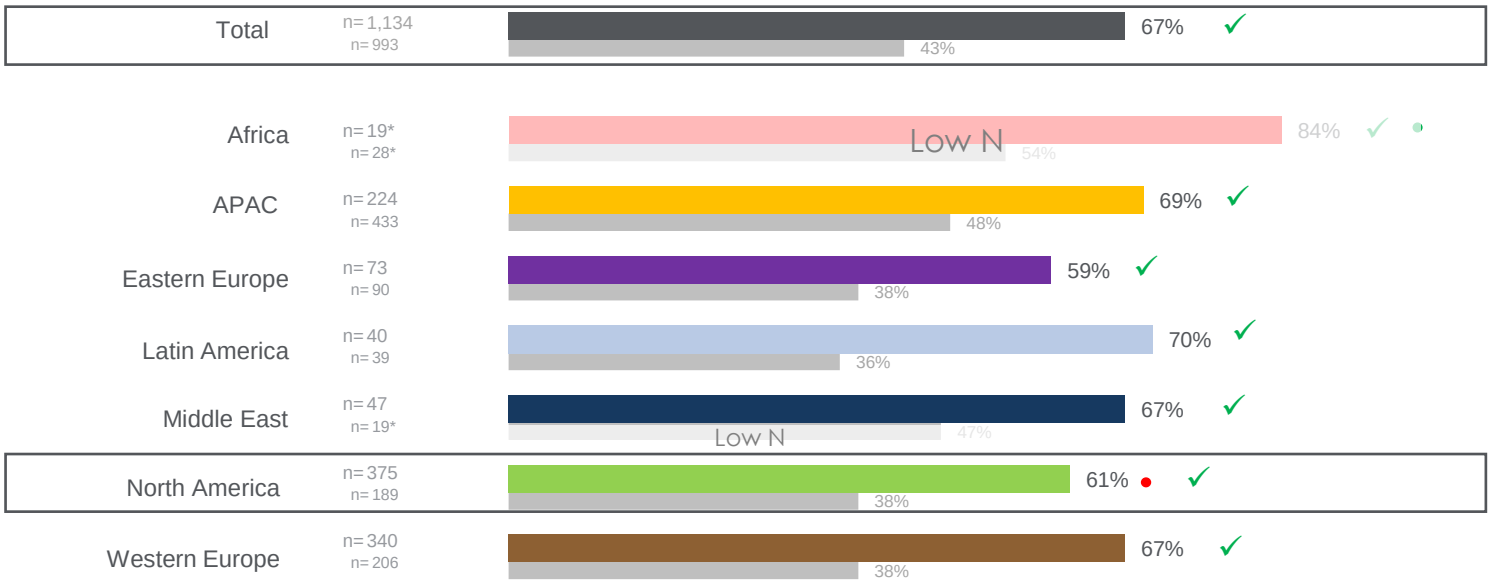
2021 Solid colour
2020 Light Grey

✓ Higher
✓ Lower
Significant difference 2021 to 2020

● Higher
● Lower
Significant difference between 2021 sub-group and overall

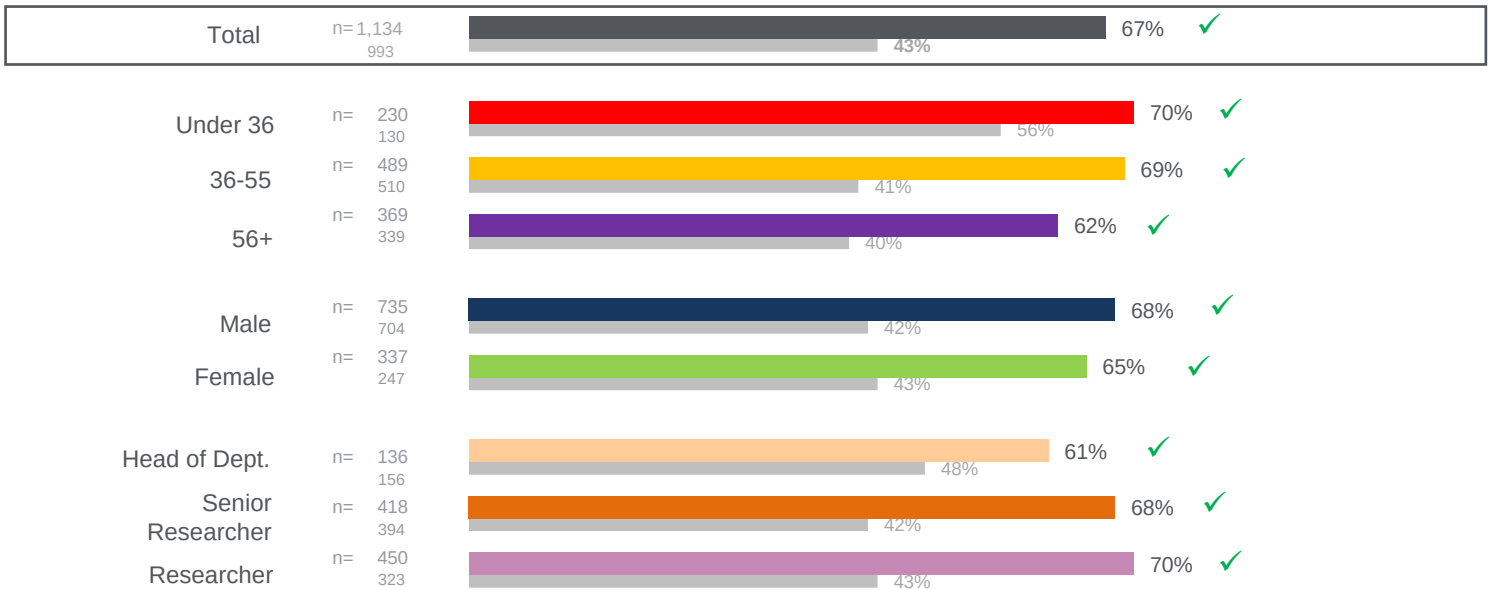
VALUE OF PREPRINTS: All regions are now more likely to value pre-prints than back in 2020. North America is slightly less likely than other regions to value pre-prints as a source of communication.

Preprints are a valued source of communication in research - (% agree)

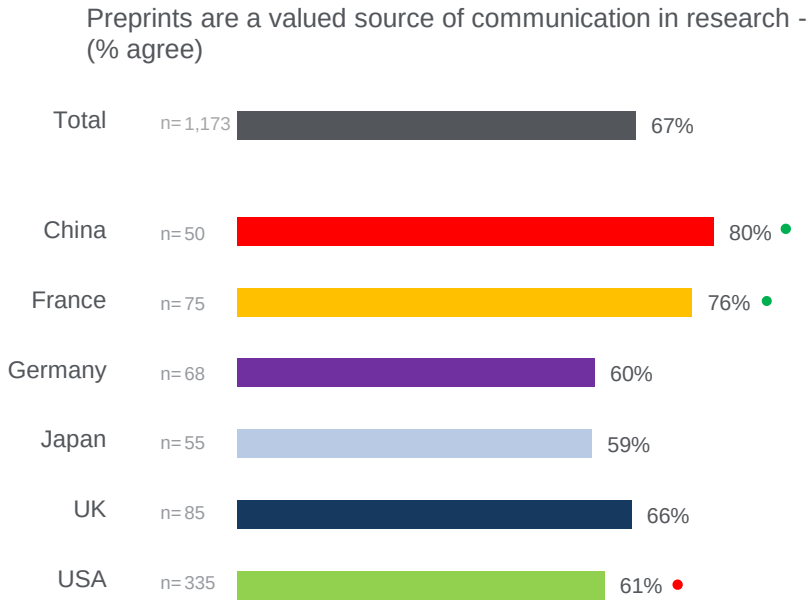


VALUE OF PREPRINTS: All age groups, genders and levels of seniority are more likely to value pre-prints than they did a year ago.

Preprints are a valued source of communication in research - (% agree)



VALUE OF PREPRINTS: Researchers in China are more likely to see the value pre-prints as a source of communication in research, with four fifths (80%) expressing they value them against two thirds (67%) of researchers worldwide.

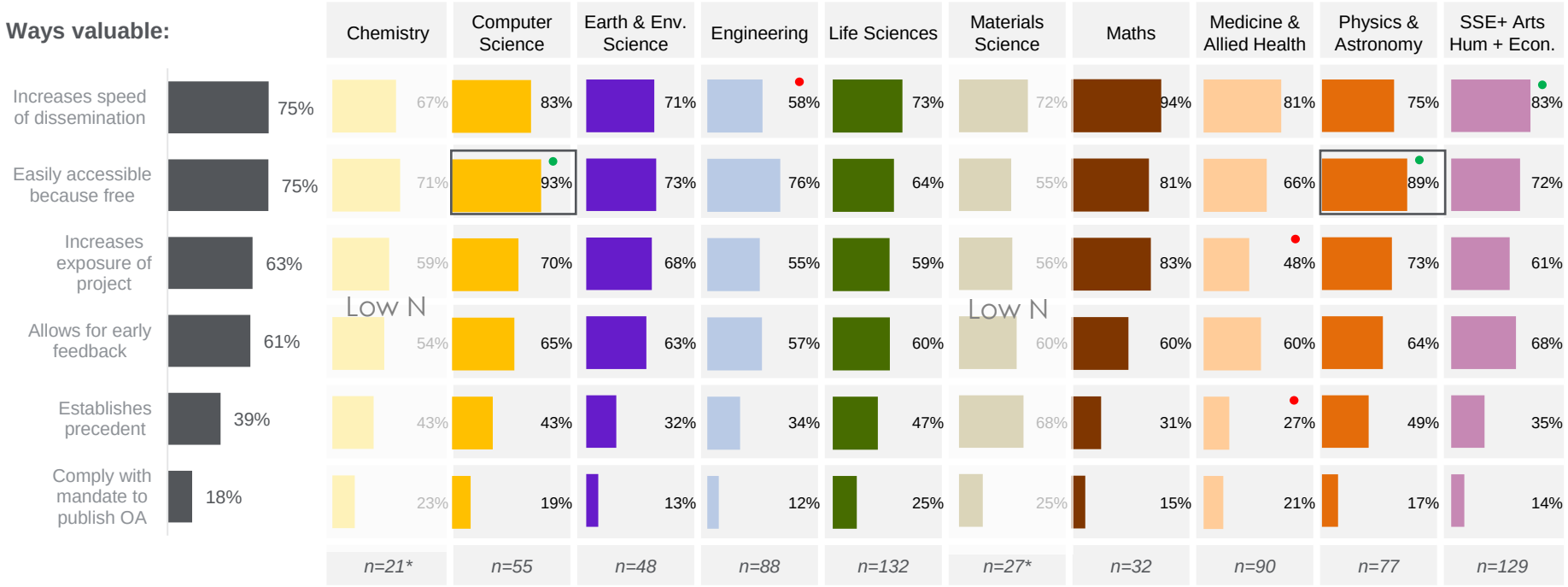


(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

VALUE OF PREPRINTS: : Easily accessible (as free) was more likely be stated by Computer Science and Physics than by other specialties as a reason for pre-prints being valued as a source of communication in research.

BY SPECIALTY

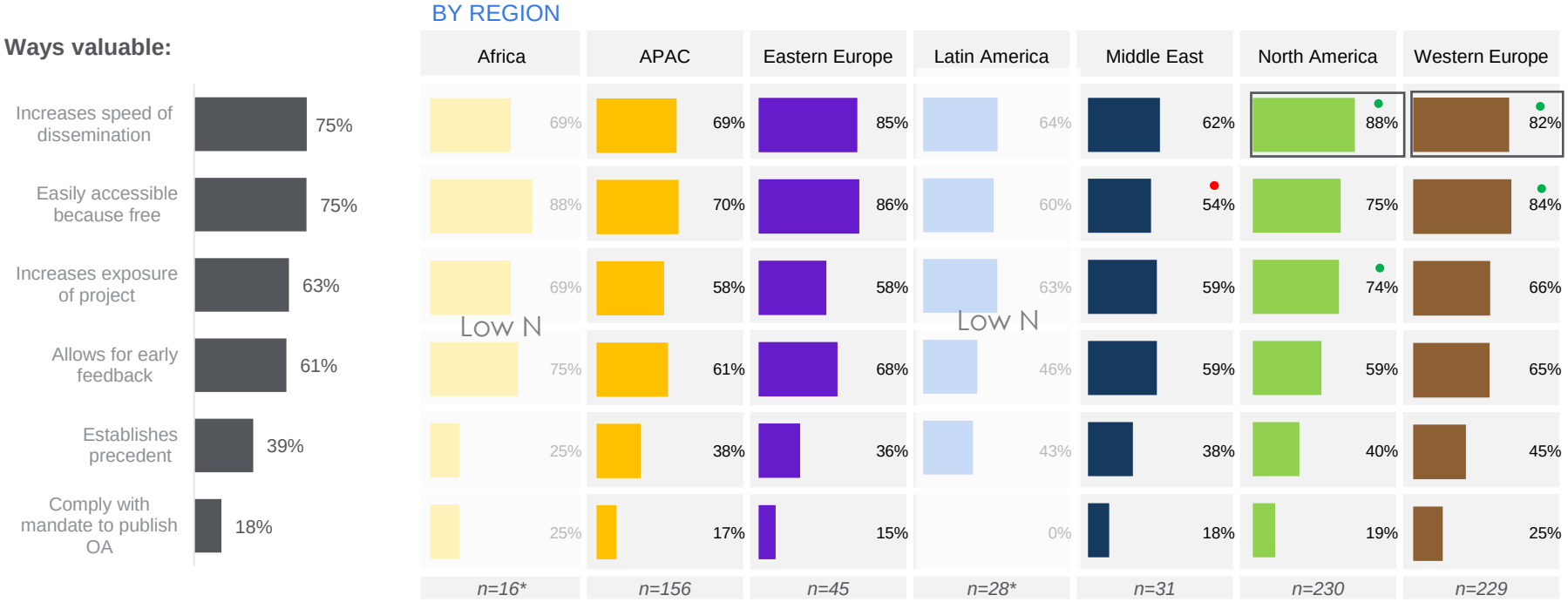


Base: All researchers who AGREED pre-prints are a valued source of communication in research n=746
Q: You agreed with the statement 'Preprints are a valued source of communication in research'. In which of the following ways are they valuable? (select all that apply).

Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

VALUE OF PREPRINTS: North America and Western Europe more likely than other regions to view increases the speed of dissemination of research as a reason for pre-prints being valued as a source of communication in research.

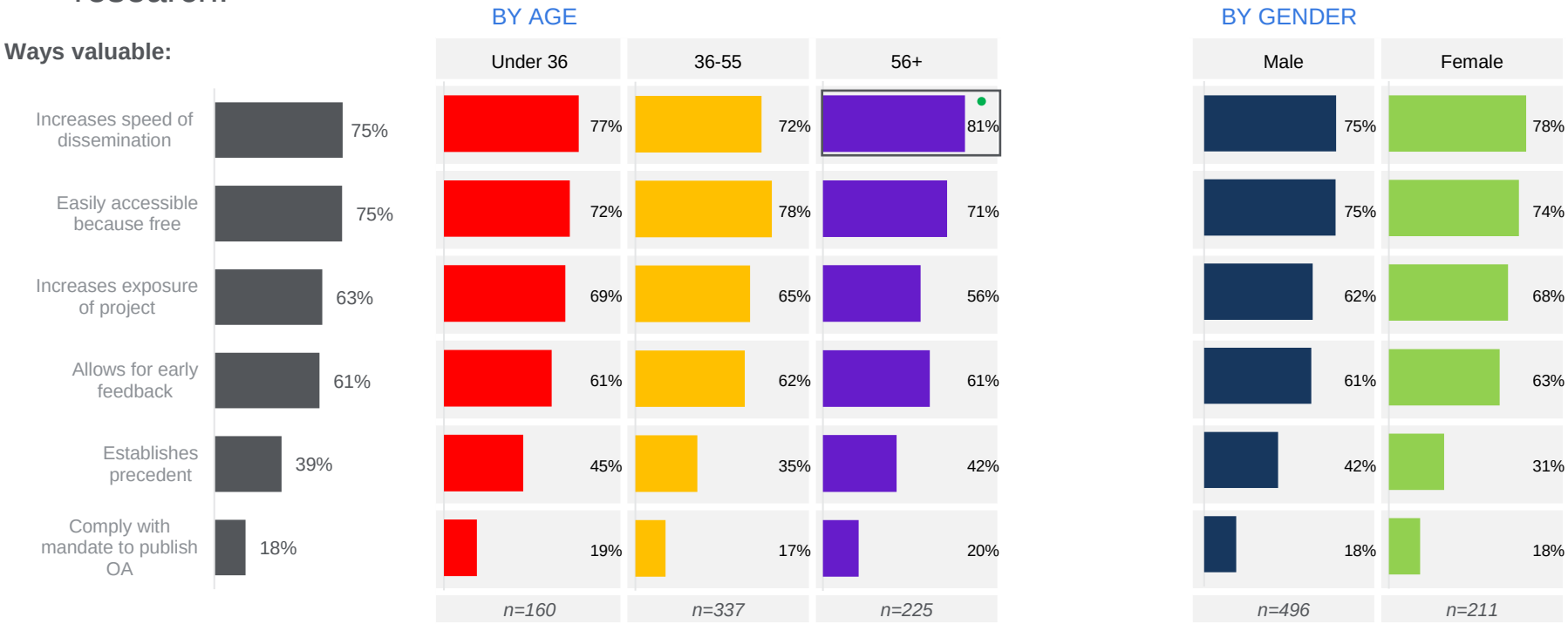


Base: All researchers who AGREED pre-prints are a valued source of communication in research n=746
Q: You agreed with the statement 'Preprints are a valued source of communication in research'. In which of the following ways are they valuable? (select all that apply).

Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

VALUE OF PREPRINTS: Older researchers are more likely to state increases the speed of dissemination as a reason for pre-prints being valued as a source of communication in research.



