Rathenau Instituut

Trust in science in the Netherlands

Survey Monitor 2018

Report

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Foreword

Trust in science. It is a topic that the Rathenau Instituut has addressed in its research and public debates for dozens of years. Policymakers often rely on scientific evidence to substantiate their policy. It is important that the public accepts that evidence, however. Since 2012, the Rathenau Instituut has surveyed public trust in a number of societal institutions every three years, one of those being science. In this edition of our survey, we see that trust in science remains undiminished in 2018. Courts of law enjoy almost the same level of public trust as science, but the media, major corporations and politicians have considerably lower scores. These findings correspond with survey results in Germany, Sweden and the United Kingdom and match the pattern revealed by our earlier surveys (2012 and 2015).

In this survey, we break down the concept of trust into three aspects: scientists' competence, reliability and integrity. We have collected data from a representative sample of the Dutch population aged 18 years and older. They give science high marks on all three aspects, but their views change as soon as scientists work for government or business. The scores for competence and reliability remain the same, but not the perception that scientists do the right thing and fulfil their promises. Many respondents, for example, believe that scientists modify their findings when they work for government or business.

Our report also shows that the Dutch are not convinced of government's ability to make good use of research results in its decision-making. The Dutch believe that government only makes use of findings that serve its own purposes. However, more Dutch people also believe that science can help solve the problems of society. It is paradoxical that we appear to lose faith in scientists and their results precisely when they work for government and the private sector. The outcomes of this study are therefore relevant for scientists, businesses and politicians.

Dr Melanie Peters
Director, Rathenau Instituut

Summary

This report covers our third survey of public trust in science. We distributed a questionnaire to a representative sample of the Dutch population in 2018, following earlier surveys in 2012 (in cooperation with the WRR) and 2015. We used the basic questionnaire developed in 2012 as a basis for the 2015 and 2018 surveys as well. Each of the three surveys also addressed other, additional topics. In the 2018 survey, that topic was the relationship between science on the one hand and business or government on the other.

General impression
As in 2012 and 2015, our 2018 survey shows that science gets higher marks for trust than all other institutions. Science has an average score of 7.07, followed by courts of law with 6.53. The average scores for the other institutions included in the survey fall below 6.

The survey shows that science is also a trusted source of information about climate change and vaccines and that it occupies a place near or at the top of the trust ladder, as it did in 2012 and 2015. We also see that, compared with 2015, a larger percentage of people expect science to contribute to solving various problems. Finally, almost all of the associations that people have with science are positive ones, as was the case in previous years. All three surveys (2012, 2015 and 2018) offer a similarly positive picture of science.

Are scientists regarded as competent, reliable and honest?
Trust is a word with many different meanings and aspects. We chose to analyse trust in science by asking our Dutch respondents to consider three characteristics of scientists: competence, reliability and integrity. The questionnaire contained statements addressing these three aspects. The respondents' responses show that the Dutch generally have a positive view of scientists. Almost 4 out of 5 (77%-79%) Dutch persons think that scientists work carefully, are experts in their field, and can be trusted even though they do not always agree with each other. Only 10%-15% think that scientists make a lot of mistakes, have less expertise than most people think, and cannot be trusted because they often disagree with each other. The majority of the Dutch population (66%) believe that scientists are objective and independent in their work. Almost a quarter (23%) of the Dutch think that scientists modify their research to get the answers they want.

The latter finding – that almost one out of four Dutch persons (23%) think that scientists modify their research to get the answers they want – is striking. We

therefore attempted to characterise this group. Of note is that, on average, this group gives all institutions a significantly lower mark for trust than the overall sample. They not only have less trust in science but in all institutions, evidently. Also notable are this group's responses to an open question about its associations with science. As expected, the percentage of negative associations is higher than among the overall group. Strikingly, almost all of the negative associations concerning falsification, fabrication or plagiarism can be traced to the members of this group of respondents.

Trust in cooperation between science and government/business?
What happens to the level of trust when scientists cooperate with government or business? Earlier studies have shown that, as institutions, government and business enjoy less trust than science. We therefore examined public trust in such cooperation by presenting statements about the three aspects of trust described earlier (competence, reliability and integrity).

