



PHARMACIE

Wellcome Global Monitor

How does the
world feel about
science and health?

2018

GALLUP



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Cover image:

A hospital pharmacy in Mali. *Godong / BSIP / Science Photo Library*

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To read our full technical report, access more detailed country profiles and download the full dataset, please visit [Wellcome.ac.uk/monitor](https://www.wellcome.ac.uk/monitor)

Foreword

Health is a personal experience, a social issue and a global concern. Any attempt to improve health, whether through new treatments, policies or procedures, will be most effective when patients and the public are engaged. No matter how great your idea or how robust your science, it still has to be accepted by the people who stand to benefit from it. Most of the time, that will mean someone putting their trust in healthcare professionals and the science and technologies that underpin modern medicine.

Wellcome Global Monitor is the largest study to date into global attitudes to science and health. Having collected responses from more than 140,000 people in over 140 countries, it offers a wealth of information about people's interest and trust in science in almost every part of the world.

Differences in attitudes between regions are fascinating, but I'm just as struck by the similarities. Wherever they are, people want to know more about science and health, and 75% of us have confidence in our own country's healthcare system.

We asked people specifically about vaccines. They are our most powerful public health tools, protecting billions of people from deadly and debilitating infections like polio or measles. But to achieve sufficient coverage of the population to be effective, people have to feel able to trust vaccines, healthcare workers and scientists. The vast majority of those surveyed agreed that vaccines are important, and even parents who were sceptical about safety or effectiveness mostly said their children had received at least one vaccine.

Like so many health issues, the acceptability of vaccines relies on a number of social factors as well as people's personal choices. This means that understanding people and society – through history, sociology, anthropology – is at least as important as understanding viruses and immunology.

It's the flipside of traditional public engagement, where the aim has been for the public to understand the science. In fact, it has to cut both ways. Science is part of society: if all of us can be more open to ideas and perspectives we don't necessarily share, the research that society supports and does will become more relevant and, ultimately, more effective. Instead of science being done for the public, it will be done with the public.

Wellcome Global Monitor presents an unprecedented and comprehensive view of current relationships between science and the public around the world. As well as providing context for further research, its findings can inform the development of policies to increase trust and engagement between scientists and society. It shows the diversity of attitudes towards science and health, and much that we all have in common. Working together, sharing, collaborating and learning from each other, we can make the most of science and research to improve our health, our lives and our world.



Jeremy Farrar, Director of Wellcome



Face to face interview taking place in Benin.
Gallup 2018

The Wellcome Global Monitor – first wave

- Nationally representative surveys conducted in over 140 countries, using more than 140 languages and interviewing more than 140,000 people.
- Timeline:
 - **Sep 2017 to Mar 2018:** developing and testing the survey questionnaire
 - **Apr to Dec 2018:** collecting the data in over 140 countries
 - **Jan to May 2019:** analysing the results
 - **Jun 2019:** publishing the findings

Summary of key findings

- Wellcome Global Monitor is the first study of public attitudes to science and health on a global scale, conducting nationally representative surveys of people aged 15 years or older in over 140 countries. We spoke directly to over 140,000 people around the world.
- The survey covers topics such as whether people trust science, scientists, and information about health, the levels of understanding and interest in science and health, the benefits of science, the compatibility of religion and science, and attitudes to vaccines.
- The report explores how attitudes vary by characteristics such as nationality, gender, income, and education. It is the first time international and regional differences in attitudes have been studied at this level of detail.
- Globally, 28% of people say they recently sought information about science, and 41% have recently sought information about medicine, disease or health.

Trust in science and health professionals

- Globally, 18% of people have a 'high' level of trust in scientists, while 54% have a 'medium' level of trust, 14% have 'low' trust and 13% said 'don't know'. This ranges from a third of people having 'high' trust in Australia and New Zealand, Northern Europe and Central Asia to around one in ten in Central and South America.
 - While most of what is related positively to a person's level of trust in scientists cannot be explained, learning science at school or college, and confidence in key national institutions (such as the government, the military and the judiciary) are the strongest factors.
 - Other factors that significantly relate positively to trust in scientists include living in a rural location as opposed to having an urban residence, the extent to which people feel it is difficult to get by on their income, higher levels of income inequality in a country, and lack of access to mobile phones and the internet.
 - Globally, 73% of people say they would trust a doctor or a nurse more than other sources of health advice, including family, friends, religious leaders or famous people. This figure ranges from a low of 65% in East Asia and the Middle East, to a high of about 90% in parts of Europe, Northern America and Australia and New Zealand.
 - People in high-income countries are about as likely to have confidence in hospitals and health clinics in their country as lower-middle-income countries (78% and 82% respectively).
 - Those who find it difficult or very difficult to get by financially in upper-middle and high-income countries have the lowest confidence in hospitals and health clinics than any other group elsewhere in the world.
- ## Understanding and interest in science and health
- Almost everywhere, men are more likely to claim greater science knowledge than women. This gap exists even when men and women report equal levels of science attainment. This gender gap is largest in Northern Europe, standing at a 17-percentage-point difference, and the lowest is in the Middle East, with a 3-percentage-point difference.
 - Young people say they know more about science than older people do. Worldwide, more than half the people aged 15–29 (53%) say they know 'some' or 'a lot' about science, compared to 40% of those aged 30–49 and 34% of those aged 50 and older.
 - Almost two-thirds of people worldwide (62%) say they are interested in learning more about science, particularly people living in low-income countries, 72%.
 - The basic concepts of 'science' and 'scientists' are not universally understood across all countries, even in high-income nations. In Central Africa, for example, 32% said they understood none of the definitions presented to them or said they didn't know. In Northern America and most of Europe this figure drops as low as 2%.

- Personal household income may be more strongly related to people's confidence in hospitals and health clinics than national income is. People who say they find it difficult to get by on their present income are less likely to say they have confidence in their country's hospitals and health clinics.
- Worldwide, more than eight in ten people (84%) say they trust medical and health advice from medical workers (such as doctors and nurses) but that decreases to 76% for trust in that same advice from the government.

Science and society

- Worldwide, about seven in ten people feel that science benefits them – but only around four in ten think it benefits most people in their country.
- About a third of people in North and Southern Africa, and Central and South America feel excluded from the benefits of science. South America has the highest proportion of people who believe that science neither benefits them personally nor society as a whole, about a quarter of people.
- In high-income countries, people who say they are 'finding it difficult' to get by on their present income are about three times as likely as people who say they are 'living comfortably' to be sceptical about whether science benefits society as a whole, or them personally.
- Overall, out of more than 140 countries in this study, people in France are most likely to see science and technology as a threat to the local employment prospects. Regionally, the people of Western Europe and Eastern Europe are the most pessimistic regions about the impact of science and technology on jobs in their countries.
- Among people with a religious affiliation, 55% would agree with their religious teachings in a disagreement between science and their religion; 29% would agree with science, and 13% say it depends on the issue.
- Among people who say they have a religion, the highest percentages of people who say that science has disagreed with their religious teachings are in the US and Southern Europe (59%),

- Globally, 64% percent of people who have a religious affiliation and who say religion is an important part of their daily life, say that when there is a disagreement, they believe religion over science.

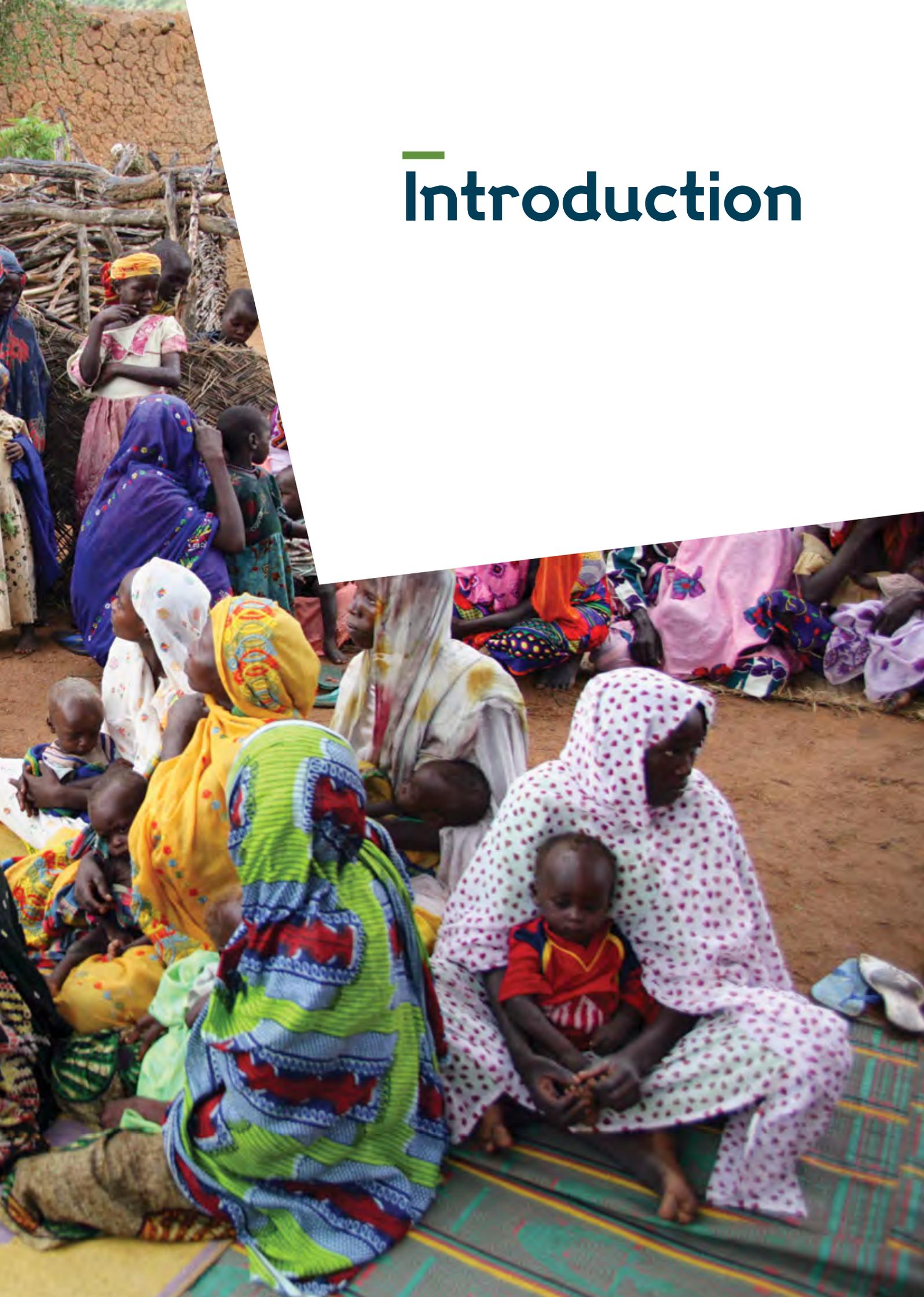
Attitudes to vaccines

- Globally, eight in ten people (79%) 'somewhat' or 'strongly agree' that vaccines are safe, while 7% 'somewhat' or 'strongly disagree'. Another 11% 'neither agree nor disagree', and 3% said they 'don't know'.
- In high-income regions, only 72% of people in Northern America and 73% in Northern Europe agree that vaccines are safe. In Western Europe, this figure is lower, at 59%, and in Eastern Europe is only 50%. In low-income regions, the proportion tends to be much higher, with highs of 95% of people in South Asia and 92% in Eastern Africa.
- In France, one in three people disagree that vaccines are safe, the highest percentage for any country worldwide.
- 92% of parents worldwide said that their children had received a vaccine to prevent them from getting childhood diseases, while 6% said they did not, and 2% said they did not know. The highest percentage of parents who said their children did not receive a vaccine were Southern Africa, 9% and East Asia and Southeast Asia, 8%.
- In most regions, people who have high trust in doctors and nurses are very likely to consider that vaccines are safe. However, this is less true in Western and Eastern Europe.
- There is a positive relationship between overall trust in scientists and attitudes towards vaccines, though the relationship is strongest in high-income countries.



A health educator talks to women about mother and child healthcare in a village in Chad.
Giacomo Pirozzi/Panos

Introduction



Chapter 1: Introduction

Why study global public attitudes to science?

Science can lead to discoveries and new technologies that change people's understanding of the world, influencing the way we live and how our communities and societies function. Active, transparent engagement between the scientific community and people from all parts of society increases mutual understanding, enabling people to communicate their support for – or concerns about – particular scientific applications. This idea of engagement is central to Wellcome's support for scientific research that can lead to improvements in health. But evidence suggests that public access to and engagement with science are influenced by important disparities related to gender, income and educational attainment¹.

A number of social and technological trends may also influence someone's attitudes to science and scientists. Those include declining trust in political and social institutions^{2,3}, the association of scientific and technological progress with economic inequality

(often through the impact on employment)^{4,5}, and changes in the media environment and mass communication through more recent technologies (such as social media and the internet)^{6,7}.

Much of the research into what the public thinks and feels about science and its relation to health, however, has been disproportionately conducted in Northern America and Europe⁸. There is limited understanding of how billions of people in other parts of the world perceive science and its relation to their health and their lives⁹. Given how easily health benefits and health risks spread across the world today, this is a serious and fundamental lack of knowledge.

Wellcome Global Monitor explores inequalities in access to and engagement with science – and their relationships to inequalities in income and health outcomes – across different segments of the population and in all regions of the world. Improved understanding of how different people feel and think about science and its relation to health is essential to encourage debate, address disparities and foster greater public engagement, with the ultimate goal of improving health for everyone.

Summary:

- Wellcome Global Monitor provides new insights and evidence into relationships between the public, science and scientists across the world.
- It is the first study of public attitudes to science and health on a global scale, conducting nationally representative surveys of people aged 15 years or older in over 140 countries.
- It provides data on topics such as trust in science and scientists, trust in sources of information about health, public understanding of the word 'science', attitudes to vaccines, and the intersection between religious teachings and science.
- The results will help scientists, researchers, health professionals and science policy makers across the world better understand public perceptions of science; in turn, this should help to improve engagement between the scientific community and the public.

Box 1.1: Science's social contract with the public

The relationship between science and society is sometimes discussed in terms of the social contract.

It is said that science 'is not an isolated enterprise', and that 'to keep its position in society requires legitimacy'¹⁰. This legitimacy justifies important types of support to the scientific community, including financial resources, legal support and research autonomy. In return, the scientific community must meet certain public expectations, including maintaining high ethical standards, conducting rigorous and credible research that is socially relevant and beneficial to the public, and being aware of the various cultural contexts in which they operate.

Some researchers believe a broader model is required to describe the modern relationship between science and society: 'Given the extraordinary effects of scientific discoveries and technological inventions during the 20th century, effects that will only increase

throughout the 21st century, social contract theory cannot give a sufficiently comprehensive account of the science-society relationship'¹¹. Instead, the idea of scientific and political pursuit for the common good means that 'it is incumbent upon the scientist to preserve the integrity of science, treat all experimental subjects with respect, inform the community about research under consideration, provide ways for the community to help define the goals of scientific research, and report in a timely manner the results of the research in forums accessible to the non-specialist'¹².

Either way, if the public comes to believe that a certain type of research is driven by motives that are not in the public good, or is harmful, this can lead to widespread distrust and resistance to acting on scientific health advice^{13,14,15}.



Face to face interview taking place in China. Gallup 2018

What research questions are in the Wellcome Global Monitor?

Wellcome Global Monitor is the first survey conducted at such a scale. Research questions that Wellcome is looking to understand better include:

1. To what extent are the concepts of ‘science’ and ‘scientists’ understood differently in different countries and cultures, and across different demographic groups (such as gender and age)? Are there any differences in understanding what those terms mean, or are they equally understood globally?
2. Is there a difference in the way people interact with science across countries and different demographic groups (such as gender, age, education, etc.)?
3. To what extent do people seek information about science and about health (separately), and would they like to know more about science and about health-related matters?
4. To what extent do people trust scientists and the work that scientists do? How does trust vary on a regional or country-by-country basis?
5. What demographic characteristics (such as gender, age, education level, etc.) or other factors influence people’s trust in scientists?
6. How does trust in scientists fare compared to trust in other societal institutions, such as government, the media, and the people who live in the same neighbourhood?
7. What is the current state of trust in doctors and nurses in different parts of the world? Who would people trust the most to give them health and medical advice?
8. How included do people feel in science and health research, and to what extent do people believe science benefits them personally as well as society as a whole?
9. Are people concerned about the impact of science and technology on their economic wellbeing and employment opportunities, and do people believe that science and technology will benefit the next generation?

10. For people for whom religion is an important part of their daily lives, to what extent do they believe that science and the teachings of their religion disagree, and in the case of disagreement, which information do they believe?

11. How do people around the world feel about the safety, effectiveness and importance of vaccines, and how do these views vary by region and country, and by key demographics such as gender, age, education level, income level and urban/rural residence?

12. How are attitudes to vaccines related to trust in science, in government and in health workers?

13. Do positive or negative attitudes towards vaccines translate into practical outcomes such as non-vaccination?

As this is the first wave of the Wellcome Global Monitor, the survey results and analyses will be cautiously interpreted in the context of existing research. However, as it includes countries that have not been studied before, some results will be presented in a more descriptive manner.

The analysis of all research questions will be done mainly by gender, age groups, urban/rural residence, education and income levels. Health research can only benefit everyone in society when the full diversity of the people it is meant to serve have the opportunity to engage with it. That is why this report analyses how people’s relationship with science and health varies by these demographic and socio-economic groups. Therefore it will be an important way for the scientific community to understand how successfully it is engaging with all parts of society. Future waves of the survey will allow for more robust testing and analysis of the results presented in this report.

Please note, in tables throughout this report, percentage data will not always add up to 100% because of rounding.

How was the Wellcome Global Monitor survey developed?

As this is a large survey asked of people in different countries, different languages, and across different levels of education and socio-economic backgrounds, many of the questions had fewer response options than is often the case in smaller national and cross-national surveys. This was to ensure consistency of understanding across all those interviewed, and also because testing in many local languages had revealed that minimal or non-existent differences between response options such as ‘strongly agree’, ‘somewhat agree’, and ‘agree’ made questions more confusing for people to answer.

Questionnaire development started with a review of the research literature on public attitudes to science and previous surveys, followed by interviews with experts at Wellcome and various academic institutions and non-governmental organisations. Once a long list of potential survey items had been developed (see Box 1.4), questions were tested in cognitive interviews with 12 people in each of seven countries: Colombia,

India, Kenya, Nigeria, South Africa, Thailand and Vietnam. This was to ensure that questionnaire items were clear, easy to understand and interpret, and focused on eliciting the desired information. Participants discussed their interpretation of survey items, the thought process by which they would arrive at an answer, and recommendations for improving or clarifying question wordings.

Questions that were cognitively challenging or easily misunderstood were deleted, while questions that were relatively well understood were reworded so they could be understood well and quickly by all demographic groups.

Another round of pilot testing was conducted with 50 people in each of ten countries, in various languages. The countries were China, Colombia, Egypt, France, India, Kenya, Nigeria, South Africa, Thailand and Vietnam. Other aspects assessed in this round of testing included whether the planned process of administering the questionnaire was workable, timely and efficient. Further refinements were then made to arrive at the final survey instrument, which can be found in Appendix B¹⁶.

Box 1.2: Theoretical approaches of research on public understanding of science

Social psychologist Martin Bauer has traced the evolution of theories on the public understanding of science from the 1960s to the present. He identifies three distinct paradigms:

1. **Scientific literacy, 1960s–1980s.** This approach took a public deficit of scientific knowledge as the main problem, using quiz-like survey items to assess the extent of the deficit and calling for increased efforts in science education.
2. **Public understanding, 1980s–1990s.** Here, the notion of a public deficit remained, but measures expanded beyond people’s knowledge of scientific
3. **Science-in-Society, 1990s–present.** This approach moved away from the public deficit idea, focusing instead on science and scientists’ relationship with the populations they served and assessing the health of the social contract between science and society. In this approach, public engagement with and trust in science and scientific institutions are key outcomes.

Bauer, M. (2009). The evolution of public understanding of science. *Science, Technology & Society*.

Box 1.3: Topics in the Wellcome Global Monitor questionnaire

Scientific understanding

The questionnaire included questions to assess respondents' own knowledge of science, and at what stage in their education they learned about any type of science. Questions about a person's factual understanding of science were kept at a general level, not about specific types of science (see 'Scientific knowledge').

Interest in and engagement with science

Some research suggests that a person's general interest in science could, in some instances, help explain their attitude to and trust in science. The survey contains several questions to assess interest in seeking information about science and health, all of which proved relatively easy to understand by all people interviewed in the testing.

Direct measures of trust in science and scientists

Several questions ask whether respondents have confidence or trust in scientific individuals or institutions, including scientists, doctors and nurses, hospitals and health clinics. All questions on this topic proved relatively easy to understand in testing.

Science and society

Several survey items ask respondents to assess how they think science will affect important aspects of their lives and society, such as job availability and the lives of the next generation. Some people's attitudes towards science and health research are affected by cultural forces and social norms that have greater influence on their lives, such as religion, traditional customs and traditional leaders or healers. The survey asked a few questions that explored this topic. All questions on this topic proved relatively easy to understand.

General levels of trust in other institutions in society

Some research has shown that levels of trust in different institutions and key groups can be important in understanding whether a person trusts science and scientists specifically. This survey asks several questions about levels of trust in different institutions and professions. All questions on this topic proved relatively easy to understand.

Vaccination questions

The survey contains a number of questions about issues related to vaccinations, a critical application of science to public health.

Explored but not included in final questionnaire¹⁷:

Scientific knowledge

The first draft of the questionnaire included questions about a person's factual understanding of different types of sciences, such as physics, chemistry and biology. These knowledge-related questions on the sciences were excluded from the final survey because of the difficulty many people had in understanding and answering them.

Drug-resistant infections

A set of questions on drug-resistant infections (or antimicrobial resistance) was included in the cognitive testing. These questions were very difficult for most people to understand. Items were interpreted differently depending on people's education and socio-economic backgrounds. Even the word 'antibiotic' caused confusion for many respondents. These questions were not included in the final draft.

What next?

Wellcome Global Monitor is the first ever global study of public attitudes to science, scientists and health. It builds on existing research and provides new insights into people's attitudes to science and health, and specifically to vaccines, a subject of critical importance in all countries today.

Results from the first wave, presented in this report, provide a baseline of evidence to assess how attitudes change over time, and to help formulate effective and targeted policy interventions to improve public engagement with science and health.

It will also help researchers take account of the social and cultural contexts of their work, stimulate more localised research to understand public attitudes to science and, in doing so, make science research more relevant to more people.

Health research can only benefit everyone in society when the full diversity of the people it is meant to serve have the opportunity to engage with it. This report is an important resource for the scientific community to understand how successfully it is engaging with all parts of society.

Regional country groupings

In this report, Wellcome has largely followed the regional groupings of the United Nations Statistics Division (see Box 1.4) for the regional analysis of the survey results. However, the UNSD does not include a region known as the 'Middle East' and instead includes those countries in the category of 'West Asia'. As many readers may be more familiar with a 'Middle East' region rather than West Asia, Wellcome modified UNSD's regional groupings to create a 'Middle East' region.

The territories of Northern Cyprus and Kosovo, which were included in the study but not in UNSD's regional definitions, are not included in the comparison of regional results. However, interviews conducted in these areas are included in any analysis of global results or when examining country-by-country results.

Face to face interview taking place in Cambodia.
Gallup 2018



Box 1.4: Regional groupings used in this report

Countries surveyed are grouped into 18 categories:

North Africa

Algeria, Egypt, Libya, Morocco, Tunisia

Eastern Africa

Burundi, Comoros, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Tanzania, Uganda, Zambia, Zimbabwe

Central Africa

Cameroon, Chad, Republic of the Congo, Gabon

Southern Africa

Botswana, Namibia, South Africa, eSwatini

Western Africa

Benin, Burkina Faso, Ghana, Guinea, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, The Gambia, Togo

Central America and Mexico

Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama

South America

Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela

Northern America

Canada, United States

Central Asia

Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

East Asia

China, Japan, Mongolia, South Korea, Taiwan

Southeast Asia

Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam

South Asia

Afghanistan, Bangladesh, India, Iran, Nepal, Pakistan, Sri Lanka

Middle East

Iraq, Israel, Jordan, Kuwait, Lebanon, Palestine, Saudi Arabia, Turkey, United Arab Emirates, Yemen

Eastern Europe

Belarus, Bulgaria, Czech Republic, Hungary, Moldova, Poland, Romania, Russia, Slovakia, Ukraine

Northern Europe

Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, United Kingdom

Southern Europe

Albania, Bosnia Herzegovina, Croatia, Cyprus, Greece, Italy, Malta, North Macedonia, Montenegro, Portugal, Serbia, Slovenia, Spain

Western Europe

Austria, Belgium, France, Germany, Luxembourg, Netherlands, Switzerland

Australia and New Zealand

Australia, New Zealand

Source:

<https://unstats.un.org/unsd/methodology/m49/>



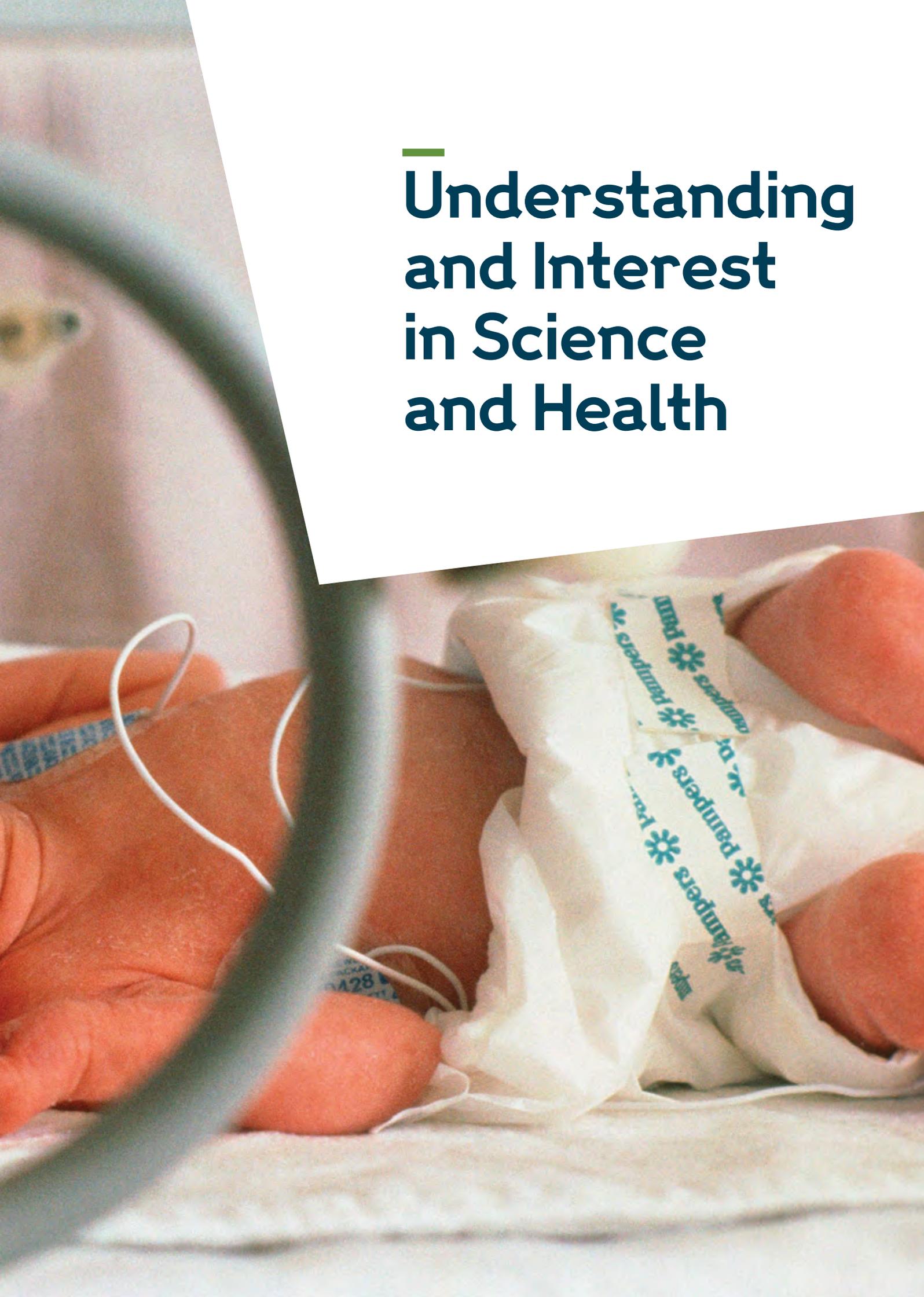
Face to face interview taking place in Nepal.
Gallup 2018

Endnotes

- 1 Entradas M. Science and the Public: The Public Understanding of Science and Its Measurements. *Portugese Journal of Social Science* 2015;14(1):71–85.
- 2 Skinner G, Clemence M. Politicians remain the least trusted profession in Britain. Ipsos MORI. 2017 30 November. <https://www.ipsos.com/ipsos-mori/en-uk/politicians-remain-least-trusted-profession-britain> [accessed 20 May 2019].
- 3 Funk C. Mixed Messages about Public Trust in Science. *Issues in Science and Technology* 2017;34(1). <http://www.pewresearch.org/science/2017/12/08/mixed-messages-about-public-trust-in-science/> [accessed 20 May 2019].
- 4 Storrow B. Coal Use Continues to Decline in the U.S. *Scientific American* 2018 5 December. <https://www.scientificamerican.com/article/coal-use-continues-to-decline-in-the-u-s/> [accessed 20 May 2019].
- 5 Mckinsey Global Institute. *Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation*. New York: Mckinsey & Company; 2017. <https://assets.mckinsey.com/-/media/BAB489A30B724BECB5DEDC41E9BB9FAC.ashx> [accessed 20 May 2019].
- 6 ALLEA (All European Academies). *Loss of Trust? Loss of Trustworthiness? Truth and Expertise Today*. Berlin: ALLEA; 2018. https://www.allea.org/wp-content/uploads/2018/05/ALLEA_Discussion_Paper_1_Truth_and_Expertise_Today-digital.pdf [accessed 20 May 2019].
- 7 Lockie A. Trust in US government, media, implodes as China's soars. *Business Insider* 2018 22 January. <https://www.businessinsider.com/trust-barometer-finds-37-point-implosion-in-us-publics-trust-china-rising-2018-1> [Accessed 20 May 2019].
- 8 The Wellcome Global Monitor Questionnaire Development Report references several studies on the subject and notes that regular public surveys have been conducted in the US (NSF, General Social Survey), Europe (Eurobarometer), the United Kingdom (Wellcome Trust, the UK government, as well as others) and a number of Latin American countries (Latin American Network for Science).
- 9 Holmgren M, Schnitzer SA. Science on the Rise in Developing Countries. *PLoS Biol* 2(1). <https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.0020001> [accessed 20 May 2019].
- 10 Hessels LK, et al. In search of relevance: the changing contract between science and society. *Science and Public Policy* 2009;36(5):387–401.
- 11 Frodeman R, Mitcham C. Beyond the Social Contract Myth. *Issues in Science and Technology* 2000;16(4). https://issues.org/p_frodeman/ [accessed 20 May 2019].
- 12 Dubé E, et al. Vaccine Hesitancy, Vaccine Refusal and the Anti-Vaccine Movement: Influence, Impact and Implications. *Expert Review of Vaccines* 2015;14(1): 99–117.
- 13 Offit PA. *Deadly Choices: How the Anti-Vaccine Movement Threatens Us All*. Basic Books; 2015.
- 14 Leiserowitz AA, et al. Climategate, Public Opinion, and the Loss of Trust. *American Behavioral Scientist* 2013;57(6):818–37.
- 15 Lewandowsky S, Oberauer K. Motivated Rejection of Science. *Current Directions in Psychological Science* 2016;25(4): 217–22.
- 16 A detailed description of the cognitive and pilot interviews, as well as the main findings from the literature review, can be found in the Wellcome Global Monitor Questionnaire Development Report: https://wellcome.ac.uk/sites/default/files/wellcome-global-monitor-questionnaire-development-report_0.pdf [accessed 20 May 2019].
- 17 For full details of the development of the survey questionnaire, please see the Wellcome Global Monitor Questionnaire Development Report, 2018 https://wellcome.ac.uk/sites/default/files/wellcome-global-monitor-questionnaire-development-report_0.pdf [accessed 20 May 2019].

A premature baby lies in an incubator and has their hair brushed with a toothbrush.
Joseph Nettis / Science Photo Library





Understanding and Interest in Science and Health

Chapter 2: Understanding and interest in science and health

Summary:

- Almost everywhere, men are notably more likely than women to claim that they know ‘a lot’ or have ‘some’ knowledge about science, indicating a ‘gender gap’ in self-assessed knowledge. This gap exists even though women are generally as likely as men to say they learned about science at different stages of education. This gender gap is largest in Northern Europe, standing at a 17-percentage-point difference. Other regions with a sizeable gender gap in perceived knowledge of science include South Asia (16 points), East Asia (15 points), Western Africa (14 points), Australia and New Zealand (13 points) and Eastern Africa (13 points).
- The Wellcome Global Monitor’s results show a strong relationship between self-assessed knowledge of science and educational attainment. In all regions, people with lower levels of educational attainment are less likely to say they understood ‘all’ or ‘some’ of the definition of ‘science’ and ‘scientists’ offered at the start of the survey. In addition, people are more likely to seek science information the more highly they rate their own knowledge of science.
- Globally, 28% of people say they recently sought information about science. That figure rises to 41% of people who have recently sought information about medicine, disease or health.
- Almost two-thirds of people worldwide (62%) say they are interested in learning more about science. This is particularly the case among people living in low-income countries. In addition, 72% of people globally are interested in learning more about health, medicine and disease.
- In all regions, people who have internet access are far more likely than those who do not have internet access to have sought science or health information in the past 30 days.
- Although science is often said to be a ‘universal’ human language, the concepts of science and scientists are not commonly understood across all countries, even in high-income nations. This was as high as 32% in Central Africa, saying they understood none of the definition¹ presented to them or ‘don’t know’, but as low as 2% in Northern America and most of Europe.
- Worldwide, more than half the people aged 15–29 (53%) say they know ‘some’ or ‘a lot’ about science, compared to 40% of those aged 30–49 and 34% of those aged 50 and older. This general pattern applies to nearly every region in the study, with younger people being more likely than their elders – especially those aged 50 and older – to say they know at least ‘some’ about science.

Box 2.1: Main research topics addressed in this chapter

1. To what extent are the concepts of 'science' and 'scientists' understood differently in different countries and cultures, and across different demographic groups (such as gender and age)? Are there any differences in understanding what those terms mean, or are they equally understood globally?
2. Is there a difference in the way people interact with science across countries and different demographic groups (such as gender, age, education, etc.)?
3. To what extent do people seek information about science and about health (separately), and would they like to know more about science and about health-related matters?

Wellcome Global Monitor questions examined in this chapter:

1. How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?
2. On this survey, when I say 'science' I mean the understanding we have about the world from observation and testing. When I say 'scientists' I mean people who study the Planet Earth, nature and medicine, among other things. How much did you understand the meaning of 'science' and 'scientists' that was just read? Did you understand all of it, some of it, not much of it, or none of it?
3. Do you think studying diseases is a part of science?
4. Have you, personally, ever learned about science at primary school, secondary school, college or university?
5. Have you, personally, tried to get any information about science in the past 30 days?
6. Have you, personally, tried to get any information about medicine, disease or health in the past 30 days?
7. Would you, personally, like to know more about science?
8. Would you, personally, like to know more about medicine, disease or health?

Introduction

The Wellcome Global Monitor starts by asking people about the level of their self-assessed knowledge of science, then offers a standardised definition of the words 'science' and 'scientists' for people to think about throughout the survey. In conversations relating to science and health with people in different countries and cultures, it is important to know whether the concepts being discussed are understood in the same way across countries, and whether the terms are clear enough for people to participate in productive and engaging conversations.

Although there is no universally accepted definition of science, for the reasons discussed in Box 2.2, the Wellcome Global Monitor uses a definition that

was adapted and simplified from definitions given by organisations such as the Science Council of Britain and various dictionaries. The definition was simplified and tested in seven countries (in local languages) and was shown to be largely effective during the testing phase of this study².

The following statement and definition of 'science' and 'scientists' was used: *On this survey, when I say 'science' I mean the understanding we have about the world from observation and testing. When I say 'scientists' I mean people who study the Planet Earth, nature and medicine, among other things.*

After the definition was read, people were asked: *How much did you understand the meaning of 'science' and 'scientists' that was just read? Did you understand all of it, some of it, not much of it or none of it?*

The definition of 'science'

The definition of 'science' is understood differently across countries and cultures

Globally, around 19% of people said they understood 'all' of the definition, and almost the same number of people said that they understood 'none' of it/did not know. Around one-third of people said they understood 'some' of the definition (36%), while 26% said they understood 'not much' of it.

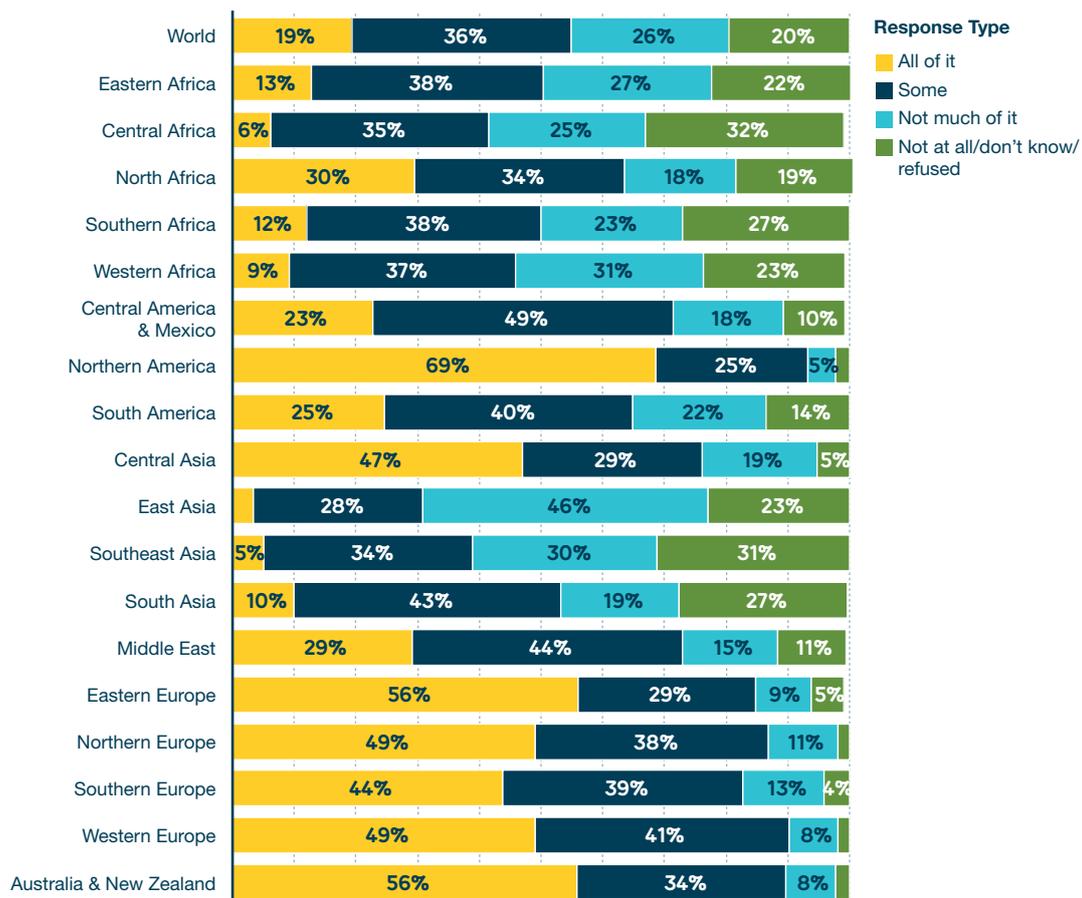
As Chart 2.1 shows, the degree of understanding varied considerably by region, with a majority of people in Northern America, Australia and New Zealand and Eastern Europe saying they understood 'all' of the definition.

Central Africa and Southeast Asia registered the highest number of people who said they understood 'none' of the definition.

Chart 2.1: Understanding of the definition of science and scientists by region

Percentage of people who answered 'all of it', 'some of it', 'not much of it', or 'none of it'.

*How much did you understand the meaning of 'science' and 'scientists' that was just read?
Did you understand all of it, some of it, not much of it, or none of it?*



Box 2.2: Should a definition of ‘science’ and ‘scientists’ be included in the survey?

Results from the Wellcome Global Monitor in-depth interview (cognitive) testing suggests that, in general, including a definition would improve the reliability of cross-country comparisons. Yet, even with a definition included, a sizeable minority of people still found the concepts of ‘science’ and ‘scientists’ challenging to understand.

There seems to be no universally accepted definition of science – even within the scientific community itself. In the 1960s, science philosophers Karl Popper and Thomas Kuhn put forth very different views of what constitutes scientific progress, both of which have been influential in shaping ideas about how science is distinguished from other knowledge systems. Even as recently as 2009, one professional organisation, the Science Council of Britain, announced its own new definition for the word ‘science’, after a year of work and research³.

Some define science as a process of study and discovery – this was the essence of the Science Council of Britain’s new definition for the word⁴ – while others would define it as a body of knowledge about the world. Given that the precise definition of science is still debated among scientists themselves, we might expect varying levels of understanding of those terms among people in most countries. In nearly 100 cognitive interviews conducted in eight countries over the questionnaire development phase

of this study, most – but not all – people provided a shared understanding of science driven by evidence, logic and research⁵.

However, in some languages (for example in some of the Arabic-speaking countries), the words used for ‘science’ and ‘scientists’ were sometimes interpreted differently to the meaning of the word in English. For instance, in some Muslim-majority countries, the word ‘scientists’ was sometimes understood to mean religious scholars. In addition, some people associated science with a type of knowledge that is beyond their grasp. In India, for example, some felt that only the wealthy educated people could understand or be connected to science or scientists. In other countries (for example in Russia), people were surprised and puzzled why humanities subjects (such as anthropology, philosophy, etc.) were not included in the definition of ‘science’.

Those (and other) findings from the survey testing stage led us to decide to include a definition of science so that cross-country results could be interpreted more reliably. Nevertheless, even with the inclusion of a definition, a significant minority of people (some 20% globally) still found the concepts of ‘science’ and ‘scientists’ challenging.

While further in-depth research is needed to understand those regional and country differences, initial research indicates that in countries where science is given more prominence in the economy – measured by how much money is spent on science and technology research, as estimated by gross domestic expenditures on research and development (GERD)⁶ statistics – tend also to have a greater percentage of people saying they understood ‘some’ or ‘all’ of the definition⁷.

Cultural differences are also likely to be a factor. Other research has found that a country’s social and cultural environment is an important factor in shaping how people feel about science and the extent of their interest and engagement with it⁸. Regions such as East Asia and South Asia both express relatively low familiarity with the definition, despite the important role that science appears to play in countries such as China, Japan or India, as indicated by such measures

as GERD⁹. This suggests that people in those regions do not necessarily understand science in the same terms as described in the definition.

Thus, while the definition helps anchor the specific concepts in people’s minds and renders cross-country comparisons more reliable, it also demonstrates the possible shortcomings of a definition that does not take into account local culturally relevant factors¹⁰.

In all regions, people with lower levels of educational attainment were less likely to say they understood ‘all’ or ‘some’ of the definition

A person’s level of education is associated with how well they understood the given definition of science: in all regions, people with lower levels of educational attainment were less likely to say they understood ‘all’ or ‘some’ of the definition.

Table 2.1: Understanding of the definition of science and scientists by education and region

Percentage of people who answered ‘all of it’, ‘some of it’, ‘not much of it’, or ‘none of it’.

How much did you understand the meaning of ‘science’ and ‘scientists’ that was just read?

Did you understand all of it, some of it, not much of it, or none of it?

Region	Primary education	Secondary education	Post-secondary education
World	22%	57%	71%
Eastern Africa	29%	65%	77%
Central Africa	42%	63%	77%
North Africa	21%	60%	86%
Southern Africa	12%	38%	87%
Western Africa	24%	48%	61%
Central America and Mexico	23%	49%	72%
Northern America	N/A*	73%	70%
South America	17%	46%	92%
Central Asia	40%	54%	63%
East Asia	16%	33%	80%
Southeast Asia	18%	51%	46%
South Asia	26%	68%	73%
Middle East	34%	61%	90%
Eastern Europe	37%	58%	79%
Northern Europe	53%	64%	80%
Southern Europe	33%	57%	79%
Western Europe	56%	66%	77%
Australia and New Zealand	27%	60%	82%

*Sample size too small

Understanding of what studying science constitutes

In all regions, a large majority agree that ‘studying disease is a part of science’

To understand further how people think of science, the Wellcome Global Monitor also asked people if they think studying disease is a part of science. This question was asked as an alternative route to assess a person’s understanding of science. If people said they did not understand the definition given, it may have been on account of the definition being somewhat technical – for example, the words ‘observation’ and ‘testing’ may be confusing for people with low educational attainment levels. Therefore, we wanted to ask a question that was uncontroversial and universally understood. If people

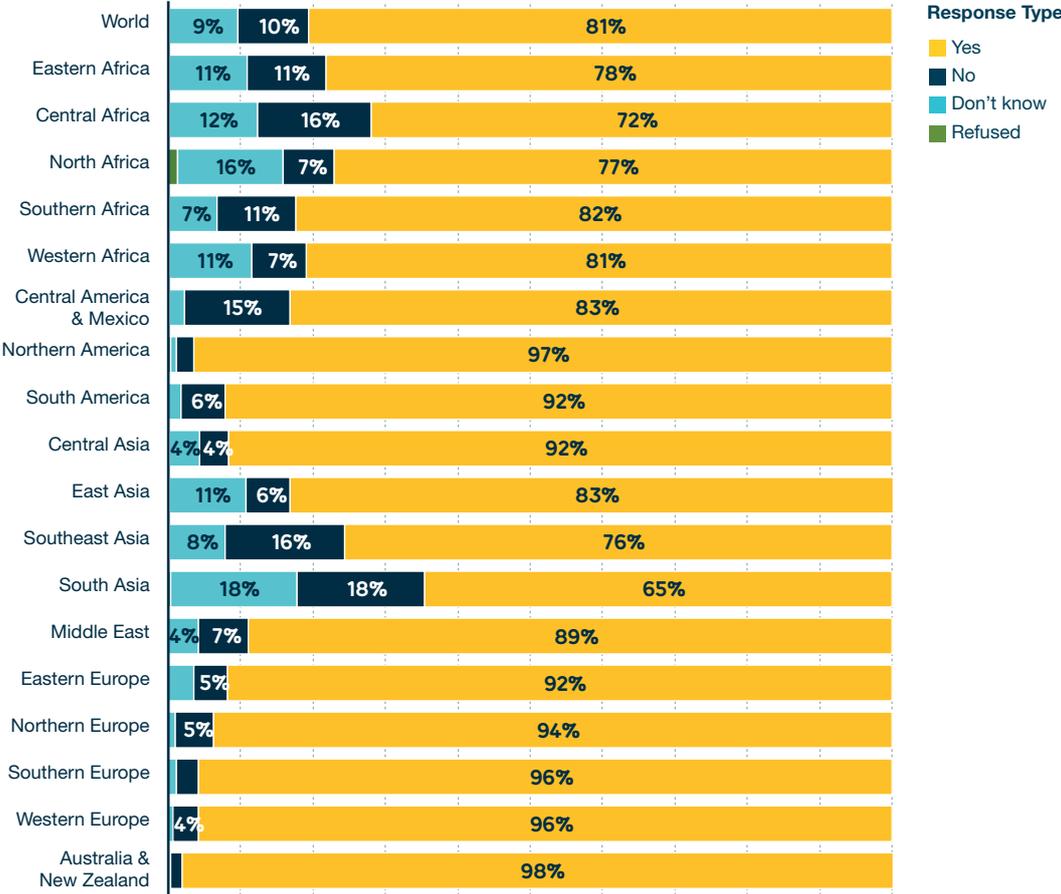
answered this question correctly, then it would indicate that they understood what science could do (studying disease), even if they did not understand the definition given.