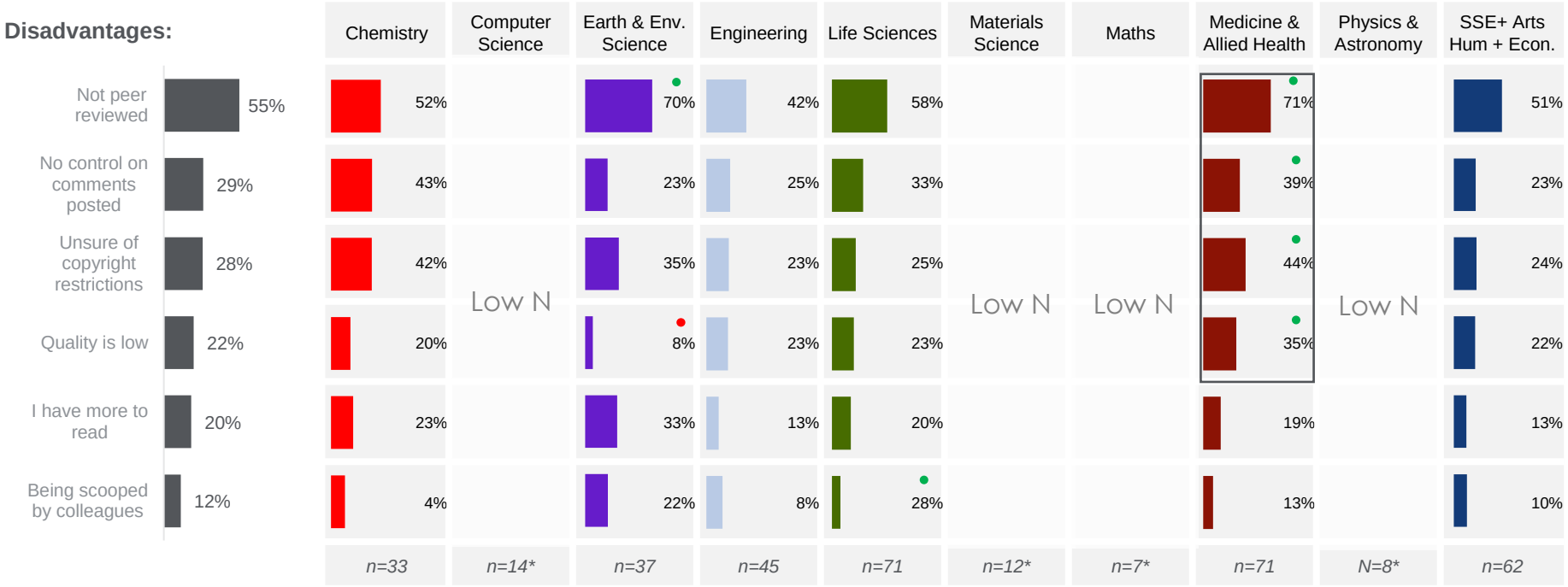
Base: All researchers who AGREED pre-prints are a valued source of communication in research n=746
Q: You agreed with the statement 'Preprints are a valued source of communication in research'. In which of the following ways are they valuable? (select all that apply).

Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

DISADVANTAGES OF PREPRINTS: Medicine were more likely than other specialities to view not peer reviewed, no control on comments posted, unsure of copyright restrictions and quality is low as disadvantages of preprints.

BY SPECIALTY



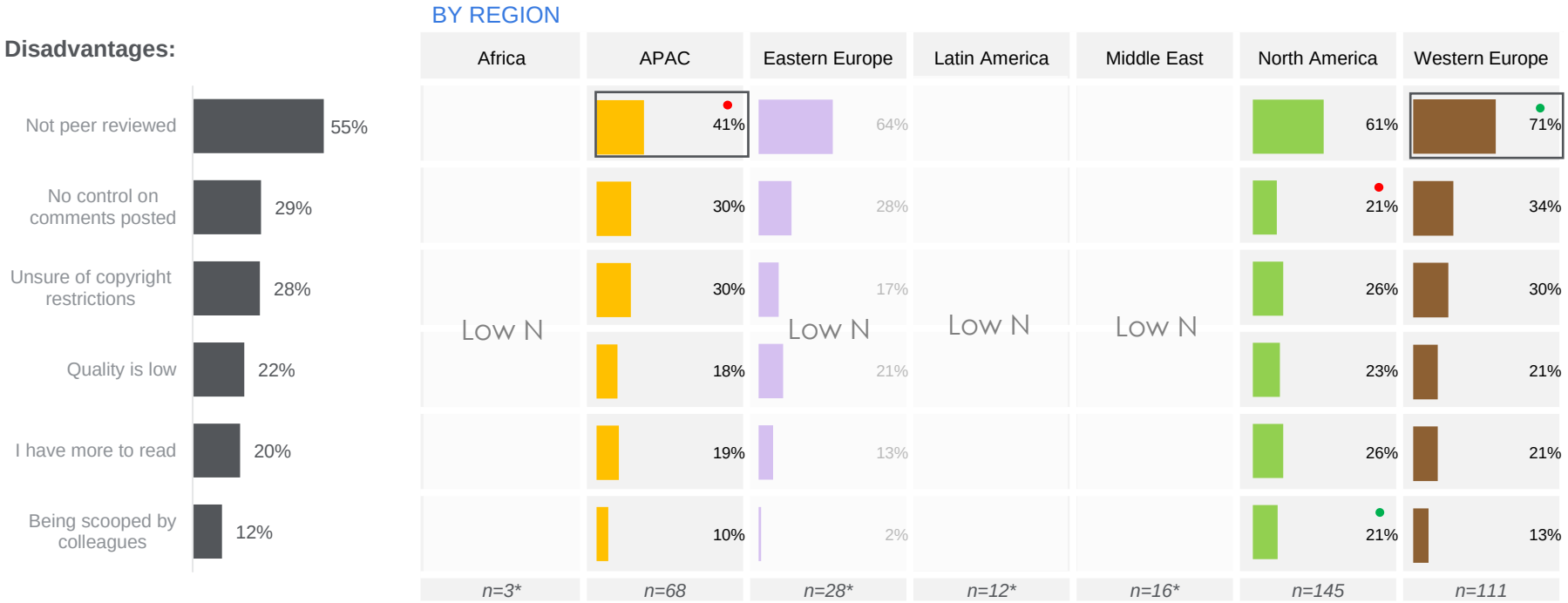
Base: All researchers who disagreed or were neutral with the statement pre-prints are a valued source of communication in research n=388

Legend

- Higher
- Lower

Significant difference between 2021 sub-group and overall

DISADVANTAGES OF PREPRINTS: Western Europe are more likely and APAC are less likely to view not peer reviewed as a disadvantage of preprints.

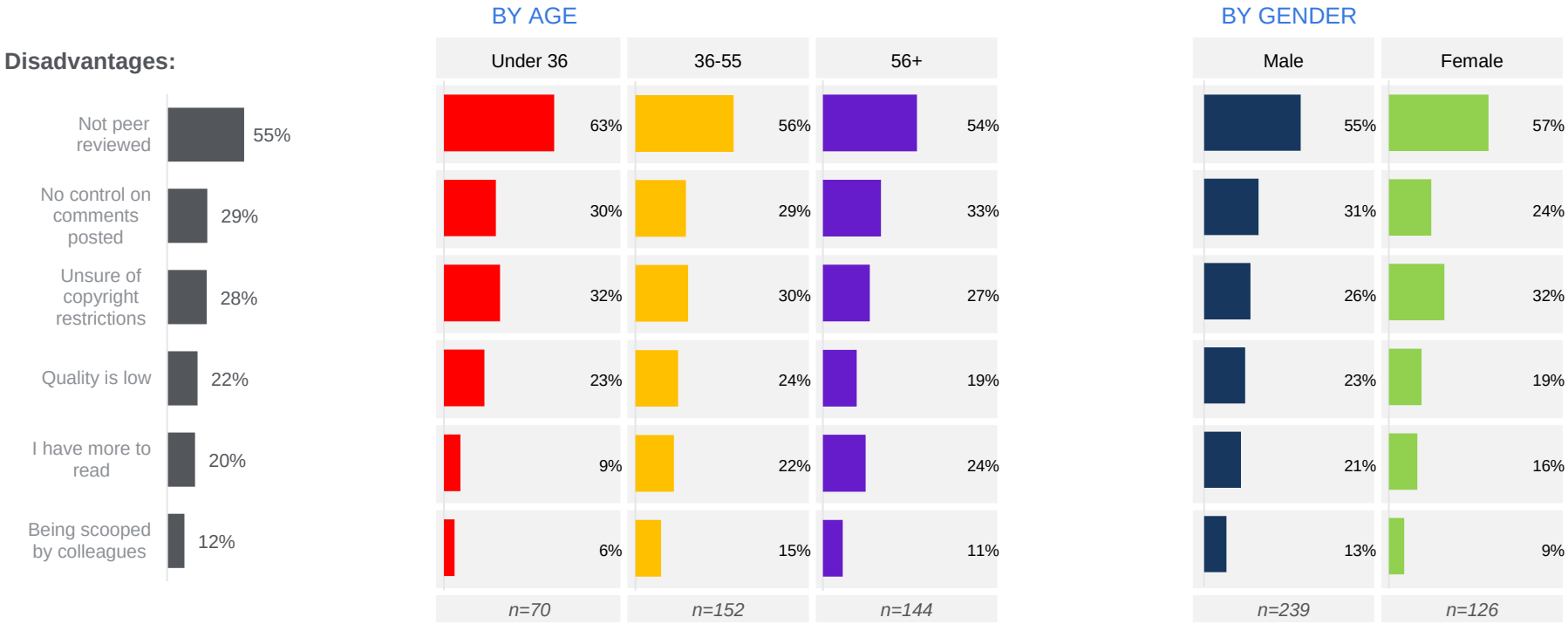


Base: All researchers who disagreed or were neutral with the statement pre-prints are a valued source of communication in research n=388

Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

DISADVANTAGES OF PREPRINTS: No significant differences by age or gender.



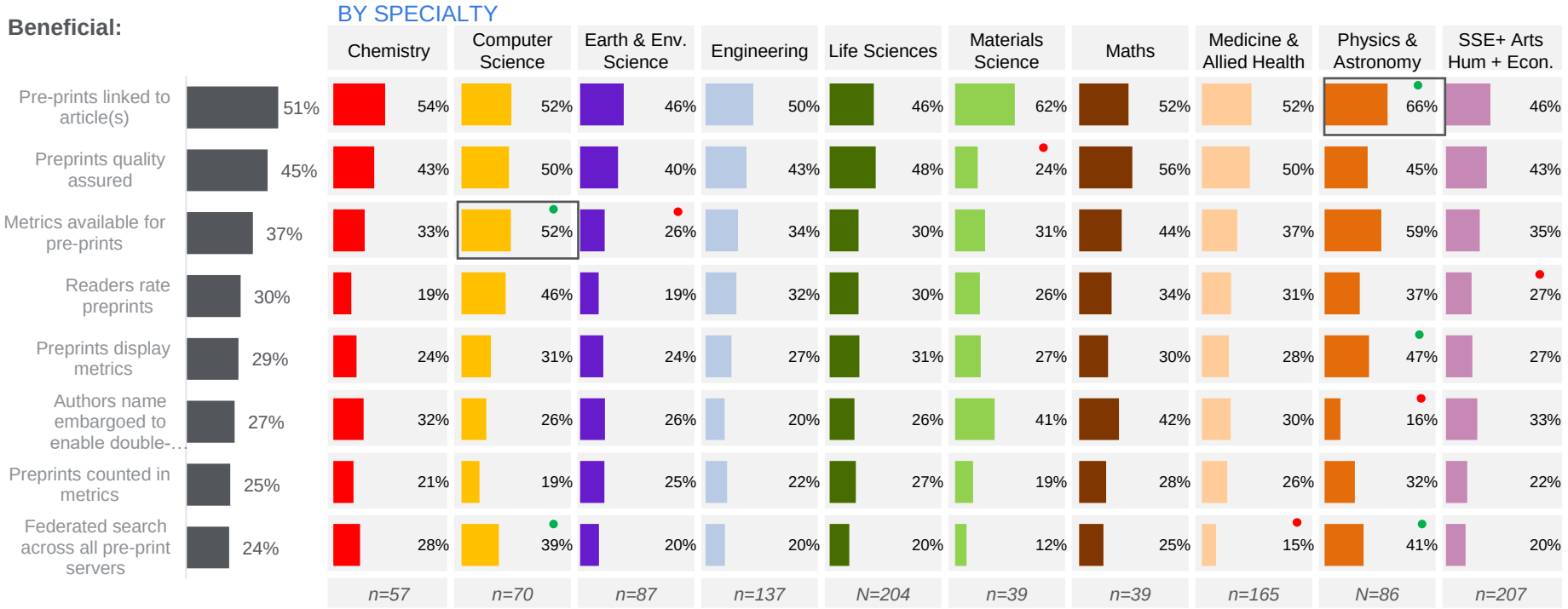
Base: All researchers who disagreed or were neutral with the statement pre-prints are a valued source of communication in research n=388

Legend

- Higher
- Lower

Significant difference between 2021 sub-group and overall

DEVELOPMENT OF PREPRINTS: Physics most likely to believe pre-prints linked to the associated journal article(s) would be beneficial. Computer Science were more likely than other specialties to view a possibility of metrics being available for pre-prints as beneficial.



Legend
- Higher
- Lower

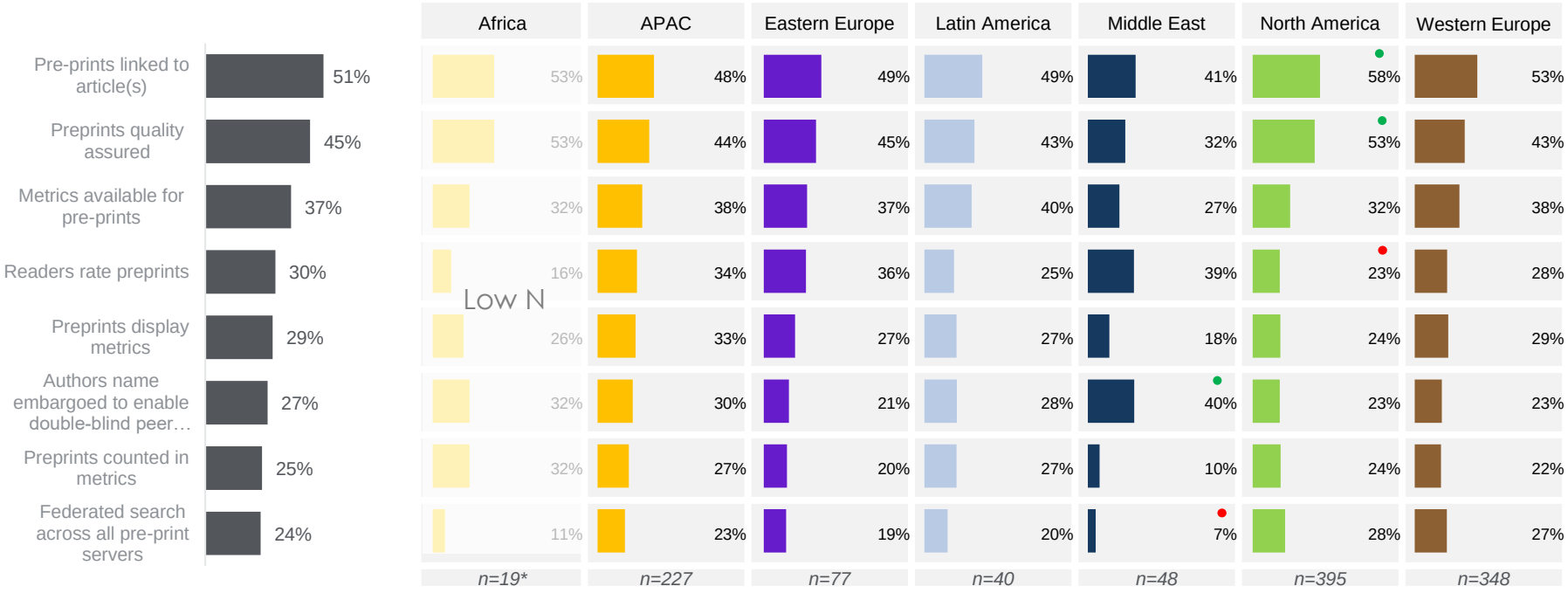
Significant difference between 2021 sub-group and overall

Q: Thinking about preprints and their role in research, do you believe any of the following would be beneficial?
Base: Researchers n=1,173

DEVELOPMENT OF PREPRINTS: North America more likely to believe pre-prints linked to the associated journal article(s) and preprints are quality assured would be beneficial.

Beneficial:

BY REGION



Q: Thinking about preprints and their role in research, do you believe any of the following would be beneficial?
Base: Researchers n=1,173

Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

DEVELOPMENT OF PREPRINTS: Older are more and younger are less likely to view authors names embargoed on preprints to enable double-blind peer review as beneficial.

Q: Thinking about preprints and their role in research, do you believe any of the following would be beneficial?
Base: Researchers n=1,173

Legend
- Higher
- Lower

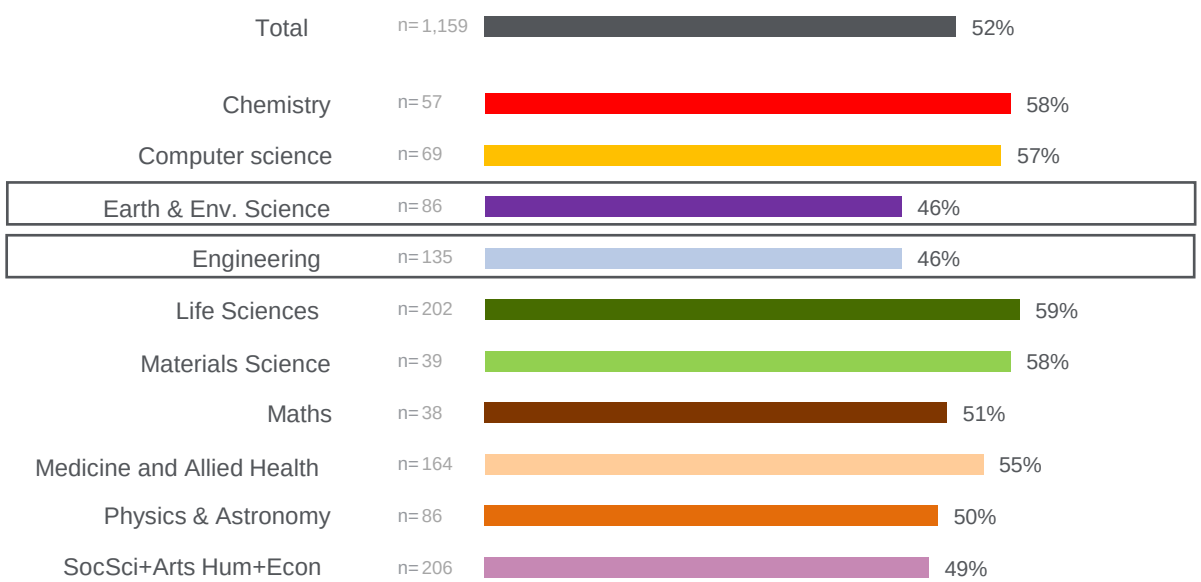
Significant difference between 2021 sub-group and overall

RESEARCH DATA

Results by subject, region, age group, gender, position and country

RESEARCH DATA: Earth & Env. Science and Engineering are slightly less likely than other specialties to report they are sharing more research data now than 2-3 years ago.