If we compare the answers to the statements about 'scientists who undertake contract research' with the answers to statements about 'scientists in general', we see one important difference. Doubts about the integrity of scientists increase as soon as they work for government or business; a proportion of the Dutch believe that scientists will modify their research to get the results that government (34%) or the business (41%) wants.

The Dutch also do not have a positive view of government and business within the context of contract research:

- 57% think that government does not really know how to make use of research results in its policy
- a large majority think that government and businesses will make use of research results only if those results support their own ideas
- and about 60% believe that government and business will try to obstruct unwanted results.

On the other hand, the Dutch also believe that it is acceptable for scientists to let their choice of research topic be guided by the interests of business and government. They also think that government more often should take the outcomes of research into account in its decisions.

The results are relevant for scientists, government and business. Scientists who work for government and business should be aware that a sizeable percentage of the Dutch population (34%-41%) believe that they modify their research to get the results that their client wants. Government should be aware that a large percentage

of Dutch citizens believe that research paid for by government is modified in its favour. That is even more the case for research paid for by businesses.

Trust among differing groups: age, gender and education
As in previous years, we see that trust in science is related to educational level. High-educated individuals trust science more than low-educated ones.

In analysing the results of the survey, we noted a difference in trust between men and women of differing ages. There is not much difference in the under-50 age categories. In the group of respondents older than 50, women's average scores for trust in science are lower than men's. We see a similar trend in the data generated by the 2012 and 2015 Rathenau surveys on trust in science. This difference remains significant even after correcting for the existing difference in educational level between men and women of that age, or for the difference in scientific knowledge.

If we consider how high- and low-educated persons assess the different aspects of trust in science (competence, reliability and integrity), a significant difference emerges between their answers to the statements about reliability and integrity. High-educated respondents are more likely than the low-educated ones to agree with the positive statements. There is no significant difference between high- and low-educated people in their answers to the statements about competence.

It is notable that the percentage of high-educated respondents who 'agree completely with' or 'lean towards' the statement 'Scientists modify their research to get the answers they want' is 19%, but this percentage increases significantly when the statement is reworded to refer to scientists

- working for government (31%)
- and working for a business (44%).

Looking at how men and women over the age of 50 assess the various aspects of trust (competence, reliability and integrity), we see that their scores are similar for most of the statements. The only exception concerns integrity: women older than 50 are more likely to 'agree completely with' or 'lean towards' the statement that scientists modify their research.

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Introduction

The Rathenau Instituut examines the public's trust in science by conducting surveys among a representative sample of the Dutch population. We did so in 2012 and 2015 and have done so again now, in 2018. Each time, we have used the same set of questions developed in 2012 in cooperation with the Scientific Council for Government Policy (WRR). Because the methodology and sampling have remained identical, we can compare the responses to these questions over time. (See Appendix 1 for an explanation of the methodology.) Besides the questions developed in 2012, we also add other questions on varying topics. In 2012, we investigated psychological factors, such as 'unease'. In 2015 our emphasis was on the gap between science and the public and on the Dutch National Research Agenda.

In the present publication, we emphasise the role of science in relation to business and government. In doing so, we examine three frequently referenced aspects of trust: competence, reliability and integrity. The Rathenau Instituut has already studied public controversies involving science and policymaking (*Contested science*, 2014); in cooperation with the WRR and the Royal Netherlands Academy of Arts and Sciences (KNAW), we also organised a series of public debates about trust in science in 2014. Trust in science and contested knowledge play a role in many of the Rathenau Instituut's studies, whether we are examining nuclear waste recycling or the use of personal data.

In 2012, there was every reason to conduct a survey on trust in science. Unlike the United Kingdom or the United States, for example, the Netherlands has no longstanding tradition of surveying trust in science at regular intervals and analysing the outcomes. Various incidents (for example data manipulation by psychologist Diederik Stapel and, in particular, misconduct by medical specialist Don Poldermans) had led government ministers to question the level of public trust in science. The assumption was that such trust had declined among the general public.

Recently, such terms as 'post-truth' and 'alternative facts' have become ubiquitous. Everyone has heard of 'fact-checking' by now, a little-known concept in the Netherlands two years ago. Statements by the current president of the United States painting science as merely 'another opinion' have probably heightened this awareness. The alarm this caused was felt far beyond the United States. In the first half of 2017, a 'March for Science' took place in some 600 cities worldwide calling

attention to the importance of research. Some commentators have suggested that the public's trust in science is declining in the Netherlands too.