The results show that, at the global level, the clear majority – 81% – agree that it is. This demonstrates that many of those who were unfamiliar with the definition offered in the survey nonetheless associated ‘science’ with efforts to understand disease, thereby exhibiting an understanding of some of the practical aspects and applications of science, rather than a seemingly more ‘theoretical notion’ (being *‘the understanding we have about the world from observation and testing’*). Even among those who say they do not understand the definition of science ‘at all’, a majority – 56% – agree that studying disease is part of science.

Chart 2.2: People who think studying disease is a part of science by region

Percentage of people who answered 'yes', 'no', 'don't know' or 'refused'.

Do you think studying disease is a part of science?



Regionally, South Asians are the least likely to say studying disease is part of science, at 65%. In Afghanistan and India, 70% and 63% of people respectively say that studying disease is a part of science. The figure is even lower in Pakistan, where only 52% say that studying disease is a part of science, fewer than any other country in the study. While there are likely to be a number of reasons for these results, one potential factor is the relative popularity of alternative medicine in Pakistan¹¹. This research is seemingly supported by the Wellcome Global Monitor finding that about one in four people in Pakistan trust traditional healers ‘a lot’¹² – one of the highest rates among the countries in the study. Of those who say they trust traditional

healers ‘a lot’, only 43% say studying disease is a part of science, compared to 56% who say they trust traditional healers ‘some’, ‘not much’, or ‘not at all’.

Box 2.3: Measuring knowledge of science

The Wellcome Global Monitor asked people to rate their own knowledge of science, asking *'How much do you, personally, know about science? Do you know a lot, some, not much or nothing at all?'*

This type of question, which relies on people's perceptions, is measuring subjective knowledge. However, many surveys examining public attitudes towards science have attempted to measure an individual's level of knowledge about science objectively, typically through a series of quiz-like questions about scientific facts¹³.

During the testing phase of the Wellcome Global Monitor¹⁴, the first draft of the questionnaire tested included a series of fact-based scientific questions. It quickly became apparent that such questions were not very well suited to a global study of this scale,

where a majority of people did not seem to understand the scientific terms in local languages, and equally importantly, people were uncomfortable – and sometimes even irritated – by being asked 'test-like' questions.

Instead, we asked people to rate their own knowledge of science. While also imperfect as a measure, self-assessed knowledge is relevant as people sometimes behave or form opinions on the basis of what they think they know, rather than what they actually know, and the two are sometimes correlated fairly well. Past research has found that measures of such 'subjective knowledge' reflect a person's confidence or comfort with the subject, which can be important in shaping other attitudes¹⁵.

Perceived knowledge of science

Globally, around four in ten people say they know 'a lot' or have 'some' knowledge about science

When asked to describe how much they personally know about science, slightly over four in ten people (43%) said they knew 'a lot' or had 'some' knowledge about science (37% said they had 'some' knowledge and 6% said they knew 'a lot' about science). Another 32% said they knew 'not much' about science, while a quarter said they knew 'nothing at all' or said they did not know. These results vary widely by country, with people in high-income countries tending to rate their knowledge more highly than people in lower-income countries (see Chart 2.3).

Nine countries included in the study were especially confident in their knowledge of science, with over seven in ten people saying they knew 'some' or 'a lot' about science. These countries include: the US (79%), Turkmenistan (78%), Norway (77%), Denmark (75%), Armenia (71%), Canada (71%), France (71%), Germany (71%) and Luxembourg (71%). Meanwhile, at the other end of the confidence spectrum, there were two countries where less than a fifth of the population said they knew 'some' or 'a lot' about science, including Sierra Leone (17%) and Rwanda (9%).

Chart 2.3: Map of perceived knowledge about science by country

Percentage of people who answered 'a lot' or 'some'.

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?

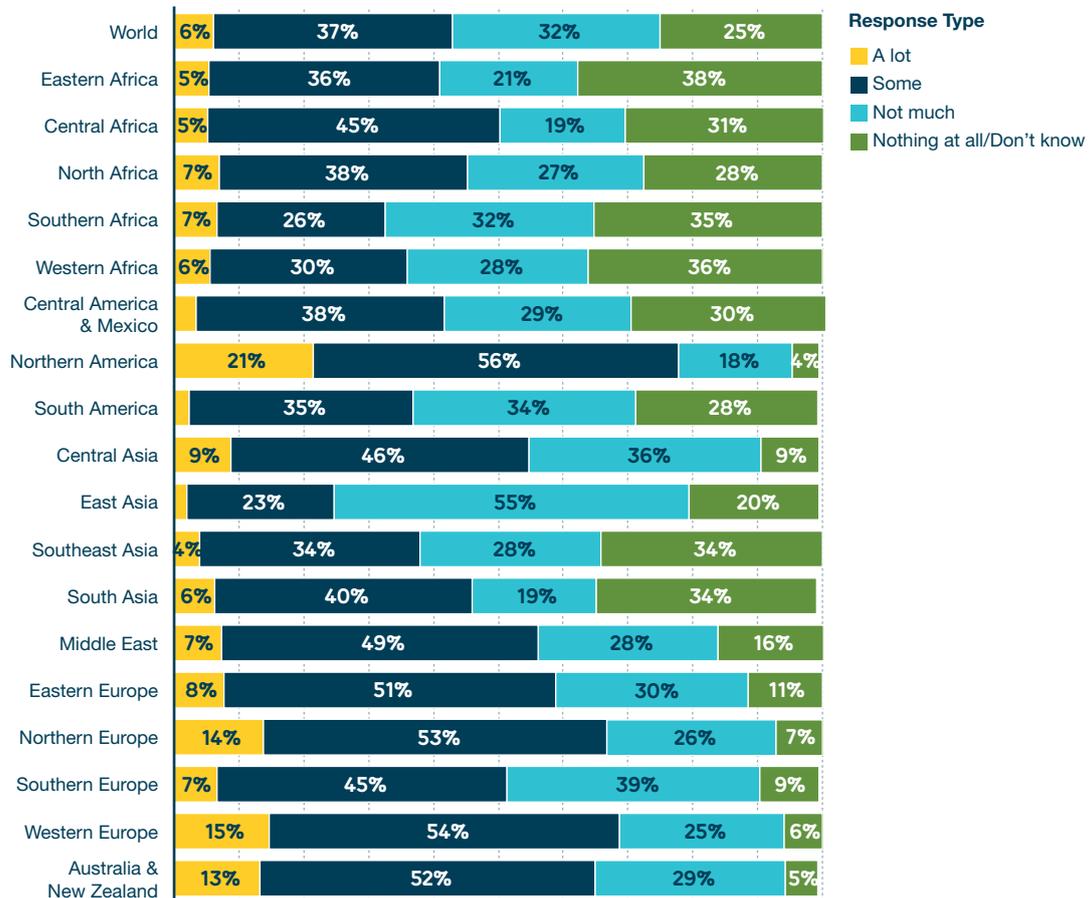


Regionally, people in Northern America are most likely to say they know 'some' or 'a lot' about science at 77%, followed by those in Northern Europe (67%), Australia and New Zealand (65%) and Western Europe (59%). People in East Asia (25%), Southern Africa (33%), and Western Africa (36%) are least likely to claim this level of scientific knowledge.

Chart 2.4: Perceived knowledge about science by region

Percentage of people who answered 'a lot', 'some', 'not much' or 'nothing at all/don't know'.

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?



Perceived self-assessed scientific knowledge also varies according to a country's income level – though the primary difference is between high-income countries and all the other groups. Slightly more than six in ten people who live in a country designated by the World Bank as high income say they know 'some' or 'a lot' about science (62%), compared to 39% of those living in other countries.

Young people rate their science knowledge more highly in nearly all regions

Worldwide, 53% of people aged 15–29 say they know 'some' or 'a lot' about science, compared to 40% of those aged 30–49 and 34% of those aged 50 and older. This general pattern applies to nearly every region in the study, with younger people being more likely than their elders – especially those aged 50 and older – to say they have at least 'some' knowledge about science.

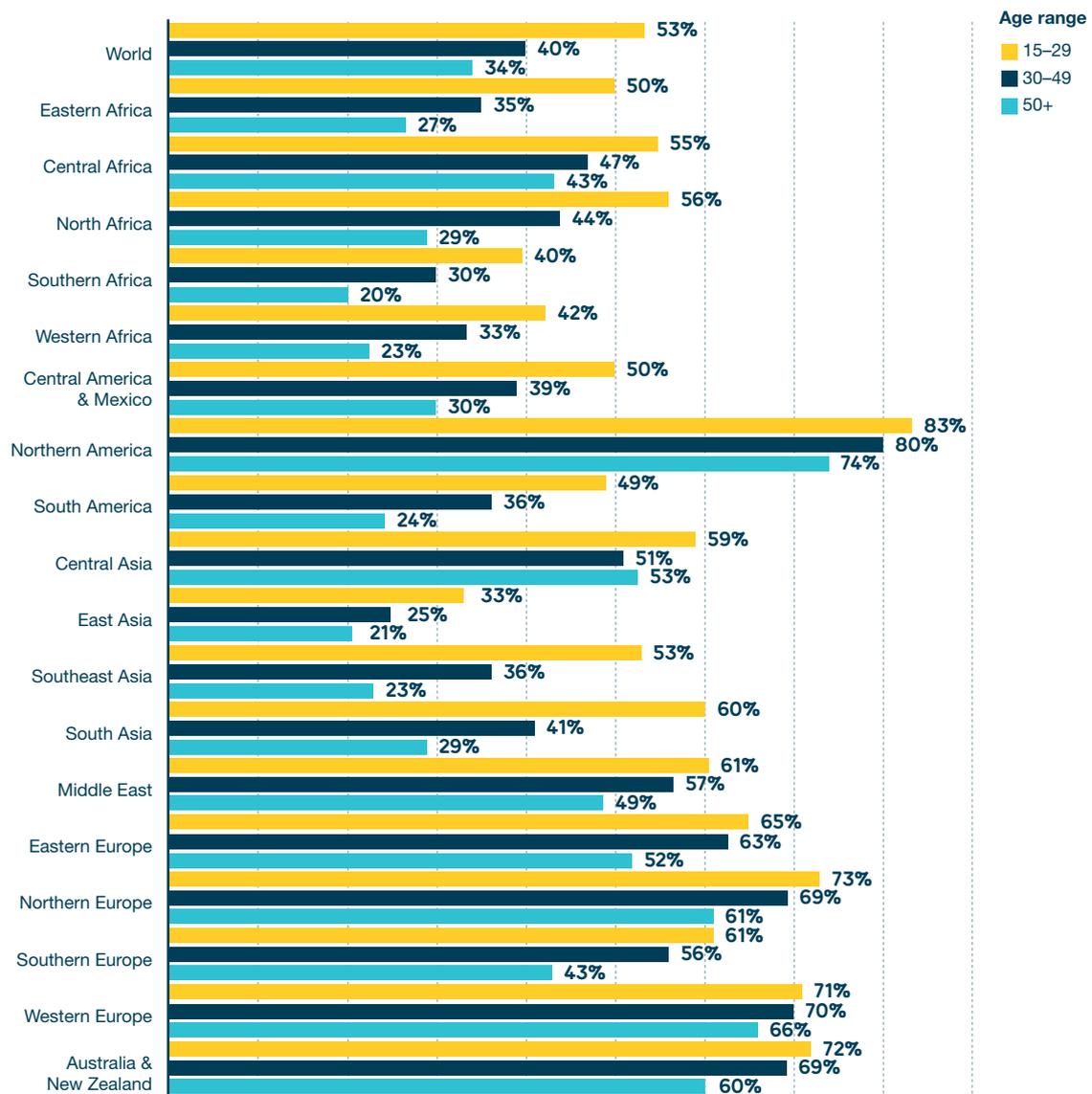
Most people aged 15–29 rate their knowledge of science positively (having 'some' or 'a lot' of knowledge) in 12 of the 18 regions, including lower-income areas like North Africa or Central Africa (56% and 55% respectively).

One possible reason for this age-related gap in how different age groups rate their knowledge of science is the fact that young people tend to be more educated than those who are older; they are also more likely to have learned science while at school. Globally, 69% of people aged 15–29 have completed at least secondary education, compared to 55% of those aged 30–49 and 40% of people aged 50 or older. Over nine in ten young people (93%) said they learned science while at school, compared to a slightly lower 88% for those aged 30–49 and 80% for people aged 50 or older.

Chart 2.5: Perceived knowledge about science by region and age group

Percentage of people who answered 'a lot' or 'some'.

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?



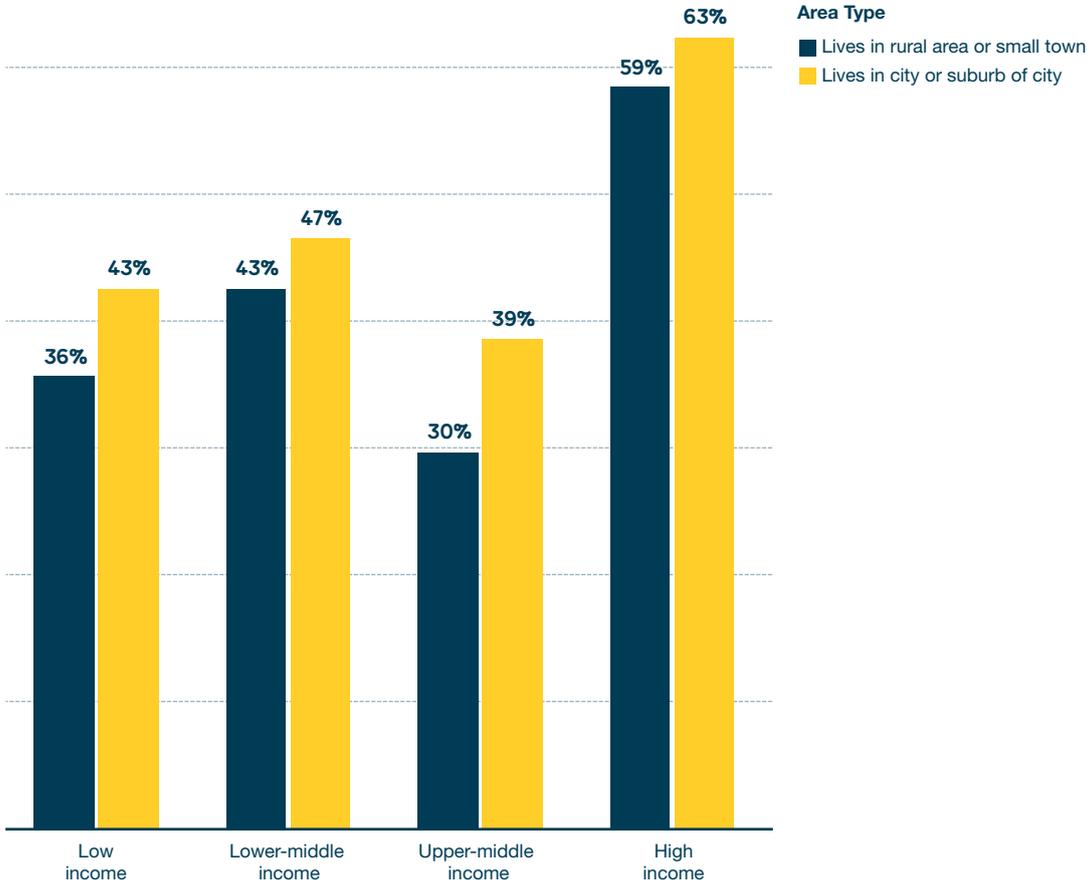
Among those people who did learn science at school, younger people may have greater confidence in their level of scientific knowledge as it is a more recent experience. This could be one of the reasons why young people are more likely to say they know 'some' or 'a lot' about science compared to older people who also learned about science at school: 58% of people aged 15–29 said they had at least 'some' knowledge about science, compared to 49% of those aged 30–49 and 47% of those aged 50 or older.

Perceived self-assessed knowledge also differs if a person lives in or around an urban area or not, with those in such areas more likely than others to say they know 'a lot' or 'some' about science (see Chart 2.6). Generally speaking, some research suggests that educational provision and its quality may be more variable in rural areas¹⁶.

Chart 2.6: Perceived knowledge about science by type of residential area and country-income

Percentage who say they know ‘a lot’ or ‘some’.

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?



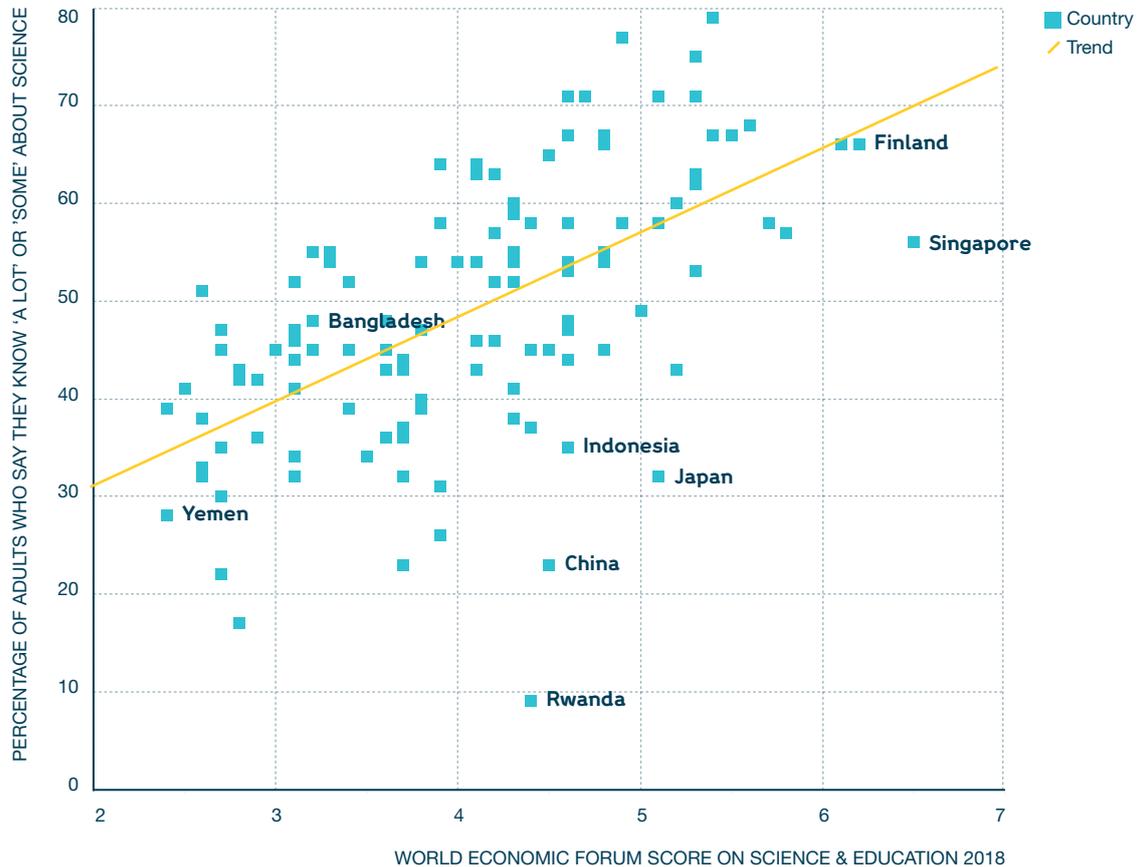
People with more education report higher levels of science knowledge

Though prior research has shown that self-assessed knowledge is not always a reliable indicator of actual knowledge,^{17,18} the Wellcome Global Monitor’s results show a strong relationship between this item and educational attainment, as well as with an indicator of perceived quality of education systems.

For example, the World Economic Forum (WEF) Global Competitiveness Index¹⁹, asks executives across industries and countries: ‘In your country, how would you rate the quality of math and science education?’ on a 1–7 scale, where 1 means ‘extremely poor’ and 7 means ‘excellent’. In Chart 2.7, scores for 124 countries are plotted against the percentage of people in each country who say they know ‘some’ or ‘a lot’ about science.

Chart 2.7: Scatterplots exploring people's perceived science knowledge by leaders' ratings of science and maths education

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?



Wellcome Global Monitor, Part of Gallup World Poll 2018, World Economic Forum Global Competitive Index

The two measures appear to be positively related, with a correlation of around 0.60 at the country level. Among countries with higher WEF scores on science and maths education, people are more likely to say they know 'some' or 'a lot' about science. In cases where the two indicators diverge, the results invite further exploration of how factors specific to a given country or region influence people's perceptions of their own knowledge. The data from East and Southeast Asia may offer further evidence that supports the research^{20,21} that finds that a cultural emphasis on modesty makes people less likely to claim a high level of science knowledge even in countries where WEF ratings suggest maths and science education is relatively strong.

Moreover, personal educational attainment is strongly linked to how people assess their own knowledge of science. Among people worldwide with eight or fewer years of formal education, fewer than one in four (22%) say they know 'some' or 'a lot' about science. That figure rises sharply to 57% among those with 9 to 15 years of education and 71% among those with 16 years of education or more. Notably, even in the highest education group – those with a college-level education – only about one in five (19%) feel they know 'a lot' about science.

Box 2.4: Rwanda: expanding education and self-assessed science knowledge

The relatively low number of Rwandans who claim at least some science knowledge relative to the country's current WEF education score (see Chart 2.7) may in part reflect the government's concerted efforts over the last decade to expand access to education for all.²² UNICEF reports that Rwanda had, as of 2016, achieved the Millennium Development Goal of universal primary education, and the 2018 Gallup World Poll found that, of the 35 countries surveyed, Rwanda boasts the highest proportion of people who are satisfied with the schools in their area, at 81%.

The Wellcome Global Monitor finds that self-assessed science knowledge is higher among the youngest Rwandans, those most likely to have benefited from the country's recent education expansion, though young people worldwide tend to rate their knowledge of science more positively than older individuals (see Chart 2.5). Rwandans aged 15 to 24 are more likely than those aged 25 and older to say they know 'some' or 'a lot' about science – 14% compared to 7% respectively. The gap is more striking with regard to those who say they know 'nothing at all' about science – 26% of Rwandans aged 15 to 24 respond this way, compared to 45% of those aged 25 and older.



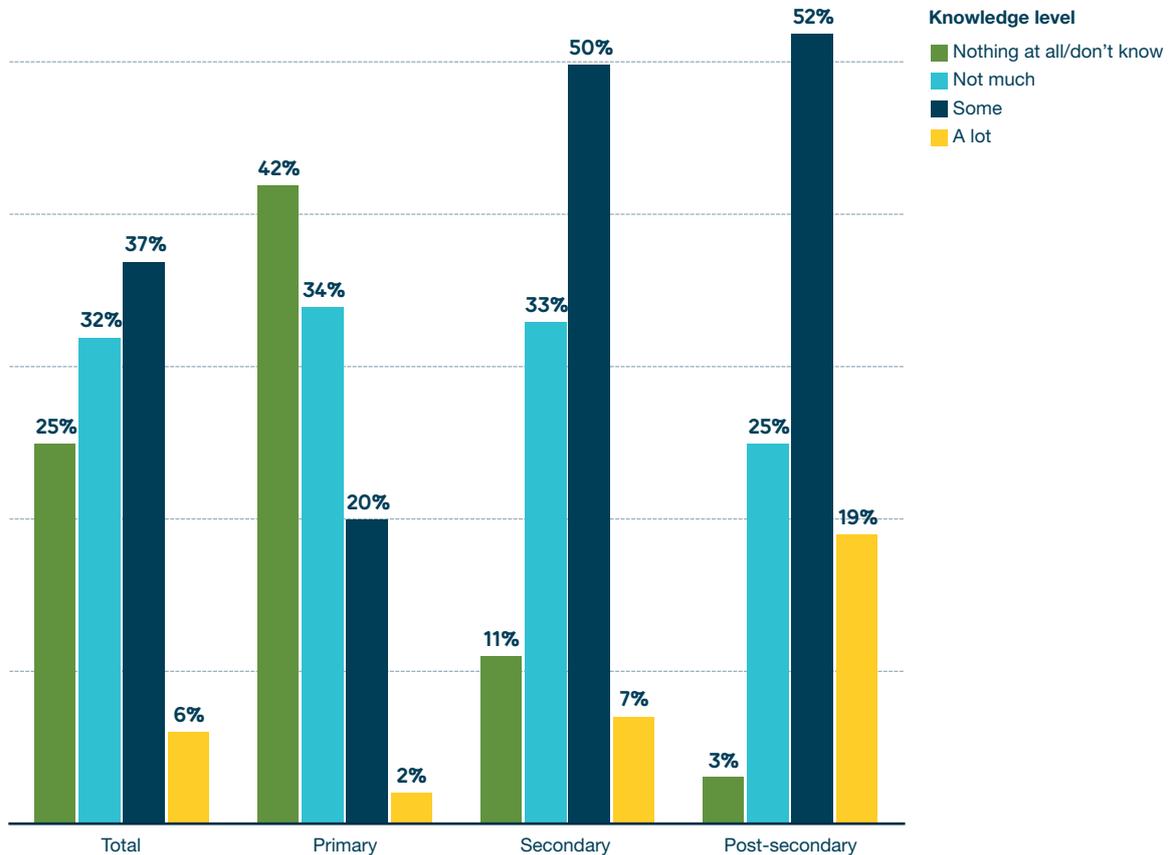
A group of excited children coming home from school. Jenny Matthews/Panos

Chart 2.8: Perceived knowledge about science by level of education

Global results.

Percentage of people who answered 'a lot', 'some', 'not much', 'not at all' or 'don't know/refused'.

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?



Lower-income countries lag in educational exposure to science

Slightly fewer than 8 in 10 people (77%) worldwide say they learned about science in school. People in low-income countries generally have lower rates of educational attainment; even so, six in ten said they learned science at school. That figure rises steadily among higher-income country groups, from 71% in lower-middle-income countries to 79% in upper-middle-income countries, to 91% in the high-income country group.

Chart 2.9: People who learned science at school, by country-income level

Percentage of people who say they learned 'a lot' or 'some' science at school.

Have you, personally, ever learned about science at primary school, secondary school, college or university?

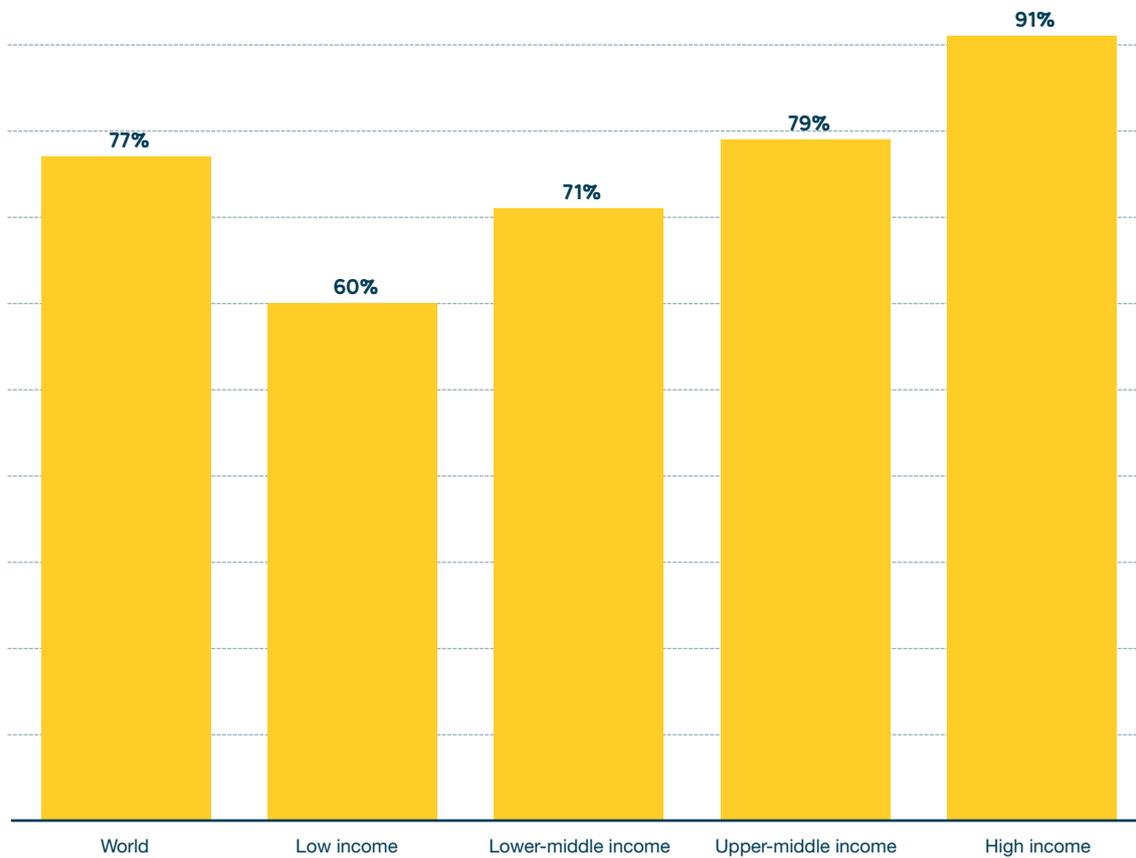
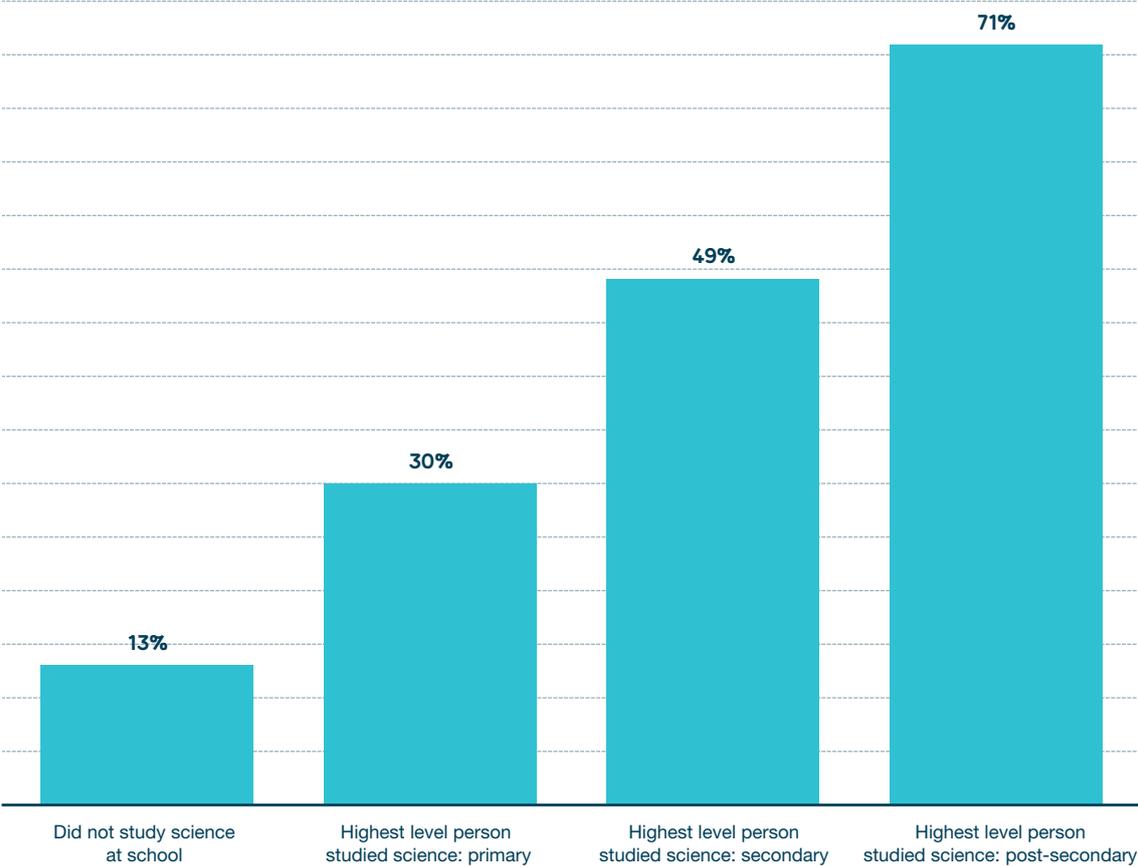


Chart 2.10: Perceived knowledge about science by exposure to science in school

Percentage of people who say they know ‘a lot’ or ‘some’ about science by level of science education.

*How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?
Have you, personally, ever learned about science at primary school, secondary school, college or university?*



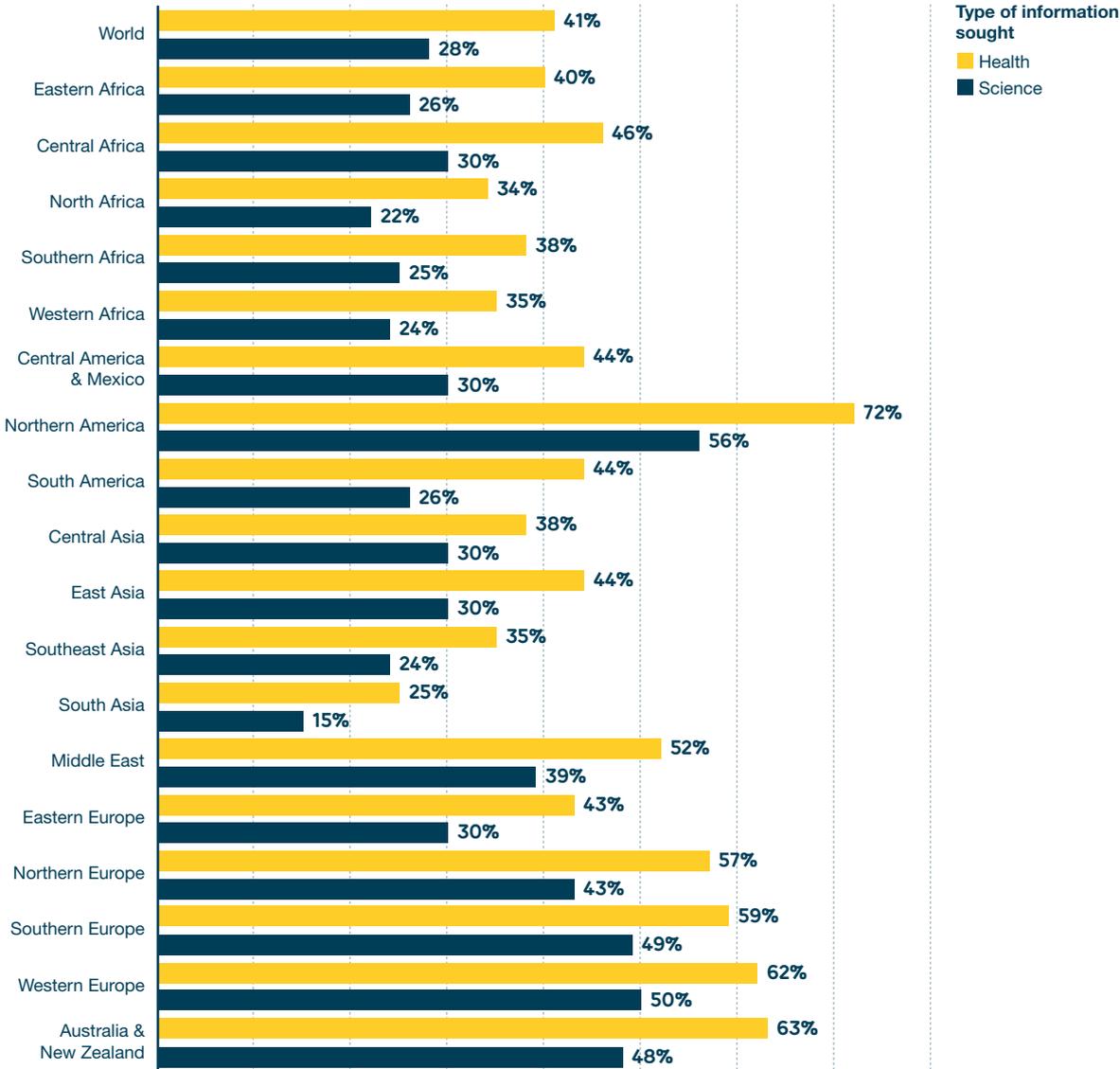
People’s assessments of their own science knowledge are also strongly related to the extent to which they have studied science at school. Among those who either did not study science at school or were not sure, fewer than one in five worldwide (13%) said they knew ‘a lot’ or ‘some’ science. Among those who learned science at the primary school level only, 30% said they knew ‘some’ or ‘a lot’ about science; for those who learned science at the secondary level and no higher, 49% said they knew ‘some’ or ‘a lot’ about science. Nearly three-quarters of people who learned science at the college or university level (71%) said they knew at least ‘some’ about science.

Chart 2.11: People seeking health or science information by region

Percentage of people who answered 'yes'.

Have you, personally, tried to get any information about science in the past 30 days?

Have you, personally, tried to get any information about medicine, disease or health in the past 30 days?



Science and health information seeking

People are significantly more likely to seek health over science information

At the global level, people are significantly more likely to have sought out health information than science information in the past month, at 41% compared to 28%.

The finding that people are likely to seek health information more than science information is consistent with past research on the topic.²³

People are more likely to seek science information the more highly they rate their own knowledge of science

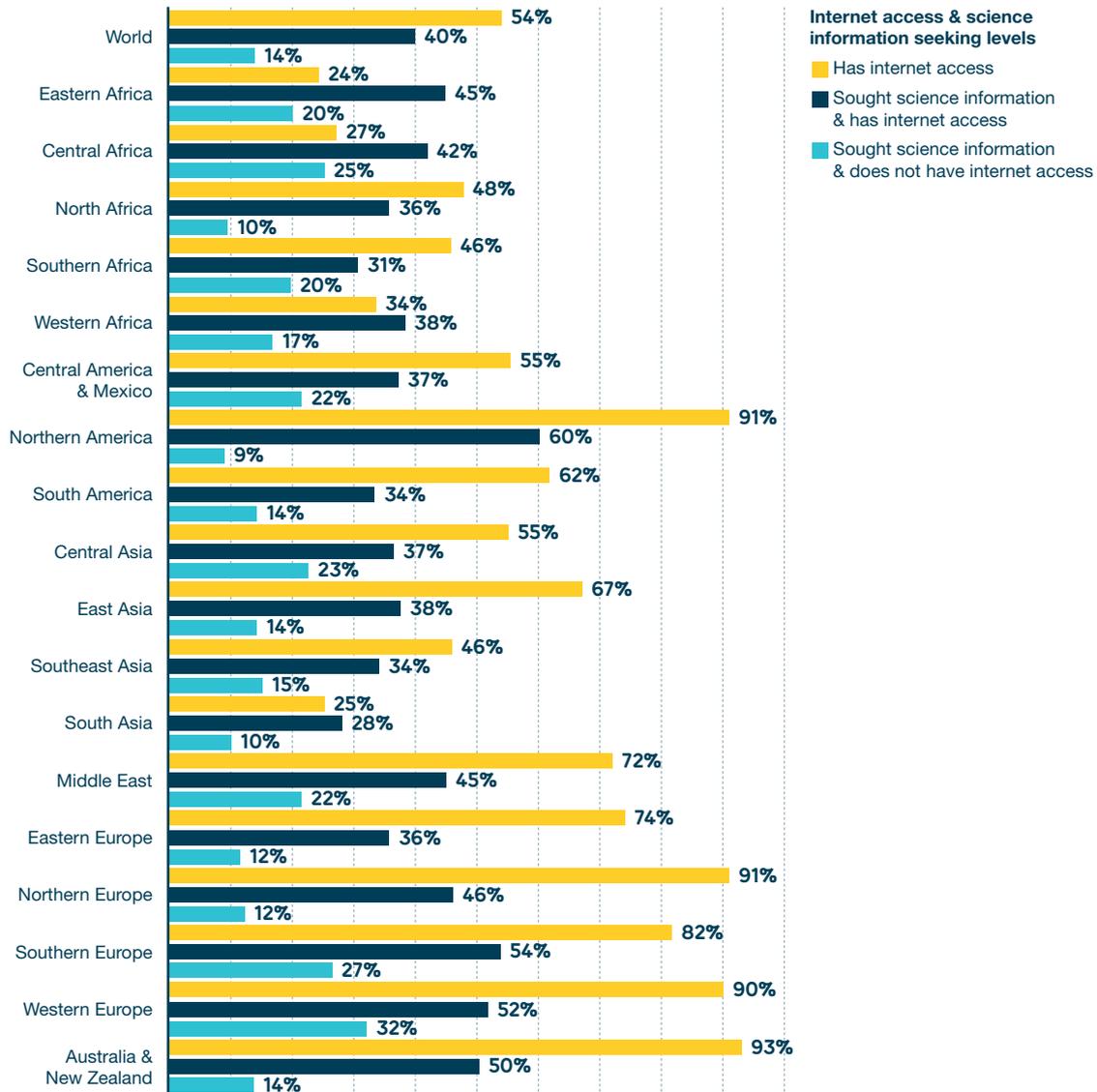
The likelihood that an individual has sought science information is strongly related to their self-assessed knowledge of science, as well as the extent to which they studied science in school. Two-thirds (67%) of those who indicated they knew 'a lot' about science say they had recently sought information about a science-related topic, as had 56% of those who said they learned science during their college or university years.

Chart 2.12: People seeking science information by region and internet access

Percentage of people who answered 'yes'.

Have you, personally, tried to get any information about science in the past 30 days?

Do you have access to the Internet in any way, whether on a mobile phone, a computer, or some other device?



People with internet access are more likely to have recently sought science or health information

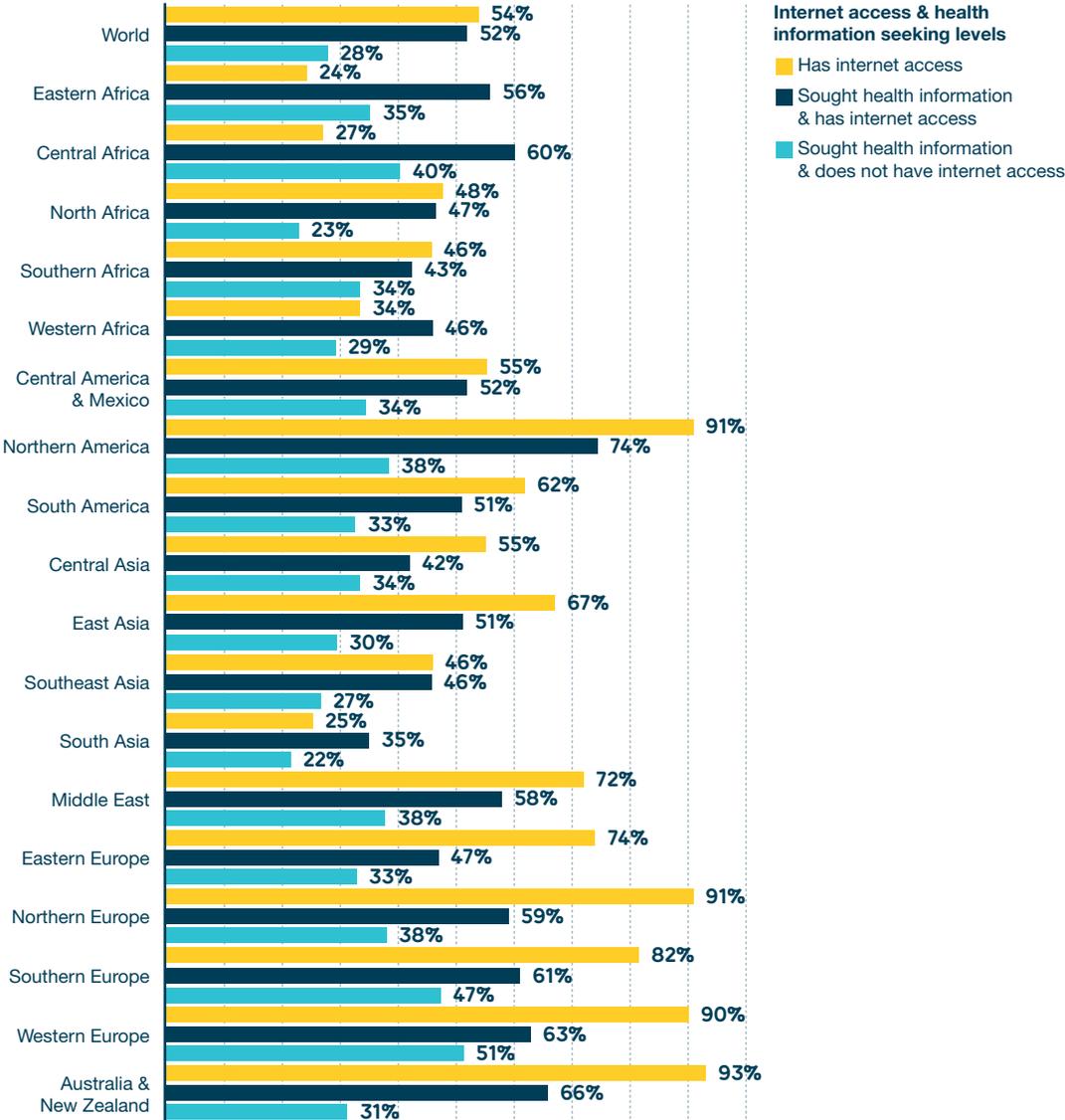
Access to the internet appears to be an important factor enabling a person to seek information on science and health. As part of the Gallup World Poll, people are asked if they personally have access to the internet; as Chart 2.12 shows, people in all regions who have internet access are far more likely than those who do not have access to the internet to have sought science information in the past 30 days.

There is a similar internet access gap when looking at the corresponding question on information about medicine, disease or health. Worldwide, 52% of people with access to the internet say they have tried to get such information in the past 30 days, compared to 28% of those without internet access.

Chart 2.13: People seeking health information by region and internet access

Percentage of people who answered 'yes'.