I am sharing more research data now than 2-3 years ago - (% agree)



Legend

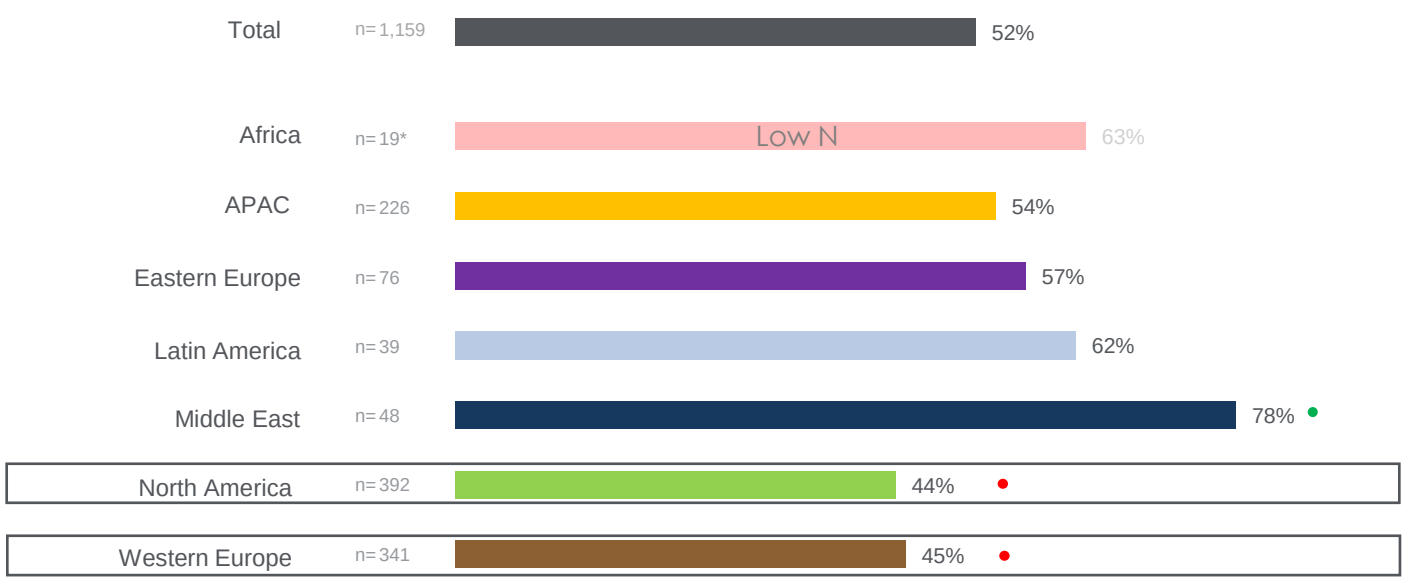
2021 Solid colour
2020 Light Grey

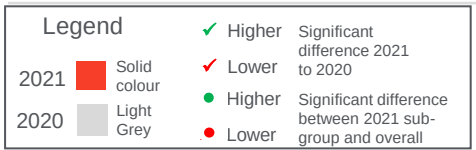
✓ Higher ✓ Lower — Significant difference 2021 to 2020

● Higher ● Lower — Significant difference between 2021 sub-group and overall

RESEARCH DATA: North America and Western Europe are slightly less likely than other regions to report they are sharing more research data now than 2-3 years ago.

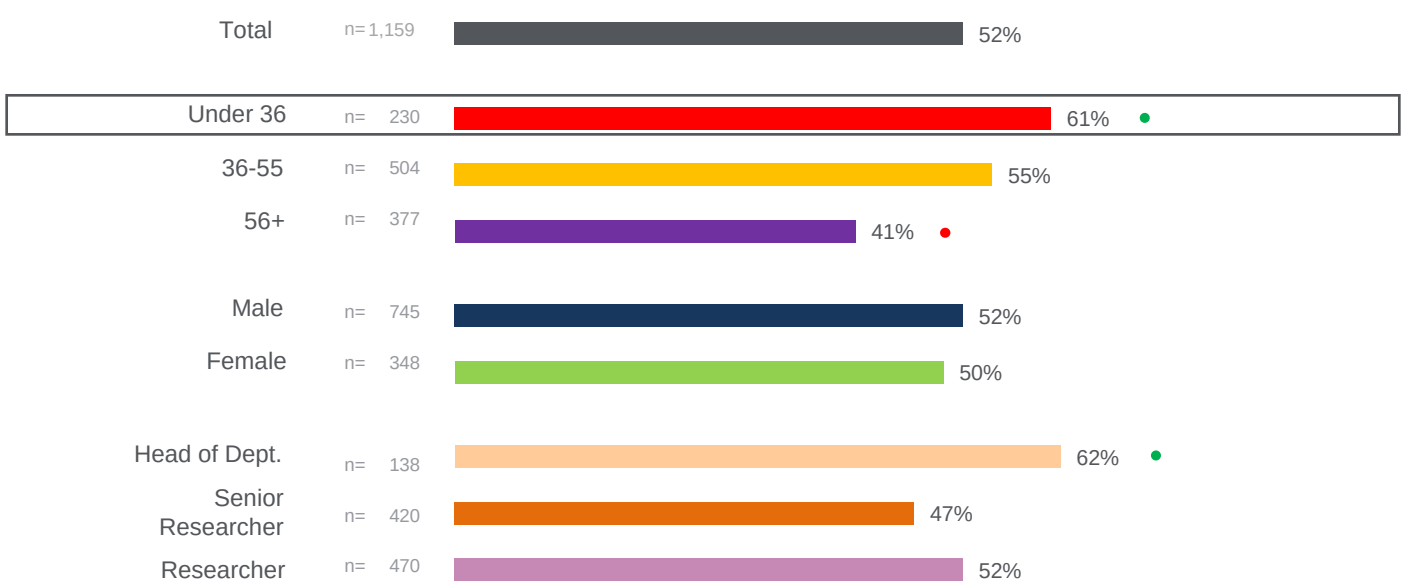
I am sharing more research data now than 2-3 years ago - (% agree)

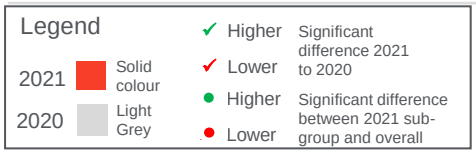




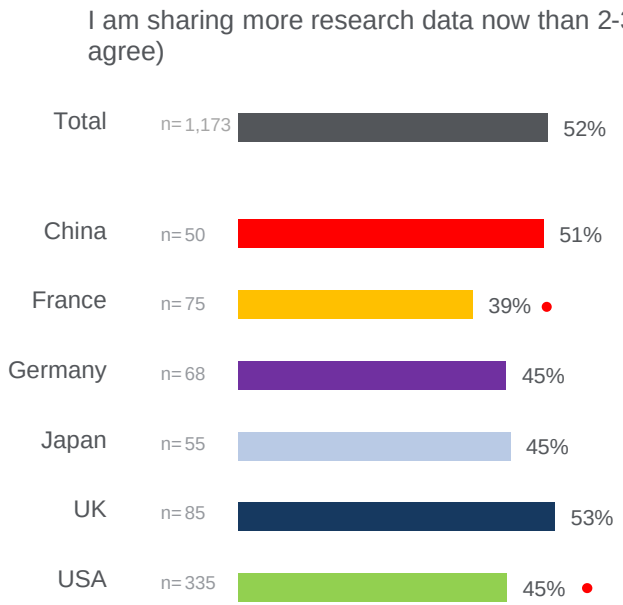
RESEARCH DATA: Younger researchers (under 36) are slightly more likely than other age cohorts to report they are sharing more research data now than 2-3 years ago.

I am sharing more research data now than 2-3 years ago - (% agree)





RESEARCH DATA: US researchers are less likely to say they are sharing more research data now than a few years ago (45%) than researchers worldwide, where this is over half (52%).



(Don't know answers are included in base size)

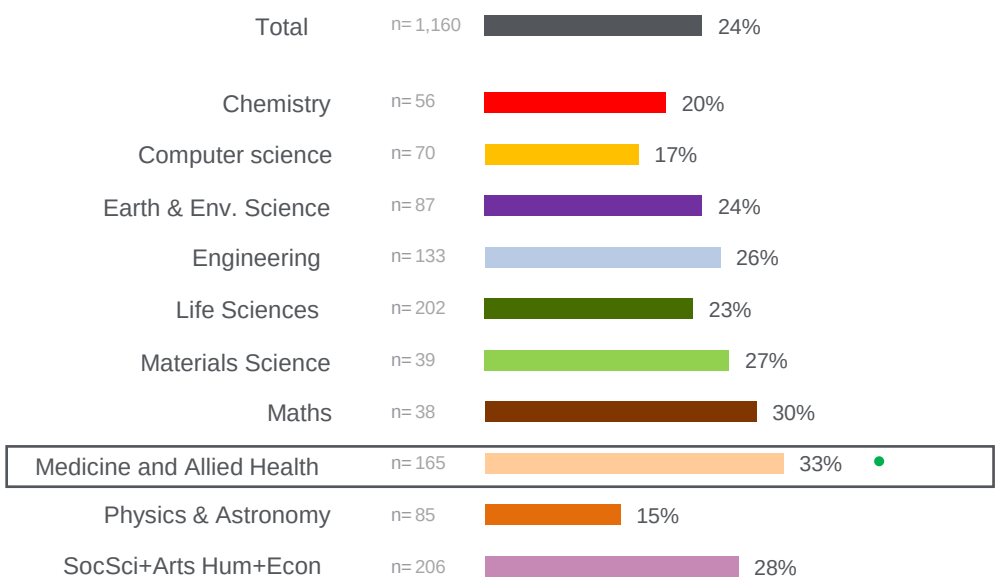
Higher
Lower
Significant difference between 2021 sub-group and overall

RESEARCH PAPERS: SUBMITTED

Results by subject, region, age group, gender, position and country

SUBMITTED MORE PAPERS: Medicine are more likely than other specialties to state that during the period of the pandemic they have submitted more research papers than they would have done otherwise.

During the period of the pandemic I have submitted more research papers than I would have done otherwise - (% agree)



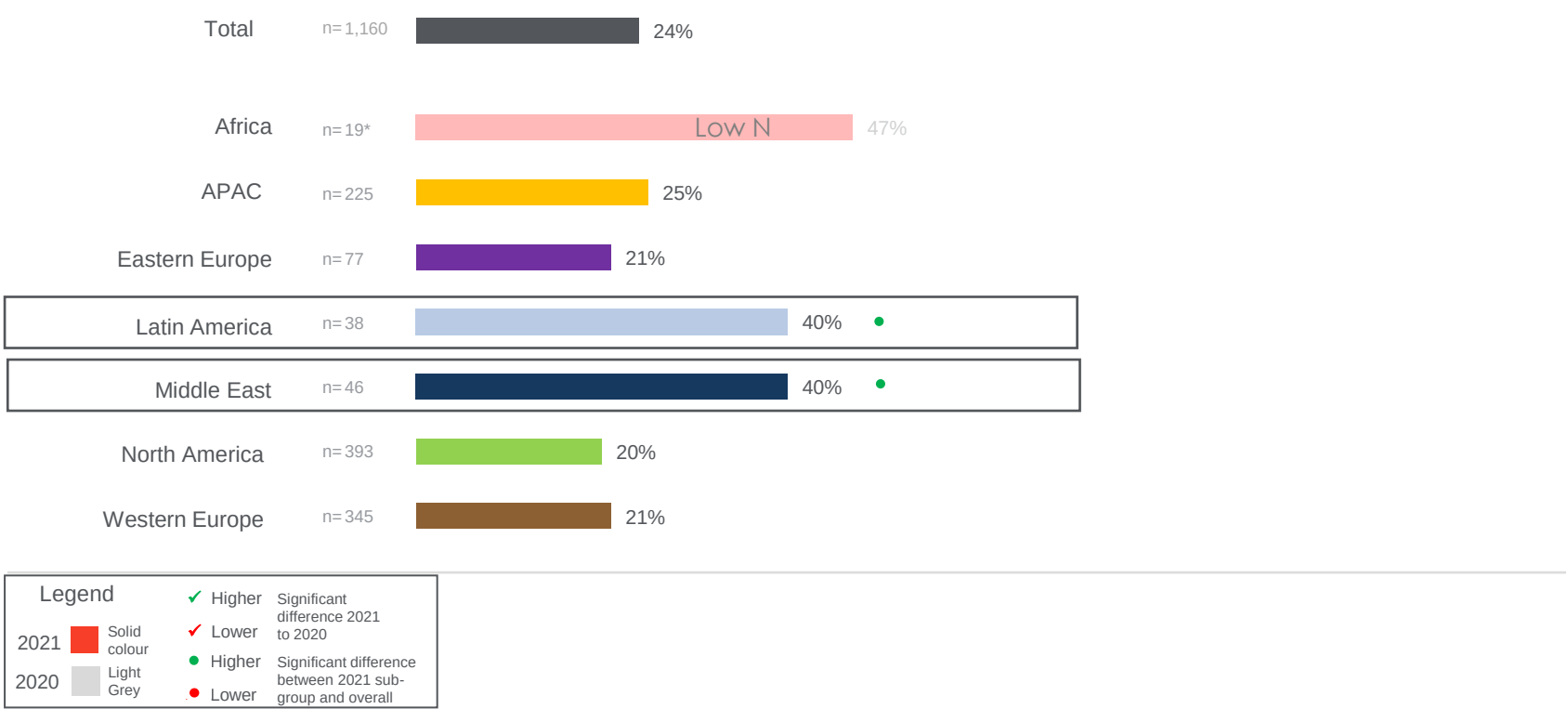
Legend

2021 Solid colour
2020 Light Grey

✓ Higher — Significant difference 2021 to 2020
✓ Lower
● Higher — Significant difference between 2021 sub-group and overall
● Lower

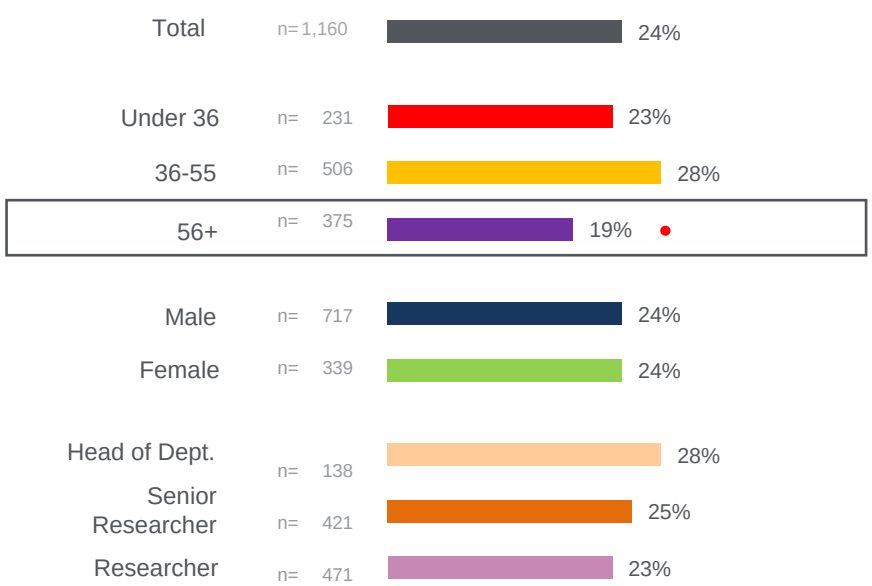
SUBMITTED MORE PAPERS: Latin America and Middle East are more likely than other regions to state that they have submitted more research papers during the period of the pandemic than they would have done otherwise.

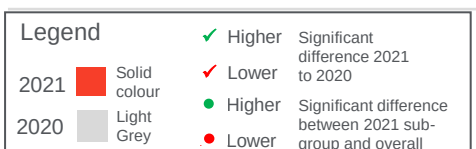
During the period of the pandemic I have submitted more research papers than I would have done otherwise - (% agree)



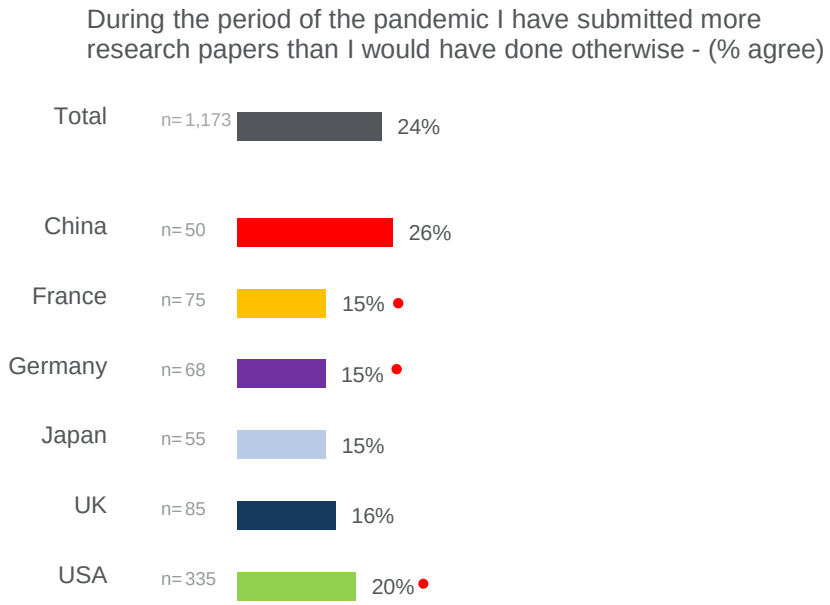
SUBMITTED MORE PAPERS: Older researchers (aged 56+) are less likely to have submitted more research papers during the period of the pandemic than they would have done otherwise.

During the period of the pandemic I have submitted more research papers than I would have done otherwise - (% agree)





SUBMITTED MORE PAPERS: During the pandemic, a quarter (24%) of researchers worldwide felt they submitted more research papers than they would have done otherwise, while this was only claimed to be the case for 15% of researchers in each of France and Germany.