All these events made it clear that another survey on trust in science was called for in 2018. A fair amount of the questions we have asked are identical to those in the 2012 and 2015 surveys, making it possible to compare the relevant responses across multiple years. In addition to these questions, the 2018 survey also includes new questions.

The concept of trust can be broken down into different aspects. Two of these are whether scientists can be trusted to deal scrupulously with their research, and whether they can be trusted to work independently. To examine the public's level of trust in science, our survey includes questions about three aspects of trust: competence, reliability and integrity. The literature offers plentiful support for this particular 'translation' of the concept. This is how we have chosen to analyse trust in this study.

Previous Rathenau Instituut studies have revealed that the public awards high marks to science as an institution, and low marks to government and major corporations. The question that arises is: what happens to trust when scientists cooperate with government or business? And what happens when these parties make use of scientists' research results? We look at these questions in detail in this study.

Reader's guide

Chapter 1 looks in general at trust in science in the Netherlands. Chapter 2 considers the extent to which scientists are regarded as competent, reliable and honest. Chapter 3 examines whether that perception changes when scientists work for government or business, and what the Dutch think about how government and business use scientific results. Finally, Chapter 4 investigates differences in trust between various groups of respondents. Appendix 1 explains the methodology.

1 What is the state of public trust in science in the Netherlands?

What is the state of public trust in science in the Netherlands?
In the spring of 2018, the Rathenau Instituut distributed a survey to a representative sample of the Dutch population (as it had done in 2012 and 2015) focusing on public trust in science. The survey also queried public trust in other institutions. In this chapter, we look at what this survey tells us about the state of public trust in science in the Netherlands. In the first section, we examine the respondents' scores for trust in various institutions. We then describe how the public views science. In the third section, we describe how often people cross paths with science in their everyday lives.

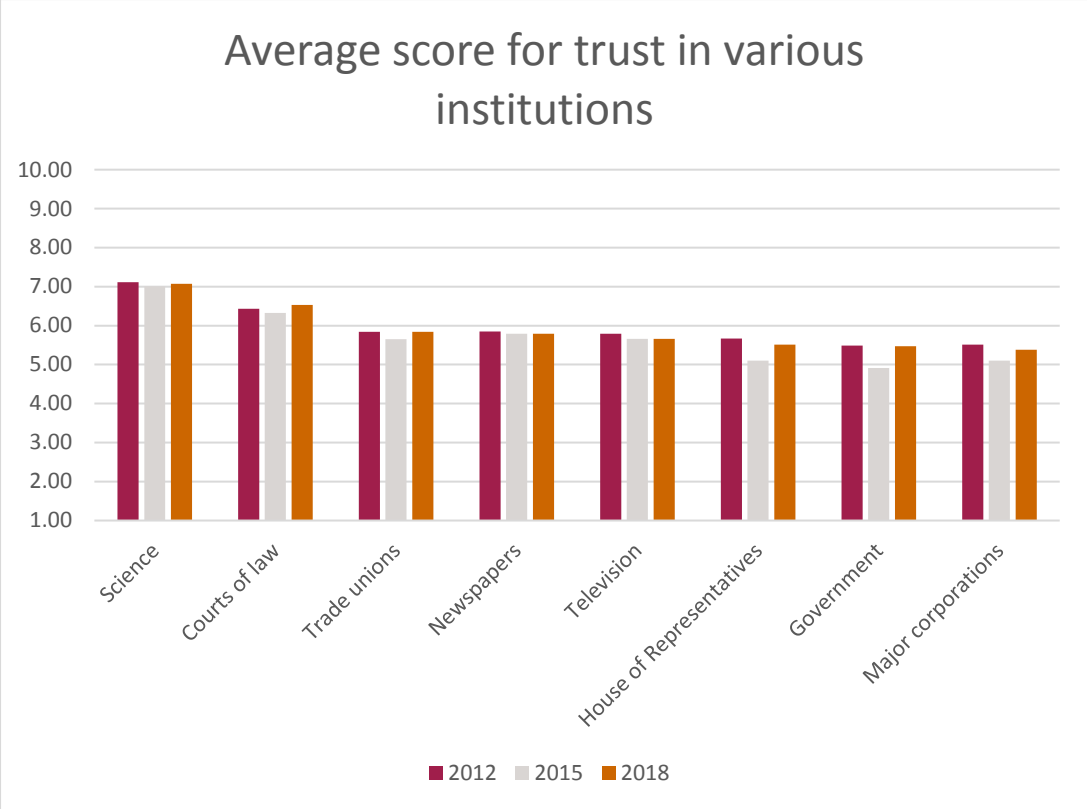
1.1 Trust in science and other institutions