*Have you, personally, tried to get any information about medicine, disease or health in the past 30 days?
Do you have access to the Internet in any way, whether on a mobile phone, a computer, or some other device?*



Interest in learning more about science and health

Worldwide, most people express interest in learning more about science and health, especially in lower-income regions

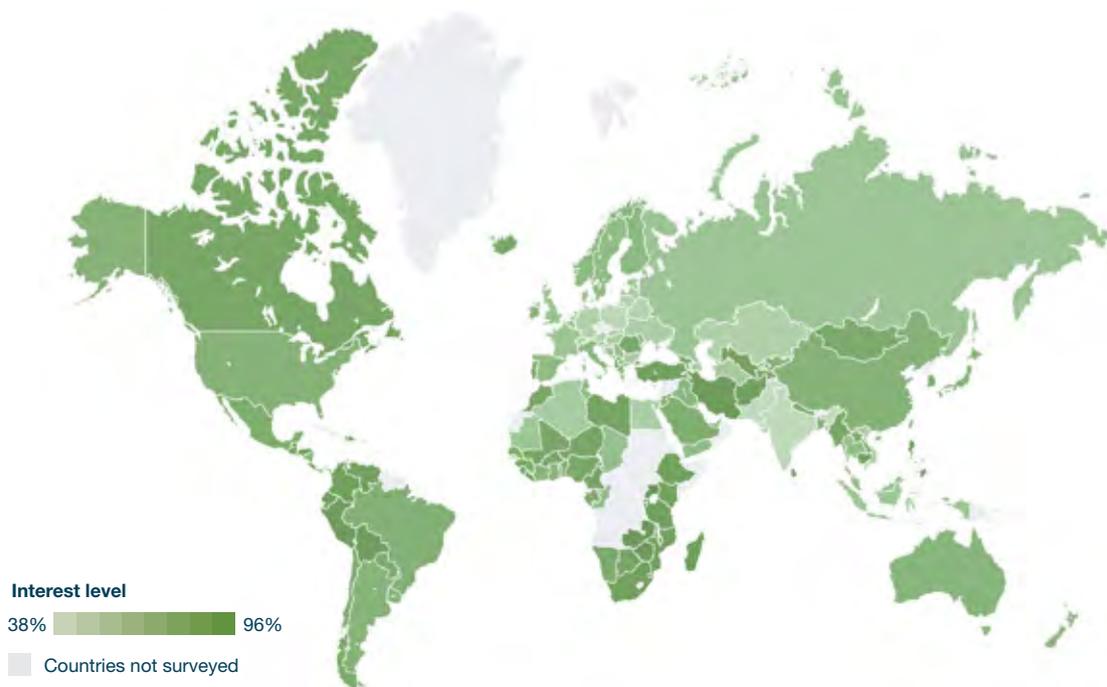
The Wellcome Global Monitor also asks people whether they are interested in learning more about science and health; these items depend less on the overall ease with which people can access information (through the internet or otherwise). At the global level, 62% of people

say they are interested in learning more about science, while 72% are interested in learning more about health. Chart 2.14 presents country-level results for interest in health, which ranges from a high of 96% in Uganda and The Gambia to a low of 38% in the Czech Republic. While further research is needed to understand exactly why so many people are interested in learning more about health, some research^{24,25} suggests that this is related to information that is directly personally relevant for either preventative or curative purposes relating to health and disease.

Chart 2.14: Map of interest in knowing more about medicine, disease or health by country

Percentage of people who answered 'yes'.

Would you, personally, like to know more about medicine, disease or health?



People in almost every country included in the study are more likely to say they would like to learn more about science or health than they are to say they have tried to get information about these topics in the past 30 days (the only exceptions are Germany and Switzerland, where the two percentages are similar).

Comparing results from these items worldwide gives some idea of the countries and regions where there is a considerable gap between the percentage of people who said they want to learn more about science and the percentage of people who said they recently sought information about science.

In many countries, people are more likely to express interest in science than to seek information about it

In Chart 2.15, countries in the lower right quadrant are those in which people are more likely than the global average to want more science information but less likely than average to have sought it out. Most are populations with low average formal education levels, living in information-poor environments, such as Madagascar, Tanzania, Cambodia, The Gambia and Burundi. ‘Social desirability’²⁶ effect notwithstanding, the results indicate that in many countries where people currently have relatively low access to science education, they are nonetheless interested in learning more about science. In addition, it may be the case that as people were being interviewed about a subject they knew relatively little about, the ‘engagement’ effect of being interviewed about the topic may have encouraged some people to say that they were interested in learning more about it.

Chart 2.15: Scatterplot exploring interest in science by those who have sought information

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?

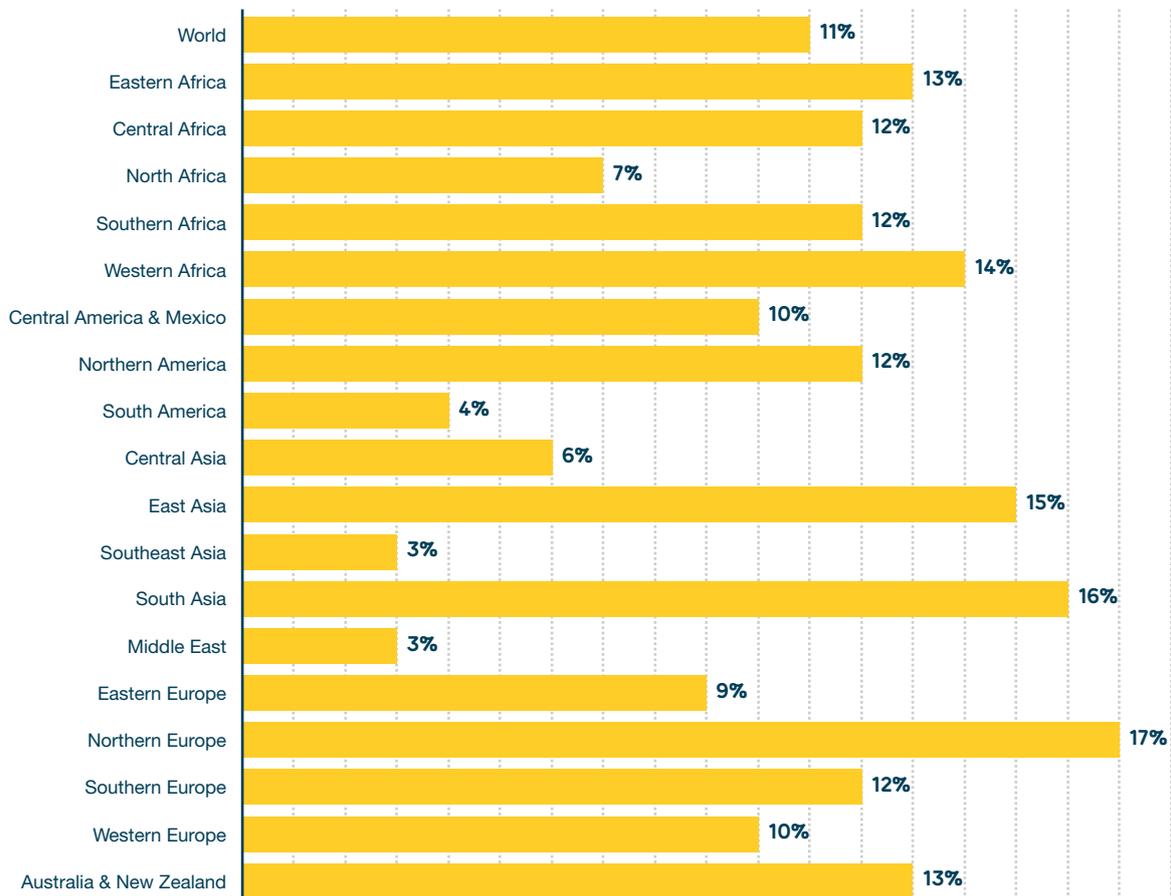


Wellcome Global Monitor, Part of Gallup World Poll 2018, World Economic Forum Global Competitive Index

Chart 2.16: Differences in perceived knowledge of science between men and women by region

Percentage point difference in answering 'a lot' or 'some' between men and women.

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?



Special focus: gender differences in perceived science knowledge and education

An increasingly important challenge facing the scientific community is whether both women and men are able to engage equally in science, or if women face barriers that men do not²⁷. This section will focus on gender differences in perceived self-assessed scientific knowledge, educational exposure to science, as well as accessing information on science and health.

Men are significantly more likely than women to say they know 'some' or 'a lot' about science

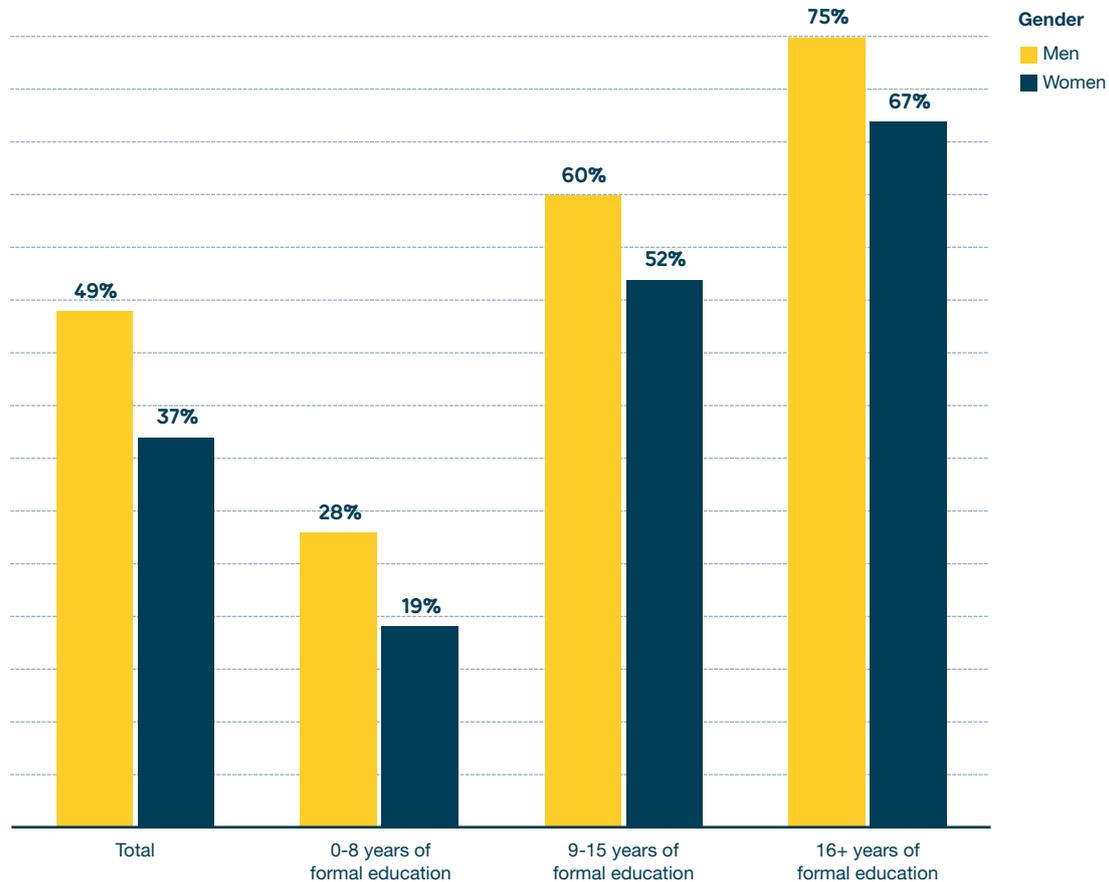
In nearly every region of the world, men are significantly more likely than women to say they know 'some' or 'a lot' about science. At 17 points, this gap is largest in Northern Europe, where 75% of men say they know at least 'some' science versus 58% of women there who say the same. Other regions with a sizeable gender gap in perceived knowledge of science include South Asia (16 points), East Asia (15 points), Western Africa (14 points) Australia and New Zealand (13 points) and Eastern Africa (13 points).

The gender gap in self-assessed knowledge is negligible in just three areas – the Middle East (gap of just 3 points), South America (a 4-point gap) and Southeast Asia (a 3-point gap).

Chart 2.17: Perceived knowledge of science by gender and level of education

Percentage of people who answered, 'a lot' or 'some' across all countries.

How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?



Gender gap in self-assessed science knowledge persists even across education groups

The gender gap in self-assessed science knowledge persists even when accounting for educational attainment. Overall, 49% of men worldwide say they know 'some' or 'a lot' about science, compared to 38% of women. Looking at the data by education narrows this gap somewhat, but in each group, women remain significantly less likely than men to say they know 'some' or 'a lot' about science.

One possible explanation is that social biases in some countries lead girls to have less exposure than boys to science classes and programmes in school²⁸. However, the Wellcome Global Monitor does not offer

support for this idea; among people worldwide in the upper two education categories, women are not meaningfully less likely than men to say they learned about science in school. The gap is minor even among those with post-secondary education; 79% say they learned about science in college – including 80% of men and 77% of women.

Given the lack of major differences in science education, other explanations for women's lower likelihood to say they have at least 'some' knowledge about science compared to men may be related to other factors, such as social norms or levels of relative self confidence (ie can be men over confident, not just women under confident)²⁹.

Table 2.2: Reported levels of science education by levels of general education and gender

Percentage of people who said they learned about science in secondary school and college/university.

Have you, personally, ever learned about science at primary school, secondary school, college or university?

	9 to 15 years education			16 or more years education		
	Total	Men	Women	Total	Men	Women
Learned about science in secondary school	86%	86%	85%	96%	95%	97%
Learned about science at college/university	25%	26%	24%	79%	80%	77%

While women are less likely than men to seek science information, they are just as likely to seek health information

One-third of men globally (32%) say they have sought science information in the past 30 days, compared to about one-quarter of women (24%). This gender gap is present among countries in different regions and at different economic development levels. Regionally, the largest gaps can be found in both high-income regions (62% of men compared to 50% of women in Northern

America, and 53% of men compared to 43% of women in Australia and New Zealand) and low-income regions (37% of men compared to 25% of women in Central America, and 32% of men compared to 20% of women in Eastern Africa).

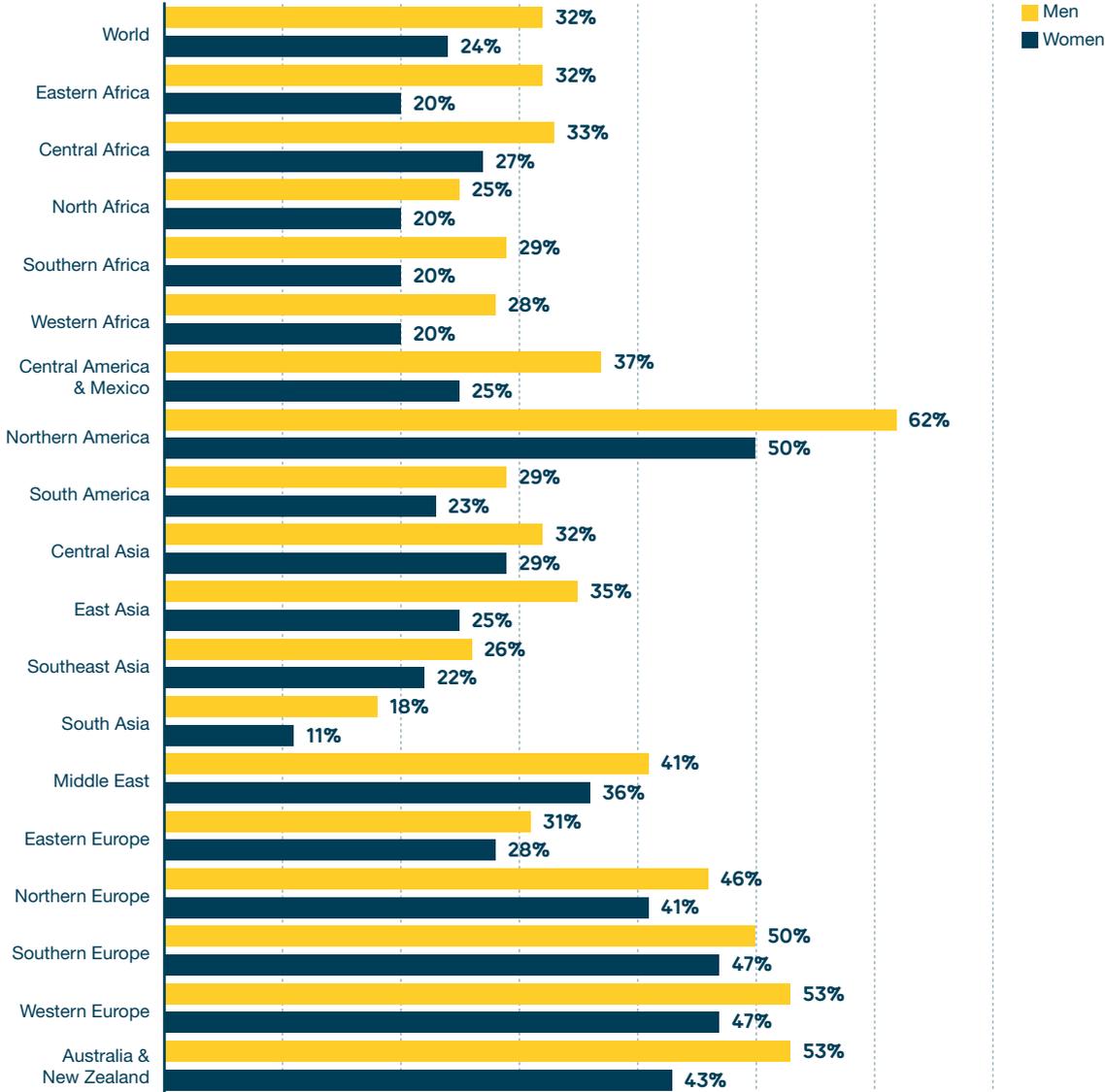
Face to face interview
taking place in
Indonesia.
Gallup 2018



Chart 2.18: People seeking science information by region and gender

Percentage of people who answered 'yes'.

Have you, personally, tried to get any information about science in the past 30 days?

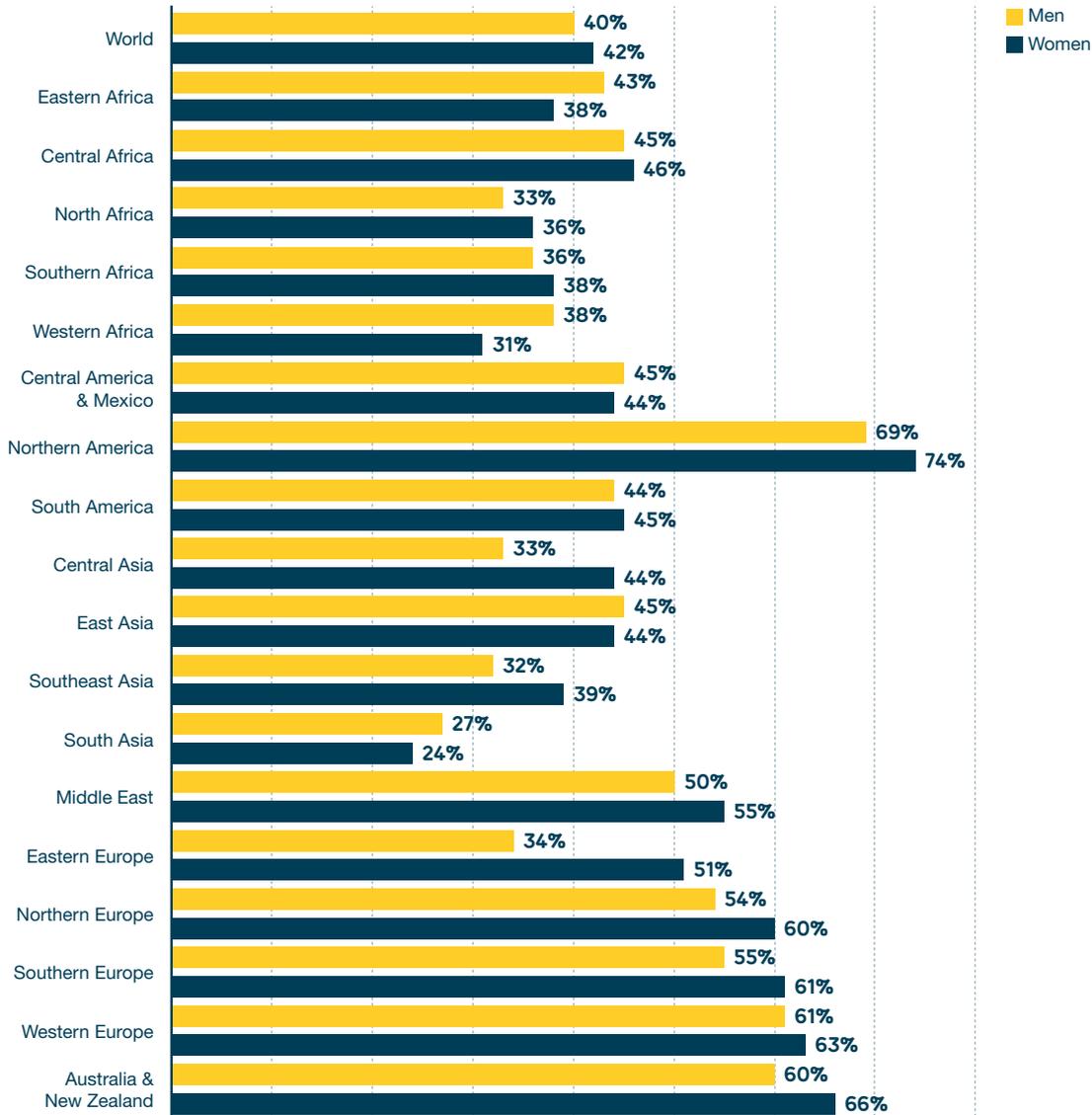


However, there is no significant gender gap in seeking health information. Men and women are similarly likely at the global level to say they have tried to get such information in the past 30 days, at 40% and 42% respectively. As Chart 2.19 shows, the larger regional differences favour women – most notably, 34% of men vs. 51% of women in Eastern Europe.

Chart 2.19: People seeking health information by region and gender

Percentage of people who answered 'yes'.

Would you, personally, like to know more about medicine, disease or health?



Conclusion

Wellcome Global Monitor shows there is an appetite across the world for learning more about science, suggesting engagement activities will usually be widely valued. The benefit of science education also shines through: more education is associated with greater perceived knowledge about science, as well as greater trust in scientists. Younger people, who tend to have had greater (or more recent) access to educational opportunities than older generations, are also more likely than their elders to say they know about science.

As important as education is to knowing about and understanding science, it does not explain all of the variations seen between regions, suggesting that a range of other social or cultural factors also influence how we think about the concept of 'science'. People are more likely to seek information about health than science, which reinforces the need to engage people more with science and research.

Gender differences in how people rate their knowledge and understanding of science are concerning. In nearly every region, men tend to rate their knowledge of science significantly higher than women do, even when they have had the same level of science education. This implies that either men tend to overstate their knowledge or women tend to understate theirs – or both. Does this reflect an entrenched bias in most societies that science is a more 'male' endeavour? What can be learned from those few regions where men and women rate their knowledge more equally? Wellcome Global Monitor cannot answer these questions, but any gender disparity in relation to science will strongly affect who participates in scientific research – and who benefits from it.

Endnotes

- 1 Respondents were asked 'On this survey, when I say 'science' I mean the understanding we have about the world from observation and testing. When I say 'scientists' I mean people who study the Planet Earth, nature and medicine, among other things. How much did you understand the meaning of 'science' and 'scientists' that was just read?'
- 2 Wellcome Global Monitor Questionnaire Development Report: https://wellcome.ac.uk/sites/default/files/wellcome-global-monitor-questionnaire-development-report_0.pdf [accessed 4 June 2019].
- 3 Science Council. Our definition of science. <https://sciencecouncil.org/about-science/our-definition-of-science/> [accessed 24 May 2019].
- 4 Sample I. What is this thing we call science? Here's one definition... Guardian 2009 4 March. <https://www.theguardian.com/science/blog/2009/mar/03/science-definition-council-francis-bacon> [accessed 24 May 2019].
- 5 Wellcome Global Monitor Questionnaire Development Report: <https://wellcome.ac.uk/what-we-do/our-work/wellcome-global-monitor> [accessed 24 May 2019].
- 6 According to the World Bank, gross domestic expenditures on research and development (GERD) 'includes both capital and current expenditures in the four main sectors: business enterprise, government, higher education and private non-profit. R&D covers basic research, applied research and experimental development.'
- 7 The correlation between a country's GERD and the percentage of people who said they understood 'some' or 'all' of the survey-provided definition of science is slightly below 0.5, as measured by Pearson's correlation coefficient. Pearson's correlation coefficient can take a range of values between -1 (indicating a perfect negative linear relationship) and +1 (a perfect positive linear relationship). A value of 0 indicates no relationship. Correlation coefficients between 0.3 and 0.5, as in this case, are generally considered to show a positive relationship of medium strength.
- 8 Liu, et al. Comparing the Public Understanding of Science across China and Europe. In Bauer MW, et al, eds. *The Culture of Science: How the Public Relates to Science Across the Globe*. London: Routledge; 2012.
- 9 UNESCO. UNESCO Science Report, Towards 2030: Executive Summary. Paris: UNESCO; 2015. <https://unesdoc.unesco.org/ark:/48223/pf0000235407> [accessed 16 May 2019].
- 10 Raina, D. Revisiting Social Theory and History of Science in Early Modern South Asia and Colonial India. *Extrême-Orient Extrême-Occident* 2013;36:191–210.
- 11 Khan GJ, et al. Alternative medicine; the tendency of using complimentary alternative medicine in patients of different hospitals of Lahore, Pakistan. *Professional Med J* 2014;21(6):1178–84.
- 12 The Wellcome Global Monitor asked 'How much do you trust each of the following? Traditional healers in this country? Do you trust them a lot, some, not much, or not at all?'. The results of this question are discussed in Chapter 3 of this report.
- 13 Entradas M. Science and the public: The public understanding of science and its measurements. *Portuguese Journal of Social Science* 2015 14(1), 71–85.
- 14 Wellcome Global Monitor Questionnaire Development Report: <https://wellcome.ac.uk/what-we-do/our-work/wellcome-global-monitor> [accessed 24 May 2019].
- 15 Shukla R, Bauer MW. Construction and Validation of Science Culture Index: Results from Comparative Analysis of Engagement, Knowledge and Attitudes to Science: India and Europe. NCAER Working Papers 100. National Council of Applied Economic Research 2009 http://www.ncaer.org/publication_details.php [accessed 24 May 2019].
- 16 Othman M, Muijs D. Educational quality differences in a middle-income country: the urban-rural gap in Malaysian primary schools. *School Effectiveness and School Improvement* 2013;24(1):1–18.



Face to face interview taking place in Nepal.
Gallup 2018

- 17 Nguyen T, et al. The effects of perceived and actual financial knowledge on regular personal savings: Case of Vietnam. *Journal of International Studies* 2017;10(2):278–91.
- 18 Radecki CM, Jaccard J. Perceptions of Knowledge, Actual Knowledge, and Information Search Behavior. *Journal of Experimental Social Psychology* 1995; 31:107–38
- 19 World Economic Forum. The Global Competitiveness Report 2018. World Economic Forum: 2018. <https://www.weforum.org/reports/the-global-competitiveness-report-2018> [accessed 24 May 2019].
- 20 Kurman J. Why is Self-Enhancement Low in Certain Collectivist Cultures?: An Investigation of Two Competing Explanations. *Journal of Cross-Cultural Psychology* 2003;34:496–510. http://iaccp.org/sites/default/files/kurman_2003_0.pdf [accessed 24 May 2019].
- 21 Heine SJ, et al. Is there a universal need for positive self-regard? *Psychological Review* 1999;106(4):766–94. <https://www.ncbi.nlm.nih.gov/pubmed/10560328> [accessed 24 May 2019].
- 22 UNICEF. Rwanda: Education. <https://www.unicef.org/rwanda/education.html> [accessed 24 May 2019].
- 23 Bromme R, Goldman SR. The Public's Bounded Understanding of Science. *Educational Psychologist* 2014;49(2):59–69.
- 24 Chu JT, et al. How, When and Why People Seek Health Information Online: Qualitative Study in Hong Kong. NCBI, US National Library of Medicine, National Institutes of Health; 2017.
- 25 Jacobs W, et al. C Alvares (Reviewing Editor) Health information seeking in the digital age: An analysis of health information seeking behavior among US adults. *Cogent Social Sciences* 2017; 3(1).
- 26 Lavrakas PJ. *Encyclopedia of survey research methods*. Thousand Oaks, CA: Sage Publications, Inc; 2008. doi: 10.4135/9781412963947 <http://methods.sagepub.com/reference/encyclopedia-of-survey-research-methods/n537.xml> [accessed 24 May 2019].
- 27 Scientific American. How to Fight Race and Gender Bias in Science [Editorial]. *Scientific American* 2014;311(4):12 <https://www.scientificamerican.com/article/how-to-fight-race-and-gender-bias-in-science-editorial/> [accessed 24 May 2019].
- 28 Feeney MK. Why more women don't win science Nobels. *The Conversation* 2018 6 October. <http://theconversation.com/why-more-women-dont-win-science-nobels-104370> [accessed 24 May 2019].
- 29 Notably, previous measures of scientific knowledge have found that women are more likely than men to say they do not know the answer to specific questions about scientific facts, controlling for education levels and other potentially confounding factors. Bauer M, Falade, BA. *Public Understanding of Science Survey Research Around the World*. In M Bucchi, B Trench. *Routledge Handbook of Public Communication of Science and Technology*. London: Routledge; 2008. 111–30

Women working at the Sanitary Pad Unit
on the Amgoorie Tea Estate in Assam, India.
Abbie Trayler-Smith/Panos



Trust in Science and Health Professionals



Chapter 3: Trust in science and health professionals

Introduction

The work of research scientists and health professionals profoundly impacts upon the public's ability to lead good and healthy lives. Public involvement and trust in science and health is important so that we can be sure that the work that scientists do reflects the needs and priorities of society, and in so doing, this work is valued and trusted by the public.

People's attitudes to science are a product of a set of complex interrelated individual and societal factors^{1,2,3}, which were summarised in Chapter 1. This chapter focuses on an essential part of attitudes to science: trust in science, scientists, and healthcare professionals.

Summary:

- Globally, 18% of people have a high level of trust in scientists, while 54% have a medium level of trust, and 14% have low trust. The remaining 13% of people have no opinion about how much they trust scientists in their respective countries. This ranges from a third of people having 'high' trust in Australia and New Zealand, Northern Europe and Central Asia to around one in ten in Central and South America.
- The two main factors associated with a person's level of trust in scientists are learning science at school or college and confidence in key national institutions (such as the government, the military and the judiciary). All other things being equal, people who have studied science at school are more likely to trust scientists, as are people who have confidence in key national institutions.
- However, the statistical analysis was able to explain only 15% of the variation in people's trust in scientists, even when controlling for a number of factors, including personal background (gender, income, etc.) and other key variables.
- Other factors that are significantly associated with trust in scientists include where a person lives (rural or urban area), how people feel about their income and access to a personal telephone and the internet. All other things being equal, people who live in rural areas are more likely to trust scientists than people living in an urban area or a small town or village; as are those who feel comfortable on their present income and who have access to mobile phones and the internet.
- Perceptions of trust towards scientists are linked with an important social and economic trend affecting many countries throughout the world – rising income inequality. More economically unequal societies tend to have lower trust in scientists, even after controlling for a country's wealth or development status, a statistical analysis shows.
- Globally, 73% of people say they would trust a doctor or a nurse more than several other possible sources of health advice, including family, friends, religious leaders or famous people. This figure ranges from a low of 65% in East Asia and the Middle East, to a high of nearly 90% in Northern Europe, Southern Europe, Northern America and Australia and New Zealand. There are few differences in trust in doctors and nurses when considering key demographics, such as age, gender and education.
- People in high-income countries are about as likely to have confidence in hospitals and health clinics in their country as lower-middle-income countries (78% and 82% respectively).
- Personal household income may be a more important factor in shaping confidence in hospitals and health clinics than national income. People who say they find it difficult to get by on their present income are notably less likely to say they have confidence in their country's hospitals and health clinics.
- Worldwide, more than eight in ten people (84%) say they trust medical and health advice from medical workers (such as doctors and nurses) but this decreases to 76% for trust in that same advice from the government.

Box 3.1: Main research topics addressed in this chapter

4. To what extent do people trust scientists and the work that scientists do? How does trust vary on a regional or country-by-country basis?
5. What demographic characteristics (such as gender, age, education level, etc.) or other factors influence people's trust in scientists?
6. How does trust in scientists fare compared to trust in other societal institutions, such as government, the media and the people who live in the same neighbourhood?
7. What is the current state of trust in doctors and nurses in different parts of the world? Who would people trust the most to give them health and medical advice?
- 15a. How much do you trust scientists working for companies in this country to be open and honest about who is paying for their work?
21. In general, how much do you trust medical and health advice from medical workers, such as doctors and nurses, in this country?
- 10b. In (country name), do you have confidence in hospitals and health clinics?
11. How much do you trust each of the following? Do you trust them a lot, some, not much, or not at all? How about – the people in your neighbourhood, the national government in this country, scientists in this country, journalists in this country, doctors and nurses in this country, people who work at charitable organisations/ NGOs in this country, traditional healers [or local equivalent] in this country?

Wellcome Global Monitor questions examined in this chapter

11. How much do you trust scientists in this country?
13. In general, how much do you trust scientists to find out accurate information about the world?
- 14a. How much do you trust scientists working in colleges/universities in this country to do their work with the intention of benefiting the public?
- 14b. How much do you trust scientists working in colleges/universities in this country to be open and honest about who is paying for their work?
15. How much do you trust scientists working for companies in this country to do their work with the intention of benefiting the public?
20. Which of the following people do you trust most to give you medical or health advice? Your family and friends, a doctor or nurse, a religious leader, a famous person, a traditional healer [or country equivalent], other?
21. In general, how much do you trust medical and health advice that the government gives? A lot, some, not much, or not at all?

The development of a new measure of trust: the Wellcome Global Monitor Trust in Scientists Index

Box 3.1 lists 11 questions that were asked in the Wellcome Global Monitor in reference to various aspects regarding trust in scientists and health sector professionals. Statistical analysis⁴ was used to determine which of those items were most suitable to

develop a composite measure of trust in scientists in each country. Five of those items were determined as the most relevant and were combined to create a composite measure of trust in scientists. A person's overall trust in scientists – or their Index score – is based on how they answered the five questions. Box 3.2 and Appendix A* present more detail about how the index was constructed.

*To read Appendix A: Methodology, please visit [Wellcome.ac.uk/monitor](https://www.wellcome.ac.uk/monitor)

Box 3.2: About the Wellcome Global Monitor Trust in Scientists Index

The Wellcome Global Monitor examines public trust in scientists from several different perspectives. In a series of five questions, individuals are asked to rate how much they trust different aspects or expectations of scientists (see Table 3.1). The Wellcome Global Monitor Trust in Scientists Index, which is a measure of overall trust, is based on how an individual responded to each of these survey items.

Questions about trust in scientists

- How much do you trust scientists in this country?
A lot, some, not much or none at all?
- In general, how much do you trust scientists to find out accurate information about the world?
A lot, some, not much or none at all?
- How much do you trust scientists working in colleges/universities in this country to do their work with the intention of benefiting the public?
A lot, some, not much or none at all?
- How much do you trust scientists working in colleges/universities in this country to be open and honest about who is paying for their work?
A lot, some, not much or none at all?
- How much do you trust scientists working for companies in this country to do their work with the intention of benefiting the public?
A lot, some, not much or none at all?

Table 3.1: Individual questions of Wellcome Global Monitor Trust in Scientists Index

How the Index is Scored:

The Wellcome Global Monitor Trust in Scientists Index is calculated at the individual level, first by scoring the amount of trust a person expressed in each of the underlying survey questions. The response ‘a lot’ of trust was assigned 4 points; ‘some’ trust was assigned 3 points; ‘not much’ trust 2 points and ‘none at all’ 1 point. Responses that did not indicate an opinion (e.g. ‘don’t know’) were not treated as valid for this analysis and were not scored.

Only respondents who gave a valid response to at least three of the five survey questions received an overall Index score, which is the simple average of their scores. The Wellcome Global Monitor Trust in Scientists Index has a range of one to four, inclusive.

Finally, people were classified into one of three levels of trust – high, medium or low – depending on their overall Index score. People who did not answer at least three of the questions were described as not having an opinion.

Level of trust	Index range
High trust	Above 3.5 to 4
Medium trust	2.5–3.5
Low trust	1 to below 2.5
No opinion	No score

The following section will discuss the results of the Index for each region and country-income grouping. This will be followed by an analysis of the factors that influence people's trust in scientists, and a discussion of the global results on the levels of trust people have in the health sector and in medical professionals in their countries.

Worldwide, the majority of people (54%) have 'medium' trust in scientists, while almost one in five people have a 'high' level of trust, and one in seven have 'low' trust in scientists

Globally, 54% of people have a 'medium' level of trust in scientists, according to the Wellcome Global

Monitor Trust in Scientists Index. Fewer than one in five people (18%) have a 'high' level of trust in scientists, and one in seven people (14%) have a 'low' level of trust in scientists. Another 13% of individuals did not offer an opinion on a majority of the individual questions asked as part of the Index (see Box 3.2).

Regionally, the largest proportion of people who have a 'high' level of trust in scientists are in Australia and New Zealand, Northern Europe and Central Asia, where they make up about a third of the population. Fewer than one in ten people in these regions have a 'low' level of trust in scientists.

Chart 3.1: Trust in Scientists Index showing levels of trust by region

Percentage of people who answered 'high trust', 'medium trust' or 'low trust'.

Wellcome Global Monitor Trust in Scientists Index.

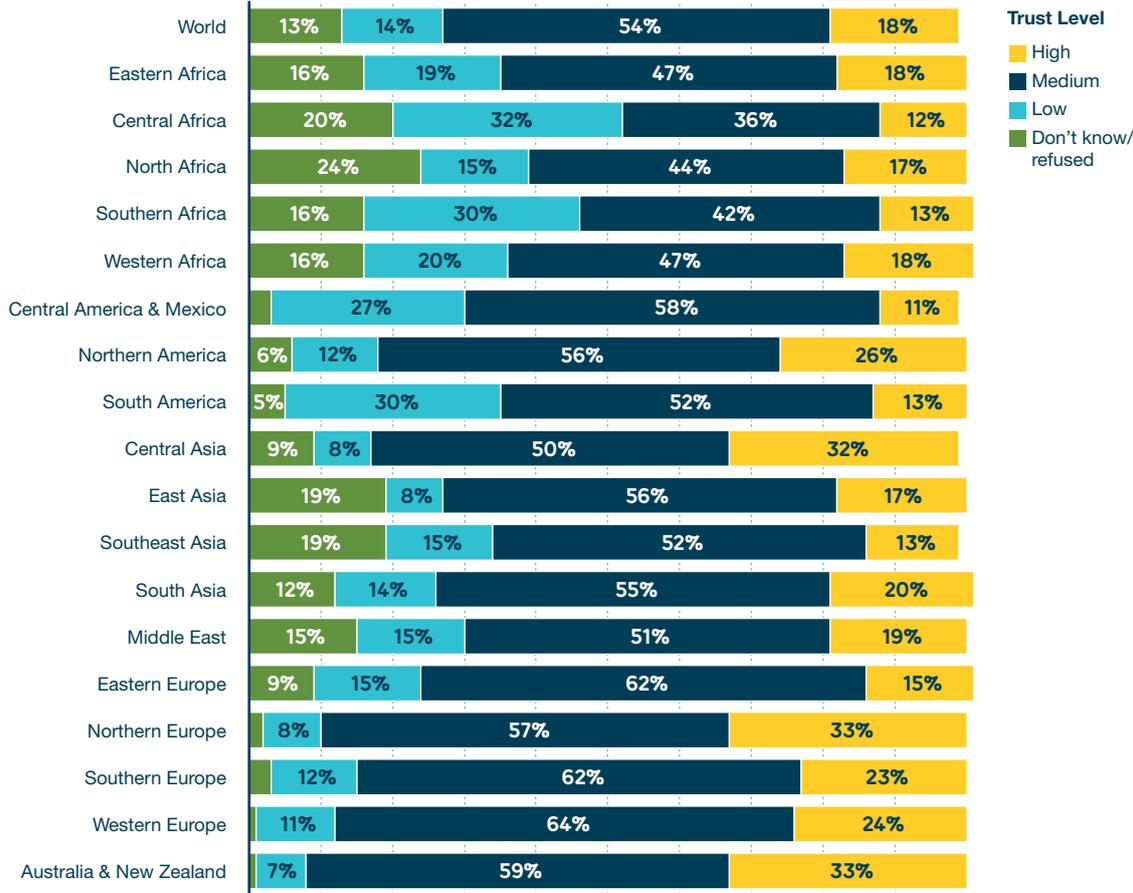
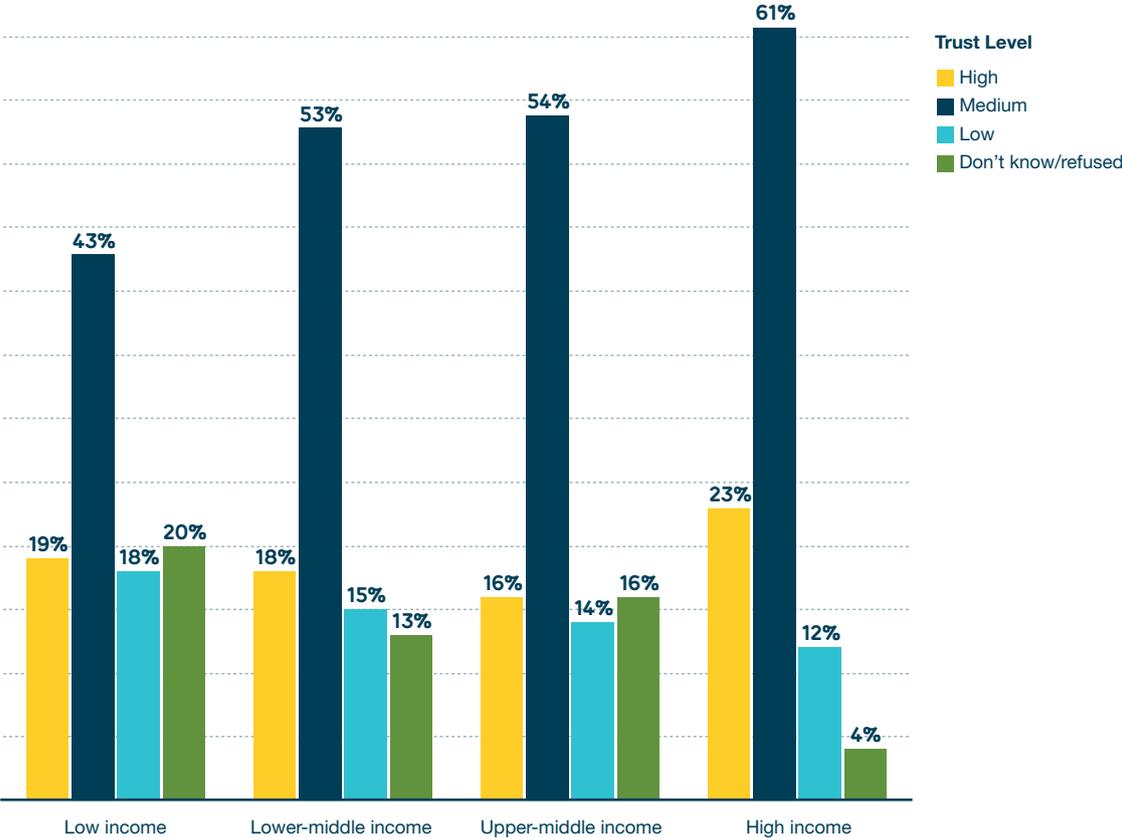


Chart 3.2: Trust in Scientists Index showing levels of trust by country-income group

Percentage of people who answered 'high trust', 'medium trust', 'low trust' or 'don't know/refused'.

Wellcome Global Monitor Trust in Scientists Index.



'Low' trust in scientists is most common in Central Africa, Southern Africa and South America

By contrast, almost one in three people in Central Africa, Southern Africa and South America have 'low' levels of trust in scientists. In Central America and Mexico, 27% of people have 'low' trust in scientists. In all of these regions, people with 'low' trust are more than twice as common as people with 'high' trust (as will be seen in the next chapter, these regions are also among the least likely to believe that science benefits them personally or benefits most people in their society).

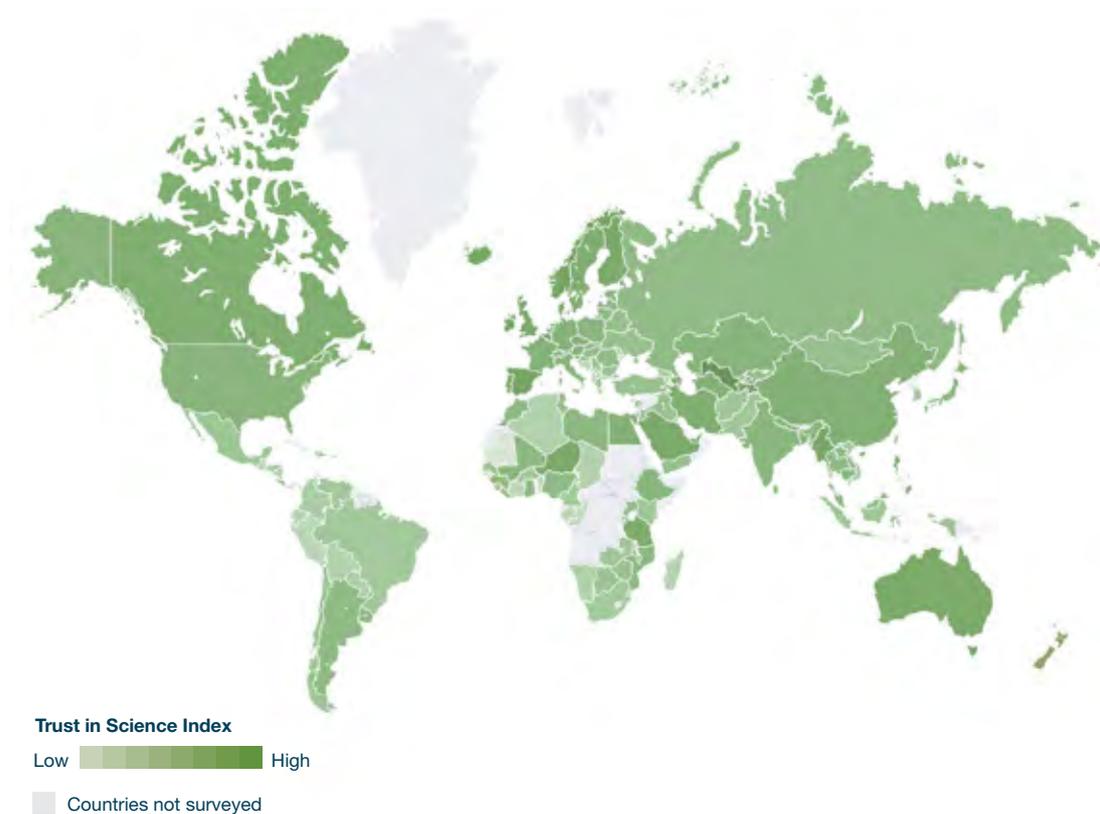
Low-income countries have a higher percentage of people who have 'low' trust in scientists, compared to high-income countries

People in high-income countries are more likely than people in low-income countries to have a 'high' trust in scientists, although by only a relatively small margin, at 23% compared to 19%. Low-income countries also have a higher percentage of people who have 'low' trust in scientists, compared to people in high-income countries, with 18% of people in low-income countries having 'low' trust in scientists compared to 12% in high-income countries. Combining the two 'positive' categories together shows that 84% of people in high-income countries have either 'medium' or 'high' trust in scientists, compared to a combined figure of only 62% in low-income countries.