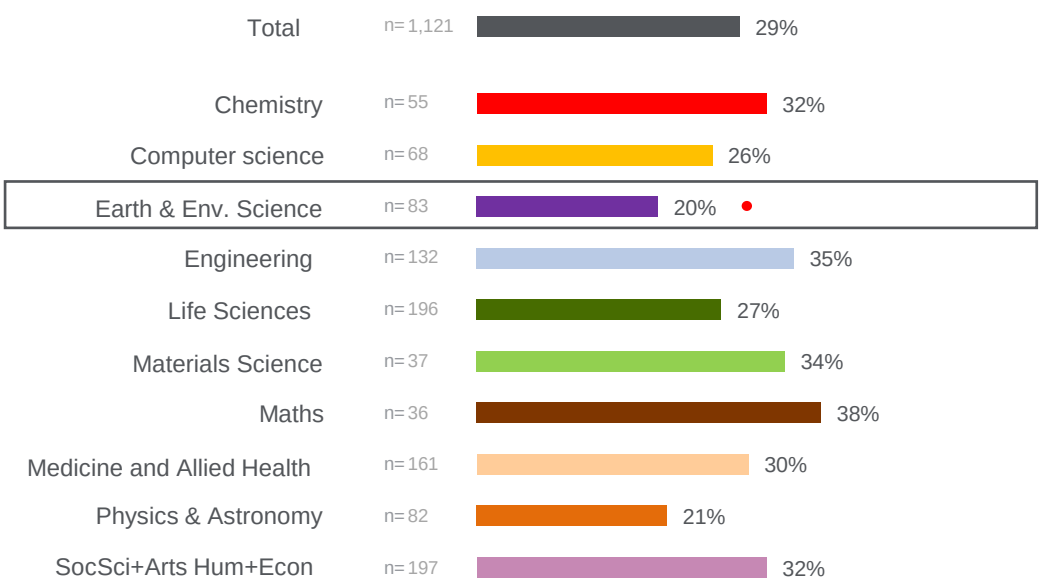


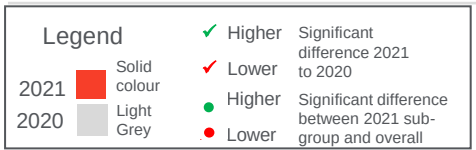
(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

VOLUME OF PAPERS: Earth & Environmental Science are less likely than other specialties to expect the amount of research papers they write to be less than prior to the pandemic.

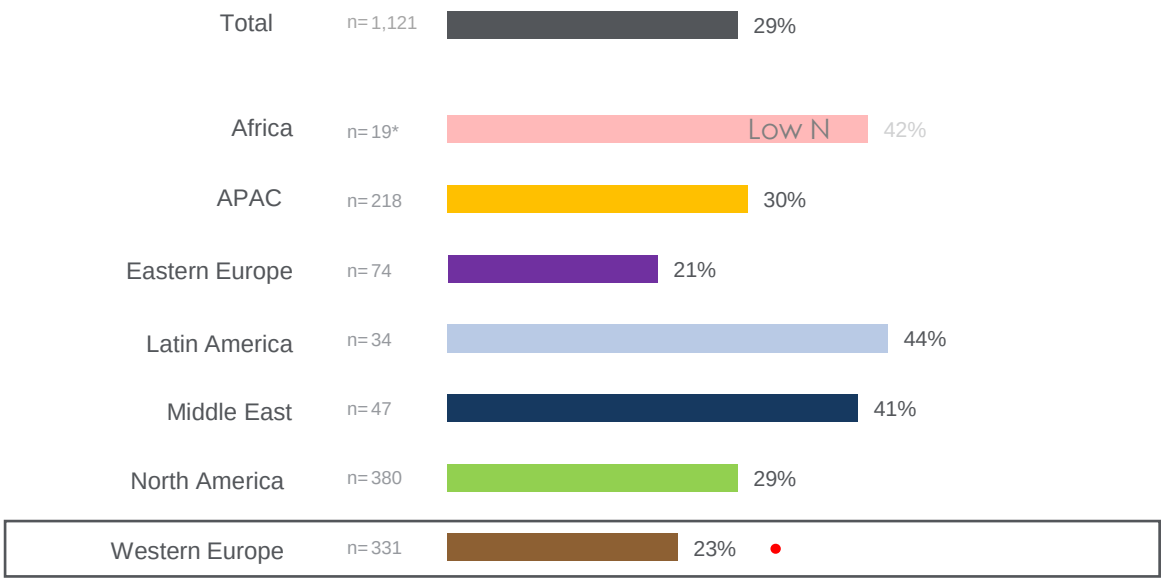
Over the next 12 months I expect the amount of research papers I write to be less than prior to the pandemic - (% agree)





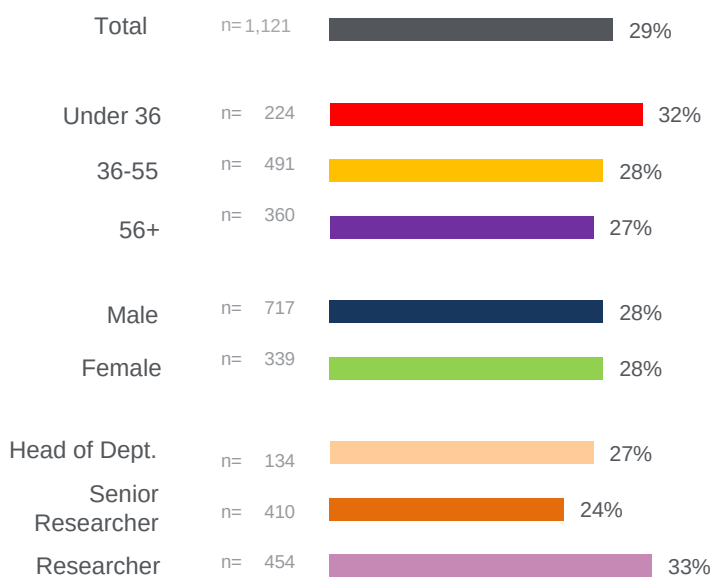
VOLUME OF PAPERS: Western Europe are less likely than other regions to expect the amount of research papers they write to be less than prior to the pandemic.

Over the next 12 months I expect the amount of research papers I write to be less than prior to the pandemic - (% agree)



VOLUME OF PAPERS: Limited variation by age, gender and seniority.

Over the next 12 months I expect the amount of research papers I write to be less than prior to the pandemic - (% agree)



Legend

2021 Solid colour

2020 Light Grey

✓ Higher — Significant difference 2021 to 2020

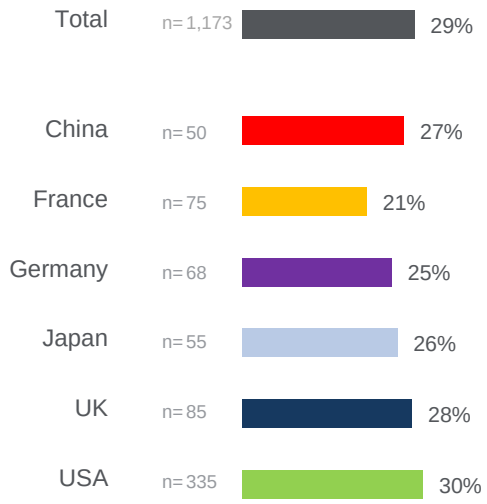
✓ Lower

● Higher — Significant difference between 2021 sub-group and overall

● Lower

VOLUME OF PAPERS: Limited variation by country.

Over the next 12 months I expect the amount of research papers I write to be less than prior to the pandemic - (% agree)



(Don't know answers are included in base size)

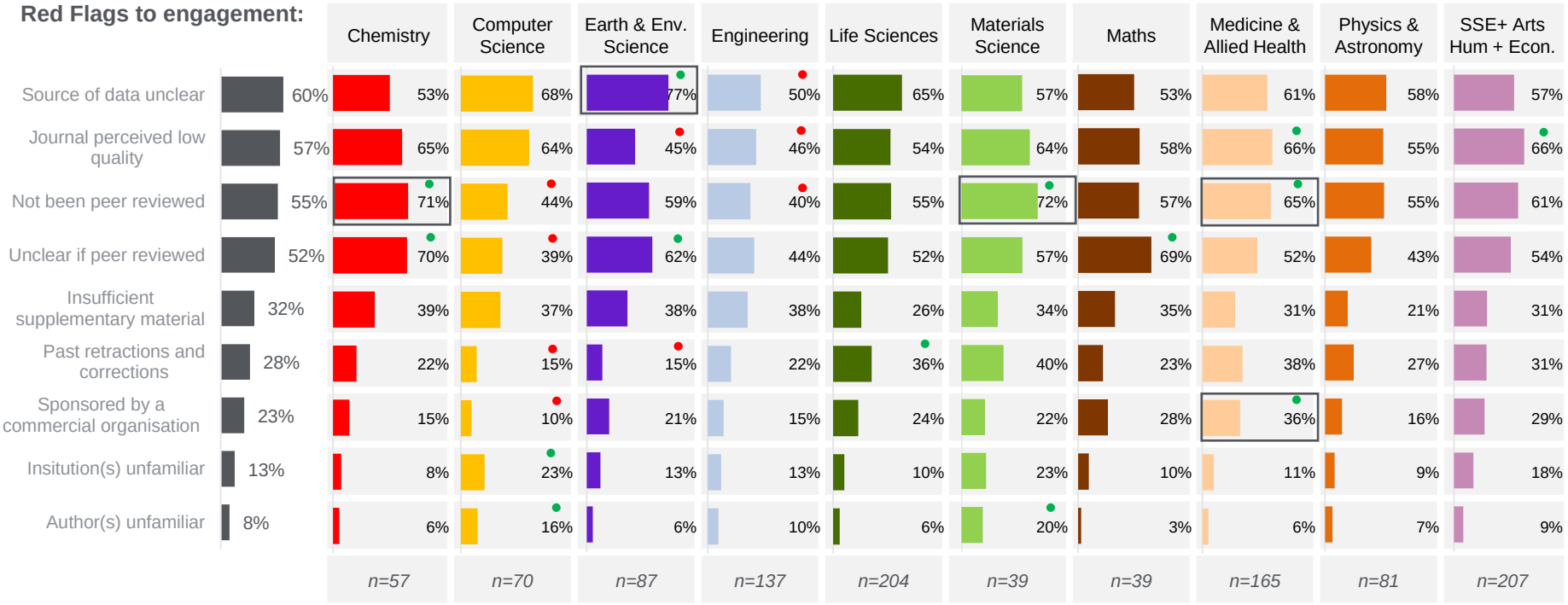
Higher
Lower
Significant difference between 2021 sub-group and overall

RED FLAGS AND CHALLENGES TO USE OF RESEARCH

Results by subject, region, age group, gender, and position

RED FLAGS TO ENGAGEMENT: Source unclear is a particular ‘red flag’ to Earth & Env. Not peer reviewed is more a barrier to engagement in Chemistry, Materials Science, and Medicine. Commercially sponsored more likely a concern in Medicine in comparison to other specialties.

BY SPECIALTY

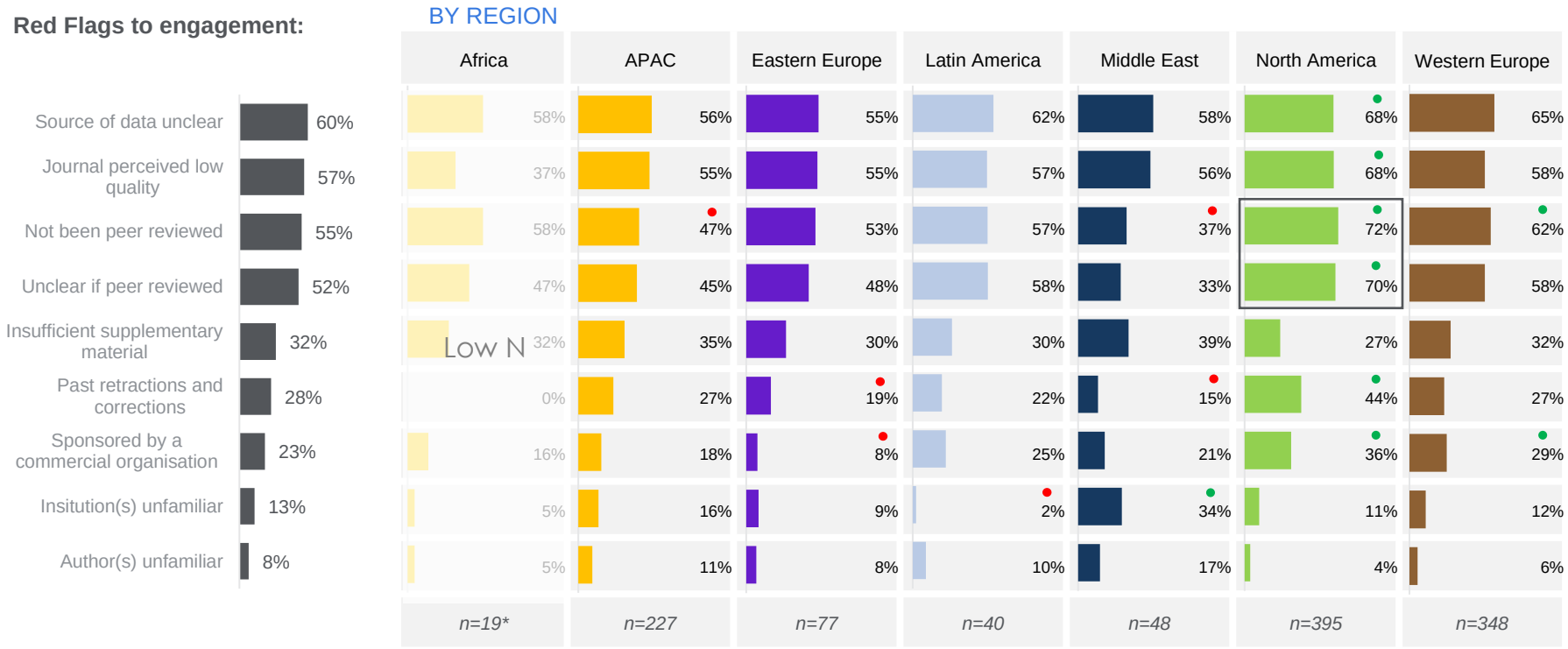


Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

*Q:*When you encounter research findings, which of the following if any, are ‘red flags’ that make it unlikely you will engage with the research?
Base: All researchers n=1,173

RED FLAGS TO ENGAGEMENT: Not or unclear if peer reviewed more likely a concern in North America.

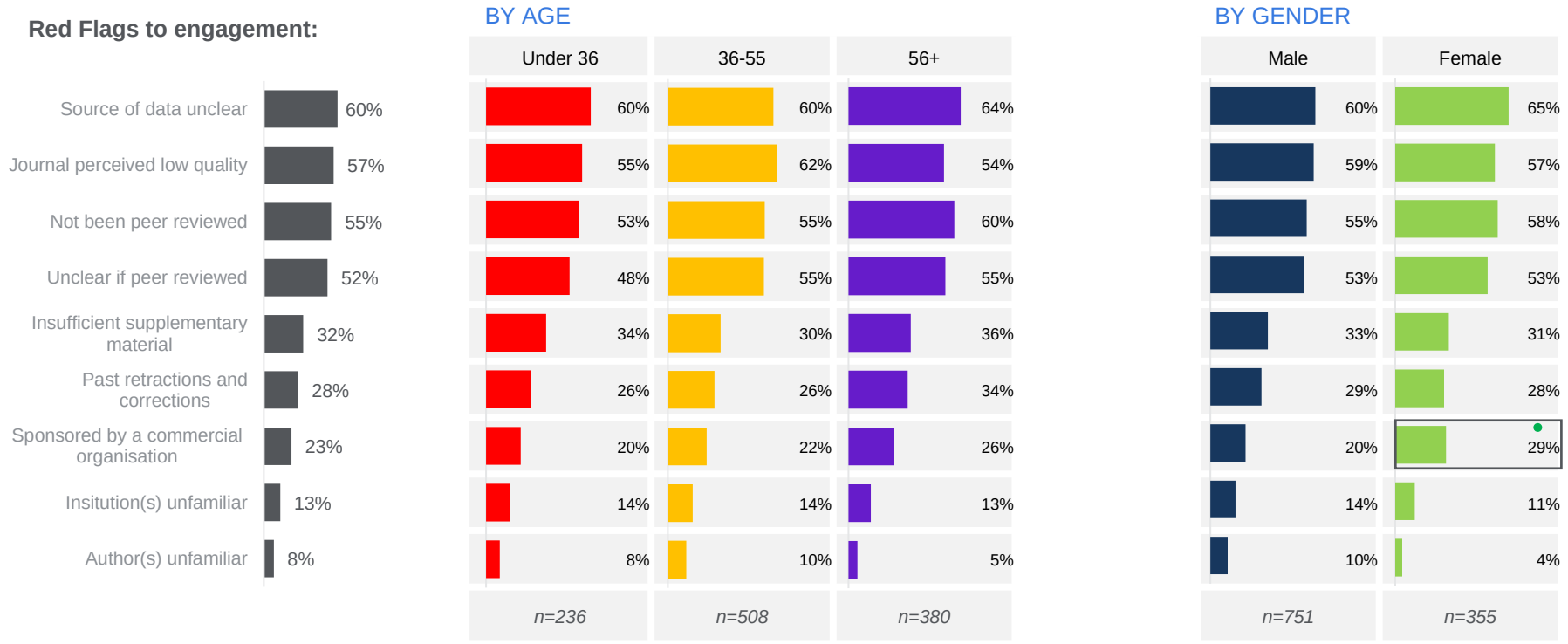


*Q:*When you encounter research findings, which of the following if any, are 'red flags' that make it unlikely you will engage with the research?
Base: All researchers n=1,173

Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

RED FLAGS TO ENGAGEMENT: Limited differences by age and gender. Females more likely to view commercially sponsored a red flag.



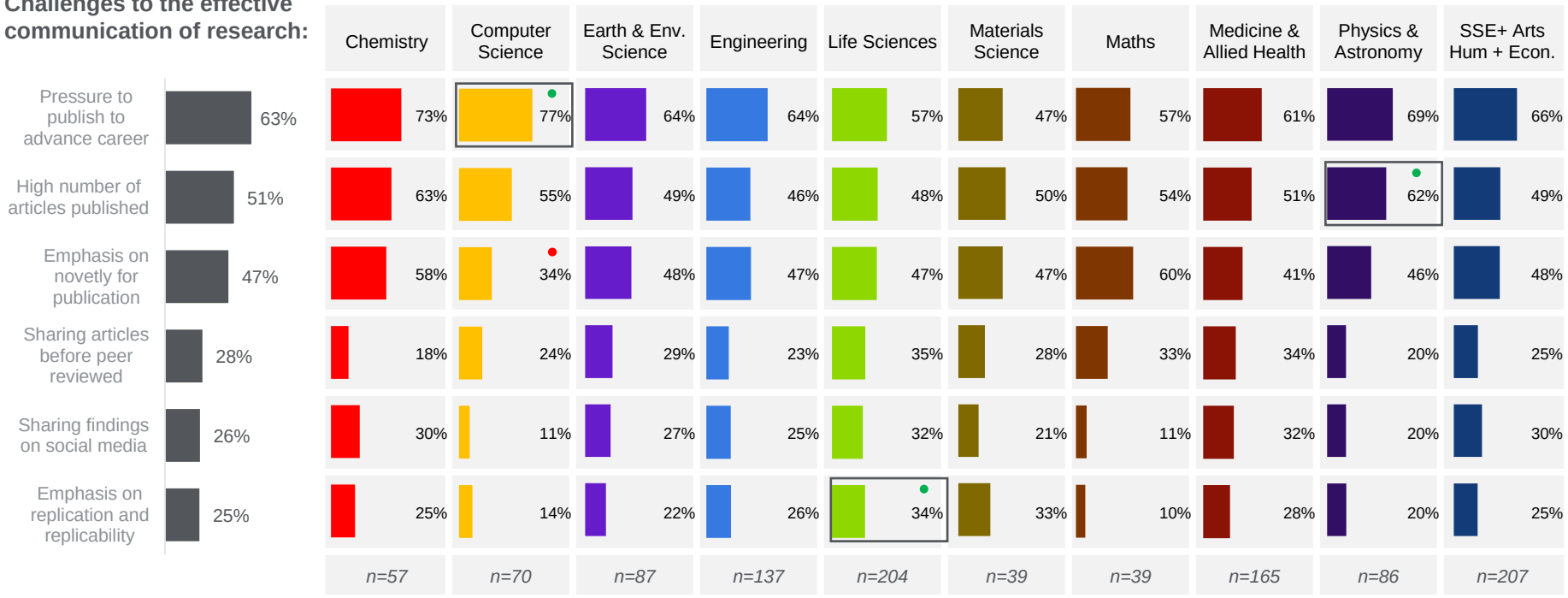
*Q:*When you encounter research findings, which of the following if any, are 'red flags' that make it unlikely you will engage with the research?
Base: All researchers n=1,173

Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

CHALLENGES TO COMMUNICATION: Pressure to publish particularly challenging in Computer Science. High volume of publishing more a challenge in Physics. Replication more likely an issue in Life Science compared to other specialities.