Chart 3.3: Map of countries according to levels of Trust in Scientists

Percentage of people who answered 'high trust', 'medium trust' or 'low trust'.

Wellcome Global Monitor Trust in Scientists Index.



Uzbekistan, Belgium and Tajikistan have the highest proportions of people who have 'high' trust in scientists

The countries with the largest proportion of people who have 'high' trust in scientists are fairly diverse, with Uzbekistan having the highest percentage by a substantial margin (with 54% of people registering 'high' trust in scientists), followed by Belgium and Tajikistan (where 42% of people have 'high' trust in scientists). Taking 30% as a cut-off point – where 30% of people or more have a 'high' level of trust in scientists (Table 3.1) – the country results show that there is geographical diversity in the countries that register 'high' trust levels, and both high-income and low-income countries appear on this list.

Large percentages of people in Uzbekistan and Tajikistan have 'high' levels of trust in scientists; and that may reflect – to an extent – government policies in recent years to expand their respective nations' scientific capacities, such as increasing funding for research and development⁵ and, in the case of Uzbekistan, opening new research universities. Both countries have also tended to emphasise science-related subjects in their educational curriculum, with 99% of people in Uzbekistan and 95% of people in Tajikistan saying that they learned science at school⁶. As will be apparent in the analysis later in this chapter, learning science at school or college is a significant factor that, in general, can contribute to having higher trust in scientists.

Table 3.2: Trust in Scientists Index showing countries where people most likely to have high trust

Countries with the highest percentage of people in the 'high' trust (30% of people and above).

Wellcome Global Monitor Trust in Scientists Index.

	High trust	Medium trust	Low trust	No opinion
Uzbekistan	54%	38%	2%	6%
Belgium	42%	48%	8%	2%
Tajikistan	42%	41%	9%	8%
Niger	39%	30%	14%	17%
Spain	39%	54%	6%	1%
Ireland	39%	55%	5%	1%
Norway	38%	59%	3%	1%
United Kingdom	35%	55%	9%	1%
Finland	35%	58%	7%	0%
Malta	34%	53%	7%	6%
Portugal	34%	54%	11%	2%
The Gambia	34%	42%	11%	13%
Australia	33%	58%	8%	1%
Czech Republic	33%	43%	16%	8%
New Zealand	32%	61%	5%	2%
Philippines	32%	52%	13%	3%
Iceland	32%	63%	4%	2%
Denmark	31%	62%	7%	0%
Tanzania	31%	51%	9%	9%

Eleven out of the 19 countries where more than 30% of people express 'high' trust in scientists are in Europe. Other research has found similar results for trust in scientists levels in Europe^{7,8,9}.

It is notable that two low-income countries that have low levels of educational attainment are among those with the highest trust in scientists. In Niger, 39% of people have a 'high' level of trust, higher than any other African country. Yet Niger has one of the highest rates of people who do not have formal education¹⁰, and 65% of people, when asked to assess their own knowledge of science, said they know 'nothing at all'

or said they did not know. While this is the case, according to agricultural scientists, the past few years have seen one of the largest positive re-greening efforts of the environment^{11,12}, which has directly benefited farmers across the country.

Another low-income country with relatively 'high' trust in scientists is The Gambia, where 34% had a 'high' level of trust. It is noteworthy that the fielding of the Wellcome Global Monitor survey in The Gambia overlapped with the country's first national science week, potentially influencing sentiment towards science at that time.

Box 3.3: U.S. and EU most trusting of scientists among ‘the Big 5’

According to the UNESCO Science Report 2015, the European Union states, China, the United States, Japan and Russia – or ‘the Big 5’ – are home to 72% of all researchers in the world. As sizeable as these countries’ research sectors might be, people from a ‘Big 5’ country are about as likely to have ‘high’ trust in scientists as people from elsewhere in the world, at 20% to 17%. However, people who do not live in a ‘Big 5’ country are twice as likely as those living in a leading research country to have ‘low’ trust in scientists (9% and 17% respectively).

Trust in scientists also varies among the individual countries of the European Union. The United Kingdom has a higher degree of trust in scientists than, for instance, France and Germany, with 35% of people in that country having ‘high’ trust. This is also ten percentage points higher than the United States. In France, slightly more than one in five people (21%) have ‘high’ trust, while this figure is 24% in all other EU countries. However, rates of ‘low’ trust are similar in each of these countries.

	High trust	Medium trust	Low trust	No opinion
All ‘Big 5’ Countries	20%	57%	9%	14%
China	19%	53%	7%	21%
US	25%	56%	13%	6%
Japan	11%	76%	7%	5%
Russia	14%	62%	14%	10%
European Union (all countries)	25%	61%	11%	2%
France	21%	69%	9%	1%
Germany	25%	62%	12%	2%
UK	35%	55%	9%	1%
All other EU Countries	24%	61%	11%	3%
Non-Big 5 Countries	17%	53%	17%	13%

In China, which has seen a remarkable growth in its scientific capabilities in recent decades, 21% of people have no opinion with respect to their trust in scientists. Chinese people living in rural areas – about 42% of the population according to the World Bank – are particularly likely to have no opinion on this matter, compared to those living in an urban area, at 26% to 15% respectively. Still, more people in China have a ‘high’ rather than a ‘low’ level of trust in scientists (19% compared with 7% respectively).

In Russia, there are an equal number of people – 14% – who have ‘low’ trust in scientists as have ‘high’ trust, and 62% of Russians have ‘medium’ trust in scientists. In Japan, 76% of people have a ‘medium’ level of trust in scientists, while only 7% have ‘low’ trust and 11% register ‘high’ trust in scientists.

Gabon and Burundi have the highest percentage of people with 'low' trust

With nearly half of its people (47%) expressing a 'low' level of trust in scientists, Gabon is the most sceptical nation of the over 140 countries included in the Wellcome Global Monitor. But this scepticism is not confined to scientists – only 30% of people in Gabon said they have 'a lot' or 'some' trust in people in their neighbourhood – the lowest level of any country. People in Gabon's confidence in the major institutions in the country (such as the government,

the judiciary, the media, etc.) also ranks among the lowest of all the countries included in the 2018 Gallup World Poll.

In the countries that have the largest proportion of people with 'low' trust in scientists – Burundi (42%), Togo (41%), Montenegro (41%), Republic of the Congo (40%), Benin (40%) and Guatemala (40%) – most also show widespread lack of confidence in their major societal institutions, an attitude that may lower a person's trust in scientists.

Table 3.3: Trust in Scientists Index showing countries where people most likely to have low trust

Countries with highest percentage of people in the 'low' trust (35% of people and above).

Wellcome Global Monitor Trust in Scientists Index.

	High trust	Medium trust	Low trust	No opinion
Gabon	9%	34%	47%	11%
Burundi	16%	26%	42%	17%
Togo	1%	18%	41%	40%
Montenegro	3%	39%	41%	17%
Republic of the Congo	11%	25%	40%	23%
Benin	14%	27%	40%	19%
Guatemala	8%	44%	40%	8%
Albania	10%	46%	39%	4%
Nicaragua	8%	47%	39%	7%
Panama	7%	51%	38%	3%
El Salvador	9%	49%	38%	4%
Peru	5%	49%	38%	8%
Moldova	5%	48%	38%	9%
Comoros	11%	36%	38%	15%
Namibia	6%	45%	37%	11%
Mauritania	3%	22%	37%	39%
North Macedonia	5%	43%	36%	16%
Ecuador	8%	53%	35%	4%
Bolivia	5%	52%	35%	7%
Bosnia Herzegovina	2%	55%	35%	8%

Burundi, like other countries with a high proportion of people who have 'low' trust in scientists, has generally low educational exposure to science, with 76% saying they have never learned science at school, or only learned about science during the

primary education stage. As the next section will show, educational exposure to science at school or college can also play a significant role in shaping a person's views and trust in scientists.

Box 3.4: A closer look at those who have no opinion about trust in scientists

Globally, 13% of people did not offer an opinion in at least three of the five ‘trust in scientists’ survey questions. This category of people is sizeable in some regions – such as North Africa, (24%), Central Africa (20%), and East and Southeast Asia (19%). Although further research is needed, initial findings suggest that educational attainment levels may play a role in people having no opinion.

In countries such as Cambodia, Togo and Mauritania, around four in ten people fall into this category.

Notably, educational attainment levels in those countries are among the lowest in the world. This is no surprise, given how strongly linked low educational attainment is to having no opinion about

trust in scientists: worldwide, people with a primary education or less are about three times more likely than people with a secondary education, and five times more likely than those with a post-secondary education, to have no opinion about the level of trust they have in scientists.

Additionally, women, older individuals and people living in urban areas are more likely, on balance, to have no opinion about the level of trust in scientists. Past research has found that these groups are also more likely not to answer other science-focused survey questions, such as items about factual knowledge¹³.

Understanding the predictors of trust in scientists

Trust in scientists, as we have seen above, varies across regions and countries. Existing research suggests that we should expect trust in scientists to vary along the lines of key demographic features, such as gender, age, education, or income^{14,15}. In this section, we explore how differences in people’s background, society and environment might influence overall trust in scientists. We will explore how people’s experience with science, such as learning the subject in school, influences their level of trust. In addition, we will investigate how some of the economy-wide factors may influence people’s trust in scientists.

A multivariate statistical analysis was performed in order to identify those factors that impact a person’s overall trust in scientists, even after accounting for other potentially confounding variables. More details on the statistical analysis can be found in the technical report online. This section will review the main findings from the analysis.



Face to face interview taking place in Republic of the Congo. Gallup 2018

Box 3.5: Variables tested in the Trust in Scientists analysis

This analysis looks at the factors or potential ‘drivers’ of trust in scientists – that is, the personal as well as national characteristics that lead to a higher score on the index. These are summarised below. Some of these factors, such as gender, educational attainment and income, have been identified in past studies as influential in shaping attitudes about science, if not specifically trust. By using Gallup World Poll questions, we were able to test the role of key attitudes, such as how a person rates their life overall, which have been found to shape a person’s perspective on a number of issues but not previously included in studies looking at attitudes to science.

The analysis also tested the role of country-level variables in shaping an individual’s trust level in scientists including the level of income inequality in a society. The latter is measured using the Gini Index, which estimates how evenly distributed a country’s overall income is among its population. The Gini Index can take a value anywhere between 0, which indicates perfect equality, and 100, which indicates perfect inequality.

Individual-level variables:

Demographic factors (gender, age, urban/rural residence, educational attainment, income), Knowledge of science (learned science in formal educational environment, self-assessed knowledge of science), Key attitudes (Gallup World Poll Life Evaluation Index, feelings about household income), Access to communications: access to communications devices (mobile phones and internet), Religious background (if person identifies with specific religion, says religion is important), Confidence in national institutions (confidence in military, confidence in judicial system, confidence in the national government).

Country-level variables:

Gini Index, GDP per capita, World Bank income level, life expectancy at birth, mortality rate, research and development expenditure as percentage of GDP, average GDP growth rate (data source: World Bank).

Trust in scientists in this analysis focused on a person’s original score on the Trust in Scientists Index (see Box 3.2 or for further detail the technical report available online), rather than the categories of high, medium or low trust that were featured in previous sections. The use of the original score allows for a greater level of granularity in the analysis.

Country and individual-level characteristics that influence trust in scientists

A person’s overall trust in scientists is likely to be shaped by both personal and country-level factors (see Box 3.5) A 2015 UNESCO Science Report stated that ‘good governance is good for science’ – an observation that indicates that scientific research is hampered by corruption and weak national institutions. Therefore, in the statistical analysis to

explore the drivers of trust in scientists, we added a variable to test the hypothesis that an individual’s confidence in national institutions may influence their overall trust in scientists.

This analysis seeks to identify which of these factors are most influential in determining trust in scientists, even after accounting for all other relevant characteristics.

Box 3.6: Educational exposure to science, confidence in national institutions and inequality significantly influence trust in scientists

The main findings are that, broadly speaking, the factors that are more influential (statistically significant) in shaping trust in scientists are:

- a person's educational exposure to science
- confidence in key national institutions, including the government, military and the judiciary
- urban/rural residence
- feelings about household income (the extent to which a person finds it difficult to live on present income)
- the level of income inequality in the country (as represented by the Gini Index), and
- access to communications: mobile phones and the internet.

At the individual level:

- Having the opportunity to learn science at school is the single most influential predictor of trust in scientists, even after taking into account other potentially relevant personal or country factors
- The level of confidence people have in the major institutions of their country matters. People who lack confidence in these key institutions, including the national government, the judicial system and the military, also have lower trust in scientists
- People who have regular access to the internet and a telephone for personal use tend to have higher trust in scientists, all other things being equal.

At the country level:

- At the macroeconomic level, the level of income inequality in a country matters. People in high-inequality countries have lower confidence in scientists.

While the findings were important and significant, the analysis only accounted for a portion of the variation in trust levels, and further research and data are needed to identify what other factors can help explain people's overall trust in scientists. All other factors tested were not found to have a statistically significant effect (please refer to the technical report online for a full listing of the estimated impact of all variables tested in the analysis).

While all of these variables (in Box 3.6) had a statistically significant effect, not all had what can be described as meaningful clear effects on public trust in scientists. This is shown in Charts 3.4 and 3.5.

These two charts show how an individual's predicted Trust in Scientists score changes for each of the factors (e.g. living in an urban area or a large city) included in the analysis²⁰.

The results show that the effect of learning science at school (and the highest level at which people studied the subject) has the largest impact on an individual's trust in scientists. For example, the model predicts that an individual with 'no formal education' in science would have a Trust in Scientists Index score of 2.8, while an individual with 'up to college'

education in science would show a Trust in Scientists Index score of 3.1 (out of a maximum score of 4).

Whether a person has confidence in the national government or courts, or believes the elections in their country are honest²¹ also impacts trust, albeit not to the same degree as learning science at school.

For ease of interpretation, we present margin plots for each of the significant variables in the final model. Margin plots present the model's predicted Trust in Scientists Index score for a given variable level, keeping all other factors at their average level.

Chart 3.4: Margin plots for individual characteristics relating to trust in scientists

Wellcome Global Monitor Trust in Scientists Index.

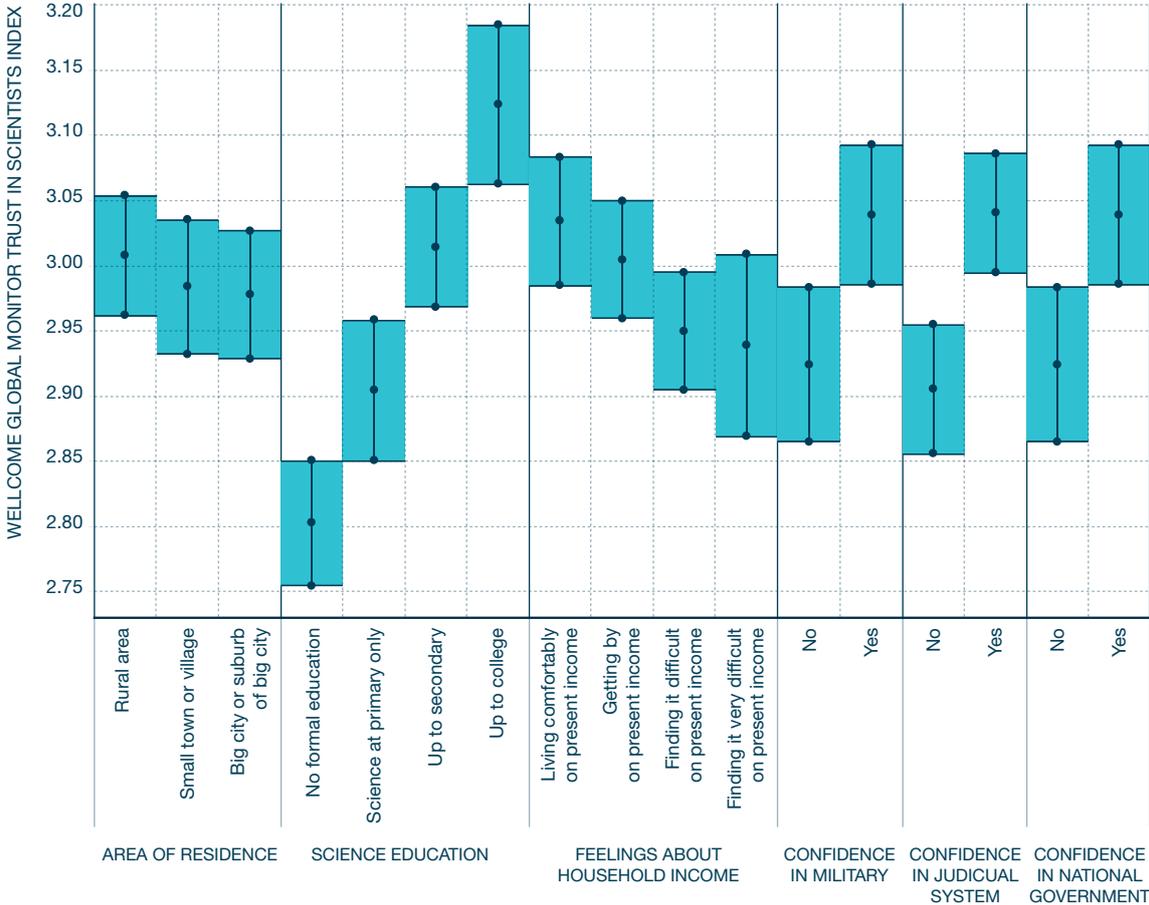
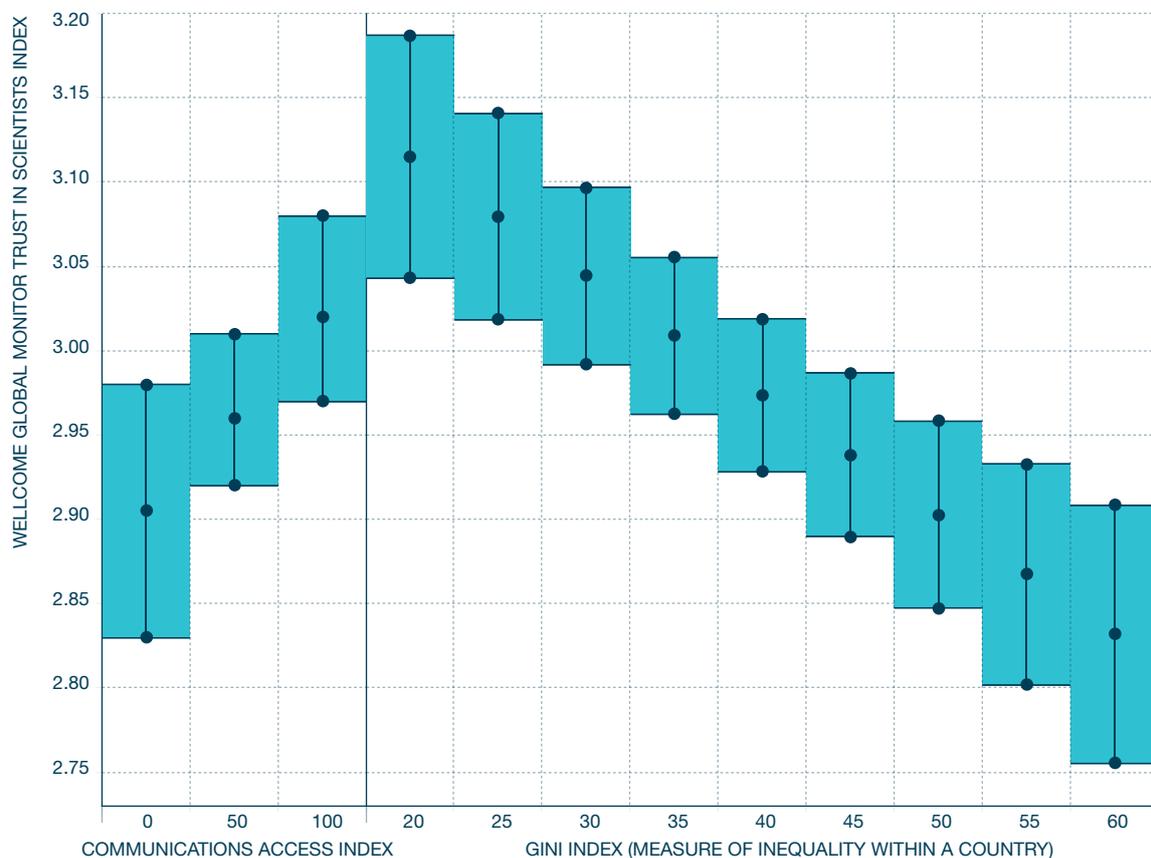


Chart 3.5 shows the margin plots of two other variables that were significant (but measured on a different scale²²): the Gini coefficient (higher scores represent greater inequality) as well as the Gallup World Poll Communications Access Index (higher scores represent greater access to communications). While the analysis

found both items to have a statistically significant effect on trust in scientists, income inequality as measured by the Gini coefficient (discussed elsewhere in this report) had the more decisive impact, with predicted trust in science falling by as much as 20% between low- and high-income inequality countries.

Chart 3.5: Margin plots for country-level characteristics relating to trust in scientists

Wellcome Global Monitor Trust in Scientists Index.



To further illustrate the effect of income inequality on trust in scientists, we looked at groups of countries that have low Gini values (more equal societies), and high Gini values (less equal societies).

Eleven countries have a relatively low Gini Index score of between 25 and 30 – a group that includes countries such as Iceland, Norway, Belgium and the Netherlands. For this group of countries – high-income, low-inequality countries – the average percentage of people who had a high level of trust in science was 30%²³.

In the 23 high-income countries with a higher Gini Index of between 30 and 40 (that is to say, rich but more unequal societies) only 21% of people had a high level of trust in science.

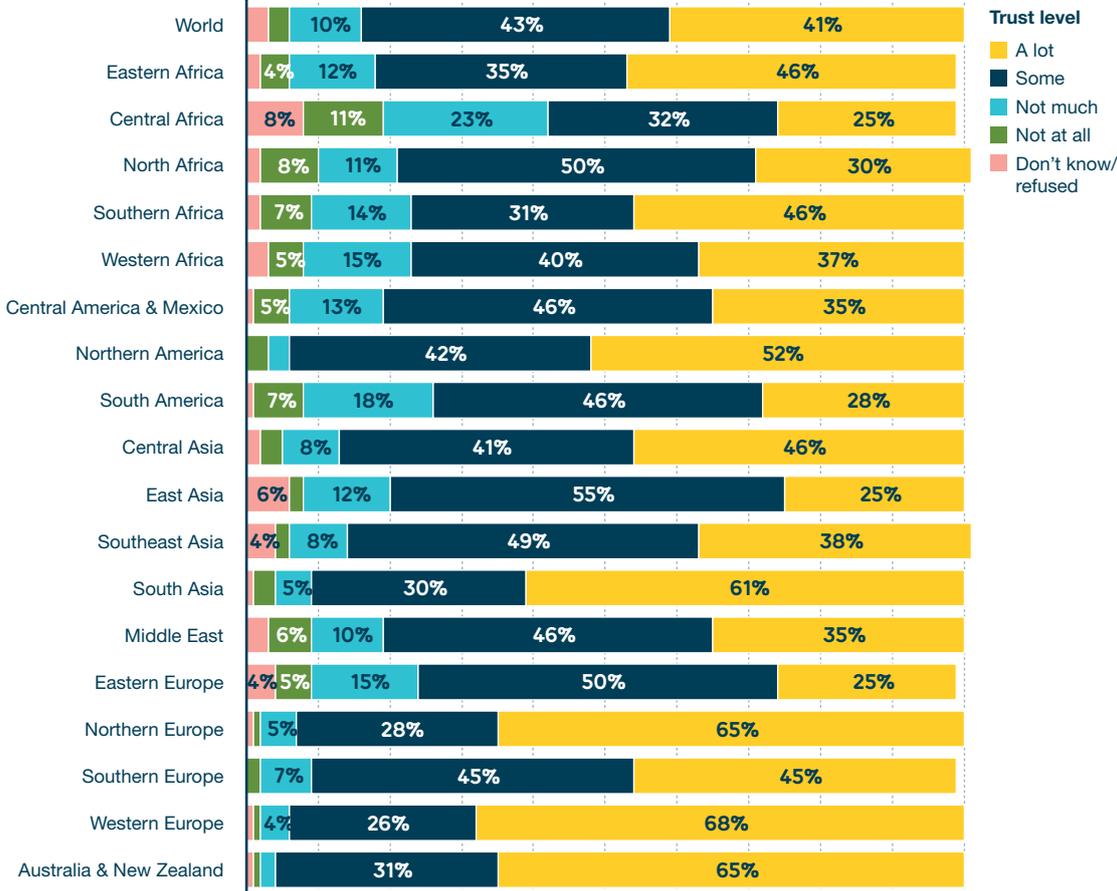
For the group of five high-income countries with a Gini index higher than 40 (meaning relatively high income inequality) – including the United States, Argentina and Chile) the proportion of people having a high level of trust in science was lower still, at 19%. The remaining factors used in the analysis, including gender, age and religious background, did not prove to have a statistically significant effect on overall trust in scientists.

However, the variables in this analysis explained only some 15% of the differences in people's Trust in Scientists Index scores, which means they were unable to explain a substantial 85% of the differences in people's scores. This indicates that important drivers were unaccounted for in the model, and further research and data are needed to better understand the factors affecting people's trust in scientists.

Chart 3.6: Trust in doctors and nurses by region

Percentage of people who answered ‘a lot’, ‘some’, ‘not much’, ‘not at all’ or ‘don’t know/refused’.

*How much do you trust each of the following? Do you trust them a lot, some, not much, or not at all?
How about doctors or nurses?*



Confidence and trust in health professionals and hospitals

Most people worldwide trust doctors and nurses, though trust is lower in Central Africa

Worldwide, 84% of people have ‘a lot’ or ‘some’ trust in doctors; this breaks down to 41% who say they have ‘a lot’ of trust and 43% who have ‘some’ trust. This compares to only 13% who either have ‘not much’ trust or ‘not at all’. Globally, doctors and nurses are more trusted than any other group or organisation tested on the Wellcome Global Monitor, including ‘people in your neighbourhood’ (79% trust ‘some’ or ‘a lot’), people who work at charitable organisations (59%), journalists (59%), the national government (58%) and traditional healers (49%).

On a regional basis, Central Africa has the least amount of trust in doctors and nurses; 57% of people have ‘some’ or ‘a lot’ of trust, while slightly more than a fifth say they do not trust doctors much. Another 11% do not trust doctors ‘at all’. Notably, key health outcomes in this region are among the lowest in the world, including life expectancy and the infant mortality rate²⁴.

While most people globally have at least some trust in doctors and nurses, higher-income areas, in general, are more likely to have the highest level of trust in these professionals, including in Western Europe, where 68% have ‘a lot’ of trust, and Australia and New Zealand and Northern Europe, where this figure stands at 65% for both regions.

Chart 3.7: Map of trust in doctors and nurses by country

Percentage of people who answered 'a lot' or 'some'.

How much do you trust each of the following?

Do you trust them a lot, some, not much, or not at all? How about doctors or nurses?



People in high-income countries are slightly more likely to have at least 'some' confidence in doctors and nurses than people who do not live in high-income countries, at 92% and 83% respectively; a gap that is due to the fact that 49% of people in high-income countries have 'a lot' of confidence in doctors or nurses compared to 40% of those in other countries.

Looking at how trust in doctors and nurses varies on a country-by-country basis, people in Africa are, on balance, relatively less trusting of these medical professionals than countries elsewhere in the world, including a number of the countries that were likely to express a low level of trust in scientists: the Republic of the Congo (43% of people have 'some' or 'a lot' of trust in doctors/nurses), Benin (50%) and Gabon (50%).

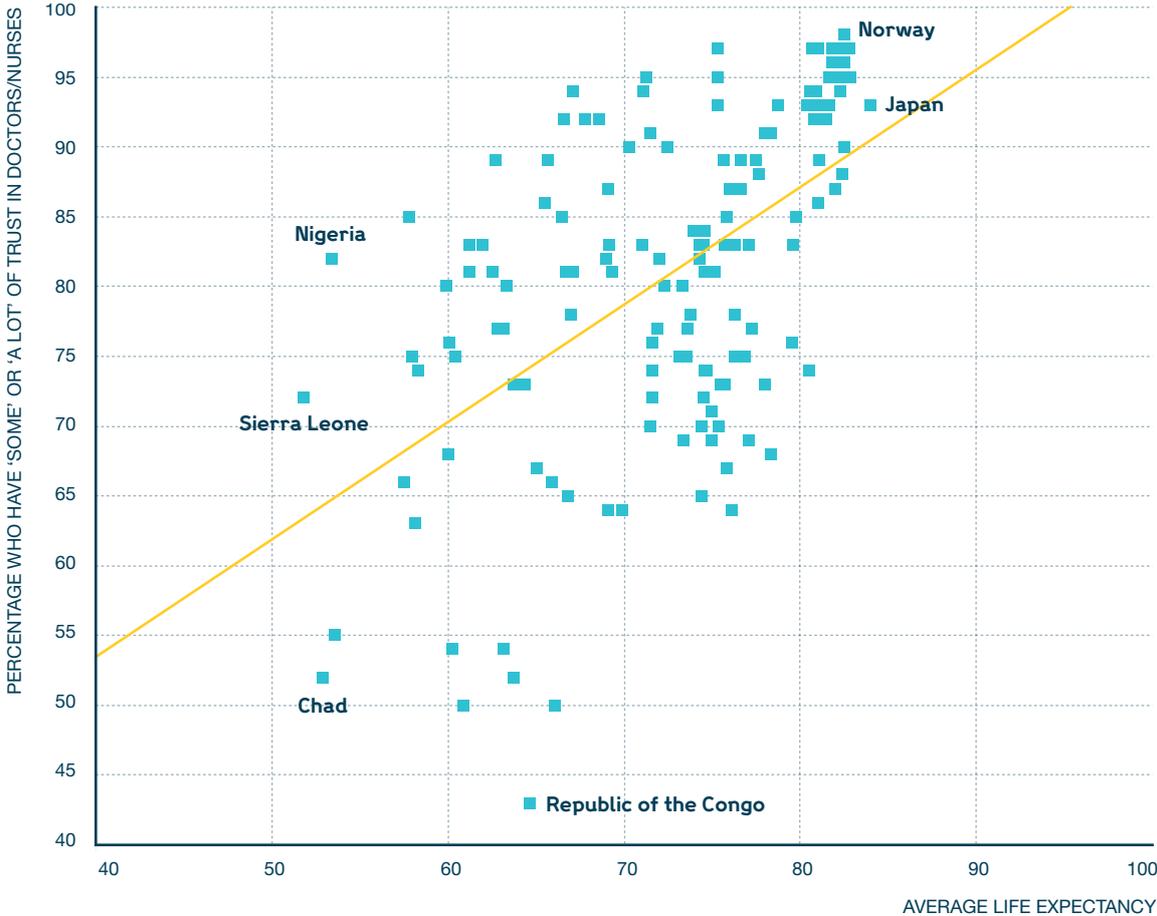
At the other end of the trust spectrum, trust in doctors and nurses approaches universal levels in several countries, most of which are in high-income European nations. In Norway, Denmark, Spain, Finland, and Iceland, confidence is at 97% or higher.

Notably, a country's level of trust ('a lot' or 'some') in doctors or nurses has a positive relationship with key metrics of national health outcomes, particularly life expectancy at birth²⁵ – a finding that is consistent with past research²⁶.

Chart 3.8: Scatterplot exploring the relationship between a country's life expectancy at birth and people who trust doctors and nurses

Percentage of people who answered 'a lot' or 'some'.

*How much do you trust each of the following? Do you trust them a lot, some, not much, or not at all?
How about doctors or nurses?*



Average Life Expectancy (World Bank)

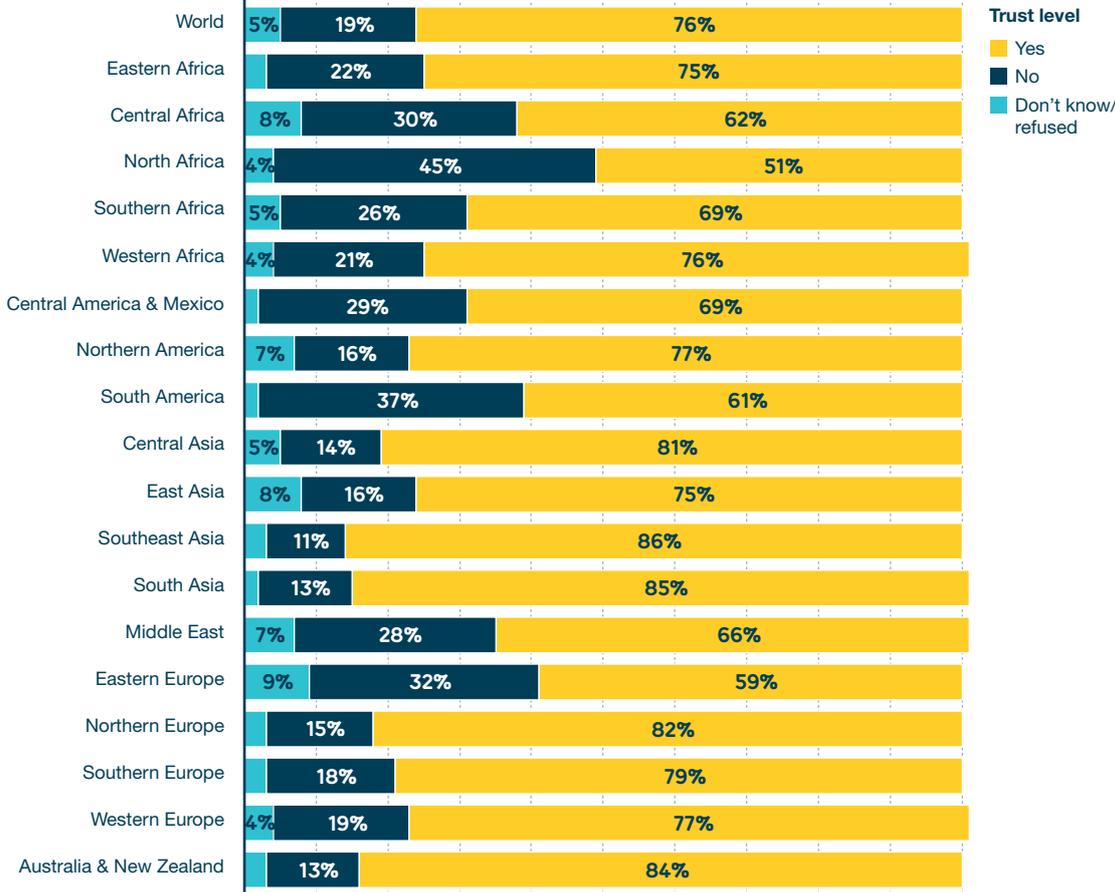
At the individual level, there are less apparent differences in trust in doctors and nurses along key demographics, such as age, gender and education, than had been observed in relation to trust in scientists measures. This finding is consistent with other studies that have found either no statistically significant effect or only a weak effect with respect to these demographics, especially compared to country-level differences in health outcomes²⁷.

80% of people who are 'finding it difficult' or 'very difficult' to get by on their present income have 'some' or 'a lot' of trust in doctors and nurses, compared to 90% of those who are 'living comfortably'. However, this trust gap is about as wide across all country-income groupings.

Chart 3.9: Confidence in hospitals and health clinics by region

Percentage of people who answered 'yes', 'no' or 'don't know/refused'.

In (country name), do you have confidence in the following or not? How about – hospitals and health clinics?



Confidence in hospitals and health clinics

Confidence in hospitals and health clinics is lowest in North Africa and Eastern Europe

Worldwide, three-quarters of people say they have confidence in hospitals and health clinics in their country. In most regions throughout the world, at least seven in ten people have confidence in hospitals and health clinics, with the main exceptions in North Africa (51%) and Eastern Europe (59%).

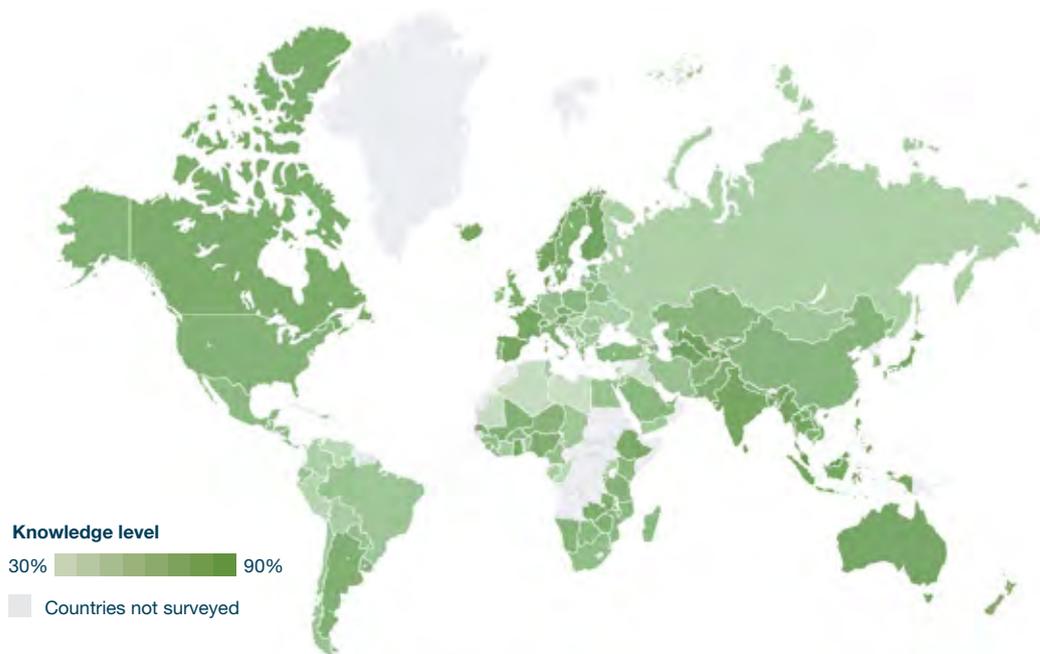
Confidence in hospitals and clinics relates more to personal, not national, income levels

At the country level, Rwandans are the most likely to express confidence in the hospitals and health clinics in their country (see Box 3.7) – with 97% expressing this sentiment. Other countries where people are most confident in their healthcare system include Malaysia (96%), Singapore (94%), Tajikistan (92%), Malta (92%), Denmark (90%) and Switzerland (90%). In general, these countries make healthcare services freely available to most, if not all, of their citizens²⁸.

Chart 3.10: Map of confidence in hospitals and health clinics by country

Percentage of people who answered 'yes'.

In (country name), do you have confidence in the following or not? How about – hospitals and health clinics?



People in high-income countries are about as likely to have confidence in hospitals and clinics in their country as people in lower-middle-income countries

Notably, the countries with the highest levels of confidence in hospitals and health clinics are not exclusively high-income countries, despite clear differences between country-income levels in terms of health outcomes²⁹. Taken as a whole, people in

high-income countries are about as likely to have confidence in hospitals and health clinics in their country as lower-middle-income countries (78% and 82% respectively). Confidence in low-income countries, at 74%, is also close to the levels in high-income countries.

Box 3.7: Rwanda: High confidence in hospitals and health clinics

Rwandans are the most likely people worldwide to express confidence in their healthcare system, at 97%. This strong vote of confidence in the country's healthcare system likely reflects the extraordinary improvements in the country's healthcare system that have taken place over the past two decades. Over that time, life expectancy has increased by more than

a third and the decrease in the infant mortality rate has been hailed by UNICEF as 'one of the most significant in human history³⁰.' More recently, the Gallup World Poll finds that the percentage of people in Rwanda who are satisfied with the quality of healthcare in their city or area has risen from 65% in 2008 to 82% in 2018.

People who say they ‘find it difficult’ to get by on their present income are less likely to say they have confidence in their country’s hospitals and health clinics

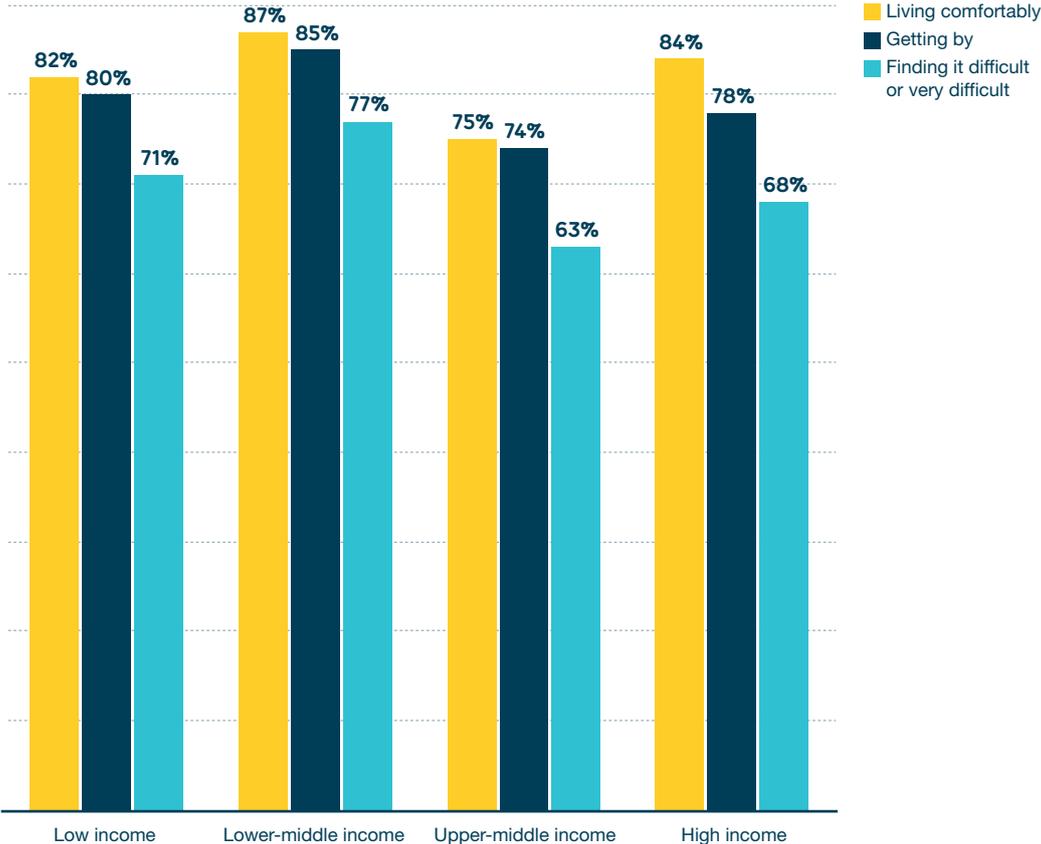
However, personal (or household) income, rather than national income, may be a more important factor in shaping confidence in healthcare. Globally, as well as in the different country-income groups, people who say they ‘find it difficult’ or ‘very difficult’ to get by on their present income are notably less likely to say they have confidence in their country’s hospitals and health clinics. Notably, the ‘confidence gap’ between

people who say they are ‘living comfortably’ on their current income and those who say they are ‘finding it difficult’ or ‘very difficult’, is wider in high-income countries – with 84% of the former group expressing confidence in hospitals and health clinics compared to 68% of the latter group, a gap of 16 percentage points. In countries that are not high-income, this gap tends to be around 10 percentage points. This suggests income inequality plays a larger role in driving health outcomes in high-income countries, though further research on this topic is needed.

Chart 3.11: Confidence in hospitals and health clinics by views about household income and country-income level

Percentage of people who answered ‘yes’.

In (country name), do you have confidence in the following or not? How about – hospitals and health clinics?



Who people trust the most to give them medical or health advice

Globally, 73% of people say they would trust a doctor or a nurse the most to give them health advice

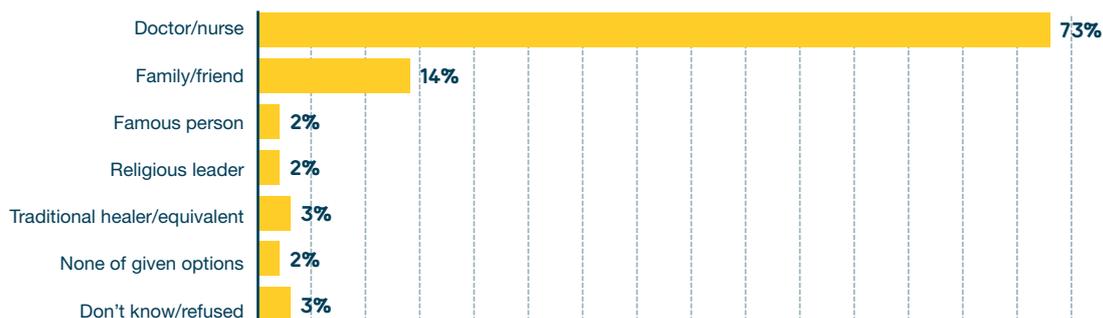
Consistent with the generally widespread trust in doctors and nurses, 73% of people worldwide say they would trust a doctor or a nurse the most to give them health advice – meaning 27% trust a difference source more than a doctor or a nurse. The next most trusted sources are a person’s family or friends, with 14% saying this is who they would turn to for health advice.

In five regions, fewer than seven in ten people say they would trust a doctor or nurse most for health advice, including East Asia (64%), the Middle East (65%), Central Africa (68%), South America (68%) and Eastern Europe (69%). In nearly all of these places, people are instead more likely to turn to friends and family members, at least compared to other areas. The one exception is Central Africa, where, after doctors and nurses, the next preferred source for health advice is a religious leader.

Chart 3.12: Trusted sources of medical or health advice - global results

Percentage of people who answered different sources of advice they trust the most.

Which of the following people do you trust most to give you medical or health advice? Your family and friends, a doctor or nurse, a religious leader, a famous person, a traditional healer [or country equivalent], other?



Box 3.8: Trust in traditional healers

In ten countries included in the Wellcome Global Monitor, at least one in ten people said they would trust ‘traditional healers’ the most for medical advice. These are: Togo (15%), Mali (12%), Comoros (11%), Haiti (10%), Iran (10%), Libya (10%), Mauritania (10%), Mongolia (10%) Senegal (10%), and Sri Lanka (10%). People in these countries are generally among the least trusting in scientists and doctors/nurses.