BY SPECIALTY



*Q:*When you encounter research findings, which of the following if any, are 'red flags' that make it unlikely you will engage with the research?
Base: All researchers n=1,173

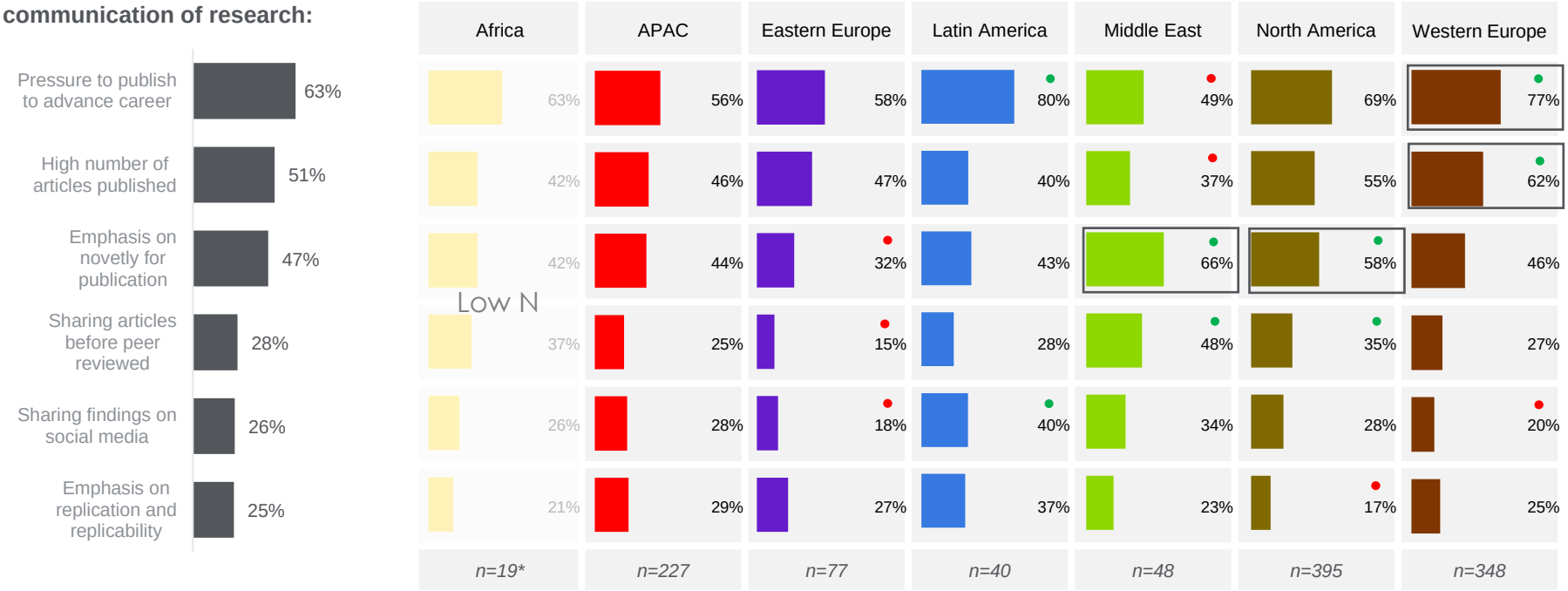
Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

CHALLENGES TO COMMUNICATION: Western Europe more likely to view pressure to publish and high volumes of publishing challenges to effective communication. Novelty more likely a challenge in North America and Middle East.

Challenges to the effective communication of research:

BY REGION



Legend

- Higher
- Lower

Significant difference between 2021 sub-group and overall

*Q:*When you encounter research findings, which of the following if any, are 'red flags' that make it unlikely you will engage with the research?
Base: All researchers n=1,173

CHALLENGES TO COMMUNICATION: Females more likely to state pressure to publish is a challenge to effective communication of research.

*Q:*When you encounter research findings, which of the following if any, are 'red flags' that make it unlikely you will engage with the research?
Base: All researchers n=1,173

Legend
- Higher
- Lower

Significant difference between 2021 sub-group and overall

Back to contents

PUBLIC ENGAGEMENT AND IMPACT OF RESEARCH

Public Engagement Contents

PUBLIC ENGAGEMENT EXECUTIVE SUMMARY

Almost two thirds (64%) of researchers believe the public understands the purpose and outcomes of their research, whilst around one in eight (13%) think public understanding of their research aims and consequences is lacking.

Earth & Env. Science are more likely than other specialties to agree that public understanding of their research is good, whereas Maths are less likely to say this understanding is good. North America are more likely than other regions to state that public understanding of their research purpose and outcomes is good. This public understanding has increased since 2020 in both North America and Western Europe. Heads of Department, females and those who are older are more likely in 2021 than in 2020 to believe public understanding of their research is good. Younger are less likely in 2021 to think this public understanding is good.

Over half of researchers (57%) have undertaken public outreach activities to share their research findings, against just under a quarter (24%) who have not.

Public outreach activity is less prevalent in Chemistry. Earth & Env. Science and Social Sciences/ Arts/ Humanities do the most public outreach activity. Public outreach activity is less in 2021 than 2020 in both Physics and Social Sciences/ Arts/ Humanities.

North America and Western Europe are most likely to have carried out public outreach activities, whilst Eastern Europe and Middle East are less likely to have done so.

Non-senior researcher positions are less likely than senior positions to perform public outreach activities. Older researchers (aged 56+) are less likely in 2021 than 2020 to do outreach activities.

Researchers are polarised on whether research must always have a real world benefit – 43% believe it should and 39% believe not necessarily.

Medicine and Engineering agree more, and Physics less, than the other specialties, that research must always have a real world benefit. Computer Science are less likely, and Medicine more likely, in 2021 than 2020, to believe research must always have a real world benefit.

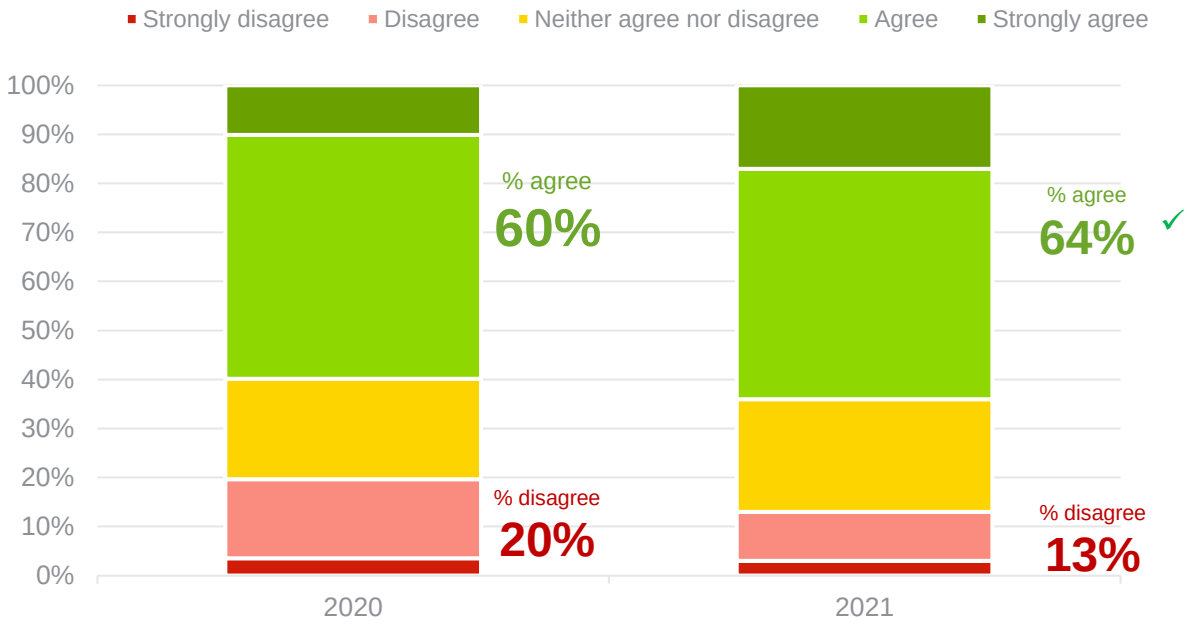
North America and Western Europe are less likely than other regions to hold the view that research must have real world benefits. Middle East are most likely to believe research must have real world benefits.

Heads of Department agree more than other positions, and increasingly so since 2020, that research must have a real world benefit.

SUMMARY OF PUBLIC ENGAGEMENT RESULTS

PUBLIC UNDERSTANDING: Almost two thirds (64%) of researchers believe the public understands the purpose and outcomes of their research, whilst around one in eight (13%) think public understanding of their research aims and consequences is lacking.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: Public understanding of the purpose and outcomes of my research is good



Reasons for AGREEING:

- Research funded by the public, as such, it is important understand their work and its benefits
- Knowledge/ information should be widely available/ in public domain
- Area of science is of interest to/ supported by/ benefit to the public

"The more the general public understands, the more they are willing to fund research through their taxes and donations." (Biochemistry, Genetics, and Molecular Biology, USA, aged 46-55)

Reasons for DISAGREEING:

- Difficult given complexity, public not scientists/ experienced in evaluation
- More effort required to counter disinformation, false/ misleading information
- More effort required to communicate research in lay level of understanding

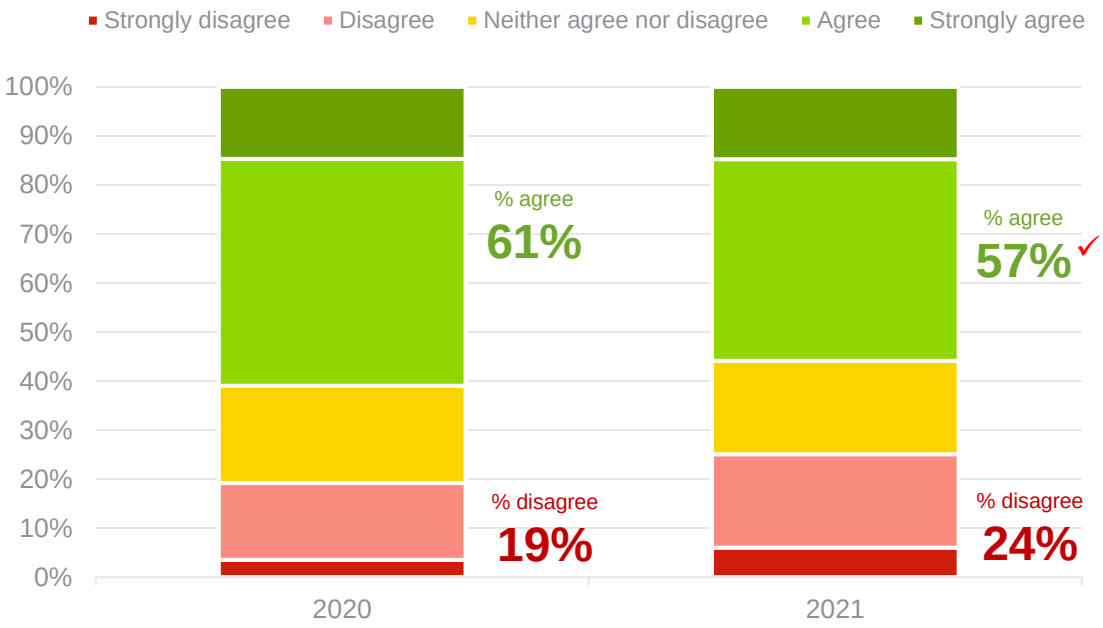
"Science literacy is poor in general, and my area is no exception" (Medicine and Allied Health, Canada, aged 36-45)

Base: All researchers 2020 (n=1,066); 2021 (n=1,173).
Chart excludes don't know answers 2020 (n=1,046); 2021 (n=1,128).

✓ Higher
✓ Lower
Significant difference 2021 to 2020

PUBLIC OUTREACH: Over half of researchers (57%) have undertaken public outreach activities to share their research findings, against just under a quarter (24%) who have not.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: I have done outreach activities to share my research findings with the wider public (e.g. non-expert summaries, speaking at schools, media appearance)



Reasons for AGREEING:

- Do outreach activities/ public speaking/ communication/ talks/ written pieces/ media interviews/ appearances/ radio/ newspaper/ government/ schools/ social media/ trade shows/ seminars
- Important to disseminate/ engage widely

"My job always obliged me to spend at least 20% of my time extending my results to farmers, students, administrators and the general public- i.e. communication." (Agriculture, Australia, aged over 65)

Reasons for DISAGREEING:

- Never undertaken/ participated in such activities
- Little need/ incentive/ inclination
- Little time available

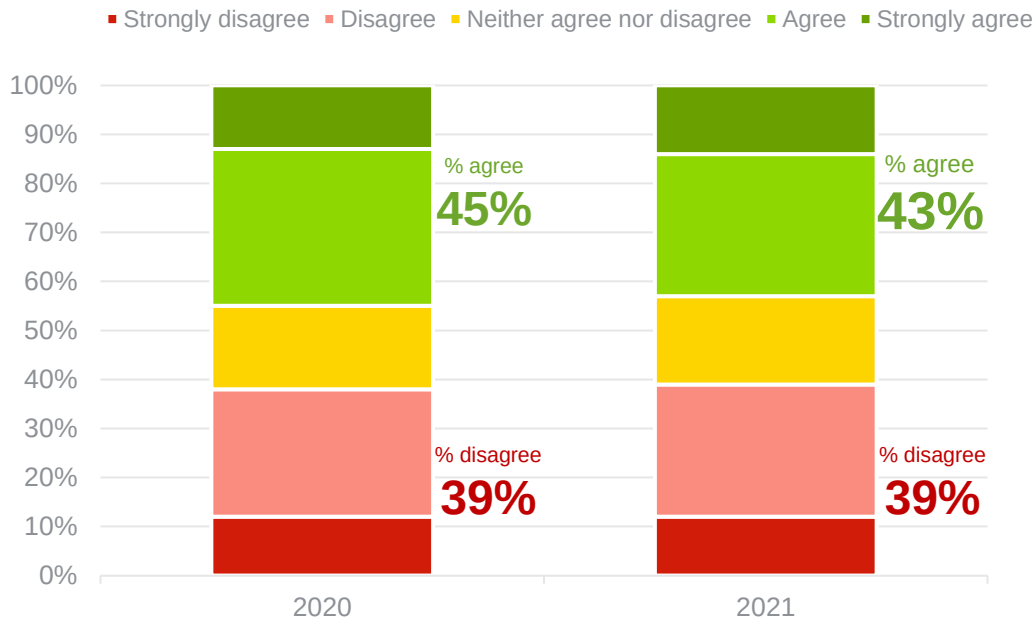
"Most of my public speaking is in congresses or workshops for researchers or professionals with a reasonable knowledge of the field. I don't really have a media or wider public communication strategy (and am not sure that would be entirely important)." (Medicine/ Allied Health, France, aged 36-45)

Base: All 2020 (n=1,066); 2021 (n=1,173).
Chart excludes don't know answers 2020 (n=1,061); 2021 (n=1,157).

✓ Higher ✓ Lower Significant difference 2021 to 2020

IMPACT OF RESEARCH: Researchers are polarised on whether research must always have a real world benefit – 43% believe it should and 39% believe not necessarily.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: Research must always have a "real world" benefit



Reasons for AGREEING:

- Research should benefit society/ be of relevance/ applicable to society
- Basic not just applied research important, should be transferable/ of practical value to real world/ society but this may be longer term/ over time

"Researchers should have social responsibility. Society supports research, both basic and applied, thus when ever possible research should benefit society." (Psychology, Israel, aged over 65)

Reasons for DISAGREEING:

- Knowledge is beneficial, even if not a "real world"/ immediately recognisable/ obvious benefit
- "Real world" benefit difficult to measure/ different to different people/ hard to define/ assess/ can be unknown at least initially
- Research is fundamentally about advancing knowledge/ concepts/ theories

"Fundamental research does not always have immediate benefits, they may come later" (Astronomy, France, over aged 65)

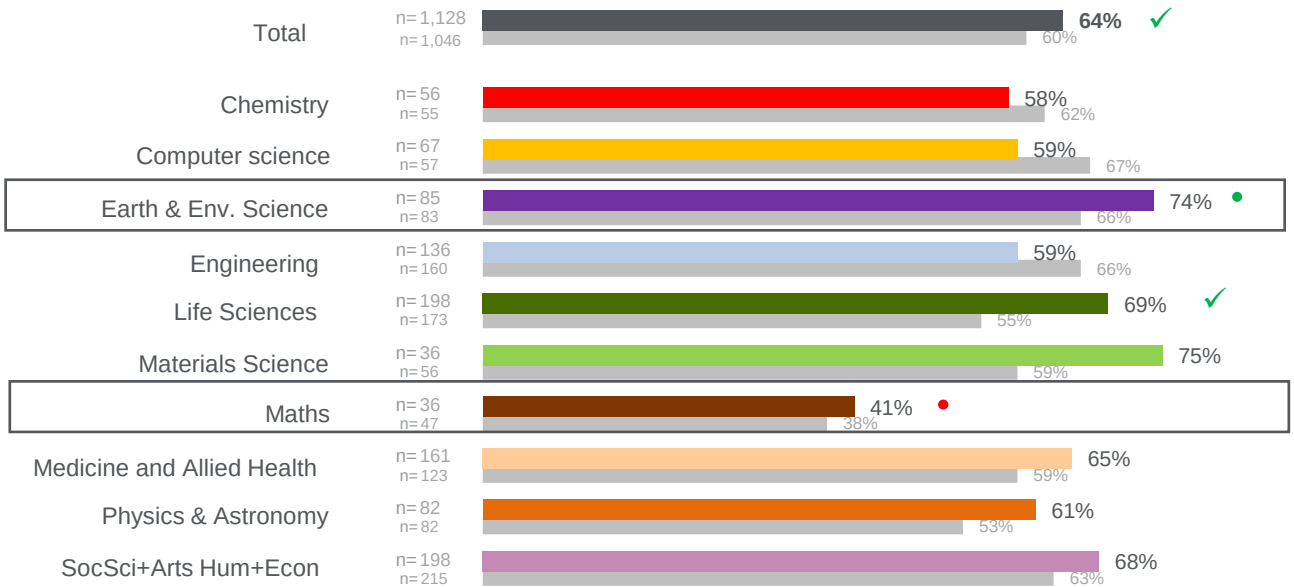
Base: All researchers 2020 (n=1,066); 2021 (n=1,173).
Chart excludes don't know answers 2020 (n=1,058); 2021 (n=1,156).