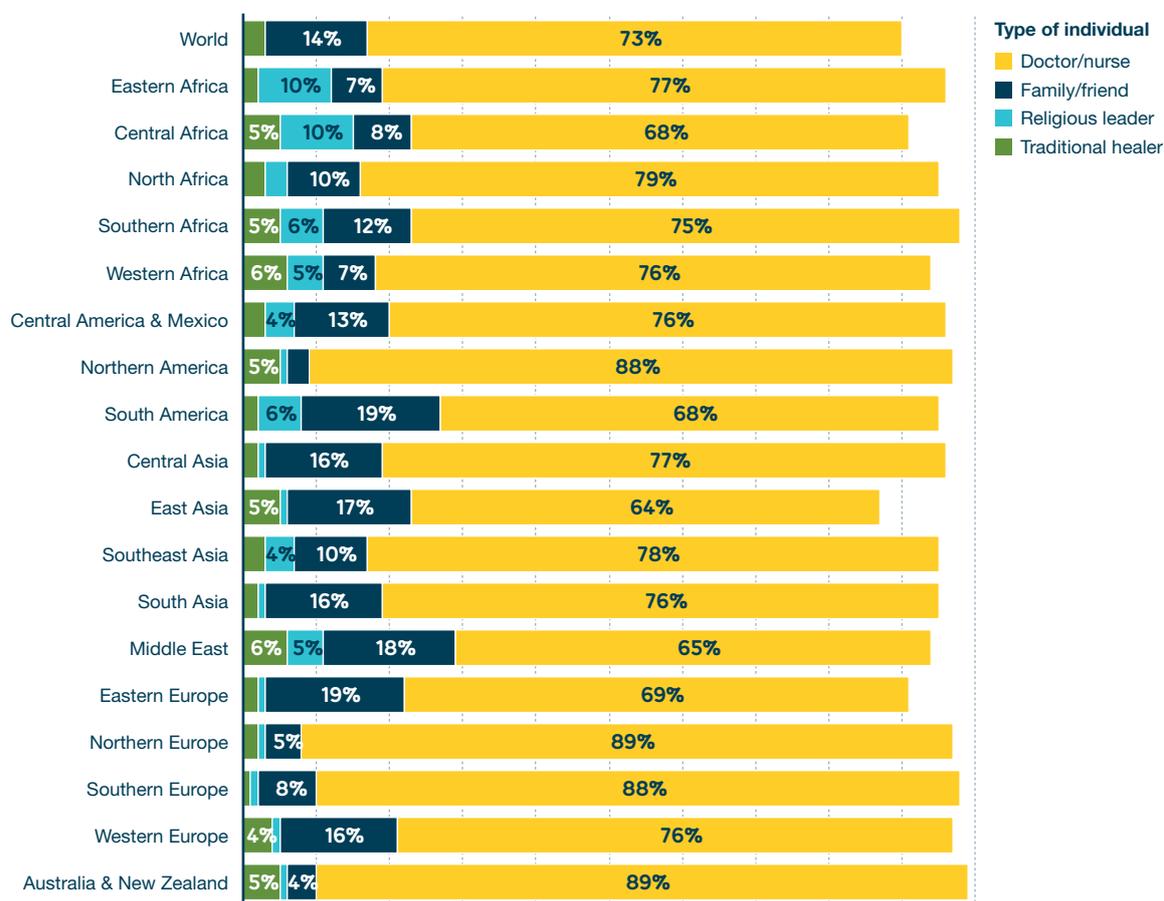
Sri Lanka, Ghana, Mongolia, Thailand, Cambodia, Nepal, Palestine and China are also countries where people are most likely to say they trust traditional healers ‘some’ or ‘a lot’.

But in general, the results find that people who trust traditional healers are not necessarily always likely to rely on them for medical advice; overall, among people who trust traditional healers ‘a lot’, 10% say they trust them most for medical advice.

Chart 3.13: Trusted sources of medical or health advice by region

Percentage of people who answered different sources of advice they trust the most.

Which of the following people do you trust most to give you medical or health advice? Your family and friends, a doctor or nurse, a religious leader, a famous person, a traditional healer [or country equivalent], other?



People in Northern America and Europe trust medical and health advice from doctors and nurses more than they do from governments

Worldwide, more than eight in ten people (84%) say they trust medical advice from medical workers (such as doctors and nurses) ‘some’ or ‘a lot’.

When asked the same question about trust in medical and health advice from the government, a smaller proportion of people globally – 76% – said they would trust that advice ‘some’ or ‘a lot’.

However, as Chart 3.14 shows, in a few regions, trust in health advice from medical workers outpaces trust in the advice from the government by a wide margin. This is most notable in Northern America, where 92% of people trust medical workers but only 61% of people trust the government for medical advice.

This large ‘trust gap’ in Northern America is largely because of trust attitudes in the US, where 92% of people trust health advice from medical workers ‘some’ or ‘a lot’, compared to only 59% of people who trust government medical advice (‘some’ or ‘a lot’). This likely reflects the relatively low trust levels Americans routinely express in their government more broadly³¹.

The Wellcome Global Monitor finds that only 47% of people in the US say they have ‘a lot’ or ‘some’ trust in their government, one of the lowest levels among the very high-income countries.

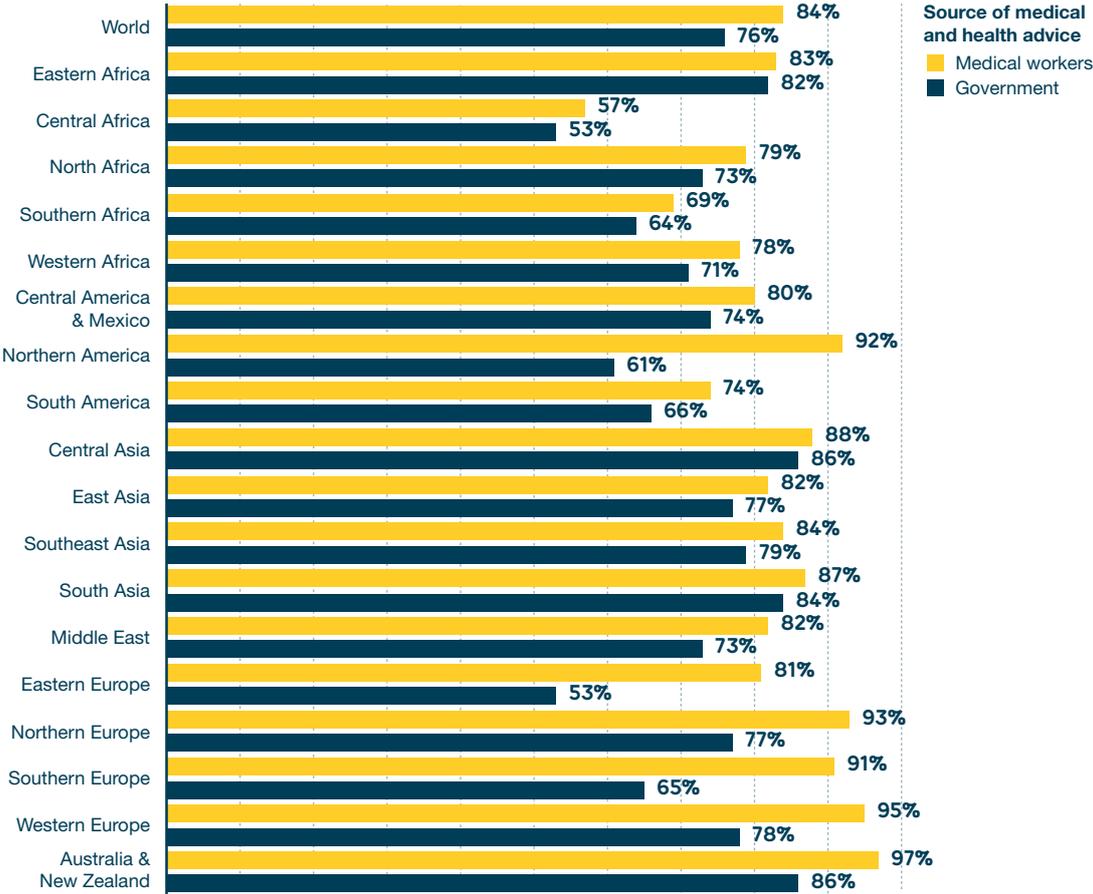
In much of Europe, people are also substantially more likely to trust health advice from medical workers over that from the government. Similar to the US, many countries in Europe also express relatively low general confidence in their governments.

Chart 3.14:

Trust in medical and health advice from government or doctors and nurses by region

Percentage of people who answered 'some' or 'a lot'.

In general, how much do you trust medical and health advice from medical workers, such as doctors and nurses, in this country? In general, how much do you trust medical and health advice that the government gives? A lot, some, not much or not at all?



Trust in the medical advice of health workers is also relatively high in most other regions of the world, though less so in Central Africa (57%), Southern Africa (69%) and South America (74%). As discussed in other sections of the report, these regions have regularly registered their scepticism about a number of topics related to science and health – including trust in scientists, confidence in hospitals and health clinics, and feeling included (or not) in the benefits of science.

Conclusion

Trust is difficult to define. In the survey, we asked people who they trusted, letting their own personal definitions guide their responses and therefore our findings. We were particularly interested in how they felt about science, scientists, healthcare professionals, and health institutions.

The Wellcome Global Monitor identified a small number of factors that seem to relate to people's trust in scientists, but these factors together only explain a small part of how people's level of trust varies. To get a full explanation, more research is needed.

However, two factors associated with trust in scientists stand out: people's education and their confidence in national institutions. Learning about science at school, and continuing to study science to higher levels, is one of the strongest predictors of your level of trust in science.

The survey also found that the level of confidence people have in their national institutions – their government, judicial system, and military – was a good predictor of their level of trust in science. This suggests that in order to engage people with science effectively,

we cannot ignore how people feel about their broader social context and their relationship with power and institutions, even though they ultimately tend to trust scientists more than the government or military.

As is consistent with previous research on public trust, doctors and nurses are much more trusted than scientists in all regions, although there is still variation between different parts of the world. Trust in health professionals relates to national health outcomes. Trust also may be higher in countries where health services are more accessible.

People's level of trust in hospitals and health clinics was much more closely related to their levels of household income than it was to the wealth of their country. In other words, People struggling financially in poor countries had similar levels of trust in hospitals to those in the same position in rich countries. The findings suggest that economic inequality within countries justifiably deserves attention in terms of how people feel about healthcare provision.

Endnotes

- 1 See the Wellcome Global Monitor Questionnaire Development Report and Chapter 1 for more details and references.
- 2 Bauer M, et al. European Public Perceptions Of Science, *International Journal of Public Opinion Research* 1994;6(2):163–86.
- 3 Bauer MW, Falade BA. Public understanding of science: survey research around the world. In M Bucchi, Trench (eds.). *Handbook of Public Communication of Science and Technology*. London: Routledge; 2008. pp. 111–30.
- 4 Please see the details in Appendix A.II.
- 5 UNESCO. UNESCO Science Report, Towards 2030: Chapter 14: Central Asia. Paris: UNESCO; 2015. <https://en.unesco.org/USR-contents> [accessed 16 May 2019].
- 6 This finding is also supported by UNESCO. *World Data on Education (Uzbekistan)*. UNESCO; 2011. <http://dmz-ibe2-vm.unesco.org/sites/default/files/Uzbekistan.pdf> [accessed 16 May 2019].
- 7 For instance, a 2011 European Competitiveness Report by the EU found Belgians' trust in science to be on par with the EU average, though 66% were defined as having trust. European Commission. *European Competitiveness Report 2011*. Luxembourg: Publications Office of the European Union; 2011. https://ec.europa.eu/growth/content/european-competitiveness-report-2011-0_et [accessed 16 May 2019].
- 8 Bauer M. The Changing Culture Across Old Europe: 1989 to 2005. In MW Bauer, et al (eds.). *The Culture of Science: How the Public Relates to Science Across the Globe*. London: Routledge; 2012. pp. 92–109.
- 9 European Competitiveness Report 2011, Chapter 3.
- 10 According to the 2018 Gallup World Poll – 62% of people in Niger say they have no formal education. The only other country in Sub-Saharan Africa with a comparable figure is Mali, at 65%.
- 11 Maclean R. The great African greening: millions of 'magical' new trees bring renewal. *Guardian* 2018 16 Aug. <https://www.theguardian.com/world/2018/aug/16/regreening-niger-how-magical-gaas-transformed-land> [accessed 16 May 2019].
- 12 Stith M, et al. A Quantitative Evaluation of the Multiple Narratives of the Recent Sahelian Regreening. *Weather, Climate, and Society* 2016;8:67–83. <https://doi.org/10.1175/WCAS-D-15-0012.1> [accessed 16 May 2019].
- 13 Bauer MW, Falade BA. Public understanding of science: survey research around the world. In M Bucchi, Trench (eds.). *Handbook of Public Communication of Science and Technology*. London: Routledge; 2008. pp. 111–30.
- 14 This is also discussed in the Questionnaire Development Report.
- 15 Rai A, Shukla R. Statistical Modelling of Public Understanding of Science. In MW Bauer, et al (eds.). *The Culture of Science: How the Public Relates to Science Across the Globe*. London: Routledge; 2012. pp. 262–81.
- 16 Bauer M, et al. What Can We Learn from 25 Years of PUS Survey Research? Liberating and Expanding the Agenda. *Public Understanding of Science*. 2007;16(1):79–95. <https://doi.org/10.1177/0963662506071287> [accessed 16 May 2019].
- 17 Angus D. Income, Health, and Well-Being Around the World: Evidence From the Gallup World Poll. *Journal of Economic Perspectives* 2008;22(2):53–72. <https://www.aeaweb.org/articles?id=10.1257/jep.22.2.53> [accessed 16 May 2019].

- 18 UNESCO. UNESCO Science Report, Towards 2030. Paris: UNESCO; 2015. 54. <https://en.unesco.org/USR-contents> [accessed 16 May 2019].
- 19 Weinbach RW. When Is Statistical Significance Meaningful? A Practice Perspective. *The Journal of Sociology & Social Welfare* 1989;16(1):31–7. <http://scholarworks.wmich.edu/jssw/vol16/iss1/4/> [accessed 16 May 2019].
- 20 This is known as a margin plot. For any given level of an independent variable, the predicted trust in scientists score would be calculated with all other factors in the model being kept at their average level.
- 21 This question was not asked in countries where elections are not held.
- 22 The two were measured on a continuous scale, meaning they can theoretically take any numeric value in the same way the area of a room can. The Gallup World Poll Communications Index is a summary variable that takes a value between 0 and 100, with a higher score indicating a person has access to a greater diversity of communication and information technology, including mobile phones and the internet. See Appendix B for more information on this.
- 23 This is the simple average of these 11 countries, i.e. projection weighting was not used.
- 24 Based on World Bank data. To calculate regional averages, projection weighting was used, which adjusts for country population. See Appendix A for more information on external data sources used in the analysis or projection weighting.
- 25 As provided by the World Bank. Higher rates of deaths by these causes implies a lower risk of death from communicable diseases. For more about external data sources used in analysis, see Appendix B.
- 26 Huang EC, et al. Public Trust in Physicians – Health Care Commodification as a Possible Deteriorating Factor: Cross-sectional Analysis of 23 Countries. *Inquiry* 2018;55:1–11. doi:10.1177/0046958018759174 [accessed 16 May 2019].
- 27 Huang EC; 2018.
- 28 Sterck O, et al. Average income per capita, health outcomes, and the allocation of development assistance for health. *VOX CEPR Policy Portal* 2018 16 February. <https://voxeu.org/article/average-income-capita-health-outcomes-and-allocation-development-assistance-health> [accessed 16 May 2019].
- 29 Sterck O; 2018.
- 30 Newey S. From horror to health: How Rwanda rebuilt itself to become one of Africa's brightest stars. *The Daily Telegraph* 2019 7 April. <https://www.telegraph.co.uk/news/0/horror-health-rwanda-rebuilt-become-one-africas-brightest-stars/> [accessed 25 May 2019].
- 31 Refers to Gallup US data, which asks Americans about their trust in different aspects of the government or its ability to perform different responsibilities. A summary of the data can be found here: Gallup. *Trust in Government*. <https://news.gallup.com/poll/5392/trust-government.aspx> [accessed 16 May 2019].



Zora the robot care-giver in a group therapy session for the elderly at Jouarre Hospital in France.
Dmitry Kostyukov

Science and Society



Chapter 4: Science and society

Introduction

The argument that science is a public good (rather than science is good for the public) has been much discussed in recent decades^{1,2,3}. The concept of the public good was first coined by economists⁴, who define it as essentially having two distinct characteristics: firstly, it is a good that is freely available to all people (non-excludable), and secondly, it is a good that is not reduced by use, meaning that use by one person does not reduce its availability to others. The assertion that science is a public good is mainly due to the fact that it is defined as knowledge⁵.

However, the beneficial results from science and scientific knowledge are not always perceived to be available to all: some people do not consider themselves included in the benefits of science. Given the importance of inclusivity in science, this idea – whether everyone feels like they actually benefit from science – is one of the important research questions the Wellcome Global Monitor explores at an unprecedented global level. The findings from this section of the study are discussed in this chapter^{6,7,8}.

Box 4.1: Main research topics addressed in this chapter

8. How included do people feel in science and health research, and to what extent do people believe science benefits them personally as well as society as a whole?
9. Are people concerned about the impact of science and technology on their economic wellbeing and employment opportunities, and do people believe that science and technology will benefit the next generation?
10. For people for whom religion is an important part of their daily lives, to what extent do they believe that science and the teachings of their religion disagree, and in the case of disagreement, which information do they believe?

Wellcome Global Monitor questions examined in this chapter

16. In general, do you think the work that scientists do benefits most, some, or very few people in this country?
17. In general, do you think the work that scientists do benefits people like you in this country?
19. Overall, do you think that science and technology will increase or decrease the number of jobs in your local area in the next five years?
18. Overall, do you think that science and technology will help improve life for the next generation?
29. Has science ever disagreed with the teachings of your religion?
30. Generally speaking, when science disagrees with the teachings of your religion, which do you believe?

Summary:

- Globally, about seven in ten people worldwide feel that science benefits them, but there is a wide variation across regions. However, only around four in ten people believe that science benefits most people in their country.
- Around a third of people in North Africa, Southern Africa, Central and South America feel personally excluded from the benefits of science.
- The region of the world where 'Sceptics' (people who do not believe that science benefits them personally nor society as a whole, see Chart 4.5) are most common is South America, where they represent almost a quarter of the population of the overall region.
- In high-income countries, people who say they are 'finding it difficult' to get by on their present income are about three times as likely as people who say they are living comfortably to be sceptical about whether science benefits them personally or benefits society as a whole.
- Overall, out of more than 140 countries in this study, people in France are most likely to see science and technology as a threat to the local employment prospects. Regionally, the people of Western and Eastern Europe are the most pessimistic regions about the impact of science and technology on jobs in their countries.
- Among people with a religious affiliation, 55% would agree with their religious teachings in a disagreement between science and their religion; 29% would agree with science and 13% say it depends on the issue.
- Among people who say they have a religion, the highest percentages of people who say that science has disagreed with their religious teachings are in the US and Southern Europe.
- Globally, 64% percent of people who have a religious affiliation and who say religion is an important part of their daily life, say that when there is a disagreement, they believe religion over science.

Do people feel that science benefits them?

Seven in ten people worldwide feel that science benefits them, but this is not uniformly the case across all regions

One condition of continued public engagement with support for science and health-related research is that work in those fields should result in clear outcomes that improve people's lives⁹. Globally, 70% of people say the work that scientists do benefits 'people like them', while 20% feel personally excluded from the benefits of science – that is, they said they do not believe the work of scientists benefits people like them. These perceptions vary considerably by region, as is shown in Chart 4.1. These findings are consistent with past research¹⁰ on this topic, although that is much more limited in country coverage.

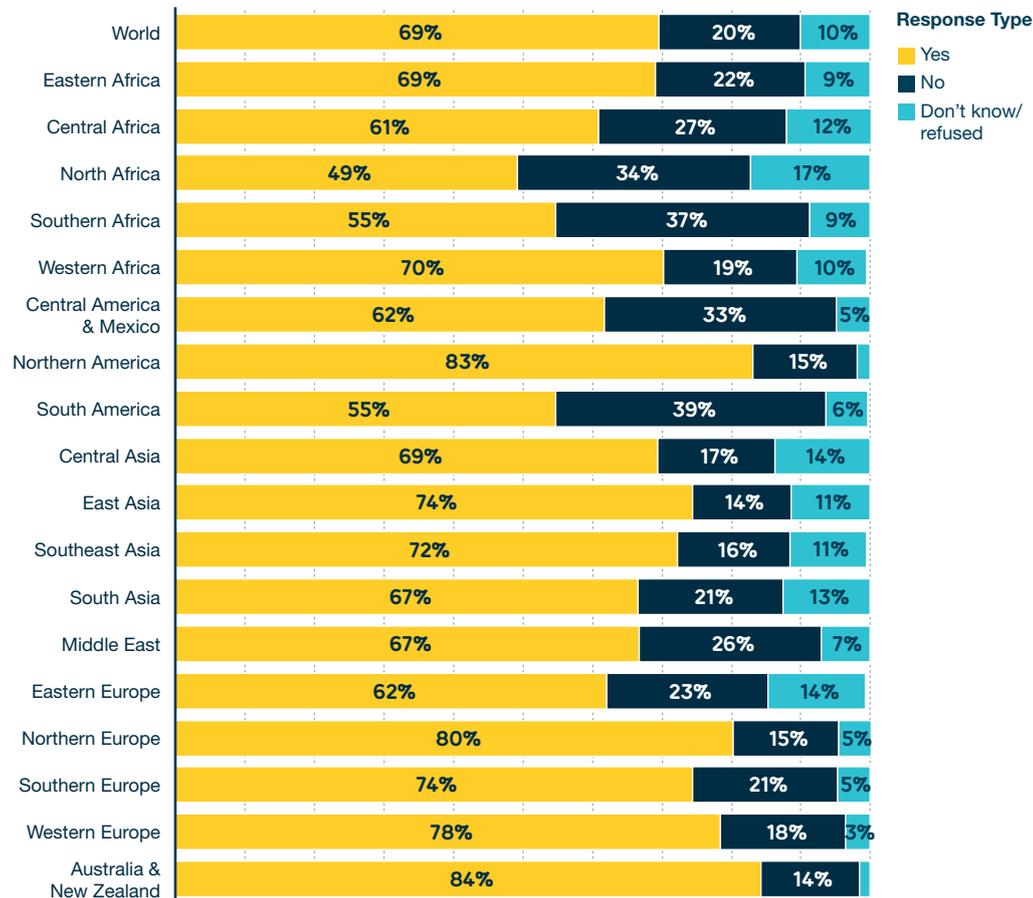
Face to face interview taking place in Haiti.
Gallup 2018



Chart 4.1: People who think the work scientists do benefits people like them by region

Percentage of people who answered 'yes', 'no' or 'don't know/refused'.

In general, do you think the work that scientists do benefits people like you in this country?



One in three people in North Africa, Southern Africa, Central and South America feels personally excluded from the benefits of science

About a third of people in each of North Africa, Southern Africa, Central and South America do not believe the work that scientists do benefits people like them. The regions that are most likely to feel personally excluded from science also tend to be the most negative about the state of their local economy¹¹, underscoring the link that many people make between science and economic growth¹². Initial research indicates that there are a range of factors such as income, education and demographic groups that relate to the feelings people have of inclusion or exclusion from the benefits of science. However, these factors only account partly for the findings, and there are other country-specific considerations that may contribute to those sentiments of being included or excluded from the benefits of science, such as

whether people feel that science is something that is shaped by their national culture or history rather than something that is 'foreign' to their culture.

For instance, it is increasingly reported^{13,14,15} that the communication of science needs to be more socially and culturally aware, for it not to be considered exclusive and 'Western' driven¹⁶. In Africa, for example, science journalists Sarah Wild and Linda Nordling note that 'the way science is taught and practised in Africa is not socially inclusive. It mostly ignores African perspectives on science and contributions to the field'.

As we will see throughout this chapter, South and Central America are the regions of the world that tend to be most sceptical about how inclusive the benefits of science are – whether the benefits of science can be felt by people like themselves or by most people in their country. This may be partly due to the way society and governments view science in general,

and the region's extreme social and economic disparities may also be a contributing factor. There also appears to be a generally low priority and lack of resources devoted to science and scientific research in many countries across the continent, which means that government funding of scientific research is limited, and 'private industries in Latin America are in general reluctant to invest in scientific development'¹⁷. In addition, other research has found that there is a basic tension between religion and science across Latin America – a finding that is also echoed by the results on this topic discussed later in this chapter¹⁸.

At least 80% of people living in Northern America, Northern Europe and Australia and New Zealand feel included in the benefits of science

At the other end of the spectrum, at least eight out of ten people living in Northern America, Northern Europe and Australia and New Zealand feel included

in the benefits of science. These findings echo other research in those regions, which also suggests that while there is broad support and belief in the benefits of science more generally, that is not always the case with regards to specific issues, such as genetically modified food or fracking, for example^{19,20,21,22}.

People in Saudi Arabia, Denmark and Iceland are most likely to say the work of scientists benefits people like them

In 115 out of over 144 countries included in this first wave of the Wellcome Global Monitor, a majority of people (over 50%) said the work scientists do benefits people like them²³. However, it is notable that in some countries those proportions are close to 90% of people. Saudi Arabia, Denmark and Iceland have the most positive outlook regarding the benefits of science to them, with nearly nine in ten people saying the work that scientists do benefits people like them.

Table 4.1: Countries where people are more likely to say the work of scientists benefits people like them

Percentage of people who answered 'yes'.

In general, do you think the work that scientists do benefits people like you in this country?

	% Yes
Saudi Arabia	89%
Denmark	88%
Iceland	88%
Australia	85%
Canada	85%
Germany	85%
Bangladesh	84%
Finland	83%
United States	83%
Uzbekistan	83%
United Kingdom	82%
Median result for all 144 countries	64%

Saudi Arabia's position at the top of the table is notable. While the country has historically had a modestly sized scientific research sector as measured by GERD²⁴, national leaders in Saudi Arabia have recently sought to build the country's scientific capacities through investment in universities and other research and development centres²⁵, and this has already seen a rise in science-related literature published in the country²⁶. Moreover, learning science at school is a very common experience in Saudi Arabia, with 84% of people saying they studied science at a secondary school or post-secondary education level. In addition, as noted in a

2016 OECD report, 'Saudi Arabia has one of the highest shares of students graduating in science fields across OECD and partner countries²⁷.'

Other countries where a large share of people believe science benefits them personally include Germany (85%), Canada (85%), Australia (85%), the US (83%), Finland (83%) and the UK (82%). Two countries on the list in Table 4.1 stand out from this group of high-income countries: Bangladesh, where 84% of people said science benefits them personally, and Uzbekistan, with a corresponding figure of 83%.

Box 4.2:

84% of people in Bangladesh believe the work scientists do benefits people like them

Bangladesh, a lower-middle-income country with a limited scientific research sector²⁸, does not seem to fit the profile of other countries that are highly positive about the benefits of science to them personally. However, recent changes in the country – including a government initiative to increase Bangladeshis’ access to the internet – may help explain these results²⁹. According to the International Telecommunications Union (ITU), internet penetration rates grew from around 4% in 2010, to 14% in 2016, to around 20% in 2018.

In addition, Bangladesh has been experiencing relatively strong economic growth: between 2008 and 2016, the economy grew, on average, by more than 6% a year according to World Bank data; in 2017

and 2018, growth was closer to 8% according to the International Monetary Fund³⁰.

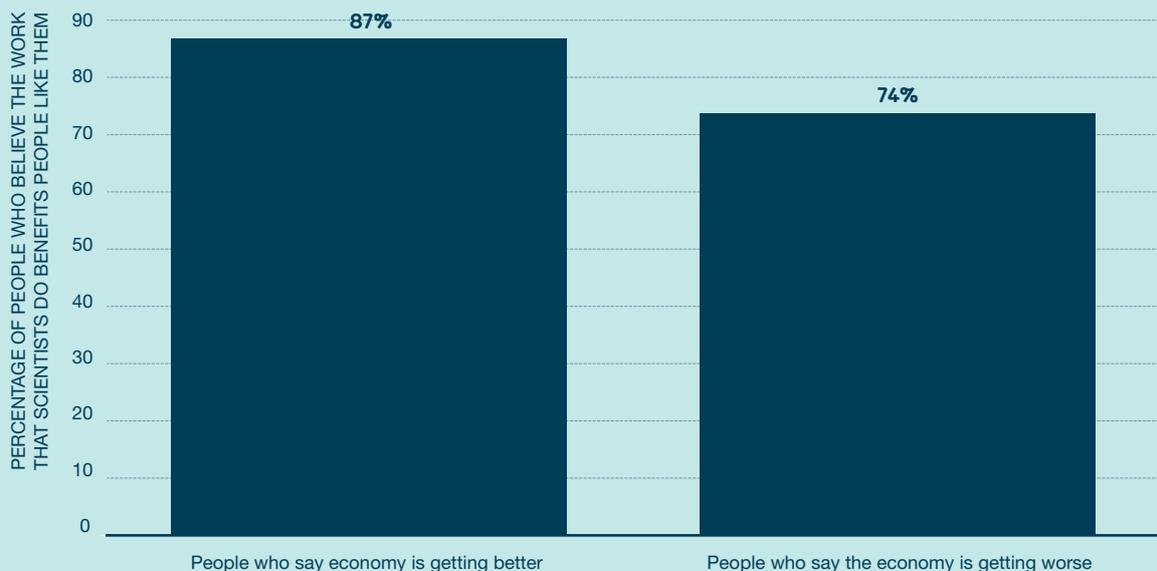
Importantly, many people in the country can feel this economic growth, with the percentage of people in Bangladesh who say their local economy is getting better rising from 55% in 2008 to 79% in 2018, according to the Gallup World Poll. This may make a difference in whether people believe the benefits of science are inclusive on a personal level – 87% of people in Bangladesh who said the local economy was getting better also said that the work that scientists do benefits people like them, compared to 74% of people in Bangladesh who believe the local economy is getting worse. However, those findings are preliminary and further research is needed.

Chart 4.2:

People in Bangladesh who think the work scientists do benefits people like them according to views about the local economy

Percentage of people who answered ‘yes’.

In general, do you believe the work that scientists do benefits people like you in this country?



Do people feel that science benefits other people in their country?

In 15 out of 18 regions, less than half say science benefits most people in their country

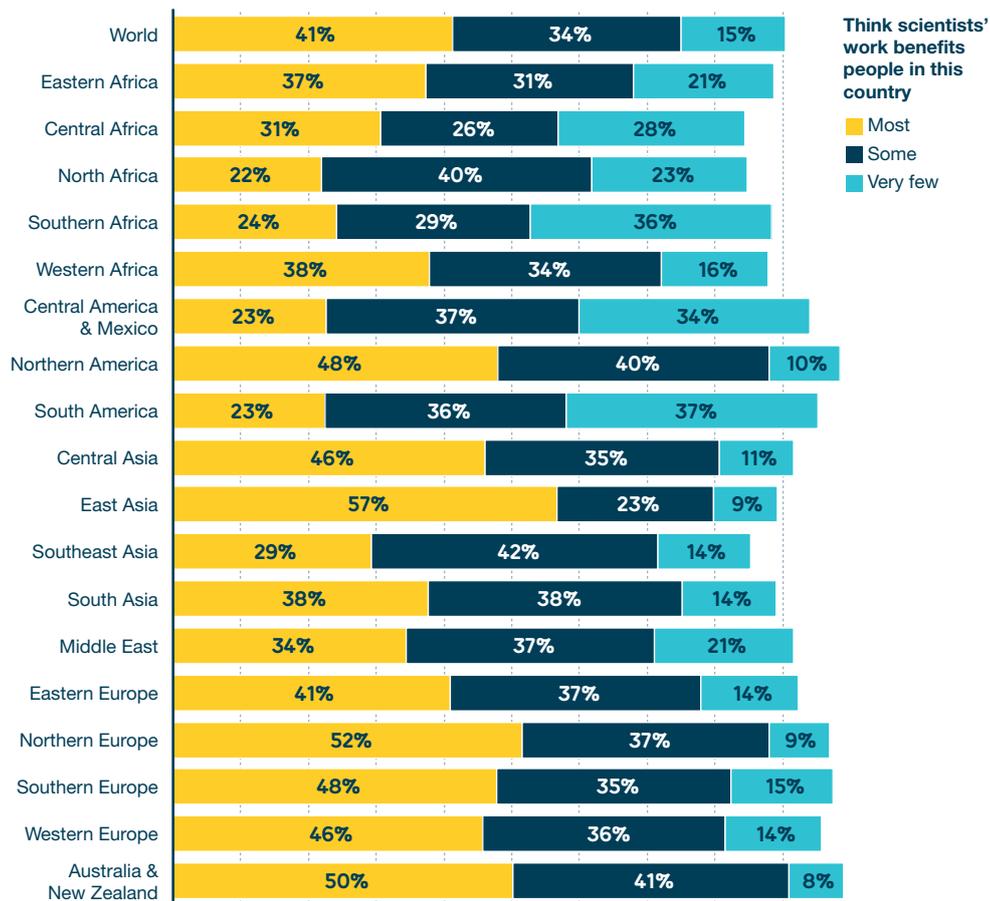
About four in ten people worldwide (41%) say the work that scientists do benefits ‘most’ people in their country, while 34% say it benefits ‘some’ and 15% say it benefits ‘very few’. Regionally, people in East Asia are most likely to say the work that scientists do

benefits ‘most’ people in their countries (57% of people in this region expressed this opinion), though this largely reflects the fact that 60% of people in China gave this response; this figure is far lower in South Korea at 44%, 35% in Taiwan, 29% in Japan and 17% in Mongolia. Japan’s result is in line with past research that shows the country has lost some confidence in the scientific community following the Fukushima disaster in 2012³¹.

Chart 4.3: Perceptions about whether scientists work benefits people in their country by region

Percentage of people who answered ‘most’, ‘some’ or ‘very few’.

Do you think the work that scientists do benefits most, some or very few people in this country?



In three regions, about a third of people said that science helps ‘very few’ people in the country: South America (37%), Central America/Mexico (34%), and Southern Africa (36%). These findings signal the relatively low confidence among people in those regions that the benefits of science are available to all of society. This is examined further in the next section, which looks at people’s views about the benefits of science at a combined personal and country-wide level.

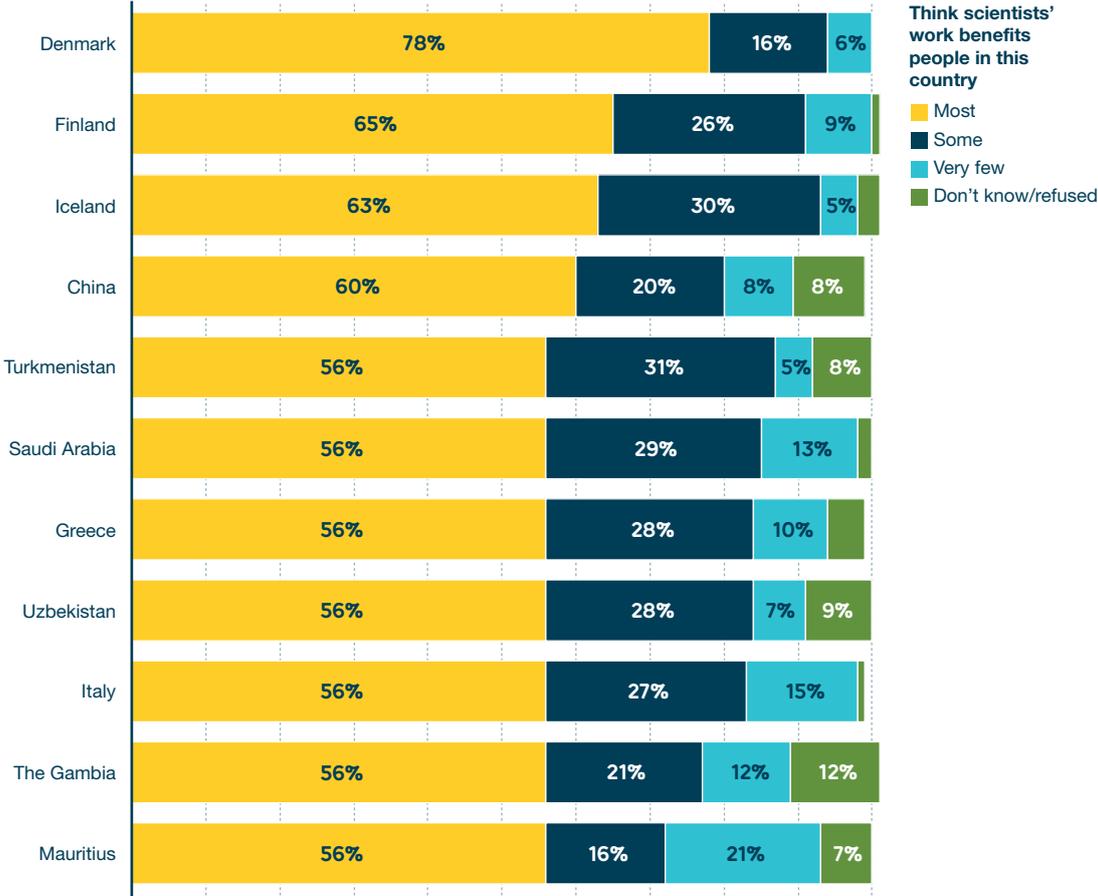
At the country level, people in Denmark are, by a notable margin, the most likely of any country to say

that the work that scientists do benefits ‘most’ people in their country, with 78% of people taking this position. A majority of people in two other Northern European countries also say science helps ‘most’ people: Finland (65%) and Iceland (63%). Notably, all three countries, relative to their size, have a sizeable scientific research industry³², though the relationship between a country’s research and development spending as a percentage of gross domestic product, and the percentage of its people who said ‘most’ is only of moderate strength³³.

Chart 4.4: Countries where people are more likely to say the work that scientists do benefit most people in their country

Percentage of people who answered ‘most’, ‘some’, ‘very few’ or ‘don’t know/refused’.

Do you think that the work that scientists do benefits most, some or very few people in this country?



A few other countries on this list also bear further mention:

- 60% of people in China believe the work that scientists do benefits ‘most’ people in their country. This suggests the Chinese government’s decades-long policies to support the country’s scientific research capabilities enjoys public support³⁴, at least in principle.
- In Greece, 56% of people say science benefits ‘most’ people in the country. Other research has found Greeks are very positive about science. For instance, a 2001 Eurobarometer poll found that people in Greece are the most likely of any European Union country to agree that science and technology ‘can solve all problems’³⁵.
- In The Gambia, the high percentage of people who believe the work that scientists do benefits most people in their country seems out of step with the country’s limited spending on research and development or the number of researchers in the country³⁶ – indicators that help measure the prominence of science in a society. However, since 2007, the country has had a specific government ministry dedicated to, among other things, promoting scientific research and access to general education³⁷. The fieldwork in

The Gambia overlapped with the country’s first national science week, potentially influencing sentiment towards science at that time.

- In Mauritius, 56% of people said science benefits most people in the country; the survey fielding period overlapped with the government launching National Science Week, which may have made public opinion in that country more positive on this question, as well as others in the survey³⁸.

The combined view: how people feel about the benefits of science on a personal and societal level

The previous two questions provided insights into how inclusive a person feels the benefits of science are at the personal level and the societal level separately. In an effort to gain an insight into how people feel about the benefits of science for both themselves and society as a whole, a summary measure was constructed combining each person’s responses to both questions together. Four groups of people were identified through this analysis: the ‘Enthusiasts’, the ‘Included’, the ‘Excluded’ and the ‘Sceptics’ (see Box 4.3)³⁹. People who said ‘don’t know’ to either of the two questions were placed into a separate category.

Box 4.3: A combined indicator of how people feel about the benefits of science

Past research has found that people associate science with progress of some kind – be it economic, technological or as improving the overall quality of life.

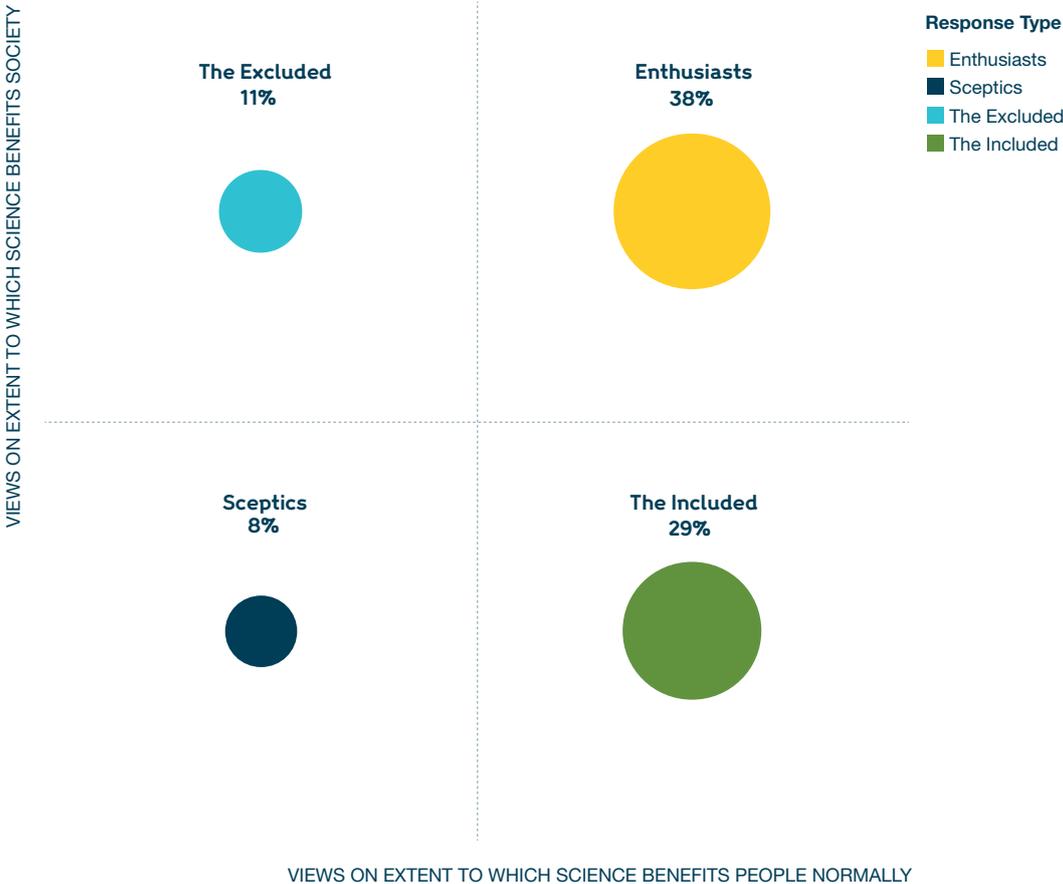
Using the two Wellcome Global Monitor questions on the benefits of science to people personally and to society overall, we combined people’s responses to those two questions to construct a measure of how broadly people view the benefits of science:

- In general, do you think the work that scientists do benefits most, some, or very few people in this country?
- In general, do you think the work that scientists do benefits people like you in this country? (Yes/No/Don’t know/Refused)

People were assigned to the following groups based on their responses to both questions:

- The Enthusiasts: people who said science benefits people like them and most people in the country
- The Included: people who said science benefits them personally but not most people in society
- The Excluded: people who said science does not benefit them personally but benefits some or most in society
- The Sceptics: people who said science does not benefit them personally nor does it benefit most in society.

Chart 4.5: The combined view of how people feel about the benefits of science on a personal and country level



Note: 15% of people did not answer at least one of the two questions and were therefore not included in any of the groups above.

Almost four in ten people worldwide (38%) fall into the ‘Enthusiasts’ group, meaning they believe the benefits of science are felt by most people in society, as well as by them personally. A somewhat lower proportion, 29% worldwide, are among ‘The Included’ – those who believe that science benefits them personally but do not think it benefits many others in society. On the other hand, 11% of people can be described as ‘The Excluded’, meaning they feel that though most people benefit from science, they themselves do not. And finally, 8% of people worldwide belong to the least positive group: the ‘Sceptics’. These are the people who believe science does not benefit them personally nor does it benefit most people in their country. Taken together, that constitutes some 19% of people worldwide – almost one in five – who believe that science does not benefit them personally – i.e. they feel excluded from the benefits of science.

The next few sections will look more closely at the most and least optimistic groups with regard to the benefits of science – the Enthusiasts and the Sceptics – in an effort to identify the regions and demographic characteristics that these groups belong to, and what factors might be associated with their opinions and perceptions of how inclusive the benefits of science are.

A closer look at the ‘Enthusiasts’: they tend to be wealthier and more educated

Enthusiasts tend to be the largest of the four groups in most countries. They are most numerous in Denmark, where they represent almost three-quarters of the population. Other countries with high ‘Enthusiast’ percentages include Iceland, Finland, Saudi Arabia and China⁴⁰.

Table 4.2: Countries where people are most likely to be science ‘Enthusiasts’

Percentage of people who said science benefits people like them and most people in the country.

Do you think the work that scientists do benefits most, some or very few people in this country?

In general, do you think the work that scientists do benefits people like you in this country?

Country	% Enthusiasts
Denmark	75%
Iceland	61%
Finland	61%
Saudi Arabia	55%
China, Greece, Uzbekistan	54%

Enthusiasts are most common in high-income countries (41%) as well as upper-middle-income countries (42%). Fewer people in lower-middle-income countries or low-income countries are Enthusiasts, at 32% and 31% respectively.

In terms of individual characteristics, people who come from a higher socio-economic background,

such as higher household income or completing a college or university-level education, are more likely than others to be Enthusiasts. Gender also plays a role – but only in some areas of the world, like Northern America or East Asia (see Chart 4.6). However, in about half of the regions, the differences between women and men are statistically negligible.