PUBLIC UNDERSTANDING

Results by subject, region, age group, gender, position and country

PUBLIC UNDERSTANDING: Earth & Env. Science more likely than other specialties to agree that public understanding of their research is good, whereas Maths are less likely to say this understanding is good.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): Public understanding of the purpose and outcomes of my research is good



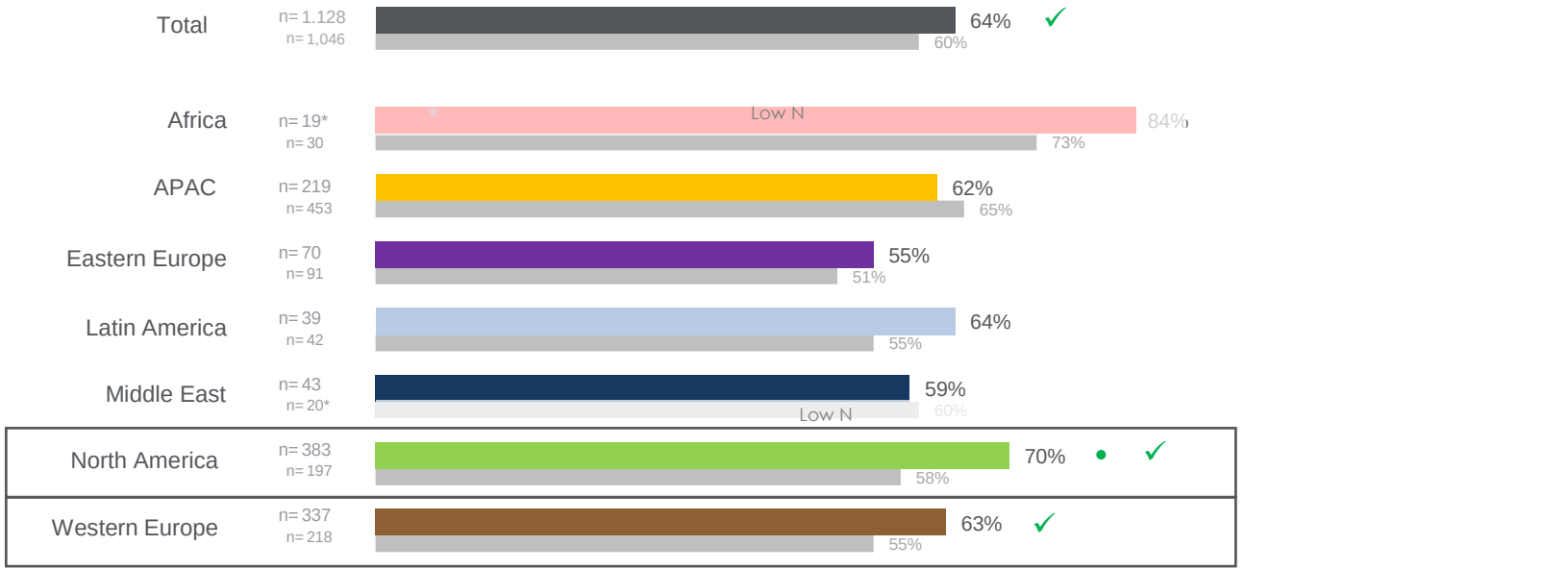
Legend

2021 Solid colour
2020 Light Grey

✓ Higher — Significant difference 2021 to 2020
✓ Lower
● Higher — Significant difference between 2021 sub-group and overall
● Lower

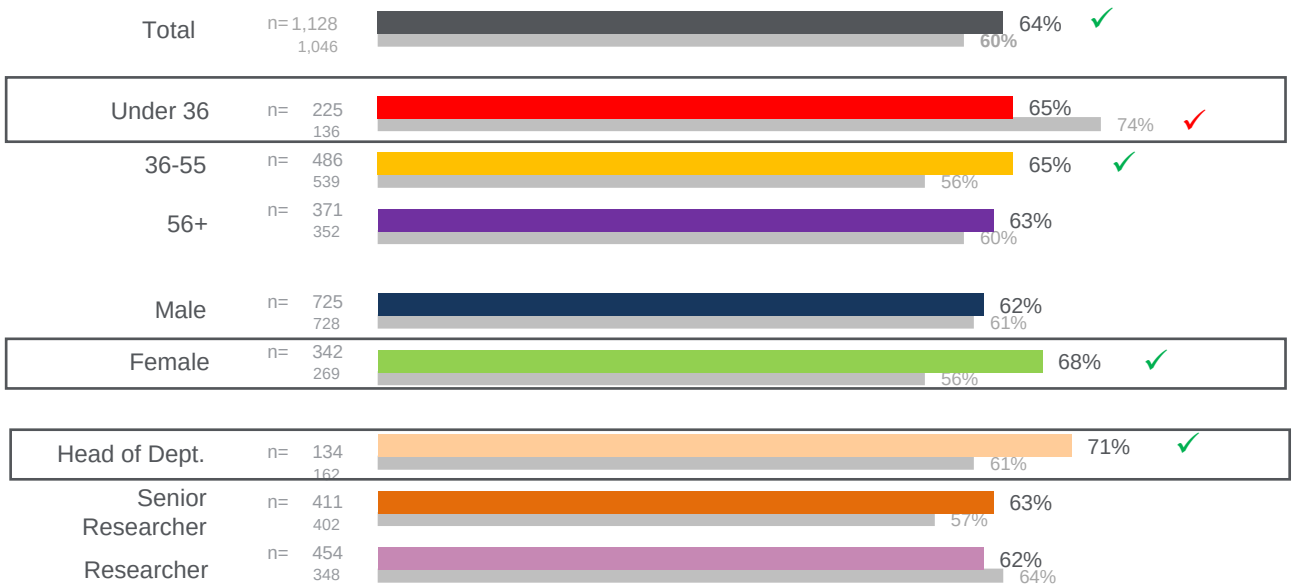
PUBLIC UNDERSTANDING: North America are more likely than other regions to state that public understanding of the purpose and outcomes of their research is good. Public understanding is good has increased in 2021 in both North America and Western Europe.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): Public understanding of the purpose and outcomes of my research is good



PUBLIC UNDERSTANDING: Heads of Department, females and those who are older are more likely in 2021 than in 2020 to believe public understanding of the purpose and outcomes of their research is good. Younger are less likely in 2021 to think this understanding is good.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): Public understanding of the purpose and outcomes of my research is good



Legend

2021 Solid colour

2020 Light Grey

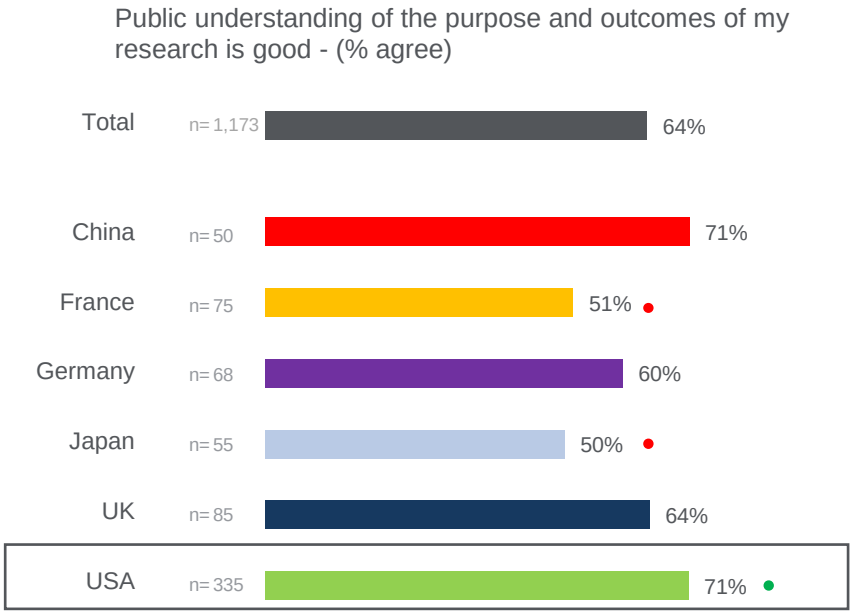
✓ Higher — Significant difference 2021 to 2020

✓ Lower

● Higher — Significant difference between 2021 sub-group and overall

● Lower

PUBLIC UNDERSTANDING: Researchers in the USA are more likely to say public understanding of the purpose and outcomes of their research is good (71%) than researchers globally (64%).



(Don't know answers are included in base size)

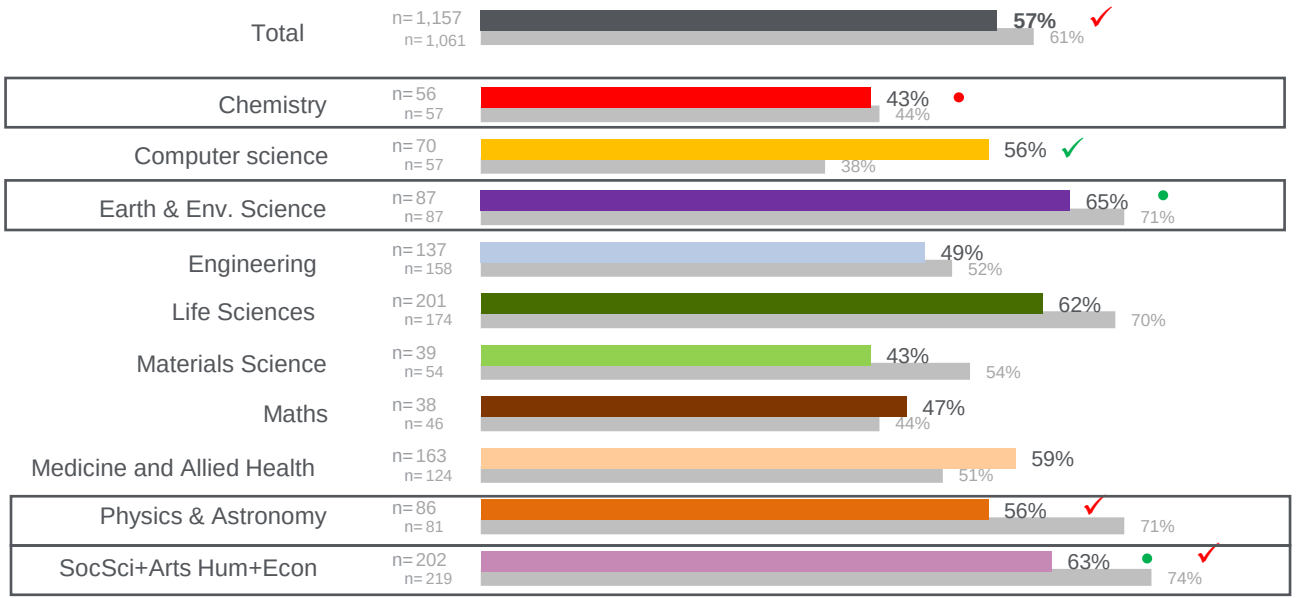
Higher
Lower
Significant difference between 2021 sub-group and overall

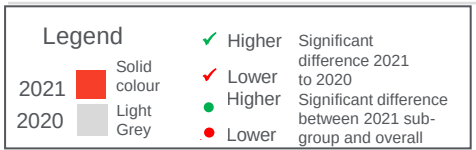
PUBLIC OUTREACH

Results by subject, region, age group, gender, position and country

PUBLIC OUTREACH: Public outreach activity is less prevalent in Chemistry. Earth & Env. Science and Social Sciences/ Arts/ Humanities do the most public outreach. Public outreach is less in 2021 than 2020 in Physics and Social Sciences/ Arts/ Humanities.

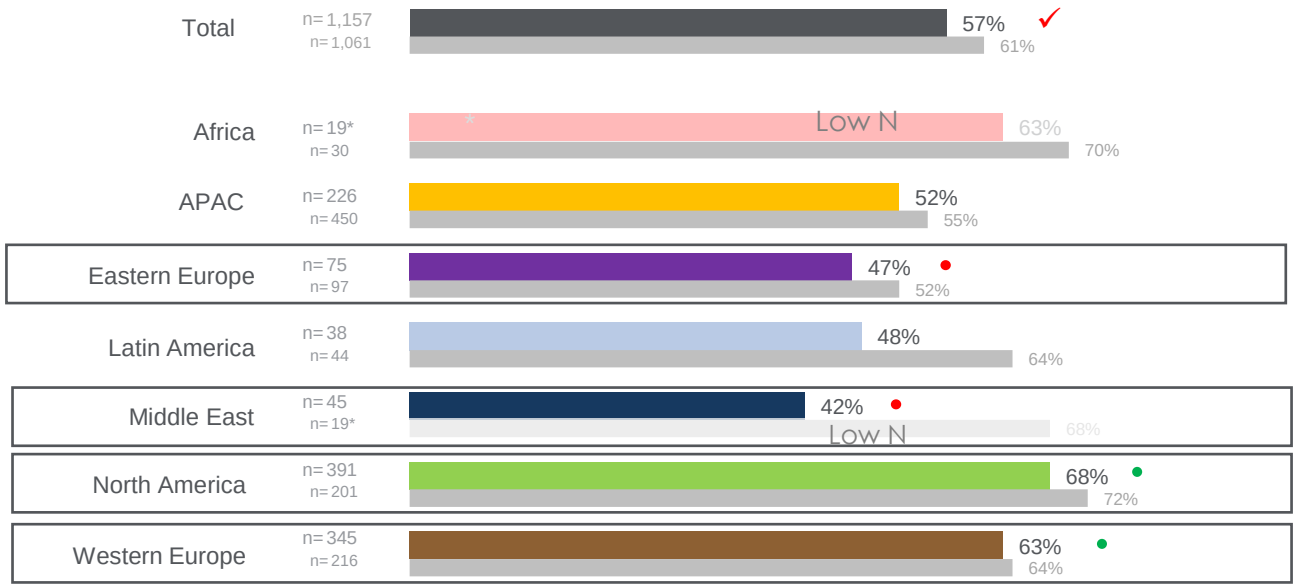
To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): I have done outreach activities to share my research findings with the wider public (e.g. non-expert summaries, speaking at schools, media appearance)





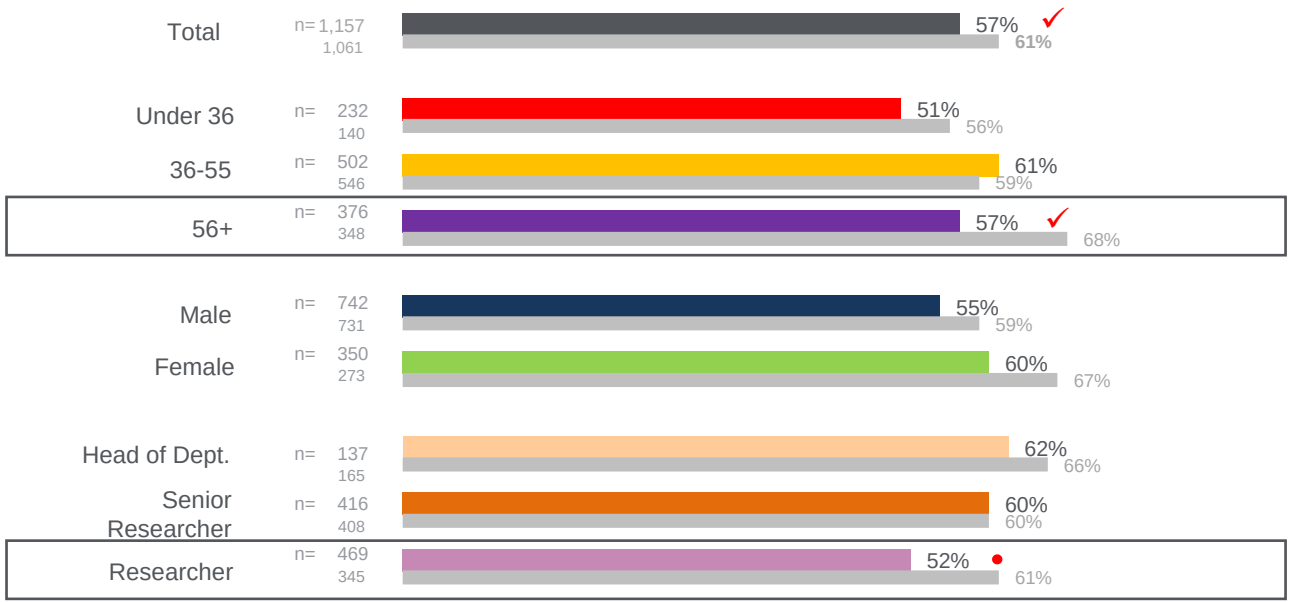
PUBLIC OUTREACH: North America and Western Europe are most likely to have carried out public outreach activities, Eastern Europe and Middle East are less likely to have done so.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): I have done outreach activities to share my research findings with the wider public (e.g. non-expert summaries, speaking at schools, media appearance)

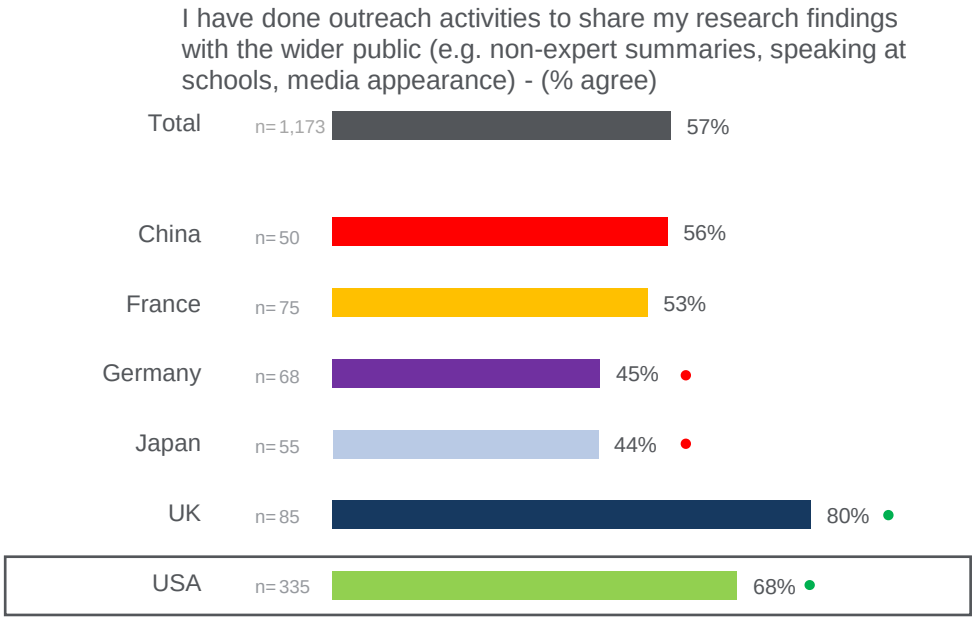


PUBLIC OUTREACH: Non-senior researcher positions are less likely than senior positions to perform public outreach activities. Older researchers (aged 56+) are less likely in 2021 than 2020 to do outreach activities.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): I have done outreach activities to share my research findings with the wider public (e.g. non-expert summaries, speaking at schools, media appearance)



PUBLIC OUTREACH: In the US, researchers are more likely to say they've done outreach activities (68%) to share their research findings with the wider public than researchers globally (57%).