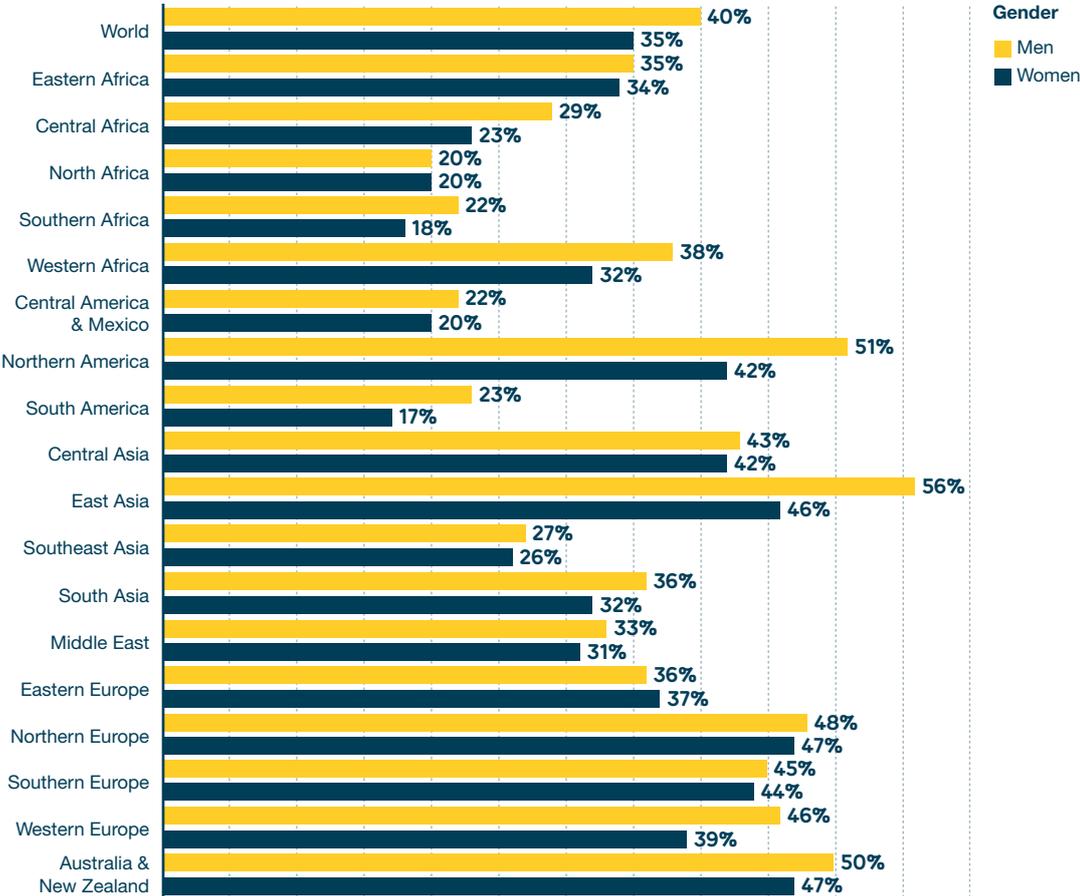
Face to face interview taking place in Indonesia. Gallup 2018

Chart 4.6: Science 'Enthusiasts' by gender and region

Percentage of people who said science benefits people like them and most people in the country.

Do you think the work that scientists do benefits most, some or very few people in this country?

In general, do you think the work that scientists do benefits people like you in this country?



In addition, on a global level, people who say religion is important in their daily lives are, on balance, less likely to be considered Enthusiasts about the benefits of science than people who say religion is not important in their daily life, at 34% to 45% respectively.

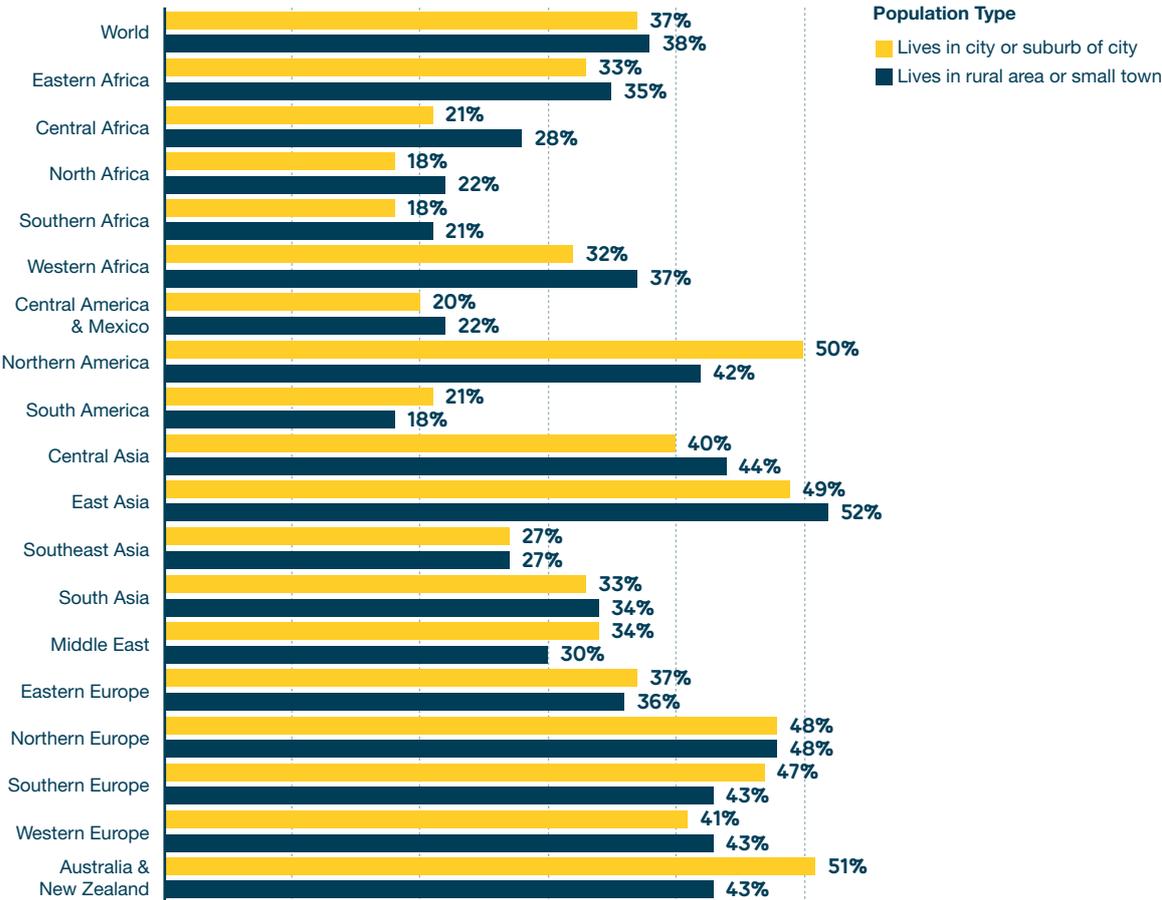
Globally, people living in urban areas (cities or suburbs of cities) are no more likely to be Enthusiasts than people living in non-urban areas (rural areas or small towns), at 37% to 38% respectively. Yet, in some regions of the world, such as Western or Central Africa, people living in non-urban areas are slightly more likely to be Enthusiasts than those living in the urban areas. In Northern America and Australia and New Zealand, this pattern is reversed.

Chart 4.7: Science 'Enthusiasts' by type of residential area and region

Percentage of people who said science benefits people like them and most people in the country.

Do you think the work that scientists do benefits most, some or very few people in this country?

In general, do you think the work that scientists do benefits people like you in this country?



People most confident in their knowledge of science are likely to be 'Enthusiasts'

Nearly six in ten people worldwide who said they know 'a lot' about science, or 56%, are Enthusiasts, suggesting that an overall greater 'comfort' or familiarity with the subject could be an important part of how a person perceives its benefits. This does not mean a person needs to feel they are an expert with science to be convinced of its benefits; recently accessing science information is also associated with a higher likelihood of being an Enthusiast, even for individuals who did not say they know 'a lot' about science.

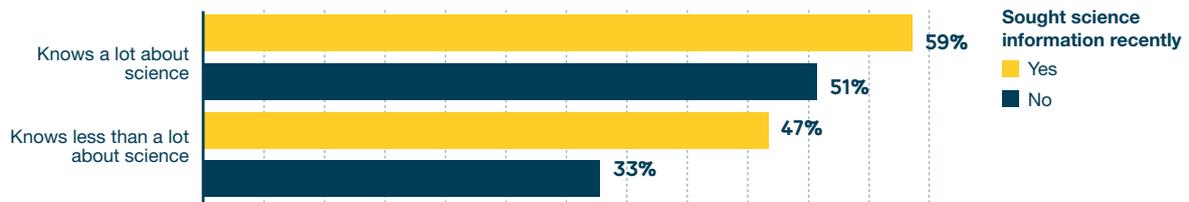
Chart 4.8: Science ‘Enthusiasts’ by perceived knowledge of science and science information seeking

Global results.

Percentage of people who said science benefits people like them and most people in the country, and had sought science information in the last 30 days.

Do you think the work that scientists do benefits most, some or very few people in this country?

In general, do you think the work that scientists do benefits people like you in this country?



In high-income countries, people who say they are ‘finding it difficult’ to live on present income are almost three times as likely to be ‘Sceptics’ as those who are living comfortably

Worldwide, people who find it difficult or very difficult to get by on their household income are slightly more likely to be Sceptics in terms of their views on the benefits of science (11% of whom are Sceptics), compared to those who are ‘getting by’ (6% of whom are Sceptics) and those who are ‘living comfortably’ on present income (5% of whom are Sceptics).

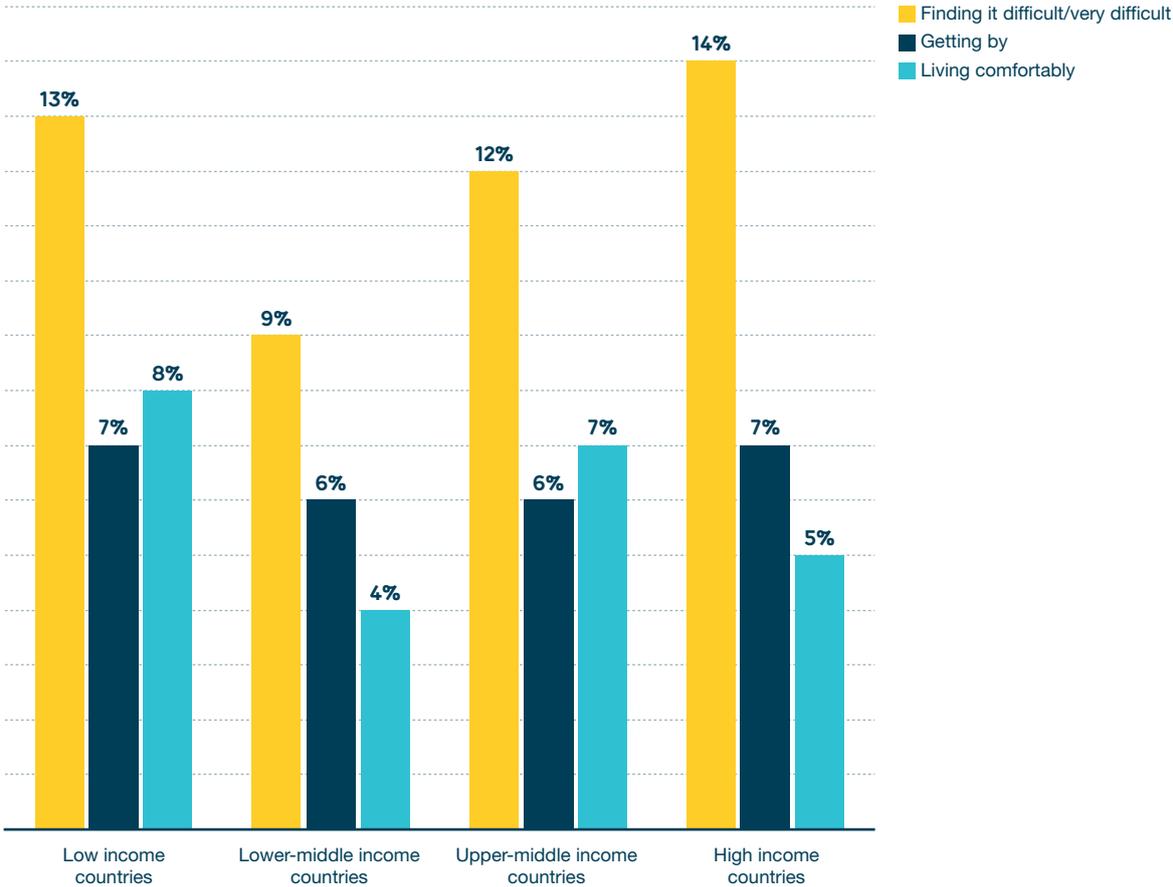
However, in countries designated as high income by the World Bank, people who are finding it difficult or very difficult to get by on their present income are nearly three times as likely to be Sceptics as people who are ‘living comfortably’ (14% compared to 5% respectively). In addition, in this group of countries, people whose household income falls in the lowest 20% of the national income distribution are more likely than other income groups to feel excluded from the benefits of science.

Chart 4.9: Science ‘Sceptics’ by country-income group and feelings about household income

Percentage of people who said science does not benefit people like them and does not benefit most in society.

Do you think the work that scientists do benefits most, some or very few people in this country?

In general, do you think the work that scientists do benefits people like you in this country?



‘Sceptics’ as a group are most prevalent in South America

Though the smallest of the four groups, the Sceptics – people who believe science does not benefit them personally nor most of society – are the most common of the four groups in six countries: Albania, Mongolia, Montenegro, Paraguay, Armenia and Georgia.

However, on a regional basis, the disconnect between society and the benefits of science is especially prevalent in Central and South America; in 12 out of the 19 countries in those regions, at least one in five people, or 20%, are classified as ‘Sceptics’. Notably, this attitude is almost as common in each of these countries, despite their different levels of country-income levels.

Table 4.3: Science ‘Sceptics’ in South and Central America by country

Percentage of people who said science does not benefit people like them and does not benefit most in society.

Do you think the work that scientists do benefits most, some or very few people in this country?

In general, do you think the work that scientists do benefits people like you in this country?

Country	Sceptics %	Country-income level
Ecuador	32%	Upper middle
El Salvador	28%	Lower middle
Honduras	28%	Lower middle
Peru	28%	Upper middle
Paraguay	26%	Upper middle
Bolivia	25%	Lower middle
Chile	24%	High income
Panama	24%	High income
Brazil	23%	Upper middle
Guatemala	23%	Upper middle
Colombia	22%	Upper middle
Venezuela	20%	Upper middle
Costa Rica	19%	Upper middle
Nicaragua	19%	Lower middle
Argentina	18%	High income
Uruguay	18%	High income
Dominican Republic	17%	Upper middle
Mexico	17%	Upper middle
Haiti	15%	Low income
Rest of the World	7%	-

These countries also rate confidence in their national institutions lower than other regions of the world⁴¹, an attitude that, as was seen in Chapter 3, is significant in affecting trust in scientists. Similarly, being a Sceptic is in some way shaped by confidence in institutions, as seen by the strong negative relationship between how many people in a country are Strong Sceptics and the country's overall confidence in their institutions⁴².

Sceptics lack confidence in their country's hospitals and health clinics

People's attitudes to science may be related to tangible results in their daily lives. For instance, people who said they do not have confidence in the hospitals or health clinics in their country are about three times more likely to be strong sceptics than people who have confidence in these health institutions, with 17% of the latter group and 6% of the former group considered strong sceptics. This general pattern holds across the different country-income levels.

Table 4.4: Science ‘Sceptics’ by confidence in hospitals and health clinics and country-income level

Percentage of people who said science does not benefit people like them and does not benefit most in society.

Do you think the work that scientists do benefits most, some or very few people in this country?

In general, do you think the work that scientists do benefits people like you in this country?

In (country name), do you have confidence in the following or not? How about – hospitals and health clinics?

	Has confidence in hospitals %	Do not have confidence in hospitals %
World	6%	17%
Low-income countries	8%	19%
Lower-middle-income countries	6%	14%
Upper-middle-income countries	6%	18%
High-income countries	6%	16%

Do people believe that science will improve life for the next generation?

More than eight in ten people worldwide believe science will improve life for the next generation

More than eight in ten people around the world – 83% – believe science and technology will help improve life for the next generation. Despite some regional variation, a majority of every region is optimistic about what science and technology can do for the next generation, from a high of 91% in Northern America to the lowest regional result of 71% in North Africa.

Do people think science and technology will increase or decrease the number of jobs in their local area in the next five years?

Western and Eastern Europe are the most pessimistic regions about the impact of science and technology on local jobs

Science and technology, whatever benefits they may bring to people, can also prove economically disruptive. In the first Industrial Revolution, for instance, handloom cotton weavers found their skills displaced by new machinery⁴³. Today, during the ‘Fourth Industrial Revolution’⁴⁴, automation is believed by some people to threaten the survival of many occupations, and the livelihoods of many high- and low-skilled workers⁴⁵.

The Wellcome Global Monitor found that people worldwide are almost three times as likely to say science and technology will increase (58%) rather than decrease (21%) the number of jobs in the local economy. The difference between these two figures can be described as the ‘perceived net impact’ of science on local jobs.

In most global regions – especially those in Africa – people are considerably more likely to believe science and technology will increase rather than decrease jobs. Western and Southern Africans are the most optimistic, though it should be noted that a fifth of people in all the African regions said they ‘don’t know’ how science will impact local job markets. People in most parts of Asia are also very optimistic, most notably in Southeast Asia, with a perceived net impact of +52 points.

The least optimistic tend to be people in high-income regions, especially Western and Eastern Europe. Among regions that contain mostly high-income countries, Northern America is an outlier. People in the United States and Canada are more likely to say science and technology will increase (61% and 53% respectively) rather than decrease (28% and 33%) jobs in their local area.

Box 4.4: The perceived impact of science and technology on jobs

The Wellcome Global Monitor asks: *Overall, do you think science and technology will increase or decrease the number of jobs in your local area in the next five years?*

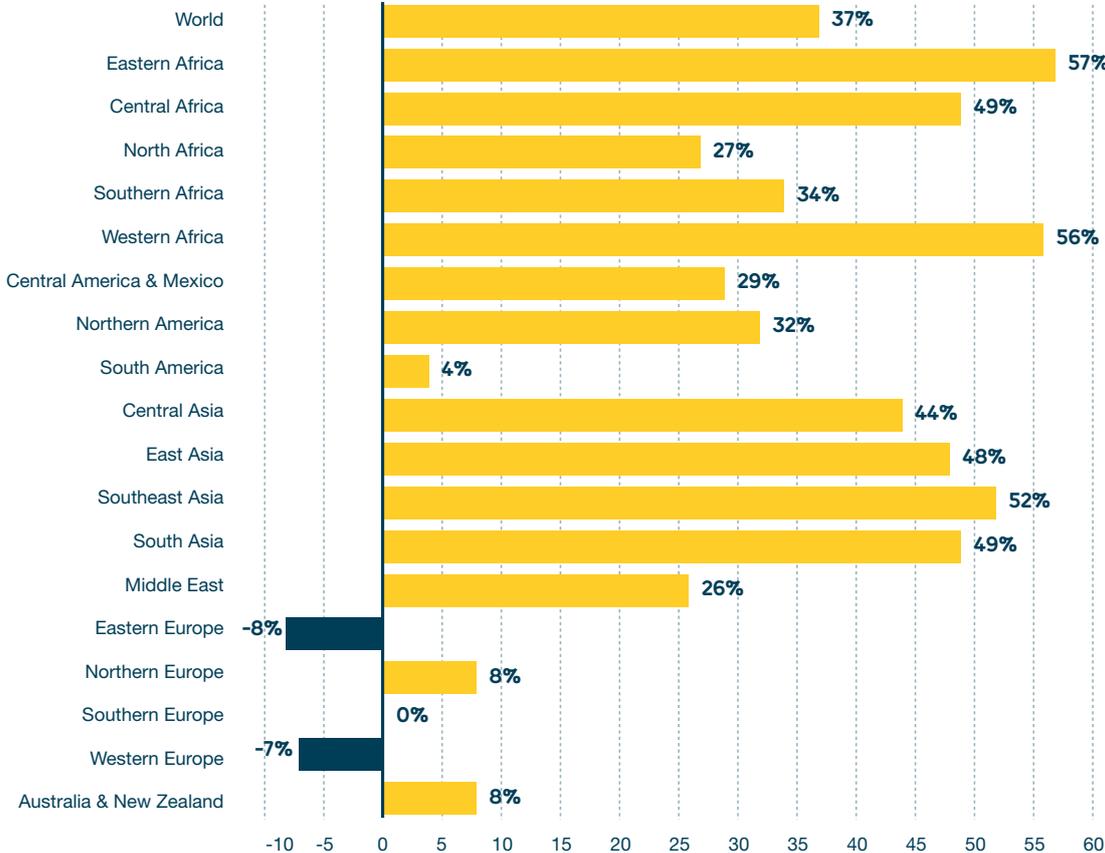
Though two answer options are explicitly offered (increase or decrease), 7% of people worldwide said science and technology would have no effect on jobs, which was accepted as a valid response. Another 14% said they did not know.

To assess if people in a country are either more optimistic or more pessimistic about the impact science and technology will have on jobs, this section will refer to the 'perceived net impact'. This is the percentage of people who said science will increase jobs minus the percentage of people who said science will decrease jobs. A positive net impact score means people are more optimistic than pessimistic about job prospects in relation to science and technology, and a negative score indicates the opposite. Note, people who did not offer an opinion or volunteered the response 'the same' were not included in calculating the 'net jobs'.

Chart 4.10: Perceived impact of science and technology on jobs over the next five years by region

Net impact score (percentage of people who said science will increase jobs minus the percentage of people who said science will decrease jobs).

Overall, do you think that science and technology will increase or decrease the number of jobs in your local area in the next five years?



Many European countries are among those most pessimistic about the impact of science and technology on jobs

Nineteen out of more than 140 countries in the study are notably more pessimistic than optimistic regarding the impact of science and technology on jobs, 17 of which are in Europe. France is the most pessimistic country in this regard, with 55% of the French saying science and technology will decrease the number of jobs over the next five years, compared to 29% who believe science and technology will increase the number of jobs, for a perceived net impact score of -26.

Three other European countries have a perceived net impact score nearly as negative as France: Latvia (-25), Lithuania (-21) and Hungary (-20). As a whole, about as many people living in the European Union believe science and technology will decrease jobs as increase jobs. In the non-EU part of Europe, views tilt slightly to the negative, with 37% saying science will increase jobs and 42% saying the opposite.

These findings merit more in-depth research, especially given the prevalence of this sentiment in both Western and Eastern Europe as a whole.

Outside of Europe, the most sceptical societies concerning the effect of science and technology on local jobs are in Uruguay (-17 points), Taiwan (-15 points), and Japan (-10 points).

Box 4.5: Pessimistic views on the impact of science and technology on jobs in France

Out of the 144 countries included in the Wellcome Global Monitor, France is the only country where more than half of the population (55%) say they think science and technology will decrease the number of jobs in their area over the next five years.

Although much more research is needed to understand why this might be the case, the sluggish performance of the French economy over the last few years may be one factor that contributes to this sentiment. In 2018, for instance, only 23% of French people said now was a good time to find a job, when asked about that in the Gallup World Poll (for the European Union as a whole, this figure was 42%). In addition, six in ten French people think the economy in their local city or area is getting worse. France's unemployment rate has remained relatively high at

around 9%, compared to that in other European economies. Last year, 60% of people in France said the economy of their local city or area was 'getting worse' compared to 25% who said this worldwide.

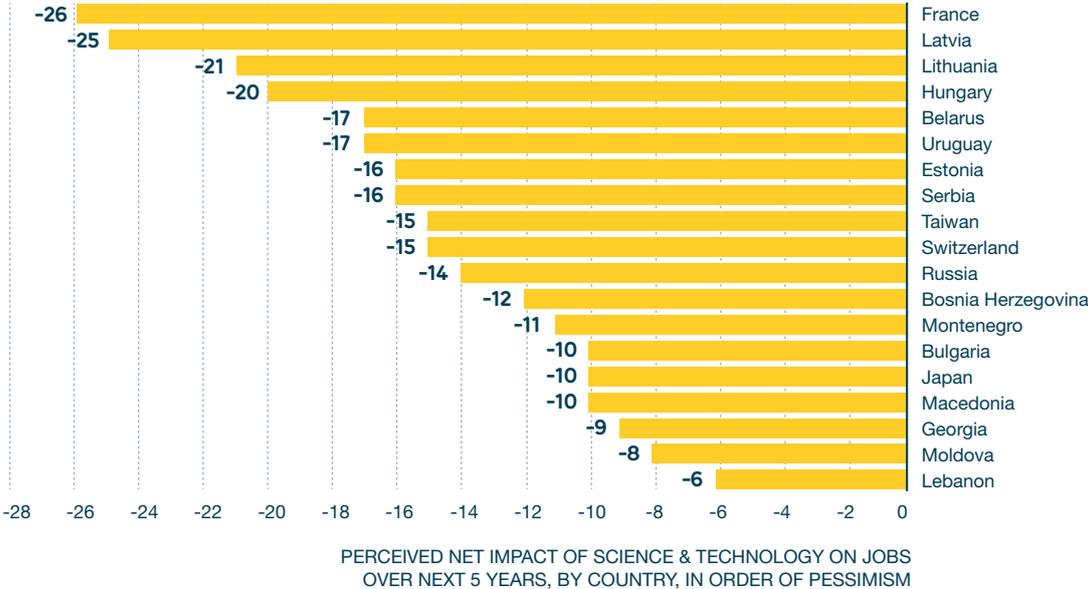
Other research has found the French particularly worried about the impact of science. A June 2015 Europa Commission study⁴⁶ found that people in France, particularly older individuals, were more likely than in other European countries to think scientific innovation moves too quickly and could lead to unemployment.

However, the Wellcome Global Monitor finds no substantial differences between different age groups in France – indeed 15–34-year-olds are about as likely as those aged 55 and older to think science will decrease jobs, with around 55% of both groups saying so.

Chart 4.11: Countries which are most pessimistic about the impact of science and technology on jobs

Net impact score by country.

Overall, do you think that science and technology will increase or decrease the number of jobs in your local area in the next five years?



Local and personal economic conditions and perceptions of threat to local jobs

Views on the effect science and technology have on the local job market may in some cases be a manifestation of personal economic discontent. Adults who feel it is ‘very difficult’ (51%) or ‘difficult’ (57%) to live on their present household income are less likely to say science and technology will increase the number of local jobs than those who are ‘getting by’ (60%) or ‘living comfortably’ (63%).

People’s economic anxiety about the future appears to shape views of science and technology as an economic threat or opportunity even more than feelings about their current standard of living. At the global level, 70% of those who told the Gallup World Poll that they believe the economy in their city or area was ‘getting better’ say science and technology will increase the number of local jobs, compared to 50% of those who believe the local economy is ‘getting worse’. Similarly, residents who say their standard of living is ‘getting better’ are more likely than those who say ‘getting worse’ to believe science and technology will increase the number of local jobs in the economy (67% and 48% respectively).

The mixed effect of education level on views of science and technology’s impact on local jobs

Education levels may inform the way adults perceive the impact of science and technology on their local economy in at least two ways. Firstly, more-educated people are likely more familiar with the generally positive impact that science and technology have on society. Secondly, higher education levels provide individuals with greater skill specialisation and that often helps to insulate them from the short-term disruptive effects of science and technology on lower-skilled jobs.

However, at the global level there is little evidence of a positive relationship between education levels and perceptions of science and technology as an opportunity for the local job market. Some six in ten adults at each education level (58% of those with no more than primary education, 58% of those with secondary education and 59% of those with post-secondary education) say science and technology will increase the number of jobs in the local economy over the next five years. In fact, adults with a post-secondary education (27%) are more likely than those with a secondary (24%) or primary (16%) education to say science and technology will decrease the number of local jobs.

People’s opinion of whether science will improve or worsen the local job market can vary, depending on their level of education – but this tends to be true in high-income countries, rather than non-high-income ones. The net difference between those who expect an increase in local jobs compared to those who expect a decrease rises with residents’ education level in high-income countries (-6 points among those with primary education or less, +9 points among those with secondary education, +18 points among those with post-secondary education). In contrast, the net difference in expectations remains high and stable among adults at all education levels in low-, lower-middle-, and upper-middle-income countries (+44 points among those with primary

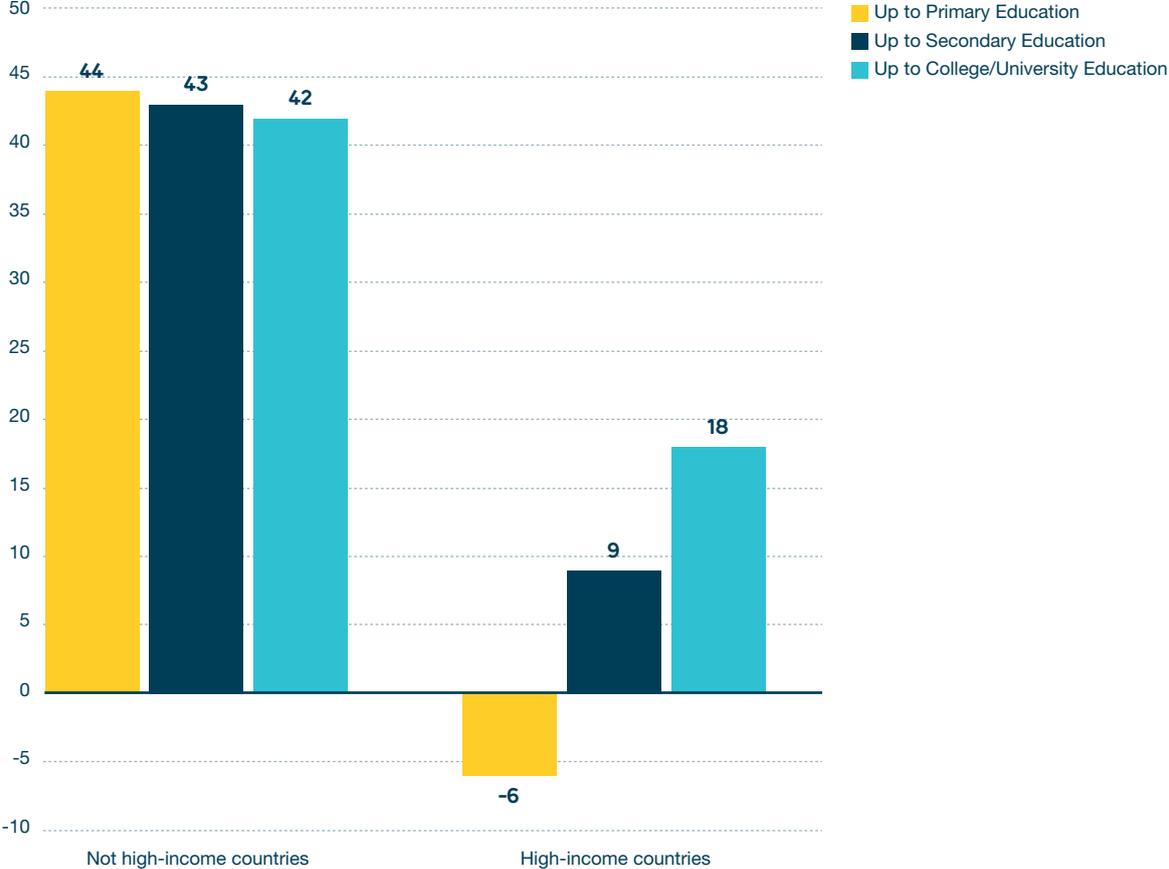
education or less, +43 points among those with secondary education, +42 points among those with post-secondary education).

Despite these countervailing trends, there remains a relatively small net difference between the proportion of job optimists and job pessimists among adults with a post-secondary education – presumably those most insulated from disruptive forces – in high-income countries (+18 points) compared to highly educated residents of countries in all other income groups (+42 points). This suggests the discussion of economic dislocation caused by scientific and technological breakthroughs has led to a relatively broad-based sense of anxiety about possible negative consequences on local job markets.

Chart 4.12: Perceived impact of science and technology on jobs over the next five years by education level and country-income group

Net impact score.

Overall, do you think that science and technology will increase or decrease the number of jobs in your local area in the next five years?



The relationship between religion and science in people's lives

Globally, 61% of people say religion is important in their daily lives

The relationship between science and religious beliefs is regularly debated⁵⁰. Scientific principles may sometimes disagree with religious tenets; one of the most long-standing examples is the ongoing opposition by religious groups in the US to teaching evolution but not creationist theories in public schools⁵¹. In every country included in the Gallup World Poll, people are asked to say what their religion is, and whether or not religion is an important part of their daily life. Worldwide in 2018, 90% of people identified with a specific faith, while 8% said they did not, and 2% said they did not know or declined to answer.

Globally, 61% of people say religion is important in their daily lives; this figure has been very stable in the World Poll since 2010. Among the least religious countries is China, where only 18% of people have said that religion is important in their daily lives. In light of these results and the country's sizeable population, it may be useful to consider China separately when looking at global results for religion-

related items. Excluding China from the global results, almost three-quarters of people (73%) say religion is important in their daily lives. The gap between those who say that they have a religion (by birth or otherwise) and those who say that religion is important in their daily lives could be considered as a proxy for the extent of people's 'religiosity'.

Among people who say they have a religion, the highest percentages of people who say that science has disagreed with their religious teachings are in the US and Southern Europe

Overall, less than three-in-ten people who identify with a religion (29%) say that science has ever disagreed with the teachings of their religion. In general, those regions where people are most likely to say they have a religion tend to be less likely to say that science has disagreed with their religious teachings. For example, in Chart 4.13, the highest rates of religious affiliation (around 95% or higher) are in Africa, South Asia, Central Asia and the Middle East. However, the highest rates of people who said that their religious teachings and science disagreed were reported in Northern America and Southern Europe, where far fewer people report having an affiliation with a particular religion.

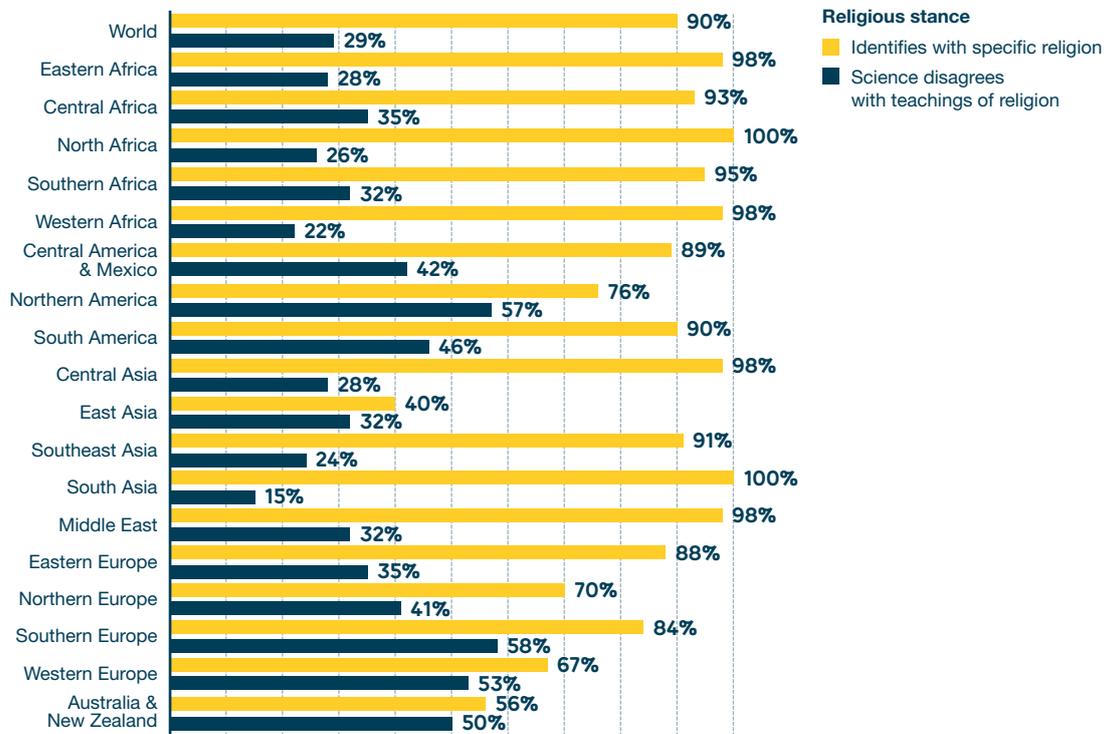


Face to face interview taking place in Senegal. Gallup 2018

Chart 4.13: People with religious faith who say science has disagreed with their religious teaching by region

Percentage of people who answered 'science' or 'teachings of your religion'.

Has science ever disagreed with the teachings of your religion?



Those who say science has disagreed with their religion's teachings are twice as likely to believe their religion than science in such instances

Among people worldwide who say they have a specific religion and that its teachings have disagreed with science, 55% say they generally agree with their religious teachings on such occasions, while 29% believe science and 13% say it depends on the issue.

However, the results vary considerably by region. In Central and East Asia – regions where previous communist regimes had discouraged overt religious

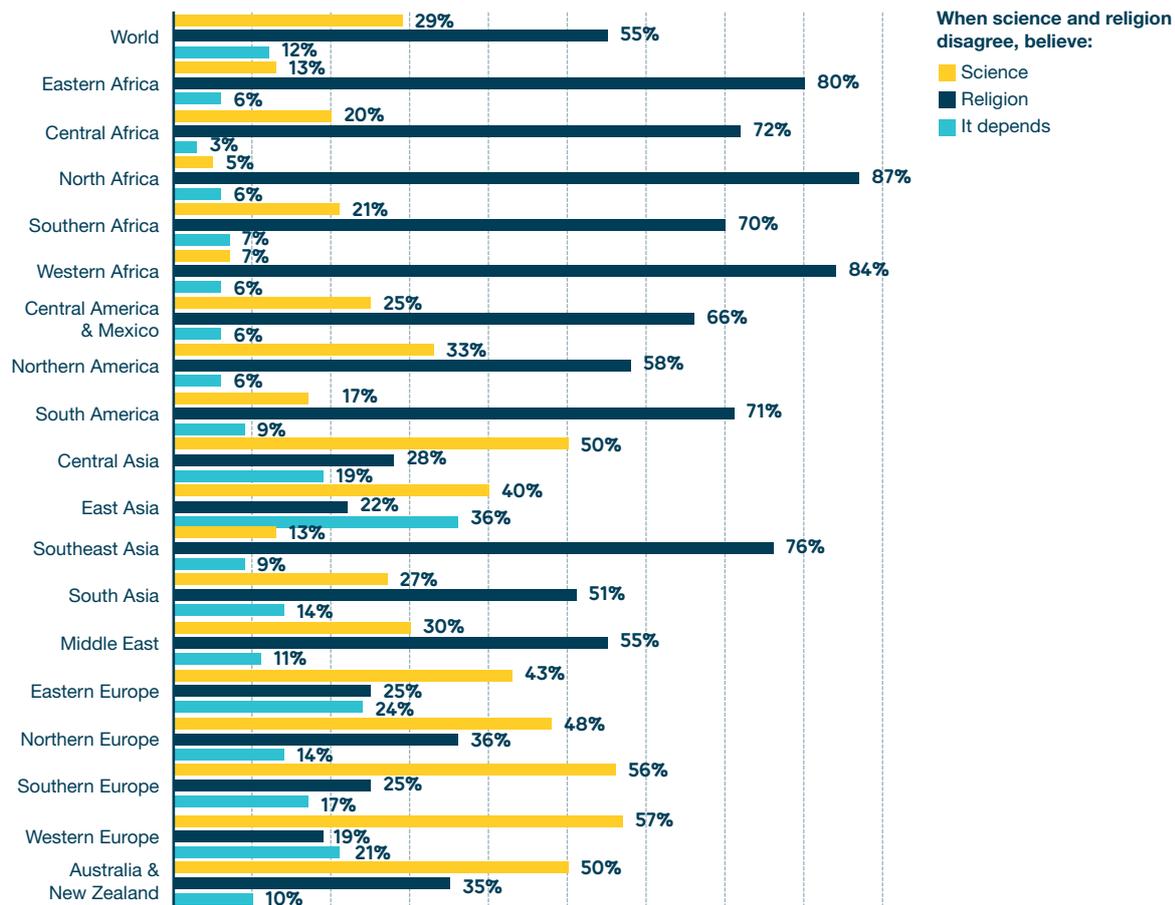
expression – as well as Europe and Australia and New Zealand, people tend to believe science over their religious teachings.

Notably, Northern America is the only high-income region in which people who say they have a religion are substantially more likely to say they believe their religion's teachings over science, in cases of disagreement. This finding is driven predominantly by the US, where people who have a religion are almost twice as likely to believe their religious teachings (60%) as science (32%) in cases of disagreement.

Chart 4.14: People with religious faith who say science has disagreed with their religious teaching and believe science or religion by region

Percentage of people who believe 'science', 'the teachings of their religion' or 'it depends'.

Generally speaking, when science disagrees with the teachings of your religion, which do you believe?



Looking at these regional results by gender and age groups offers more insights about how people think about perceived differences between religion and science. In most regions, men who identify with a specific religion are somewhat more likely than women to say they believe scientific findings when they are different from their religious teachings. This gender difference is widest by far in East Asia (however, given the low number of people who said they have a religion in China, just 5% of East Asians were asked this question, which was a 'screener' for asking the rest of the questions in this section). Men who identify with a religion are also substantially more likely than women to believe science when the two disagree in Northern America (39% compared to 28%) and Central America and Mexico (31% compared to 20%).

At the global level, the Wellcome Global Monitor finds that people under the age of 50 who identify with a religion are somewhat less likely than their older counterparts to believe science when it disagrees with their religious teachings – 26% compared to 32%, respectively. However, this pattern varies by region. Younger people in Northern Europe, are least likely to say they believe science – though 15–29-year-olds in this region are, relatively speaking, among the least likely people to say they identify with a specific religion. In other regions, including Southern Africa, Southern and Eastern Europe as well as Central America and Mexico, younger people are more inclined than their elders to believe science when it differs from their religious teachings.

Table 4.5: People with religious faith who say science has disagreed with their religious teaching but believe science by region and demographic groups

Percentage of people who believe 'science'.

Generally speaking, when science disagrees with the teachings of your religion, which do you believe?

	Total	Men	Women	Age 15 to 29	Age 30 to 49	Age 50+
World	29%	30%	27%	26%	26%	32%
Eastern Africa	13%	14%	12%	17%	10%	7%
Central Africa	20%	24%	16%	22%	15%	26%
Northern Africa	5%	5%	4%	5%	3%	6%
Southern Africa	21%	18%	25%	25%	18%	18%
Western Africa	7%	7%	8%	8%	7%	7%
Central America/Mexico	25%	31%	20%	34%	20%	18%
Northern America	33%	39%	28%	N/A	36%	29%
South America	17%	19%	14%	18%	15%	16%
Central Asia	50%	49%	50%	51%	52%	42%
East Asia	40%	54%	24%	54%	36%	37%
Southeast Asia	13%	15%	11%	11%	15%	13%
Southern Asia	27%	28%	26%	29%	24%	30%
Middle East	30%	31%	29%	33%	29%	27%
Eastern Europe	43%	46%	41%	51%	43%	39%
Northern Europe	48%	52%	45%	40%	55%	48%
Southern Europe	56%	60%	53%	63%	60%	50%
Western Europe	57%	54%	60%	56%	58%	57%
Australia and New Zealand	50%	53%	48%	N/A*	N/A*	51%

*Sample size too small

Likelihood to believe science or religion depends largely on the importance of religion in daily life

Globally, 64% percent of people who have a religion and who say religion is an important part of their daily life, say that when there is a disagreement, they believe religion over science; 62% of those who say religion is not an important part of their daily lives believe science.

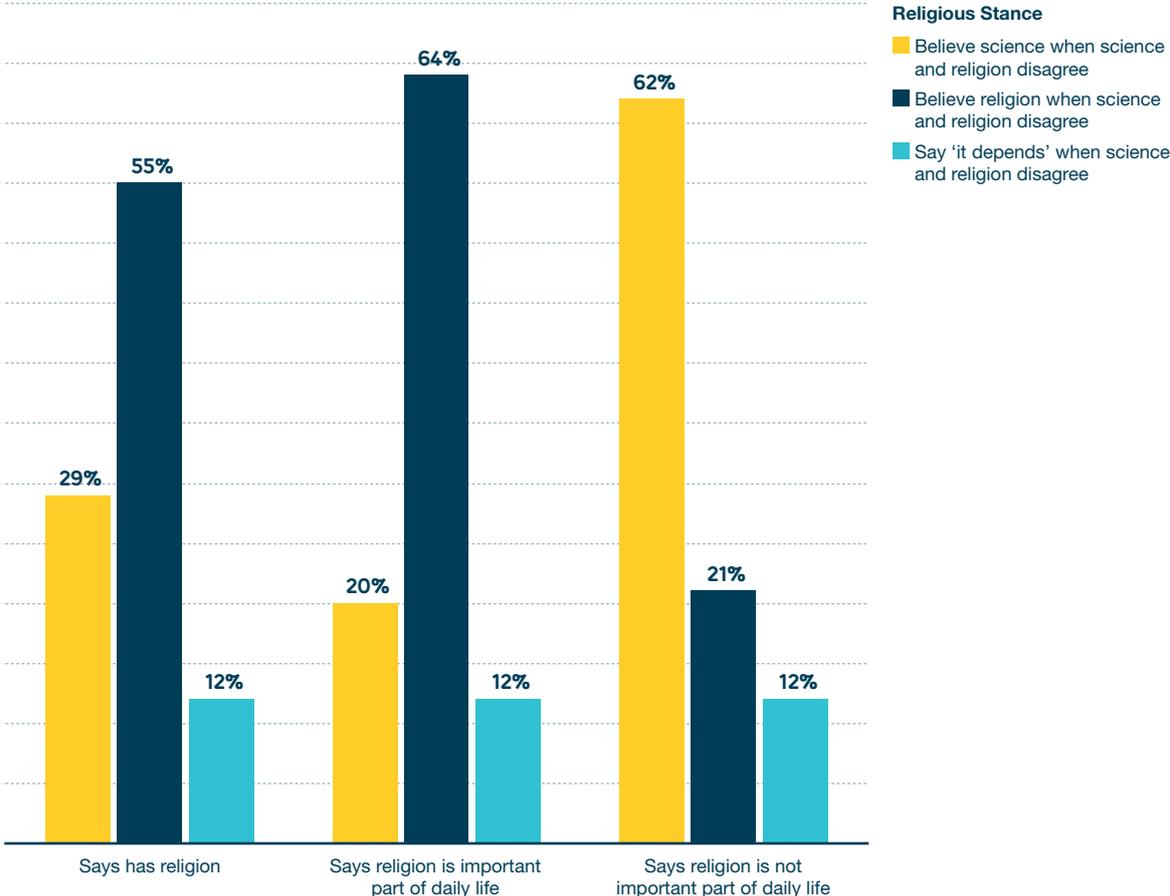
This finding is important in relation to the efforts of the scientific community to engage with people

across different countries and cultures. Religion plays a vital role in the lives of billions of people around the world, and it can influence how people think about science. Ignoring this, or treating science and religion as completely separate and independent domains, might make it harder to understand and affect the way people feel about scientific issues.

Chart 4.15: People with religious faith who believe science or religion when they disagree by religiosity

Percentage of people who believe 'science', 'the teachings of their religion' or 'it depends'.