(Don't know answers are included in base size)

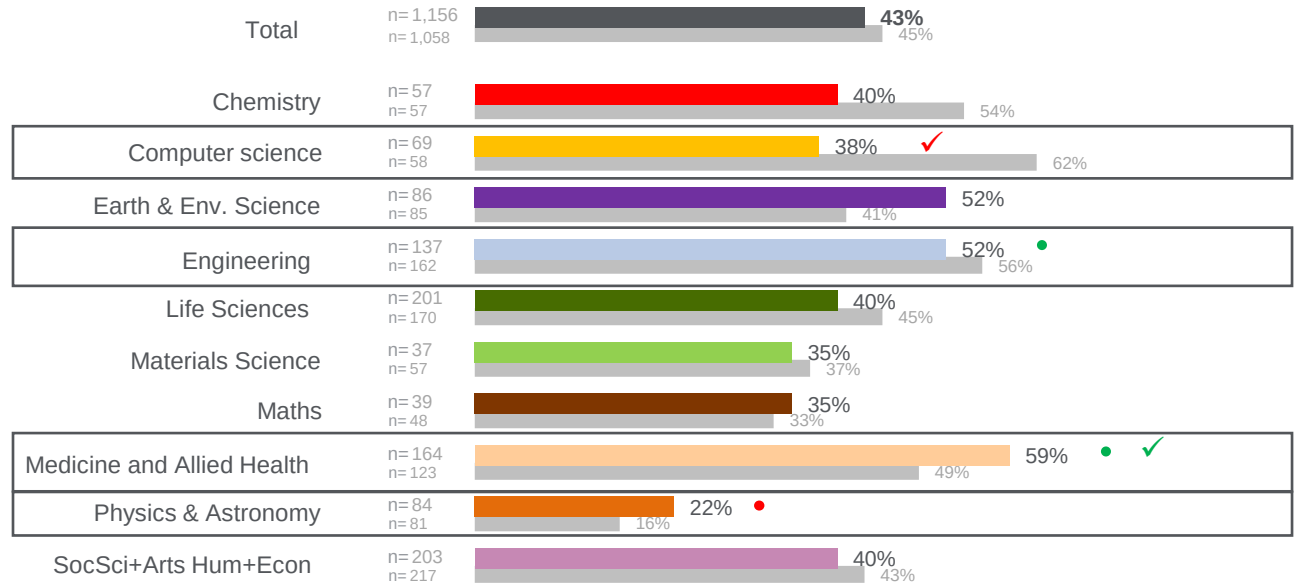
Higher
Lower
Significant difference between 2021 sub-group and overall

IMPACT OF RESEARCH

Results by subject, region, age group, gender, position and country

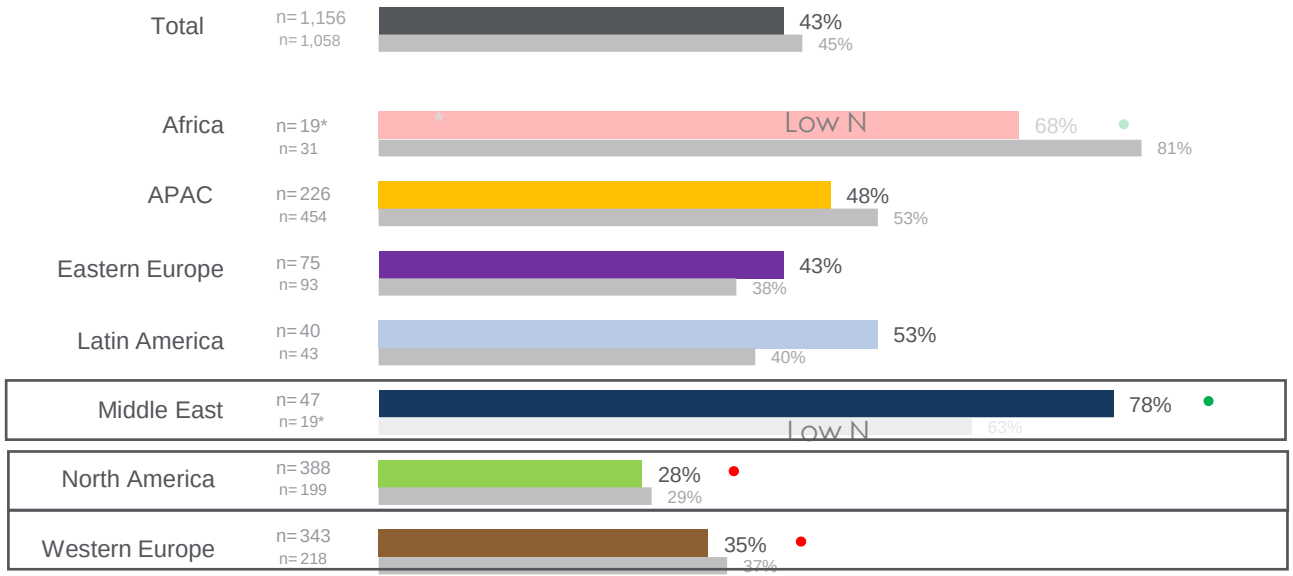
IMPACT OF RESEARCH: Medicine and Engineering agree more, and Physics less, than the other specialties, that research must always have a real world benefit. Computer Science are less likely, and Medicine more likely, in 2021 than 2020, to believe research must always have a real world benefit.

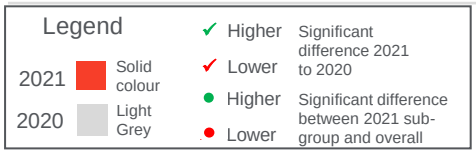
To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): Research must always have a "real world" benefit



IMPACT OF RESEARCH: North America and Western Europe are less likely to hold the view that research must have real world benefits. Middle East are most likely to believe research must have real world benefits.

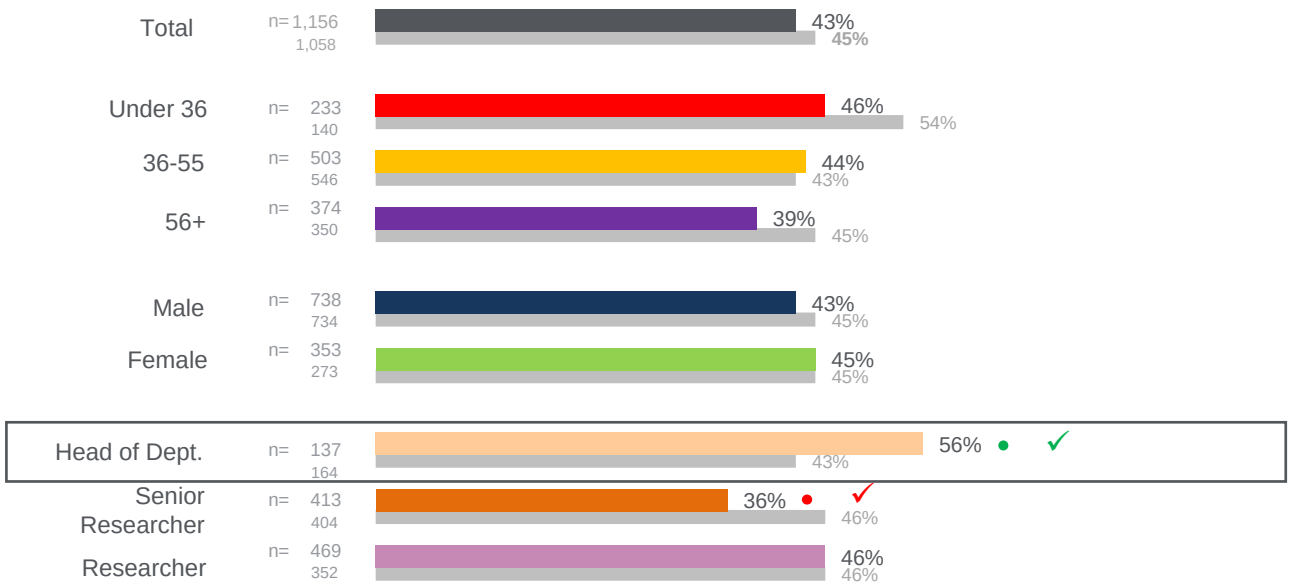
To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): Research must always have a "real world" benefit





IMPACT OF RESEARCH: Heads of Department agree more than other positions, and increasingly so since 2020, that research must have a real world benefit.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement (% agree): Research must always have a "real world" benefit



Legend

2021 Solid colour

2020 Light Grey

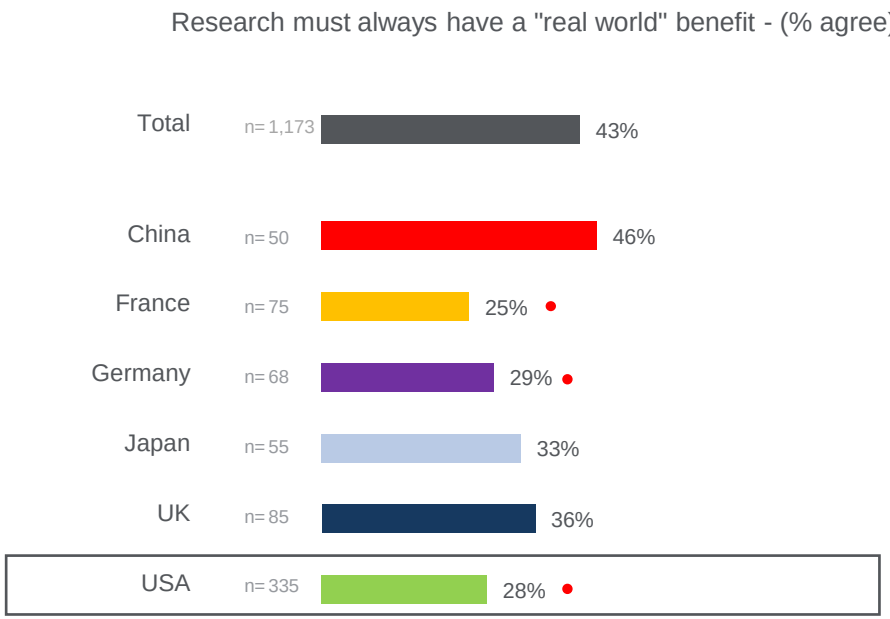
✓ Higher — Significant difference 2021 to 2020

✓ Lower

● Higher — Significant difference between 2021 sub-group and overall

● Lower

IMPACT OF RESEARCH: That research must always have a "real world" benefit, is a view held by only 28% of researchers in the US versus 43% of researchers globally.



(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

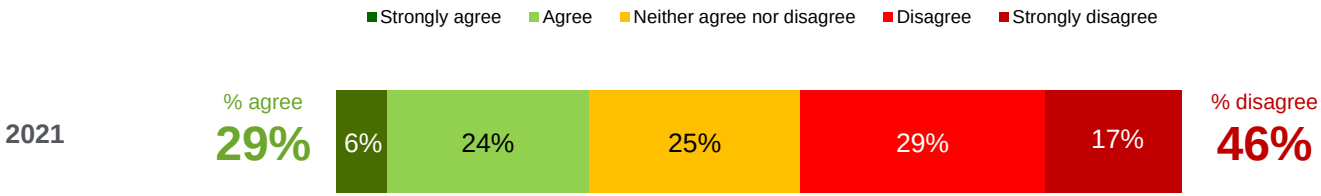
Back to contents

ELSEVIER

EDUCATION

EDUCATION: Nearly half (46%) are of the view that the shift of teaching to online negatively impacts teachers against under a third (29%) who see the shift to teaching online as a positive for teachers.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: The shift of teaching to online positively impacts teachers



Reasons for AGREEING:

- Reduces travel, convenience, saves time, improved personal life
- Facilitates flexibility/ ease of individual/ one-to-one contact
- Enables a wider reach/ teach independent of geography
- Improved/ new digital resources

"Online work is a great value to reconcile personal life, to optimize time." (Biochemistry, Spain, aged 46-55)

Reasons for DISAGREEING:

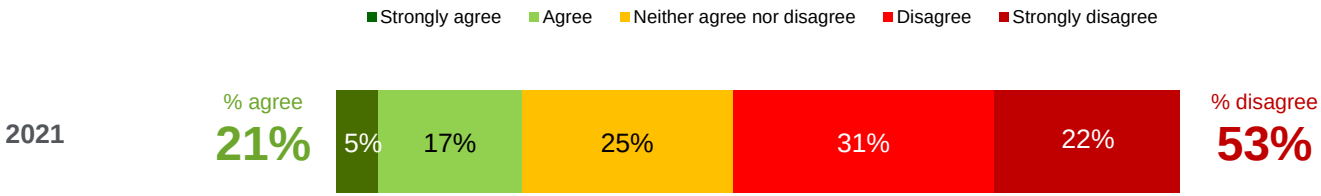
- Remote/ indirect interaction less valuable/ not as effective/ not as involving/ engaging/ not a substitute for direct contact
- Shift to online teaching/ courses involved substantial preparation/ workloads/ overheads for teachers
- Lab use/ field activities of paramount importance

"Students are disengaged online… teaching becomes less rewarding for both students and teachers" (Physics, Australia, aged 36-45)

Base: All researchers (n=1,173)
Chart excludes don't knows (n=1,097)

EDUCATION: Just over half (53%) are of the view that the shift of teaching to online negatively impacts students against just over a fifth (21%) who see the shift to teaching online as a positive for students.

To better understand your attitudes towards research and scholarly publishing, please indicate how much you agree or disagree with the following statement: The shift of teaching to online positively impacts students



Reasons for AGREEING:

- Convenience, flexibility, reduces travel time
- Improved work/life balance/ family life
- Access to greater/ better materials online
- More opportunity for individual consultation

"Online teaching gives students the flexibility of engagement hours and also put multiple sources of information at their disposal…. content delivery more engaging for the students." (Environmental, India, aged 36-45)

Reasons for DISAGREEING:

- Less effective, disengaged/ distraction (impersonal, disconnected)
- Less interaction, interpersonal communication, informal discussion
- Practical, hands-on, field, lab work not feasible

- **"Online-only education cannot provide a similar level of student engagement, community building and interpersonal communication--all critical for successful learning outcomes"** (Biochemistry, USA, aged 56-65)

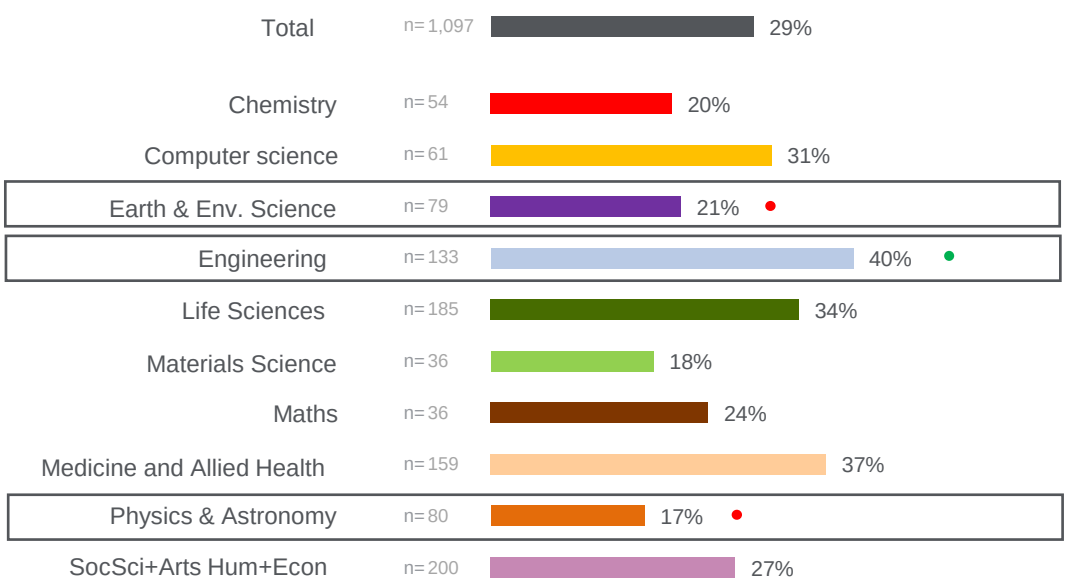
Base: All researchers (n=1,173)
Chart excludes don't knows (n=1,096)

EDUCATION

Results by subject, region, age group, gender, position and country

EDUCATION: Earth & Environmental Science and Physics are less likely than other specialties to believe the shift of teaching to online positively impacts teachers. Engineering are more likely to see the shift to online teaching as a positive for teachers.