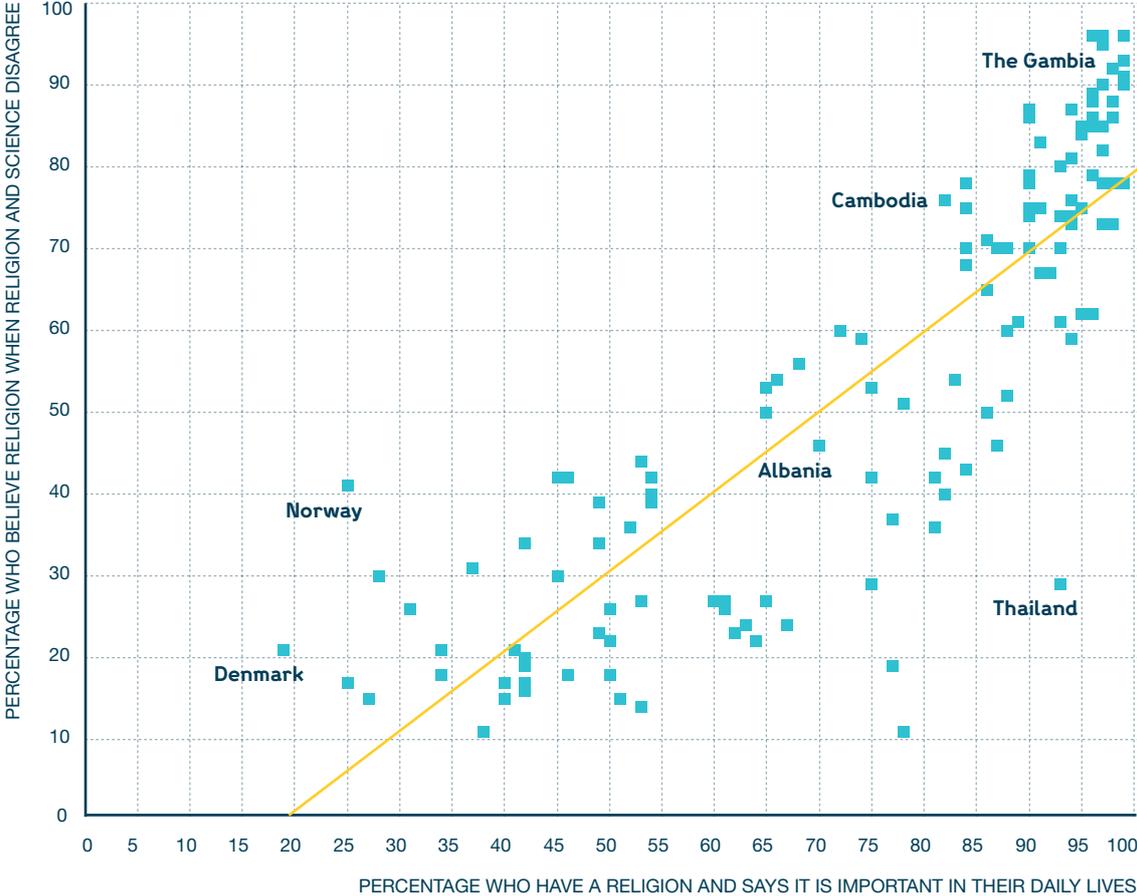
Generally speaking, when science disagrees with the teachings of your religion, which do you believe?



There is also a strong correlation at the country level between a population’s overall level of religiosity (i.e. the percentage of people who say they have a religion and that it plays an important role in their daily life) with the percentage of people who believe religion when science and religion disagree. The countries in the lower left-hand corner of Chart 4.16

– those with low levels of religiosity and where people are less likely to believe religious teachings when they conflict with science – are predominantly in Western, Northern, and Southern Europe as well as East Asia. Countries in the upper right-hand corner are mainly in Central and South America, Africa, and the Middle East.

Chart 4.16:
Scatterplot exploring percentage of people with religious faith who religion is an important part of their lives and who believe their religious teachings when science disagrees



A few countries in Chart 4.16 that seem to be relative outliers are notable. In Thailand, for example, 93% of people say religion is important in their daily lives, but people in Thailand are about as likely to say they would believe science (26%) as their religious teachings (29%) when the two disagree (notably, 38% of people say ‘it depends’ on the issue).

By contrast, in Norway, just 25% of people say they have a religion that is important in their daily lives, but among those who do identify with a religion, a relatively high 41% say they believe their religious teachings when there is conflict with science.

Conclusion

Science is often described as a public good – it seems obvious to many in the scientific community that their work helps to generate knowledge that the rest of society can use to improve people’s lives. The Wellcome Global Monitor tested whether people outside the scientific community agreed with this view, and asked who they thought science benefits.

Around two fifths of people in the world think science benefits people like them, as well as most people in their country. People with this view tend to be relatively well-off in their country, and they tend to be in countries with a higher national income. However, in high-income countries, people who are struggling financially are three times more likely than those who are comfortable to think science brings no benefits to most people. This view, held by 10% of people worldwide, is particularly prevalent in Central and South America, where, in many countries, at least 20% of people – and as high as 32% in Ecuador – say they see no benefits from science for most people, including themselves.

Most people do think science and technology will improve life for the next generation and increase the number of jobs. An exception is in some high-income

regions like Europe, where people tend to be much less optimistic, with many (55% in France, for example) believing science and technology will reduce jobs.

These findings suggest that people largely see science as a public good, but there are certain contexts in which science is seen as a threat to people’s livelihoods. This has to be taken into account when thinking about the relationships between science and society.

Religion and science are sometimes depicted as being in opposition, but Wellcome Global Monitor challenges this stereotype by finding that most people in the world do not see a conflict between their religious beliefs and science. The relationships between religion and science are evidently complex and specific not only to particular religions, but also to different countries and cultures in which people practise their religion. North America and North Africa are good examples; the former has comparatively fewer religious adherents, but of those that do, they are far more likely to see a conflict between religion and science, while the latter has a high proportion of religious people, most of whom do not see such a conflict.



Face to face interview taking place in Cambodia. *Gallup 2018*

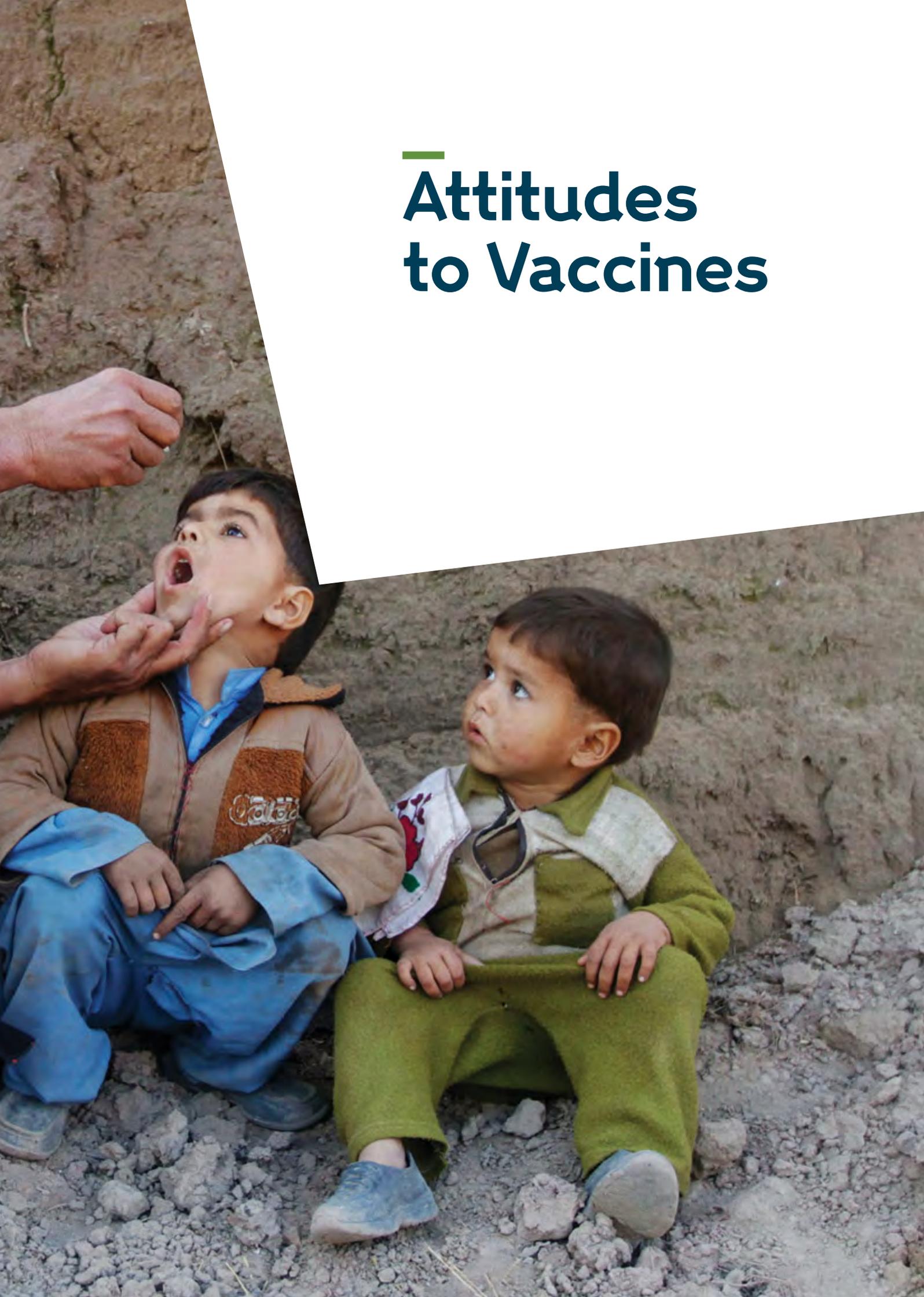
Endnotes

- 1 Callon M. Is Science a Public Good? Fifth Mullins Lecture, Virginia Polytechnic Institute, March 1993. *Science, Technology and Human Values* 1994;19(4): 395–424.
- 2 Thursby M. 'Is saying "science is a public good" a wrong assumption?' Swiss National Centre of Competence in Research. <https://nccr-chembio.ch/blog/science-public-good/> [accessed 9 May 2019].
- 3 The Royal Society. Science and the Public Interest. https://royalsociety.org/-/media/Royal_Society_Content/policy/publications/2006/8315.pdf. April 2006 [accessed 9 May 2019].
- 4 Countless economists have written about public goods – all economics textbooks discuss the subject. The economist Paul A Samuelson is often credited as the first economist to develop a theory of public goods in his 1954 work: *The Pure Theory of Public Expenditure*. *Review of Economics and Statistics* 1954;36(4):387–9.
- 5 Dalrymple D. Scientific Knowledge as a Global Public Good: Contributions to Innovation and the Economy. In JM Esanu, PF Uhlir (eds). *The Role of Scientific and Technical Data and Information in the Public Domain*. Washington (DC): National Academies Press (US); 2003, and in *The Scientist*, June 20, 2005.
- 6 Martinson BC et al. Scientists behaving Badly. *Nature* 2005 9 June; 737–8. Also https://files.transtutors.com/cdn/uploadassignments/2663608_1_w5-scientists-behaving-badly.pdf [accessed 9 May 2019].
- 7 Rutjens BT et al. Not All Skepticism Is Equal: Exploring the Ideological Antecedents of Science Acceptance and Rejection. *Personality and Social Psychology Bulletin* 2018;44(3):384–405.
- 8 National Academies of Sciences, Engineering, and Medicine. *Examining the Mistrust of Science: Proceedings of a Workshop—in Brief*. Washington, DC: The National Academies Press; 2017.
- 9 For more on this, please see the discussion of the social contract in Chapter 1.
- 10 National Science Board. *Science and Engineering Indicators 2018*, Chapter 7. Alexandria, VA: National Science Foundation; 2018. Also <https://www.nsf.gov/statistics/2018/nsb20181/report/sections/science-and-technology-publicattitudes-and-understanding/public-attitudes-about-s-t-in-general> [accessed 9 May 2019].
- 11 As measured by the Gallup World Poll question, 'Is the economy in your city area getting better or getting worse?'
- 12 Entradas M. Science and the public: The public understanding of science and its measurements. *Portuguese Journal of Social Science* 2015;14(1):71–85.
- 13 Rasekoala E. Science must evolve or risk being marginalised. <https://www.scidev.net/global/technology/opinion/science-must-evolve-or-risk-being-marginalised.html> [accessed 10 May 2019].
- 14 Mitchell R, et al. New database puts African education research at the heart of policy and practice. *The Conversation* 2018 22 August. <https://theconversation.com/new-database-puts-african-education-research-at-the-heart-of-policy-and-practice-101694> [accessed 25 May 2019].
- 15 Joubert M. New policy commits South Africa's scientists to public engagement. Are they ready? *The Conversation* 2019 7 April. <https://theconversation.com/new-policy-commits-south-africas-scientists-topublic-engagement-are-they-ready-114832> [accessed 10 May 2019].
- 16 Joubert M. Science needs to start speaking to people's everyday lives in Africa. <http://theconversation.com/science-needs-to-start-speaking-to-peopleseveryday-lives-in-africa-67938> [accessed 10 May 2019].
- 17 Ciocca D, Delgado G. The reality of scientific research in Latin America; an insider's perspective. *Cell Stress & Chaperones* 2017;22(6):847–52. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5655372/> [accessed 10 May 2019].
- 18 Pew Research Center. Religion in Latin America: Widespread Change in a Historically Catholic Region. Chapter 8. 2014 13 Nov. <https://www.pewforum.org/2014/11/13/chapter-8-religion-and-science/> [accessed 10 May 2019].
- 19 Pew Research Center. Americans, Politics and Science Issues. 2015 1 July. <https://www.pewresearch.org/science/2015/07/01/americanspolitics-and-science-issues/> [accessed 10 May 2019].
- 20 Science Media Centre. Public attitudes to science and technology – key takeaways. 2014 4 December. <https://www.sciencemediacentre.co.nz/2014/12/04/public-attitudes-to-science-and-technology-key-takeaways/> [accessed 10 May 2019].
- 21 Ministry of Business, Innovation & Employment, New Zealand. Report on Public Attitudes Towards Science and Technology. <https://www.curiousminds.nz/assets/Uploads/report-on-public-attitudes-towards-science-and-technology.pdf> [accessed 10 May 2019].
- 22 Department of Industry, Innovation and Science, Australia. *The Australian Beliefs and Attitudes Towards Science Survey 2018*. https://www.industry.gov.au/sites/g/files/net3906/t/2018-0/the_australian_beliefs_and_attitudes_towards_science_survey_2018.pdf [accessed 10 May 2019].
- 23 Includes nominal majorities, i.e. countries where only between 51%–53% answered this question in the affirmative.
- 24 UNESCO Institute for Statistics. <http://uis.unesco.org/en/country/sa?theme=science-technology-and-innovation> [accessed 10 May 2019]
- 25 Alshayea A. Scientific Research in the Kingdom of Saudi Arabia: Potential for Excellence and Indicators of Underdevelopment. *Higher Education Studies* 2013;3(5). <https://files.eric.ed.gov/fulltext/EJ1079211.pdf> [accessed 25 May 2019]
- 26 UNESCO. UNESCO Science Report, Towards 2030: Executive Summary. Paris: UNESCO; 2015.
- 27 OECD. Education at a Glance: OECD Indicators. http://gpseducation.oecd.org/Content/EAGCountryNotes/EAG2016_CN_SAU.pdf [accessed 10 May 2019].
- 28 Ramos, Yulye Jessica. Science and Technology for Development in Bangladesh & Nepal: Key Topics, Challenges and Opportunities. *SciDev.net Learning Series* 2015. https://www.scidev.net/filemanager/root/site_assets/docs/south-asianreport-digital_final_1_.pdf [accessed 10 May 2019]
- 29 GSMA. Country Overview: Bangladesh. 2018. <https://www.gsmainelligence.com/research/?file=a163eddca009553979bcd9b8f45f2ef0&download> [accessed 10 May 2019]
- 30 International Monetary Fund. World Economic Outlook, April 2019: Growth Slowdown, Precarious Recovery. IMF World Economic Reports. International Monetary Fund. <https://www.imf.org/en/Publications/WEO/Issues/2019/03/28/world-economic-outlook-april-2019#Full%20Report%20and%20Executive%20Summary> [accessed 10 May 2019]
- 31 UNESCO. UNESCO Science Report, Towards 2030: Executive Summary. Paris: UNESCO; 2015.
- 32 Unesco Institute for Statistics. <http://uis.unesco.org/apps/visualisations/research-and-development-spending/> [accessed 10 May 2019].
- 33 111 countries included in the study also have available data regarding the level of gross domestic expenditures on research and development (R&D) expressed as a percentage of gross domestic product (GDP). Among these countries, the correlation between the percent of people who said science benefits "most" people in the country and amount spent on R & D as a percentage of GDP was about 0.5.
- 34 UNESCO. UNESCO Science Report, Towards 2030: Executive Summary. Paris: UNESCO; 2015. Report notes Chinese spending on R & D now represents 20% of all R&D spending worldwide (closer to 10% earlier this decade) and 20% of all science-related publications are published in China (compared to 5% in 2010).
- 35 European Commission. Eurobarometer 55.2: Europeans, Science and Technology. Brussels, Belgium: The European Opinion Research Group EERG. 2001. http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_154_en.pdf [accessed 10 May 2019].
- 36 UNESCO. UNESCO Science Report, Towards 2030: Executive Summary. Paris: UNESCO; 2015.
- 37 Gambia Information Site. Min. of State for Higher Education, Research & Science. <http://www.accessgambia.com/information/education-department.html> [accessed 10 May 2019].
- 38 Republic of Mauritius. Science, Technology and Innovation is the future, says Education Minister. Republic of Mauritius News May 10, 2018. <http://www.govmu.org/English/News/Pages/Science,-Technology-and-Innovation-is-the-future,-says-Education-Minister.aspx> [accessed 10 May 2019].
- 39 Note: while this analysis cannot be compared directly to past research, other studies have identified different types of attitudinal groups derived from survey results, such as the Public Attitudes to Science 2008 report released by the Research Councils UK. In that study, cluster analysis was used to identify four groups that, in general, had similar profiles to those described above, including the Confident, Sceptical Enthusiasts, the Less Confident and the Distrustful.
- 40 See above for discussion for further context about these countries' opinions towards the benefits of science.
- 41 South America's score on the Gallup World Poll Confidence in Institutions Index is 36 (out of 100), the lowest of the 19 regions. The second-lowest score was Central America and Mexico, at 41.
- 42 As measured by the Gallup World Poll Confidence in National Institutions Index. Correlation between % of country who are Strong Sceptics and country's Index score is - 0.609.
- 43 Rule J. Labour in a Changing Economy, 1700–1850. *ReFRESH (Economic History Society)* Spring 1991. <http://www.ehs.org.uk/dotAsset/a9ce710d-3b24-406c-9652-07bf43657f86.pdf> [accessed 10 May 2019].
- 44 World Economic Forum. <https://www.weforum.org/focus/fourth-industrialrevolution> [accessed 10 May 2019].
- 45 Nedelkoska L, Quintini G. Automation, skills use and training. *OECD Social, Employment and Migration Working Papers* No.202. Paris: OECD Publishing, Paris; 2018. Also https://www.oecd-ilibrary.org/employment/automation-skillsuse-and-training_2e2f4eea-en [accessed 10 May 2019].
- 46 European Commission Eurobarometer Qualitative Study (2015). *Public Opinion on Future Innovations, Science and Technology*. http://ec.europa.eu/commfrontoffice/publicopinion/archives/quali/ql_futureofscience_en.pdf [accessed 10 May 2019].
- 47 Dennett D, Plantinga A. *Science and Religion – Are They Compatible?* Oxford: OUP;2011. <https://plato.stanford.edu/entries/religion-science/> [accessed 26 May 2019]
- 48 Pew Research Center. The Social and Legal Dimensions of the Evolution Debate in the U.S. 2009 4 Feb. <https://www.pewforum.org/2009/02/04/the-social-and-legal-dimensions-of-the-evolution-debate-in-the-us/> [accessed 10 May 2019].

A child receives the polio vaccination during an anti-polio campaign on the outskirts of Jalalabad, Afghanistan.
Parwiz/REUTERS



Attitudes to Vaccines



Chapter 5: Attitudes to vaccines

Introduction

Vaccines are a vitally important application of scientific research that save millions of lives worldwide every year^{1,2}. They reduce healthcare costs and are an integral part of public health policy³. The central importance of vaccines to global health is why we devoted a question series in the Wellcome Global Monitor to understanding people's attitudes towards vaccines around the world.

Vaccines are also one of the few medical interventions with which most people have personal experience, and as a result they are sometimes used as a proxy for trust in the broader health system. Although vaccines have always generated some anxiety among people⁴, their uptake has generally been widespread enough that deadly diseases such as smallpox have been eradicated, and many other debilitating infectious diseases such as tetanus and cholera, diphtheria and polio have largely disappeared in many countries.

However, over the past decade or so, an increasing number of studies^{5,6,7} have documented a rising number of people in both high-income and low-income countries who seem to be losing confidence in some vaccines, to the point of choosing not to vaccinate their children⁸. According to organisations such as the WHO and UNICEF, gains in the world's fight against vaccine-preventable diseases are at risk. Lack of confidence in the safety and/or effectiveness of vaccines and the health system, shortages of health workers and supplies, depleted or destroyed health infrastructure, poverty and access difficulties (such as distance to the nearest clinic), all threaten to disrupt the effectiveness of vaccination programmes⁹.

The WHO has specifically identified vaccine hesitancy – which the organisation defines as ‘the delay in acceptance or refusal of vaccines despite the availability of vaccination services’ – as one of the top ten health threats to the world in 2019¹⁰.

Summary:

- Globally, eight in ten people (79%) somewhat or strongly agree that vaccines are safe, while 7% somewhat or strongly disagree. Another 11% neither agree nor disagree, and 3% said they ‘don't know’.
- In high-income regions, there is less certainty about the safety of vaccines, with 72% of people in Northern America and 73% in Northern Europe agreeing that vaccines are safe. In Western Europe, this figure is even lower, at 59%, and in Eastern Europe it stands at only 40%. In low-income regions, the proportion of people who agree ‘strongly’ or ‘somewhat’ that vaccines are safe tends to be much higher at 80% or above, with highs of 95% of people in South Asia and 92% in Eastern Africa.
- In France, one in three people disagree that vaccines are safe, the highest percentage for any country worldwide.
- Despite relatively high levels of vaccine scepticism in some countries, 92% of parents worldwide said that their children have received a vaccine to prevent them from getting childhood diseases, while 6% said they did not, and 2% said they did not know. The highest percentage of parents who said their children did not receive a vaccine were Southern Africa, 9%, and East Asia and Southeast Asia, 8%.
- In most regions, people who have high trust in doctors and nurses are very likely to consider that vaccines are safe. However, this is less true in Western and Eastern Europe.
- There is a clear positive relationship between overall trust in scientists, as measured by the Wellcome Trust in Scientists Index, and overall attitudes towards vaccines, though the relationship is strongest in high-income countries.

Box 5.1: Main research topics addressed in this chapter

11. How do people around the world feel about the safety, effectiveness and importance of vaccines, and how do these views vary by region and country, and by key demographics such as gender, age, education level, income level and urban/rural residence?
12. How are attitudes to vaccines related to trust in science and in health workers?
13. Do positive or negative attitudes towards vaccines translate into practical outcomes such as non-vaccination?

Wellcome Global Monitor questions examined in this chapter

The Wellcome Global Monitor includes a series of items on vaccines based on the questions asked in the Vaccine Confidence Project™¹¹.

People were first asked if they had ever heard of the term ‘vaccine’ before (in their local languages). The following statement was read at the start of this section of the survey:

23. A vaccine is given to people to strengthen their body’s ability to fight certain diseases. Sometimes people are given a vaccine as [insert country equivalent term for a shot or an injection], but vaccines can also be given by mouth or some other way. Before today, had you ever heard of a vaccine?

After this question, those who had heard of vaccines were asked about the importance of vaccines for children, the safety of vaccines, and the effectiveness of vaccines, along the following lines¹²:

23. Do you agree, disagree, or neither agree nor disagree with the following statement?
Vaccines are important for children to have.
 - After the response was given to this question, the following question was asked to determine the intensity of the response: Do you strongly (dis)agree or somewhat (dis)agree?
 - The same questions were asked with reference to two other statements:

25. Vaccines are safe.

26. Vaccines are effective

28. Parents were asked if, to the best of their knowledge, their children received a vaccine that was supposed to prevent them from getting childhood diseases such as polio, measles or mumps (or the most common vaccinations in each country).

People’s decision not to vaccinate – for whatever reason – is not just a personal choice of risk-taking; it also poses a risk to others. Being vaccinated protects an individual from being infected themselves, and if enough people are vaccinated, it stops the disease from being spread to the larger population¹³. This provides what epidemiologists refer to as ‘herd immunity’, or protection from the disease for the entire population, including people who cannot be vaccinated for medical reasons.

But for herd immunity to work, a large proportion of the population needs to be vaccinated. How large depends on how contagious the disease is.

For example, approximately 90–95% of the population needs to be vaccinated against measles for herd immunity to work^{14,15}. For less contagious diseases such as polio, the vaccination uptake needs to be 80–85% of the population^{16,17}. For influenza, the figure is closer to 75% for vulnerable groups (very young children, people with chronic illnesses and the elderly)^{18,19}. If enough people choose not to vaccinate and to rely on herd immunity for protection, outbreaks of preventable diseases become more common, as we have seen with the recent measles outbreaks in several countries, including the US, India, Brazil and Ukraine²⁰.

Box 5.2: Recent measles outbreaks attributed to insufficient vaccination rates

According to the Centers for Disease Control and Prevention, in developing countries, approximately 1 or 2 in every 1000 children with measles will die from the disease or its complications²¹. UNICEF warned as recently as March 2019 that cases of measles around the world were surging to ‘alarmingly high levels’, led by ten countries that accounted for approximately 74% of the increase, and others previously declared measles-free²². This is a source of serious concern for public health professionals, as measles is extremely contagious and it is estimated that around nine in ten people who are not already immune will become infected following exposure²³.

Table 5.1: Countries with highest increases in measles cases between 2017 and 2018.

	2017	2018	Percentage increase 2017–2018
Ukraine	4,782	53,218	1,013%
Madagascar	85	23,558	27,615%
Philippines	2,409	20,758	762%
Brazil	0	10,362	N/A
Yemen	2,101	13,622	548%
Venezuela	727	5,668	680%
Serbia	702	5,076	623%
Sudan	665	4,978	649%
Thailand	2,033	5,160	154%
France	518	2,913	462%

(Provisional monthly data reported to WHO, March 2019, annually). Number of confirmed cases.

Awareness of vaccines

About nine in ten people worldwide had heard of vaccines prior to this survey

Public confidence is an important factor in maintaining high vaccination rates. Therefore, much of the recent research on attitudes towards vaccines has focused on vaccine hesitancy – especially why people might refuse vaccines even when they are available. In 2015, the Vaccine Confidence ProjectTM launched a Vaccine Confidence Index (VCI)TM to measure the change in confidence over time. The Wellcome Global Monitor included questions based on the VCITM to measure public trust in the safety, effectiveness, and importance of vaccines.

Before the full field implementation of the questionnaire in over 140 countries, it was tested in 10 countries (in local languages), partly to establish whether the terms used were broadly well understood and interpreted across countries and different socio-economic groups. One of the findings from the testing was that it is important to provide simple definitions of technical terms, to ensure that people understand what they are being asked about, and whether they have previously heard of the term.

Therefore, the first question about vaccines in the Wellcome Global Monitor defined the word vaccine,

and then asked people about their familiarity with the term, as follows:

A vaccine is given to people to strengthen their body's ability to fight certain diseases. Sometimes they are given a vaccine as a shot or an injection, but vaccines can also be given by mouth or some other way. Before today, had you ever heard of a vaccine?

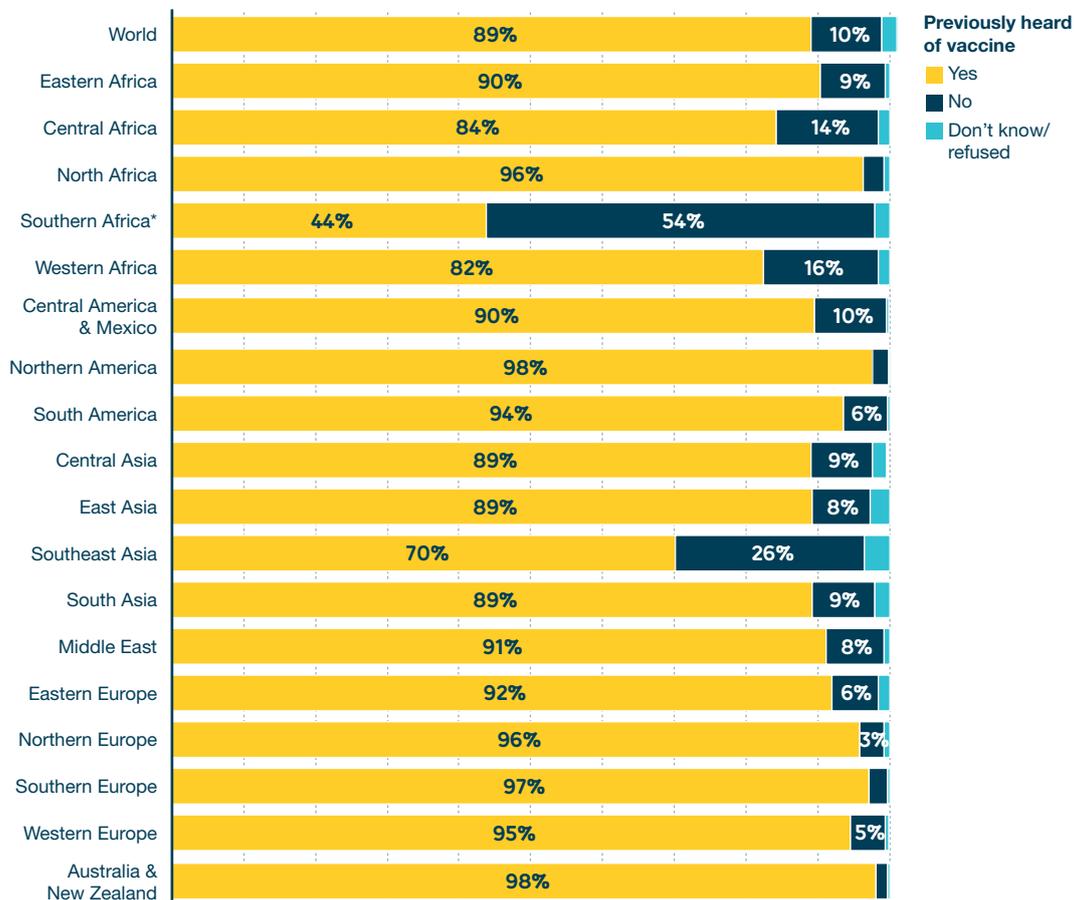
Those who answered ‘yes’ were asked specific questions about the safety, effectiveness and importance of vaccines. At the global level, almost nine in ten people (89%) had heard of vaccines before the survey, with results relatively consistent across global regions. The findings show that in only 2 of the 18 global regions (Southern Africa and Southeast Asia) a significantly higher proportion of people say that they have not heard of a vaccine (54% and 26% respectively).

The results for Southern Africa need further investigation. For example, in the region’s most populous economy, South Africa, people in rural areas were less familiar with the word ‘vaccine’ than people in large cities/suburbs, at 37% to 49% respectively. However, in general, people seemed to understand what a vaccine does when shown the action of administering one, even if they did not recognise the word itself.

Chart 5.1: Awareness of vaccines by region

Percentage of people who answered “yes”, ‘no’ or ‘don’t know’.

Before today, had you ever heard of a vaccine?



*Results need further investigation

Perceptions of the safety of vaccines

People in high-income regions are less likely to agree that vaccines are safe, compared to people in low-income countries

In line with the VCI™²⁴ questions, the Wellcome Global Monitor asked people around the world about their level of agreement with three key statements regarding perceptions of vaccines: 1) if they are safe, 2) if they are effective, and 3) if they are important for children to have. Overall, most people around the world ‘agree’ that vaccines are safe. Eight in ten people (79%) ‘strongly’ or ‘somewhat’ agree that they are safe, while 7% ‘strongly’ or ‘somewhat’ disagree, 11% ‘neither agree nor disagree’ and 3% say they don’t know or have no opinion.

The Wellcome Global Monitor highlights deeper pockets of doubt about the safety of vaccines in certain regions and demographic groups. For example, people in several higher-income regions are among the least certain about vaccine safety. Only 72% of people in Northern America and 73% in Northern Europe ‘agree’ that vaccines are safe, and the figure is as low as 59% in Western Europe, and 50% in Eastern Europe²⁵.

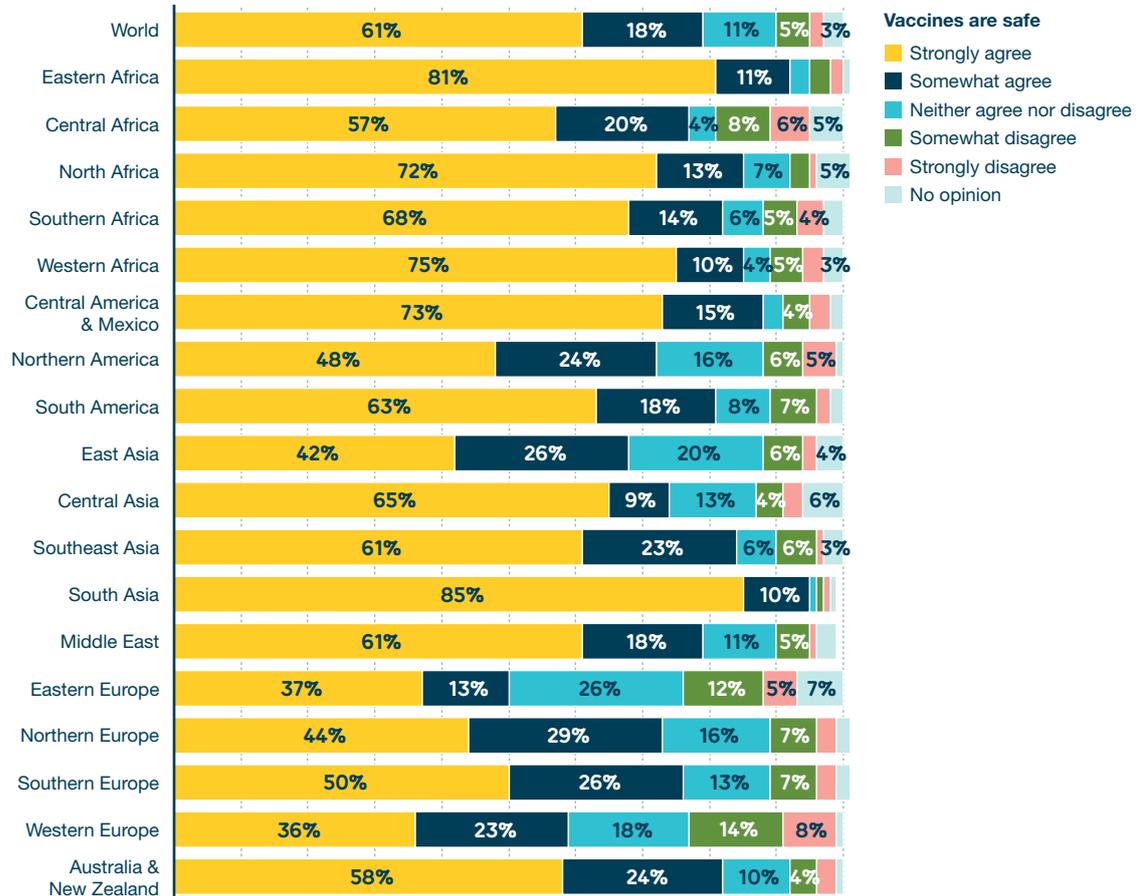
By contrast, an overwhelming majority of people in lower-income areas ‘agree’ (‘somewhat’ or ‘strongly’) that vaccines are safe. The highest such proportions are in South Asia, where 95% of people said they ‘agree’ that vaccines are safe, and in Eastern Africa, where the figure stands at 92%.

Chart 5.2: Perceived safety of vaccines by region

Percentage of people who answered 'strongly agree', 'somewhat agree', 'neither agree nor disagree', 'somewhat disagree', 'strongly disagree' or 'no opinion'.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe.



Perceptions of the effectiveness of vaccines

Eastern Europeans are least likely to agree that vaccines are effective

Worldwide, 63% of people 'strongly agree' and 21% 'somewhat agree' that vaccines are effective, or 84% who agree to some extent with this statement.

Only 5% either strongly or somewhat disagree that vaccines are effective while another 12% either said they did not agree or disagree or said they had no opinion. Perceptions of the effectiveness of vaccines vary less by region than do views about vaccine safety. There are some significant differences,

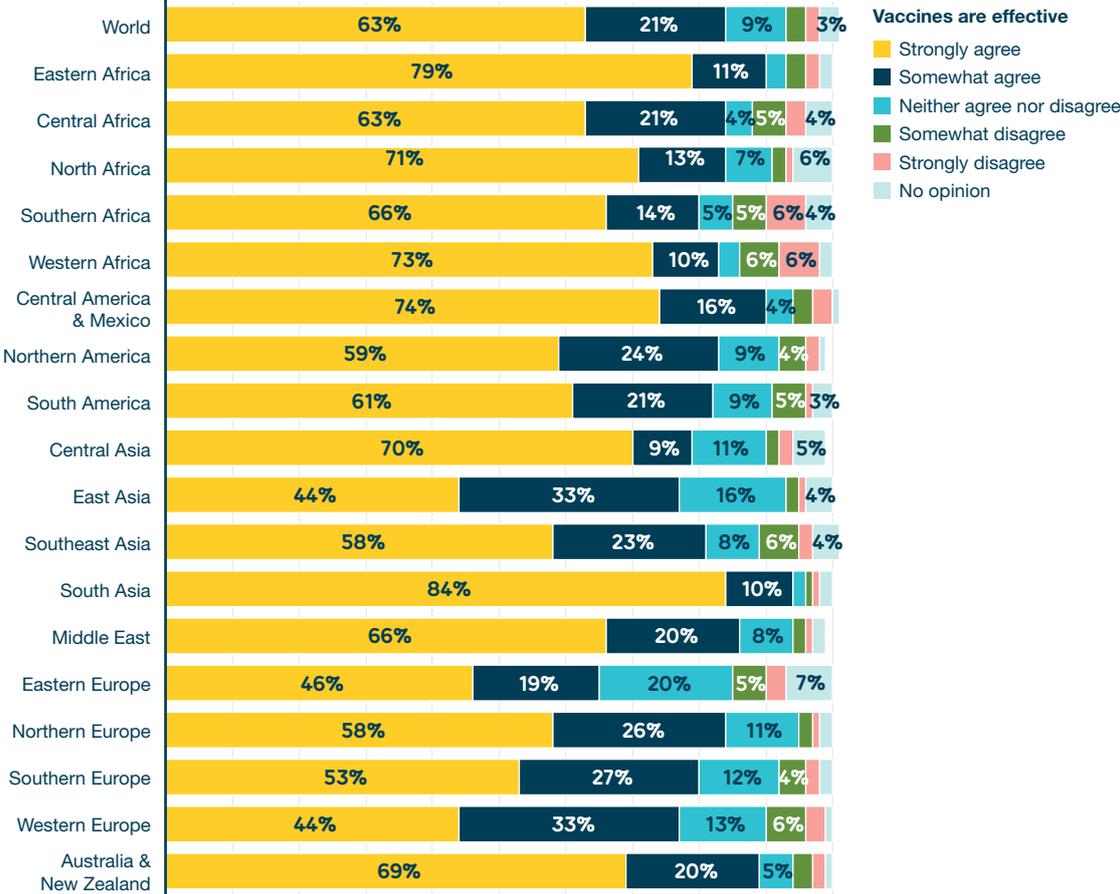
however, with Eastern Europeans being least likely to 'agree' ('strongly' or 'somewhat') that vaccines are effective, at 65%. Within Eastern Europe, the pattern is similar to the findings on vaccine safety, with countries that are in the EU having higher percentages of people who agree that vaccines are effective, compared to Eastern European countries that are outside the EU. For example, in Ukraine, only 50% of people 'agree' that vaccines are effective; this figure is 46% in Belarus, 49% in Moldova, and 62% in Russia. By contrast, three quarters of people or more agree that vaccines are safe in Romania (75%), Czech Republic (76%), Hungary (78%), Slovakia (80%) and Poland (84%).

Chart 5.3: Perceived effectiveness of vaccines by region

Percentage of people who answered 'strongly agree', 'somewhat agree', 'neither agree nor disagree', 'somewhat disagree', 'strongly disagree' or 'no opinion'.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are effective.



Perceptions of the effectiveness and safety of vaccines

Scepticism about vaccine safety does not always translate into scepticism about vaccine effectiveness

In several regions where people are least likely to agree that vaccines are safe, the percentage who agree that they are effective is significantly higher; the biggest gaps are seen in Western Europe (59% safe, 77% effective) and Eastern Europe (50% safe, 65% effective). This gap suggests that some people accept that they are effective at preventing certain diseases, even if they also believe some vaccines may have negative side-effects²⁶.

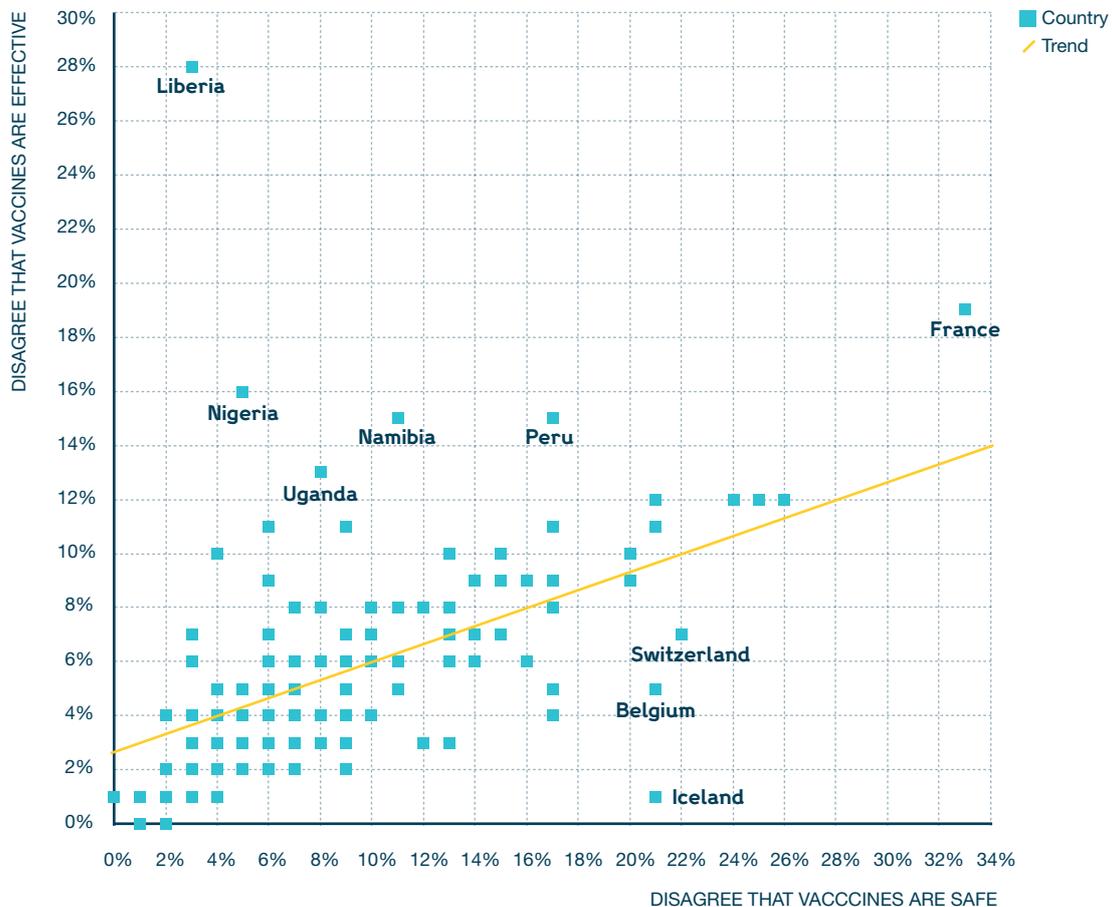
Chart 5.4 highlights some interesting outliers. In Liberia, where 28% of people disagree that vaccines are effective (the highest in the world), just 3% of people disagree that they are safe. In a few other countries in sub-Saharan Africa, relatively high proportions of people disagree that vaccines are effective, though concerns about vaccine safety are less common. Liberia continues to grapple with infectious diseases such as yellow fever and tetanus, despite vaccination programmes²⁷. In countries where weak health supply and infrastructure systems exist, and there are difficulties with access to vaccines (in terms of distance to nearest clinics, for example), it is harder to achieve the vaccination rates necessary for herd immunity²⁸, and the persistence of infectious diseases may lead some people to conclude that the vaccines themselves are not working.

Chart 5.4: Scatterplot exploring people's perceptions of vaccine safety and vaccine effectiveness

Percentage of people who answered 'disagree'.

Do you agree, disagree, or neither agree nor disagree with the following statements?

Vaccines are effective. Vaccines are safe.



Box 5.3: Bangladesh and Rwanda: nearly universal agreement about the safety, effectiveness and importance of vaccines

Bangladesh and Rwanda are two of the most notable countries that achieve very high rates of agreement on all three items: vaccine safety, their effectiveness and the importance of children having them. In both countries, success in achieving very high immunisation rates was achieved despite numerous challenges in implementation.

In **Bangladesh**, the country's strong commitment to childhood vaccinations is credited for achieving the Millennium Development Goal 4 of reducing childhood mortality²⁹. Since 2017, Bangladesh has also mounted vaccination campaigns with UNICEF and other agencies to halt the rapid spread of diphtheria and other preventable diseases among Rohingya refugees in the country³⁰.

In **Rwanda**, according to the WHO, the country has seen tremendous success and progress in its vaccination programme over the past two decades. In 1995, the national immunisation coverage rate was less than 30% and incidence of vaccine-preventable diseases was very high. Over the past two decades, the authorities have adopted an approach that included working with international partners, local community health workers, and adopting technological solutions that could be adapted locally, in order to raise the immunisation coverage rate, which now stands at a remarkable 95%, with gender and geographic equity. The authorities have also successfully introduced six new vaccines into the routine immunisation programme, and the number of vaccine-preventable diseases has dropped significantly.



Face to face interview
taking place in Republic of
the Congo. *Gallup 2018*

Table 5.2: Countries where people are most likely to agree that vaccines are safe, effective and important for children to have

Percentage of people who answered 'strongly agree' or 'somewhat agree' above 90%.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe. Vaccines are effective. Vaccines are important for children to have.

Vaccines are safe	Vaccines are effective	Vaccines are important for children to have			
Strongly/somewhat agree	Strongly/somewhat agree	Strongly/somewhat agree			
Bangladesh	97%	Rwanda	99%	Egypt, Ethiopia, Nicaragua, Northern Cyprus	100%
Egypt	97%			Bangladesh, Burundi, Cambodia, Colombia, Dominican Republic, Ecuador, Honduras, Iceland, Jordan, Nepal, Palestinian Territories, Rwanda, Sierra Leone, Tanzania, Venezuela	99%
Ethiopia, Liberia, Tanzania	96%	Bangladesh, Ethiopia, Iceland	97%	Afghanistan, Argentina, Benin, Cameroon, Comoros, Costa Rica, Guatemala, Haiti, India, Laos, Malawi, Mexico, Myanmar, Sri Lanka, Uzbekistan, Zimbabwe	98%
India	95%	Afghanistan, Egypt	96%	Brazil, El Salvador, Iraq, Kenya, Lebanon, Liberia, Madagascar, Mozambique, Nigeria, Norway, Tajikistan, Thailand, Uganda	97%
Afghanistan, Rwanda	94%	India, Tajikistan, Uzbekistan	95%	Albania, Bolivia, Republic of the Congo, Gabon, Ivory Coast, Kosovo, Mauritius, Panama, Paraguay, Portugal	96%
Thailand, Sierra Leone, Uzbekistan, Venezuela	93%	Cambodia, Comoros, Malawi, Thailand, Venezuela	94%	Ghana, Peru, Senegal, Zambia	95%
Jordan, Laos, Malawi, Mozambique, Nepal, Nicaragua	92%	Myanmar, Norway, Sierra Leone	93%	Botswana, Burkina Faso, eSwatini, Finland, Greece, Iran, Kuwait, Mali, Malta, Morocco, Namibia, Niger, Saudi Arabia, UAE, Uruguay	94%
Malaysia, Myanmar, Nigeria, Palestinian Territories, Tajikistan	91%	Dominican Republic, Jordan, Niger, Northern Cyprus	92%	Chad, Denmark, The Gambia, Indonesia, Malaysia, Mongolia, Pakistan, Philippines, Sweden, Turkey, Yemen	93%
		Australia, Burundi, Republic of the Congo, Iraq, Laos, Madagascar, Mexico, Tanzania, Zimbabwe	91%	Australia, Guinea, South Africa, Vietnam	92%
				China, Ireland, Mauritania, Netherlands, Tunisia, Togo	91%

One in three French people disagree that vaccines are safe, the highest percentage worldwide

One of the most notable countries where a large percentage of people seem to be vaccine sceptics is France. Overall, one in three French people (33%) disagree that vaccines are safe – easily the highest proportion in the world. French people are also among the most likely to disagree that vaccines are effective, at 19%, and to disagree that vaccines are important for children to have, at 10% (see Table 5.3)³¹.

Box 5.4: Why is vaccine scepticism so common in France?

The French are the most sceptical people in the world about the safety of vaccines, with one in three French people (33%) disagreeing that vaccines are safe. This level of scepticism is present and

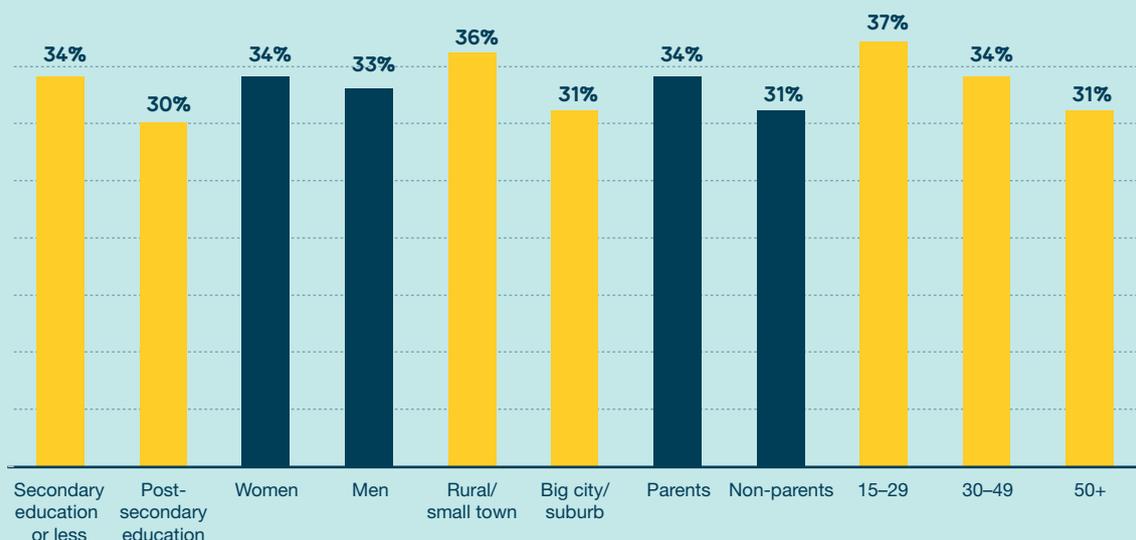
consistent across several demographic groupings within French society; it does not vary significantly by education, age, gender, urban or rural status, or whether people are parents.

Chart 5.5: Perceived safety of vaccines in France by demographic breakdown

Percentage of People in France who answered 'disagree'.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe.



Scepticism about vaccines in France is not new, but researchers noticed an increase after the controversial influenza pandemic vaccination campaign in 2009, during which the WHO was alleged to have been influenced by pharmaceutical companies³². The rising vaccine hesitancy in France over the past several years – which even now includes some members of the medical community – has helped drive vaccine coverage among some children and young adults below immunity thresholds and led to rising numbers of measles and meningococcal disease cases³³.

To help reduce this scepticism and combat rejection rates, the French government in 2018 expanded the number of compulsory vaccines from 3 to 11 for children up to the age of 2 years. In addition to the new law, the government is conducting promotional campaigns and providing additional support to healthcare professionals who have vaccine-hesitant patients. The mandate is intended to be temporary until the government sees evidence of higher confidence among the public³⁴.

Table 5.3: Countries where people are most likely to disagree that vaccines are safe, effective and important for children to have

Percentage of people who answered 'strongly disagree' or 'somewhat disagree'.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe. Vaccines are effective. Vaccines are important for children to have.

Vaccines are safe		Vaccines are effective		Vaccines are important for children to have	
Strongly/somewhat disagree		Strongly/somewhat disagree		Strongly/somewhat disagree	
France	33%	Liberia	28%	Armenia	12%
Gabon	26%	France	19%	Austria	12%
Togo	25%	Nigeria	16%	France	10%
Russia	24%	Namibia	15%	Russia	9%
Switzerland	22%	Peru	15%	Switzerland	9%
Armenia	21%	Uganda	13%	Azerbaijan	8%
Austria	21%	Armenia	12%	Belarus	8%
Belgium	21%	Gabon	12%	Italy	8%
Iceland	21%	Russia	12%	Bulgaria	7%
Burkina Faso	20%	Togo	12%	Moldova	7%
Haiti	20%	Austria	11%	Montenegro	7%
		Indonesia	11%		
		Netherlands	11%		
		South Africa	11%		

Table 5.4: Perceived safety of vaccines by highest reported level of science education and region

Percentage of people who answered 'strongly disagree' or 'somewhat disagree'.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe.

	Total	Primary level or did not study science or did not say	Secondary level	College or university level
World	7%	7%	8%	10%
Central Africa	14%	11%	16%	17%
Southern Africa	9%	7%	8%	16%
Western Africa	8%	8%	9%	9%
Eastern Africa	5%	4%	6%	8%
Northern Africa	4%	3%	5%	4%
Northern America	11%	20%	12%	9%
South America	9%	8%	10%	10%
Central America and Mexico	7%	7%	7%	7%
Eastern Asia	8%	6%	8%	12%
Central Asia	7%	11%	7%	6%
Southeast Asia	7%	4%	9%	9%
Southern Asia	2%	2%	2%	2%
Middle East	6%	5%	6%	8%
Western Europe	22%	25%	22%	17%
Eastern Europe	17%	12%	15%	20%
Northern Europe	10%	13%	9%	7%
Southern Europe	10%	12%	9%	6%
Australia and New Zealand	7%	8%	7%	8%

Factors related to perceptions of vaccine safety

Education levels influence confidence in vaccines differently in different regions

There is no obvious global relationship between levels of science education and vaccine confidence.

In some places – like Northern Europe and Northern America – people with higher levels of science education are less likely to either strongly or somewhat disagree with the statement that vaccines are safe.

In others – like Eastern Europe Central Africa, and Southern Africa – the opposite is true. In places like South America, Central America and Mexico, and the Middle East, there is no significant difference between people with higher levels of science education.

Looking at the results by the type of area a person lives in – in or around a large city, a small town or a rural area – reveals that there are no significant differences, with the exception of Central Africa, where urban-dwellers are more likely than those in rural areas to disagree that vaccines are safe. This is the opposite to Western Africa and Western Europe, where rural dwellers are slightly more likely to disagree that vaccines are safe.

Table 5.5: Perceived safety of vaccines by type of area a person lives in and region

Percentage of people who answered 'strongly disagree' or 'somewhat disagree'.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe.

	Total	Large city/ suburb	Small town	Rural area
World	7%	9%	7%	6%
Eastern Africa	5%	6%	5%	4%
Central Africa	14%	17%	13%	9%
Northern Africa	4%	6%	1%	3%
Southern Africa	9%	12%	7%	8%
Western Africa	8%	7%	8%	12%
Central America and Mexico	7%	8%	6%	8%
Northern America	11%	9%	15%	10%
South America	9%	10%	8%	9%
Eastern Asia	8%	9%	8%	8%
Central Asia	7%	7%	9%	6%
Southeast Asia	7%	8%	7%	6%
Southern Asia	2%	2%	2%	2%
Middle East	6%	5%	7%	7%
Eastern Europe	17%	19%	14%	16%
Northern Europe	10%	9%	9%	11%
Southern Europe	10%	10%	9%	11%
Western Europe	22%	20%	22%	25%
Australia and New Zealand	7%	7%	10%	7%

People who recently sought information about science are less likely than those who did not to agree that vaccines are safe

The Wellcome Global Monitor asked people if they recently sought information about science or health, though it did not ask about information regarding vaccines specifically. People who recently sought science information are less likely to strongly or somewhat agree that vaccines are safe than those who said they did not recently seek information about science: 74% to 81% respectively. A similar result holds for recently seeking information about medicine or health (75% to 82%).

People who trust a doctor or nurse more than any other source of information are more likely to agree that vaccines are safe

The sources of information a person most relies on to find out about health matters is likely to be important in shaping individual perceptions. People who trust a doctor or nurse more than any other source of information (including friends/family, religious leaders, traditional healer or other) are more likely to strongly or somewhat agree that vaccines are safe than people who said they either trusted another source the most or did not name a source, at 72% to 81%. This relationship holds across all regions. This suggests that further research is needed in order to understand the link between attitudes to vaccines and sources of health information.

Box 5.5: Information sources and perceptions about vaccines

Anxieties and public concerns about the safety of vaccines have always existed, but the rise of social media has allowed the spread of what UNICEF calls the ‘real infection of misinformation’ to much wider audiences³⁵.

For example, while a number of factors are likely to be behind declining vaccination coverage in Eastern Europe – where people are by far the least likely of any region to agree that vaccines are either ‘safe’ or

‘effective’ – some researchers claim that vaccine scepticism may have been bolstered by Russian disinformation campaigns that amplified the vaccine debate on social media. Researchers do not yet know enough about the influence of misinformation online towards intentions and behaviours in the region, and the WHO is hoping to shed more light on the relationship as it develops a framework on how to study vaccine hesitancy in the context of Russian and Eastern European culture³⁶.

Perceptions of the importance of vaccines for children

Worldwide, 92% of people say vaccines are important for children to have

In general, people are more likely to say it is important for children to have vaccines than they are to agree that vaccines are safe or effective. Globally, 92% of people strongly or somewhat agree that it is important for children to have vaccines. This tendency holds in every region; even among populations where scepticism about the effectiveness and safety of vaccines is most widespread, people are still more likely to say it is important for children to have vaccines. In Eastern Europe, for example, where just 50% of people agree that vaccines are safe and 65% agree that they are effective, 80% nonetheless say it is important for children to have vaccines.

However, some regional results for this question may still be a source of concern. Herd immunity for highly contagious diseases such as measles requires at least 90% of the population to be vaccinated, and for less contagious diseases such as polio, the required range is 80% to 85%³⁷. In that light, even if the 80% of people in Eastern Europe who agree that vaccines are important for children to have acted on their beliefs, it is still possible that the level of immunisation required for herd immunity for some diseases may not be met.

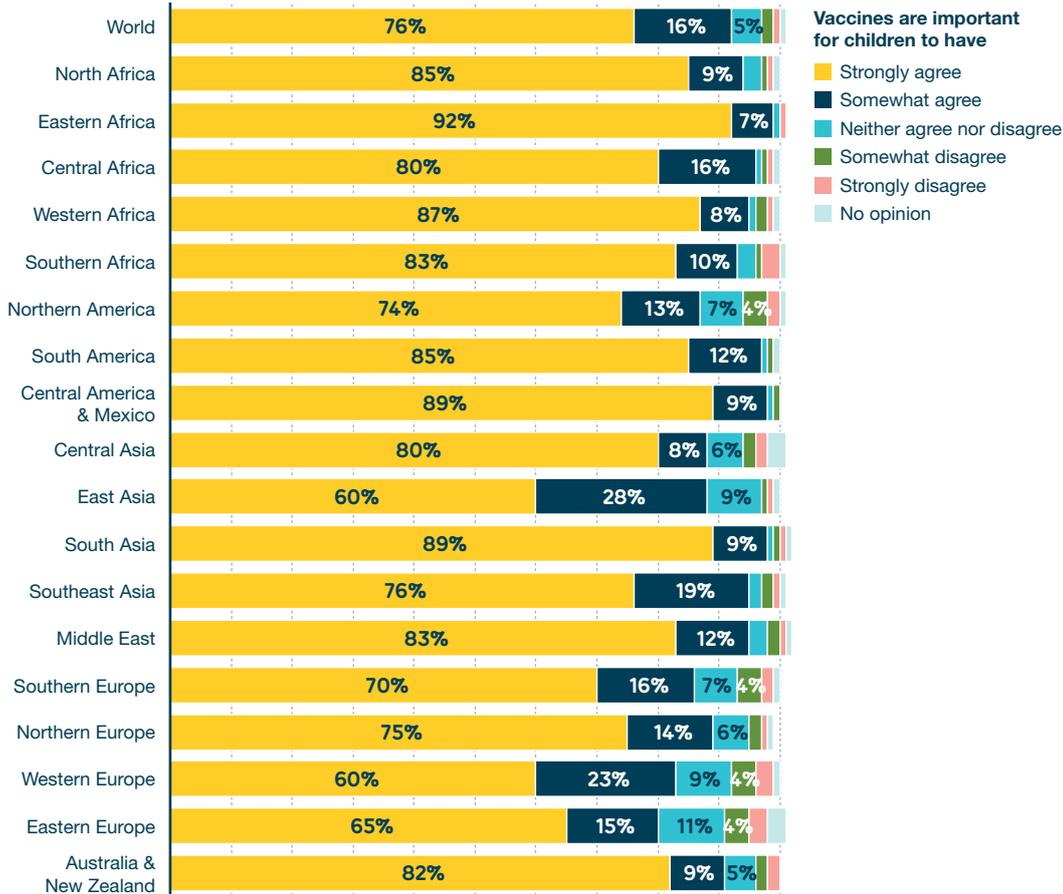
Within Eastern Europe, agreement is particularly low in Belarus (62%), Moldova (65%) and Bulgaria (71%).

Chart 5.6: Perceived importance of vaccines for children to have by region

Percentage of people who answered ‘strongly agree’, ‘somewhat agree’, ‘neither agree nor disagree’, ‘somewhat disagree’ ‘strongly disagree’ and ‘no opinion’.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are important for children to have.



Some 92% of parents worldwide said that their children have received a vaccine to prevent them from getting childhood diseases, while 6% of parents said that they have not

Reflecting the high proportion who agree that vaccines are important for children to have, the vast majority of parents worldwide – 92% – said that to the best of their knowledge, one or more of their children had received a vaccine that was supposed to prevent them from getting childhood diseases

such as diphtheria, polio or tetanus. In every region of the world, and regardless of income classification, at least 89% of parents said one or more of their children had been vaccinated for such diseases.

However, globally, 6% of people said that their children did not receive a vaccine that is supposed to prevent them from getting childhood diseases. The highest percentages registered were in Southern Africa at 9%, as well as in East Asia and Southeast Asia, at 8% of people.

Chart 5.7: Map of proportions of people reporting vaccinating their children

Percentage of people who answered 'yes' by country.

*To the best of your knowledge, have any of your children ever received a vaccine that was supposed to prevent them from getting childhood diseases such as diphtheria, polio or tetanus or not?*³⁸



Did people report vaccinating their children?

However, there is more variation in these results at the country level; in 24 countries, less than 90% of parents say one or more of their children have been vaccinated, and in three countries, this number falls below 80% (see table 5.6). These are Honduras (77%), Benin (73%) and Niger (69%) – three countries, with relatively weak public health systems and a lack of resources to deliver sufficient health services, especially to people living in rural areas.

The presence of two high-income countries on the list – Japan and Austria – is notable. In the case of Japan³⁹, issues around the safety of the HPV and

other vaccines in recent years have reduced public confidence in vaccines, and government policies over the past two decades have also been cited as a reason why there have been recent outbreaks of diseases such as rubella and measles⁴⁰. Also, contributing to the rise in the number of measles cases in the past year are the objections of some of the religious communities in the country to medicine in general, including vaccines⁴¹.

In Austria, it seems that an increasing number of people are choosing not to vaccinate out of fear of adverse effects, scepticism about the effectiveness of vaccines, and distrust towards the pharmaceutical industry⁴².

Table 5.6: Percentages of people reporting vaccinating their children by 24 countries with the lowest levels of reported vaccinating

Percentage of people who answered 'yes' by country.

To the best of your knowledge, have any of your children ever received a vaccine that was supposed to prevent them from getting childhood diseases such as diphtheria, polio or tetanus or not?

	Yes	No	Don't know/Refused
Niger	69%	29%	1%
Benin	73%	24%	3%
Honduras	77%	19%	3%
Lithuania	82%	4%	14%
Georgia	84%	9%	7%
Republic of the Congo	85%	14%	1%
Tajikistan	85%	10%	5%
Guatemala	86%	12%	2%
Austria	88%	8%	4%
China	88%	9%	3%
Indonesia	88%	10%	1%
Ivory Coast	88%	7%	4%
Japan	88%	7%	5%
Mauritius	88%	12%	0%
Moldova	88%	8%	4%
Armenia	89%	4%	7%
Azerbaijan	89%	3%	8%
Belarus	89%	3%	8%
Chad	89%	10%	1%
Ghana	89%	8%	2%
Kazakhstan	89%	4%	8%
Kyrgyzstan	89%	6%	4%
Senegal	89%	8%	3%
Taiwan	89%	10%	1%

The relationship between trust in scientists and attitudes towards vaccines

There is a positive relationship between overall trust in scientists and overall attitudes towards vaccines

There is a clear positive relationship between overall trust in scientists, as measured by the Wellcome Global Trust in Scientists Index (see Chapter 3) and

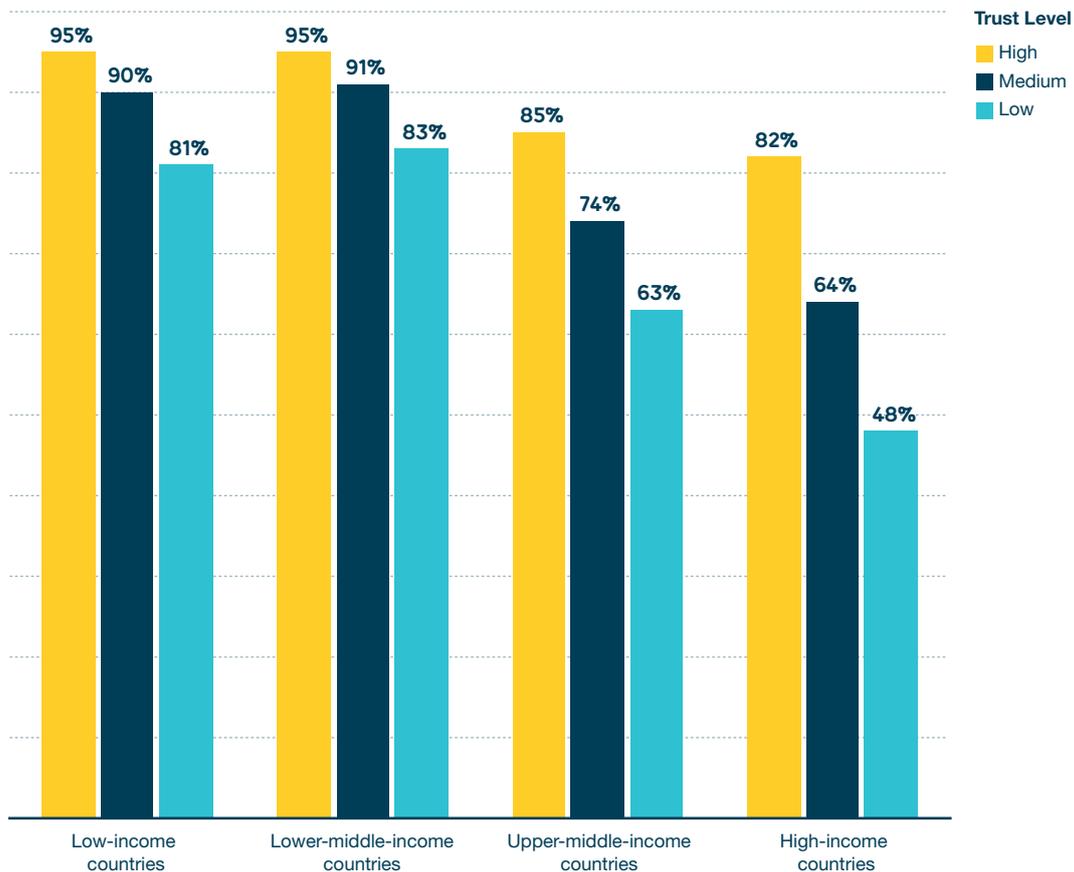
overall attitudes towards vaccines, though the relationship is strongest among high-income countries. In particular, countries such as the Netherlands, the United States, the United Kingdom, Austria and New Zealand see large differences in perceptions of vaccines by overall level of trust in scientists, especially on the question about perceptions of vaccine safety.

Chart 5.8: Perceived safety of vaccines by level of Trust in Scientists Index among countries of different income levels

Percentage of people who answered 'strongly agree' or 'somewhat agree'.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe.



The relationship between trust in doctors and nurses and attitudes towards vaccines

People with a high trust in doctors or nurses are very likely to say vaccines are safe

In general, people are more likely to believe vaccines are safe if they trust scientists and medical professionals – though the relationship is strongest for trust in doctors and nurses. Worldwide, people who said they trust doctors or nurses ‘a lot’ are very likely to believe that vaccines are safe, at 87%⁴³. While high levels of trust in doctors or nurses are associated with high levels of agreement that vaccines are safe in all regions, this is less true in

Western and Eastern Europe. In Eastern Europe, 67% of people who trust doctors and nurses ‘a lot’ believe vaccines are safe, perhaps due partly to the fact that in this region attitudes about various aspects of the healthcare system and healthcare professionals are comparatively less positive, including confidence in hospitals and clinics.

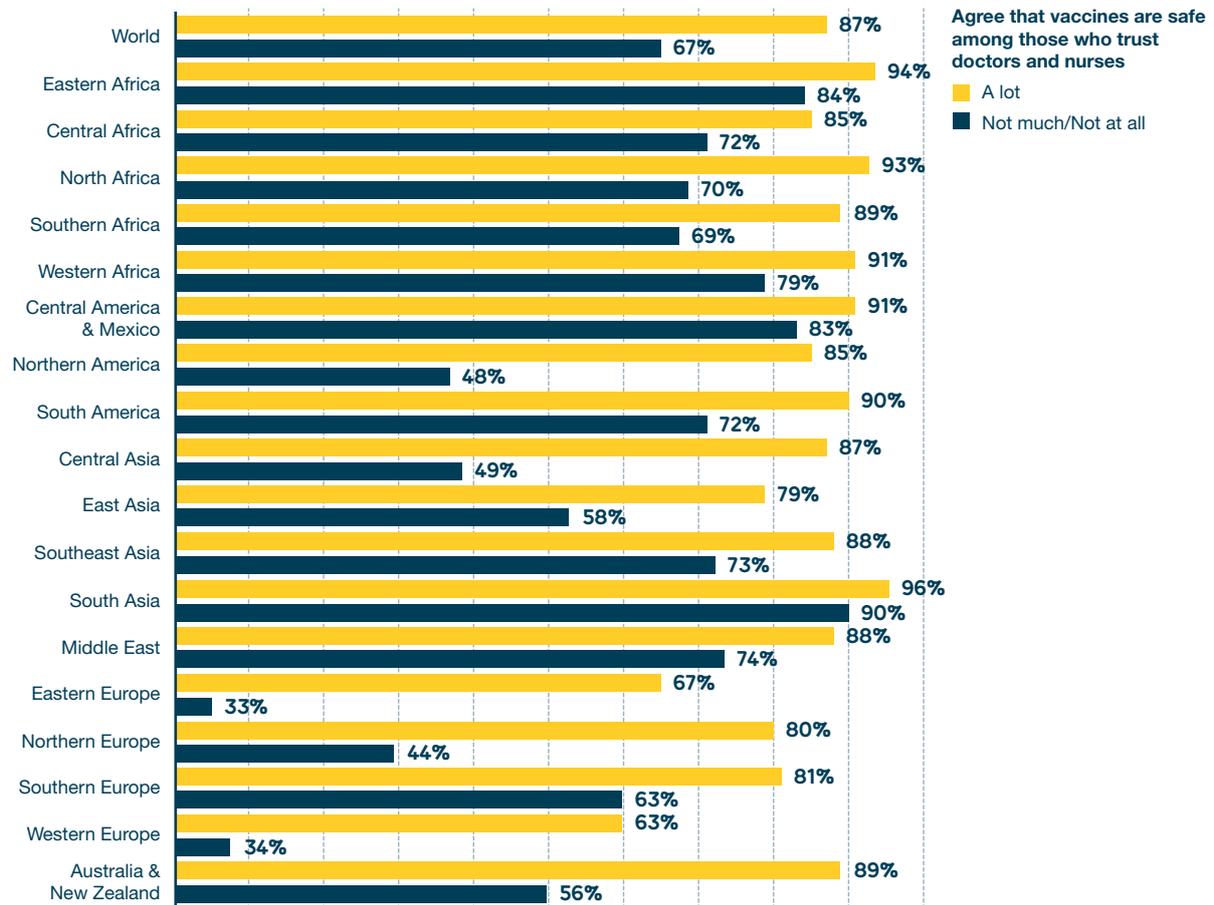
In Western Europe, slightly more than six in ten people who have ‘a lot’ of trust in doctors (63%) also believe vaccines are safe. Western Europe, however, has among the highest levels of trust in doctors and nurses of all regions, suggesting attitudes to vaccines are somewhat separate from overall healthcare perceptions.

Chart 5.9: Perceived safety of vaccines by level of trust in doctors and nurses and by region

Percentage of people who answered 'strongly agree' or 'somewhat agree'.

Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe.



Conclusion

Wellcome Global Monitor shows that confidence in vaccines is generally very high across the world, particularly in lower-income countries. People in high-income countries have less confidence – most people in these regions think vaccines are effective at preventing infectious diseases, but a significant minority (50% in Eastern Europe) have concerns over safety. And in some of these regions, greater scientific knowledge or levels of education is actually associated with less confidence in vaccines. This suggests that putting out more scientific information, or trying to educate more people, will not be enough to change minds on this issue.

In France, one-third of people do not agree that vaccines are safe, but only 19% disagree that they are effective. Just 10% disagree that it is important for children to be vaccinated – although if 10% of people remain unvaccinated against measles, for example, that can be enough to allow the infection to spread and cause dangerous outbreaks.

People with more trust in scientists, doctors and nurses tend to be more likely to agree that vaccines are safe. Conversely, those who have sought information about science, medicine or health recently appear to be less likely to agree. There is no evidence of what information people were seeking, but is there something about people who actively

seek science and health information, or the information they find, that means they are more likely to be sceptical about vaccines?

Globally, more than 90% of parents say their children have been vaccinated, and even in countries like France, it would appear that many people who doubt

the safety or effectiveness of vaccines still agree to having their children vaccinated. However, recent outbreaks of measles in the US, Brazil and India suggest that we cannot take herd immunity for granted – understanding trends in people’s attitudes to vaccines will be critical to maintaining public health in the years ahead.

Endnotes

- 1 Wellcome. Vaccines: A world equipped to combat infectious disease. <https://wellcome.ac.uk/what-we-do/our-work/vaccines> [accessed 13 May 2019].
- 2 World Health Organization. 10 Facts on Immunization. 2018 March. <https://www.who.int/features/factfiles/immunization/en/> [accessed 13 May 2019].
- 3 World Health Organization. Immunization, Vaccines and Biologicals: Addressing Vaccine Hesitancy. 2018 12 September. https://www.who.int/immunization/programmes_systems/vaccine_hesitancy/en/ [accessed 13 May 2019].
- 4 Stern A, Markel H. The History of Vaccines and Immunization: Familiar Patterns, New Challenges. *Health Affairs* 2005;24(3):611–21.
- 5 Larson HJ, et al. The State of Vaccine Confidence 2016: Global Insights Through a 67-Country Survey. *EBioMedicine* 2016;12:295–301.
- 6 Barrows M, et al. Parental Vaccine Hesitancy: Clinical Implications for Pediatric Providers *Journal of Pediatric Health Care* 2015;29(4):385–94.
- 7 Onnela JP, et al. Polio vaccine hesitancy in the networks and neighborhoods of Malegaon, India. *Social Science & Medicine* 2016;153:99–106.
- 8 Diekema DS. Improving Childhood Vaccination Rates. *The New England Journal of Medicine* 2012;391–3.
- 9 World Health Organization. Immunization, Vaccines and Biologicals: Addressing Vaccine Hesitancy. 2018 12 September. https://www.who.int/immunization/programmes_systems/vaccine_hesitancy/en/ [accessed 13 May 2019].
- 10 World Health Organization. Ten threats to global health in 2019. <https://www.who.int/emergencies/ten-threats-to-global-health-in-2019> [accessed 13 May 2019].
- 11 Larson, HJ, et al. The State of Vaccine Confidence 2016: Global Insights through a 67-Country Survey. *EBioMedicine* 2016;12:295–301. <https://www.vaccineconfidence.org/research/the-state-of-vaccine-confidence-2016/>
- 12 The actual questions and response options were broken down into 'branching' sub-sections so that they formed a lower response burden on the respondents across different education levels. Please see the full questionnaire in Appendix B.
- 13 Fine P, et al. 'Herd immunity': A rough guide. *Clinical Infectious Diseases*;52(7):911–6. <https://academic.oup.com/cid/article/52/7/911/299077> [accessed 14 May 2019].
- 14 Sadarangani M. Herd Immunity: How does it work? *Oxford Vaccine Group* 2016 26 April. <https://www.ovg.ox.ac.uk/news/herd-immunity-how-does-it-work> [accessed 14 May 2019].
- 15 Tannous L, et al. A short clinical review of vaccination against measles. *JRSM Open* 2014;5(4):1–6, April 2014. <https://journals.sagepub.com/doi/10.1177/2054270414523408> [accessed 14 May 2019].
- 16 Onnela JP, et al. Polio vaccine hesitancy in the networks and neighborhoods of Malegaon, India. *Social Science & Medicine* 2016;153:99–106.
- 17 Sadarangani M. Herd Immunity: How does it work? *Oxford Vaccine Group* 2016 26 April. <https://www.ovg.ox.ac.uk/news/herd-immunity-how-does-it-work> [accessed 14 May 2019].
- 18 European Centre for Disease Prevention and Control. Influenza vaccination coverage rates in the EU/EEA. 2018. <https://ecdc.europa.eu/en/seasonal-influenza/prevention-and-control/vaccines/vaccination-coverage> [accessed 14 May 2019].
- 19 Centers for Disease Control and Prevention. Estimates of Influenza Vaccine Coverage among Adults – United States. 2017–18 Flu Season. 2018 25 October. <https://www.cdc.gov/flu/fluavaxview/coverage-1718estimates.htm> [accessed 14 May 2019].
- 20 UNICEF. 'Alarming global surge of measles cases a growing threat to children.' Press release: 28 February, 2019. <https://www.unicef.org/press-releases/alarming-global-surge-measles-cases-growing-threat-children-unicef-0> [accessed 14 May 2019].
- 21 Centers for Disease Control and Prevention. Measles: It Isn't Just a Little Rash [Infographic]. 2018 5 February. <https://www.cdc.gov/measles/parent-infographic.html> [accessed 14 May 2019].
- 22 UNICEF. 'Alarming global surge of measles cases a growing threat to children.' Press release: 28 February, 2019. <https://www.unicef.org/press-releases/alarming-global-surge-measles-cases-growing-threat-children-unicef-0> [accessed 14 May 2019].
- 23 World Health Organization. Immunization, Vaccines and Biologicals: Measles and Rubella Surveillance Data. 2019 13 May. https://www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/active/measles_monthlydata/en/ [accessed 14 May 2019].
- 24 Larson HJ, et al. The State of Vaccine Confidence 2016: Global Insights Through a 67-Country Survey. *EBioMedicine* 2016;12:295–301. <https://www.vaccineconfidence.org/research/the-state-of-vaccine-confidence-2016/> [accessed 14 May 2019].
- 25 There is substantial variation by country in Eastern Europe, with country-level results significantly below the population-weighted regional figure of 50% in the following countries: Ukraine (32%), Belarus (41%), and Bulgaria (44%). The results for the following countries are above the regional aggregate: Czech Republic (69%), Hungary (79%) Poland (81%), Romania (69%) and Slovakia (77%). The weighted regional aggregate is affected by Russia's large population, where the figure stands at 48%.
- 26 Other research shows similar findings, for example: Larson HJ, et al. The State of Vaccine Confidence 2016: Global Insights through a 67-Country Survey. *EBioMedicine* 2016;12:295–301. <https://www.vaccineconfidence.org/research/the-state-of-vaccine-confidence-2016/> [accessed 14 May 2019].
- 27 Hackett DW. Liberia reports significant infectious disease outbreaks. *Precision Vaccinations* 2018 19 June. <https://www.precisionvaccinations.com/lassa-fever-acute-flaccid-paralysis-tetanus-measles-meningitis-and-yellow-fever-outbreaks-reported> [accessed 14 May 2019].
- 28 Kaufmann J, et al. Vaccine supply chains need to be better funded and strengthened, or lives will be at risk. *Health Affairs* 2011;30(6):1113–21. <https://doi.org/10.1377/hlthaff.2011.0368> [accessed 14 May 2019].
- 29 Boulton M, et al. Socioeconomic factors associated with full childhood vaccination in Bangladesh, 2014. *International Journal of Infectious Diseases* 2018;69:35–40. <https://www.sciencedirect.com/science/article/pii/S1201971218300365> [accessed 15 May 2019].
- 30 UN Office for the Coordination of Humanitarian Affairs (OCHA). Bangladesh: Diphtheria Outbreak – 2017–2019. <https://reliefweb.int/disaster/ep-2017-000177-bgd> [accessed 14 May 2019].
- 31 Schwarzingler M, et al. Low Acceptability of A/H1N1 Pandemic Vaccination in French Adult Population: Did Public Health Policy Fuel Public Dissonance? *PLOS ONE* 2010;5(4):1–9. <https://doi.org/10.1371/journal.pone.0010199> [accessed 14 May 2019].
- 32 Bruhl D, et al. Extension of French vaccination mandates: From the recommendation of the Steering Committee of the Citizen Consultation on Vaccination to the law. *Euro Surveill* 2018;23(17).
- 33 Le Monde with AFP. WHO justifies its management of influenza A. *Le Monde* 2010 26 January. https://www.lemonde.fr/epidemie-grippe-a/article/2010/01/26/l-oms-justifie-sa-gestion-de-la-grippe-a_1296718_1225408.html [accessed 14 May 2019].
- 34 Rey D, et al. (2018). Vaccine hesitancy in the French population in 2016, and its association with vaccine uptake and perceived vaccine risk-benefit balance. *Euro Surveill* 2018;23(17). <https://doi.org/10.2807/1560-7917.ES.2018.23.17.17-00816> [accessed 15 May 2019].
- 35 UNICEF. Alarming global surge of measles cases a growing threat to children. 2019 28 February. <https://www.unicef.org/press-releases/alarming-global-surge-measles-cases-growing-threat-children-unicef-0> [accessed 14 May 2019].
- 36 Synovitz R. Are Russian trolls saving measles from extinction? *Radio Free Europe/Radio Liberty* 2019 13 February. <https://www.rferl.org/a/are-russian-trolls-saving-measles-from-extinction/29768471.html> [accessed 14 May 2019].
- 37 Fine PEM. Herd Immunity: History, Theory, Practice. *Epidemiologic Reviews* 1993;15(2):265–302. <https://doi.org/10.1093/oxfordjournals.epirev.a036121> [accessed 14 May 2019].
- 38 Diseases referred to in the question varied by country according to which types of vaccinations were most common; in some regions, the question referred to 'childhood diseases such as measles, mumps, or rubella'.
- 39 Saitoh A, Okabe N. Progress and challenges for the Japanese immunization program: Beyond the 'vaccine gap'. *Vaccine* 2018; 36(30):4582–8. <https://doi.org/10.1016/j.vaccine.2018.01.092> [accessed 15 May 2019].
- 40 Tanaka Y, et al. History repeats itself in Japan: Failure to learn from rubella epidemic leads to failure to provide the HPV vaccine. *Human Vaccines & Immunotherapeutics* 2017;13(8):1859–60. <https://doi.org/10.1080/21645515.2017.1327929> [accessed 15 May 2019].
- 41 The Japan Times. Japan's backward vaccination policy. *The Japan Times*. 2018 26 June. <https://www.japantimes.co.jp/opinion/2018/06/26/commentary/japan-commentary/japans-backward-vaccination-policy> [accessed 14 May 2019].
- 42 Sandhofer MJ, et al. Vaccine hesitancy in Austria: A cross-sectional survey. *Wien Klin Wochenschr* 2017; 129(1–2):59–64. <https://doi.org/10.1007/s00508-016-1062-1> [accessed 15 May 2019].
- 43 A similar relationship holds for the other two questions about vaccines, though not as noticeable as this question. This is why this item is being singled out in this section.

Appendix B: Wellcome Global Monitor questionnaire 2018

For the fully scripted questionnaire and data dictionary please search for Wellcome Global Monitor at the UK Data Archive, see <https://www.data-archive.ac.uk/find/>. Please note some demographic questions were not asked in this questionnaire but were in the wider Gallup World Poll of which this is a part.

Q1. How much do you, personally, know about science? Do you know a lot, some, not much, or nothing at all?

A lot Some Not much Not at all Don't know Refused

Q2. On this survey, when I say 'science' I mean the understanding we have about the world from observation and testing. When I say 'scientists' I mean people who study the Planet Earth, nature and medicine, among other things. How much did you understand the meaning of 'science' and 'scientists' that was just read? Did you understand all of it, some of it, not much of it, or none of it?

A lot Some Not much None Don't know Refused

Q3. Do you think studying diseases is a part of science?

Yes No Don't know Refused

Q4. Do you think writing poetry is a part of science?

Yes No Don't know Refused

Q5. Have you, personally, ever, learned about science at _____ ?

a. Primary school:

Yes No Never attended this type of school Don't know Refused

b. Secondary school:

Yes No Never attended this type of school Don't know Refused

c. College/university:

Yes No Never attended this type of school Don't know Refused

Q6. Have you, personally, tried to get any information about science in the past 30 days?

Yes No Don't know Refused

Q7. Have you, personally, tried to get any information about medicine, disease, or health in the past 30 days?

Yes No Don't know Refused

Q8. Would you, personally, like to know more about science?

Yes No Don't know Refused

Q9. Would you, personally, like to know more about medicine, disease, or health?

Yes No Don't know Refused

Q10. Do you have confidence in each of the following, or not? How about _____?

a. [insert country equivalent term for charitable organisations/NGOs]:

Yes No Don't know Refused

b. Hospitals and health clinics

Yes No Don't know Refused

Q11. How much do you trust each of the following? Do you trust them a lot, some, not much, or not at all?

a. The people in your neighbourhood:

A lot Some Not much Not at all Don't know Refused

b. The national government in this country:

A lot Some Not much Not at all Don't know Refused

c. Scientists in this country:

A lot Some Not much Not at all Don't know Refused

d. Journalists in this country:

A lot Some Not much Not at all Don't know Refused

e. Doctors and nurses in this country:

A lot Some Not much Not at all Don't know Refused

f. People who work at [insert country equivalent term for charitable organisations/NGOs] in this country:

A lot Some Not much Not at all Don't know Refused

g. [insert country equivalent term for traditional healers] in this country:

A lot Some Not much Not at all Don't know Refused

As a reminder, on this survey, when I say 'science' I mean the understanding we have about the world from observation and testing. When I say 'scientists' I mean people who study the Planet Earth, nature and medicine, among other things.

Q12. In general, would you say that you trust science a lot, some, not much, or not at all?

A lot Some Not much Not at all Don't know Refused

**Q13. In general, how much do you trust scientists to find out accurate information about the world?
A lot, some, not much, or not at all?**

A lot Some Not much Not at all Don't know Refused

Q14. How much do you trust scientists working in colleges/universities in this country to do each of the following?

a. To do their work with the intention of benefiting the public. Do you trust them to do this a lot, some, not much, or not at all?

A lot Some Not much Not at all Don't know Refused

b. To be open and honest about who is paying for their work. Do you trust them to do this a lot, some, not much, or not at all?

A lot Some Not much Not at all Don't know Refused

Q15. Now, thinking about companies – for example, those who make medicines or agricultural supplies – how much do you trust scientists working for companies in this country to do each of the following?

a. To do their work with the intention of benefiting the public. Do you trust them to do this a lot, some, not much, or not at all?

A lot Some Not much Not at all Don't know Refused

b. To be open and honest about who is paying for their work. Do you trust them to do this a lot, some, not much, or not at all?

A lot Some Not much Not at all Don't know Refused

Q16. In general, do you think the work that scientists do benefits most, some, or very few people in this country?

A lot Some Not much Not at all Don't know Refused

Q17. In general, do you think the work that scientists do benefits people like you in this country?

Yes No Don't know Refused

Q18. Overall, do you think that science and technology will help improve life for the next generation?

Yes No Don't know Refused

Q19. Overall, do you think that science and technology will increase or decrease the number of jobs in your local area in the next five years?

Increase Decrease Neither/Have no effect Don't know Refused

Q20. Which of the following people do you trust most to give you medical or health advice?

- Your family and friends A religious leader A doctor or nurse A famous person
 [insert country equivalent term for a traditional healer] None of these/Someone else
 Don't Know Refused

**Q21. In general, how much do you trust medical and health advice from the government in this country?
A lot, some, not much, or not at all?**

- A lot Some Not much Not at all Don't know Refused

Q22. In general, how much do you trust medical and health advice from medical workers, such as doctors and nurses, in this country? A lot, some, not much, or not at all?

- A lot Some Not much Not at all Don't know Refused

Q23. A vaccine is given to people to strengthen their body's ability to fight certain diseases. Sometimes people are given a vaccine as [insert country equivalent term for a shot or an injection], but vaccines can also be given by mouth or some other way. Before today, had you ever heard of a vaccine?

- Yes No Don't know Refused

The following Vaccine questions were only asked to respondents who answered 'Yes' to the question above.

Q24. Do you agree, disagree, or neither agree nor disagree with the following statement?

**Vaccines are important for children to have. (If agree) Do you strongly or somewhat agree?
(If disagree) Do you strongly or somewhat disagree?**

- Strongly agree Somewhat agree Neither agree nor disagree Somewhat disagree
 Strongly disagree Don't know Refused

Q25. Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are safe. (If agree) Do you strongly or somewhat agree? (If disagree) Do you strongly or somewhat disagree?

- Strongly agree Somewhat agree Neither agree nor disagree Somewhat disagree
 Strongly disagree Don't know Refused

Q26. Do you agree, disagree, or neither agree nor disagree with the following statement?

Vaccines are effective. (If agree) Do you strongly or somewhat agree? (If disagree) Do you strongly or somewhat disagree?

- Strongly agree Somewhat agree Neither agree nor disagree Somewhat disagree
 Strongly disagree Don't know Refused

Now, on a different topic...

Q27. Do you, personally, have any children? [This can also include adopted and step-children.]

- Yes No (Yes, but no longer living) Don't know Refused

If answered yes to have you ever heard of a vaccine? and yes to question above continue;
Otherwise, skip to next question on religion.

Q28. To the best of your knowledge have any of your children ever received a vaccine that was supposed to prevent them from getting childhood diseases such as [insert most relevant examples in each country, such as polio, measles or mumps], or not?

- Yes No Don't know Refused

Could you tell me what your religion is?

- | | |
|---|---|
| <input type="checkbox"/> Other (Write in: _____) | <input type="checkbox"/> Spiritism |
| <input type="checkbox"/> Christianity: Roman Catholic, Catholic | <input type="checkbox"/> Judaism |
| <input type="checkbox"/> Christianity: Protestant, Anglican, Evangelical, SDAs, Jehovah's Witnesses, Quakers, AOG, Monophysite, AICs, Pentecostal, etc. | <input type="checkbox"/> Baha'i |
| <input type="checkbox"/> Christianity: Eastern Orthodox, Orthodoxy, etc. | <input type="checkbox"/> Jainism |
| <input type="checkbox"/> Islam/Muslim | <input type="checkbox"/> Shinto |
| <input type="checkbox"/> Islam/Muslim (Shiite) | <input type="checkbox"/> Cao Dai |
| <input type="checkbox"/> Islam/Muslim (Sunni) | <input type="checkbox"/> Zoroastrianism |
| <input type="checkbox"/> Druze | <input type="checkbox"/> Tenrikyo |
| <input type="checkbox"/> Hinduism | <input type="checkbox"/> Neo-Paganism |
| <input type="checkbox"/> Buddhism | <input type="checkbox"/> Unitarian-Universalism |
| <input type="checkbox"/> Primal-indigenous/African Traditional and Diasporic/Animist/Nature Worship/Paganism | <input type="checkbox"/> Rastafarianism |
| <input type="checkbox"/> Chinese Traditional Religion/Confucianism | <input type="checkbox"/> Scientology |
| <input type="checkbox"/> Sikhism | <input type="checkbox"/> Secular/Nonreligious/Agnostic/Atheist/None |
| <input type="checkbox"/> Juche | <input type="checkbox"/> Christian |
| | <input type="checkbox"/> Taoism/Daoism |
| | <input type="checkbox"/> Don't Know |
| | <input type="checkbox"/> Refused |

Additional questions for respondents who identified with a religion

The next few questions ask about science and religion. Please remember there is no right or wrong answer and that your responses are confidential.

Q29. Has science ever disagreed with the teachings of your religion?

- Yes No Don't know Refused

Only asked if answered 'Yes' to question above.

Q30. Generally speaking, when science disagrees with the teachings of your religion, what do you believe? Science or the teachings of your religion?

- Science The teachings of your religion It depends Don't know Refused

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