The shift of teaching to online positively impacts teachers - (% agree)



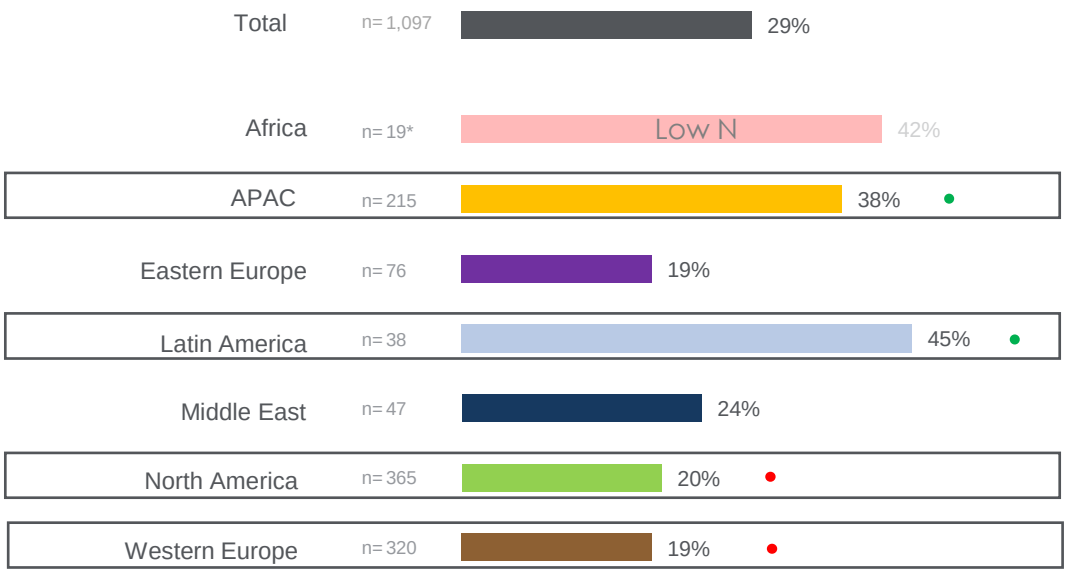
Legend

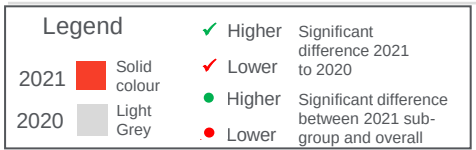
2021 Solid colour
2020 Light Grey

✓ Higher — Significant difference 2021 to 2020
✓ Lower
● Higher — Significant difference between 2021 sub-group and overall
● Lower

EDUCATION: APAC and Latin America are more likely than other regions to believe the shift of teaching to online positively impacts teachers. North America and Western Europe are less likely to see the shift to online teaching as a positive for teachers.

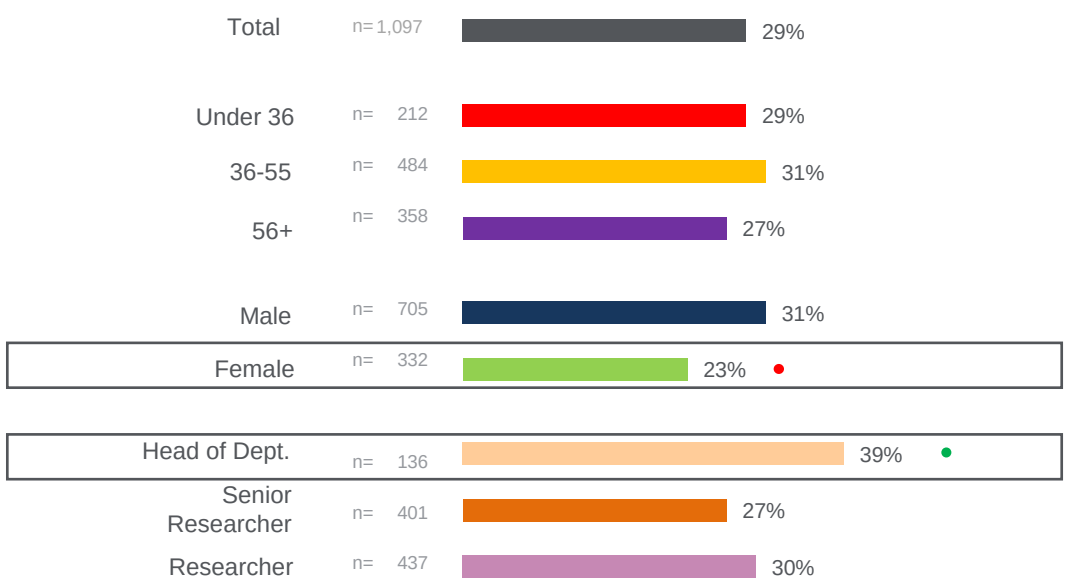
The shift of teaching to online positively impacts teachers - (% agree)





EDUCATION: Heads of Department are more likely than less senior positions to believe the shift of teaching to online positively impacts teachers. Females are less likely to see the shift to online teaching as a positive for teachers.

The shift of teaching to online positively impacts teachers - (% agree)

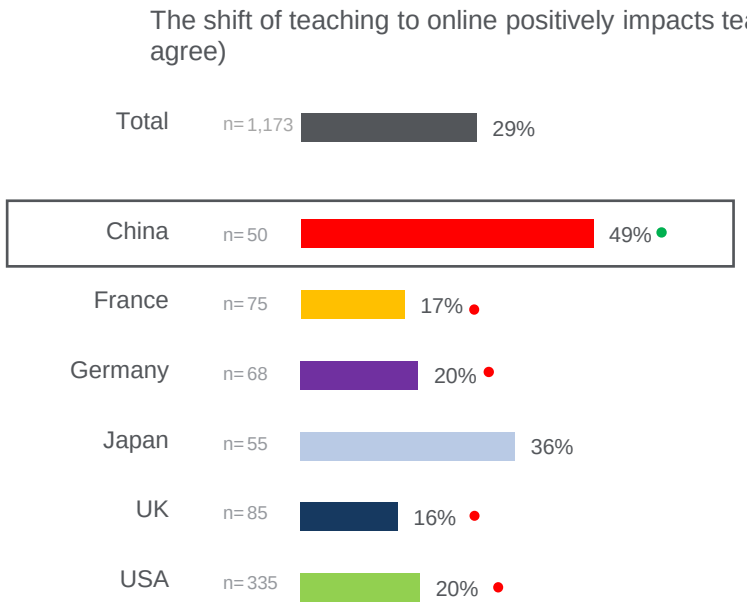


Legend

2021 Solid colour
2020 Light Grey

✓ Higher — Significant difference 2021 to 2020
✓ Lower
● Higher — Significant difference between 2021 sub-group and overall
● Lower

EDUCATION: Researchers in China are more likely to think that the shift of teaching to online positively impacts teachers (49% vs. 29% for researchers worldwide).

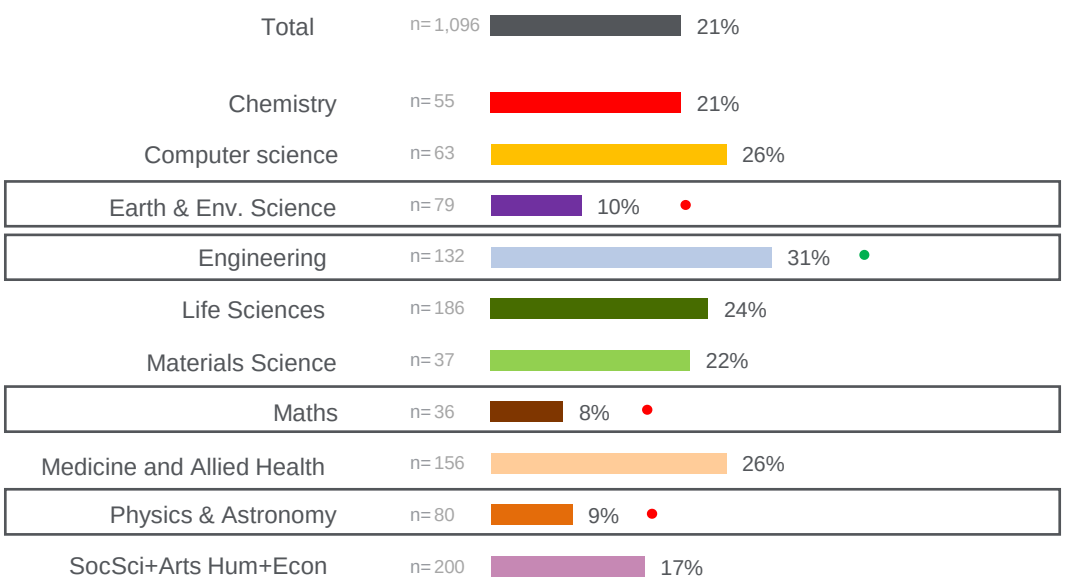


(Don't know answers are included in base size)

Higher
Lower
Significant difference between 2021 sub-group and overall

EDUCATION: Earth & Environmental Science, Maths and Physics are less likely than other specialties to believe the shift of teaching to online positively impacts students. Engineering are more likely to see the shift to online teaching as a positive for students.

The shift of teaching to online positively impacts students - (% agree)



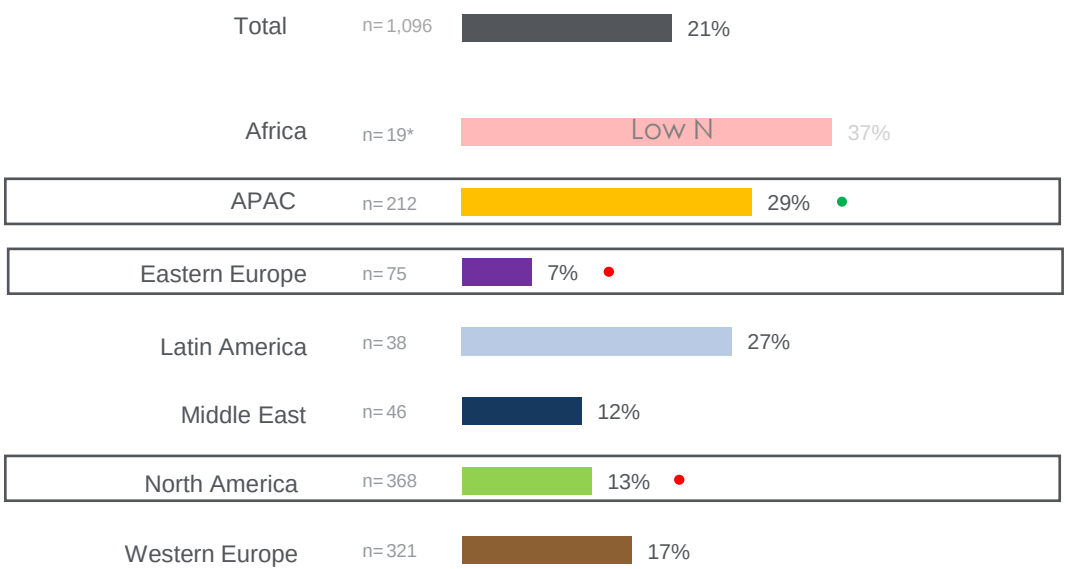
Legend

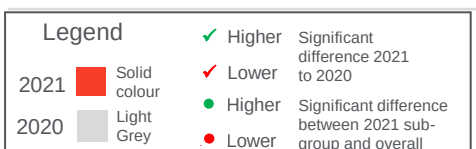
2021 Solid colour
2020 Light Grey

✓ Higher — Significant difference 2021 to 2020
✓ Lower
● Higher — Significant difference between 2021 sub-group and overall
● Lower

EDUCATION: APAC are more likely than other regions to believe the shift of teaching to online positively impacts students. North America and Eastern Europe are less likely to see the shift to online teaching as a positive for students.

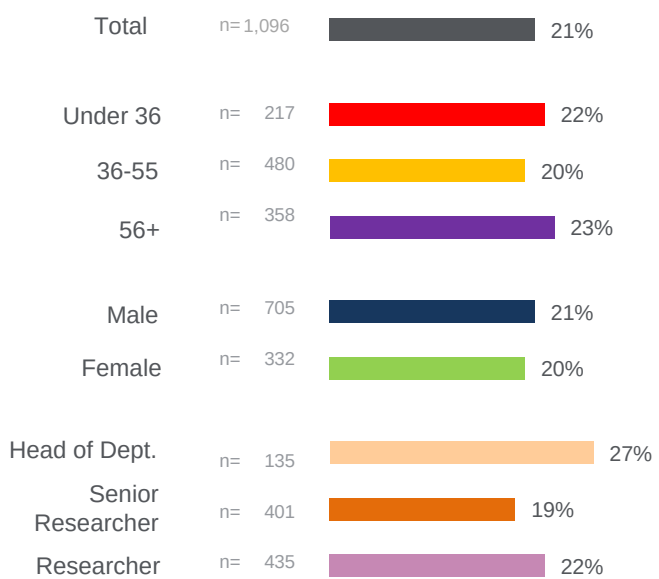
The shift of teaching to online positively impacts students - (% agree)





EDUCATION: No significant variation by age, gender and seniority.

The shift of teaching to online positively impacts students - (% agree)



Legend

2021 Solid colour

2020 Light Grey

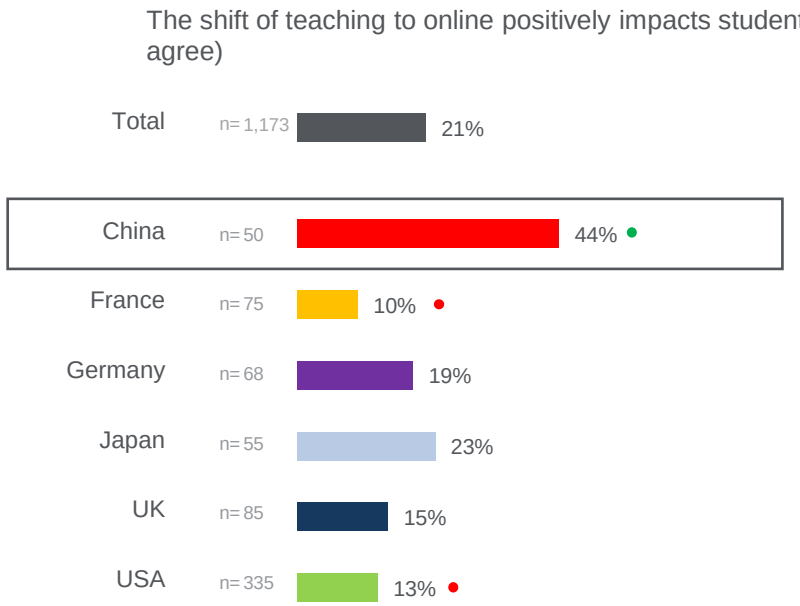
✓ Higher — Significant difference 2021 to 2020

✓ Lower

● Higher — Significant difference between 2021 sub-group and overall

● Lower

EDUCATION: Researchers in China were more likely to feel the shift of teaching to online overall positively impacted students than researchers worldwide.



(Don't know answers are included in base size)

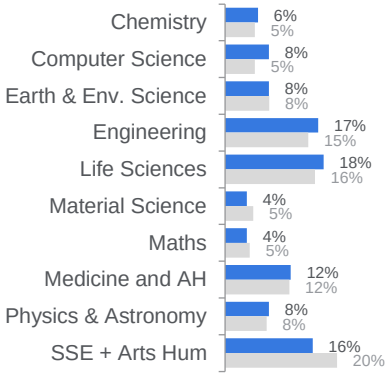
Higher
Lower
Significant difference between 2021 sub-group and overall

DEMOGRAPHICS

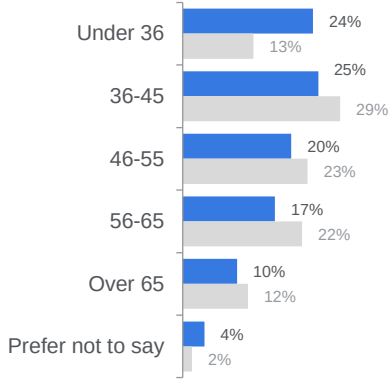
Weighted Demographics

2021
2020

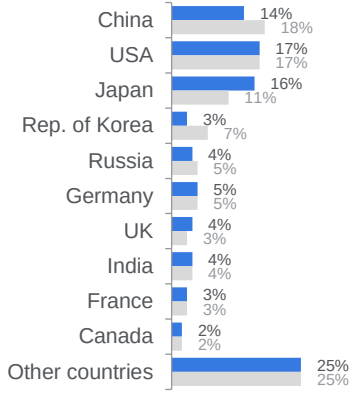
Subject



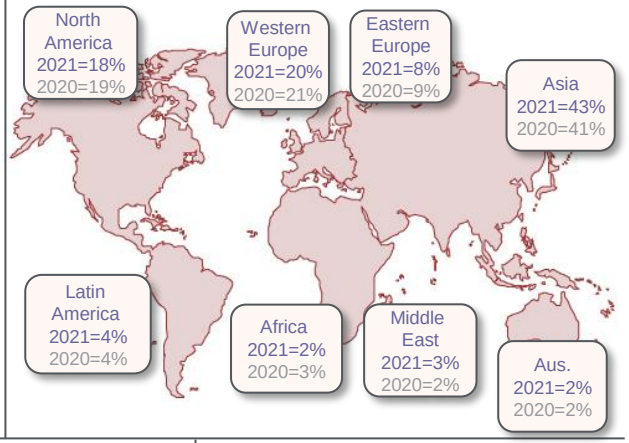
Age



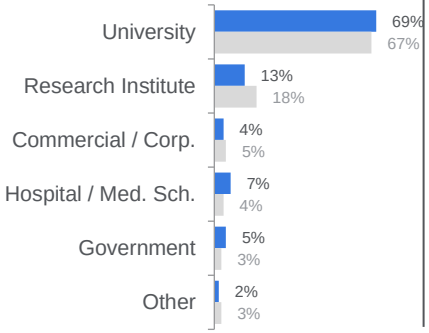
Country*



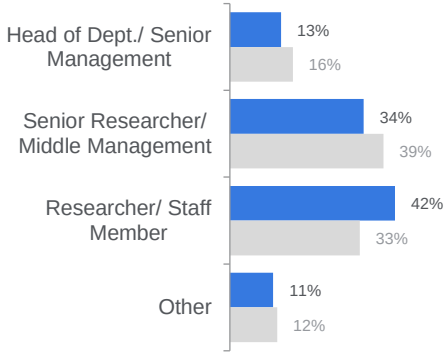
Region



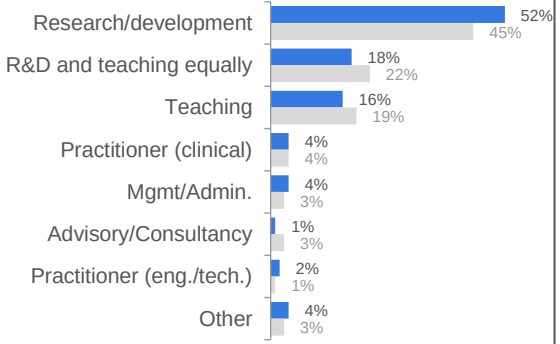
Organization



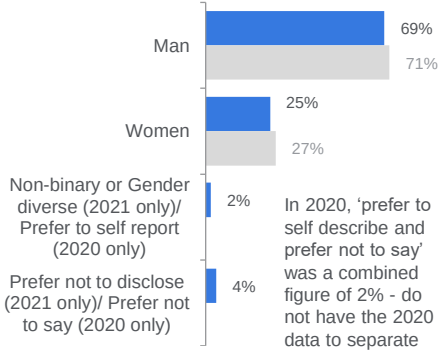
Position



Role



Gender



In 2020, 'prefer to self describe and prefer not to say' was a combined figure of 2% - do not have the 2020 data to separate

* In order to keep weighting factors below 4, China, Japan, and South Korea were weighted together.

2021 n=1,173
2020 n=1,066

Gender by discipline (2021)