The main question posed in this survey is: *'Can you indicate whether you do or do not have trust in the institutions below?'*. The respondents were asked to indicate the level of trust that they have in the separate institutions on a ten-point scale, with 1 indicating no trust at all and 10 indicating complete trust.

One notable outcome is that the public's trust in science is undiminished in 2018, and that it trusts science above all other institutions. This matches the outcomes of the previous surveys in 2012 and 2015. Science receives an average score of 7.07, followed by courts of law with 6.53. The figure below shows the average scores for the various institutions, ranked from highest to lowest, for 2012, 2015 and 2018.[1]

The public has the most trust in science, followed by courts of law, trade unions, newspapers, television, the Dutch House of Representatives, the Dutch Government, and major corporations. Compared with the survey three years ago, trust in almost all institutions has increased, but their ranking remains unchanged (outside of a few minor details).

1 In calculating the averages for trust, we used weighting factors to ensure that the results would be representative for the Netherlands in terms of gender, age, size of household, education, social class and region.

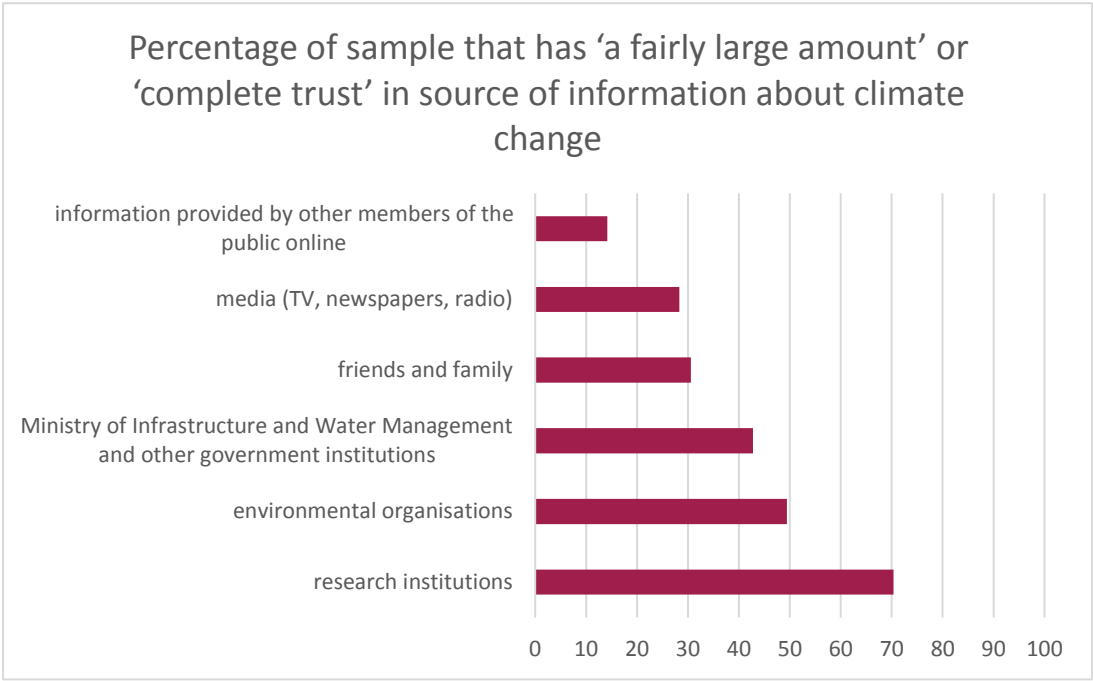


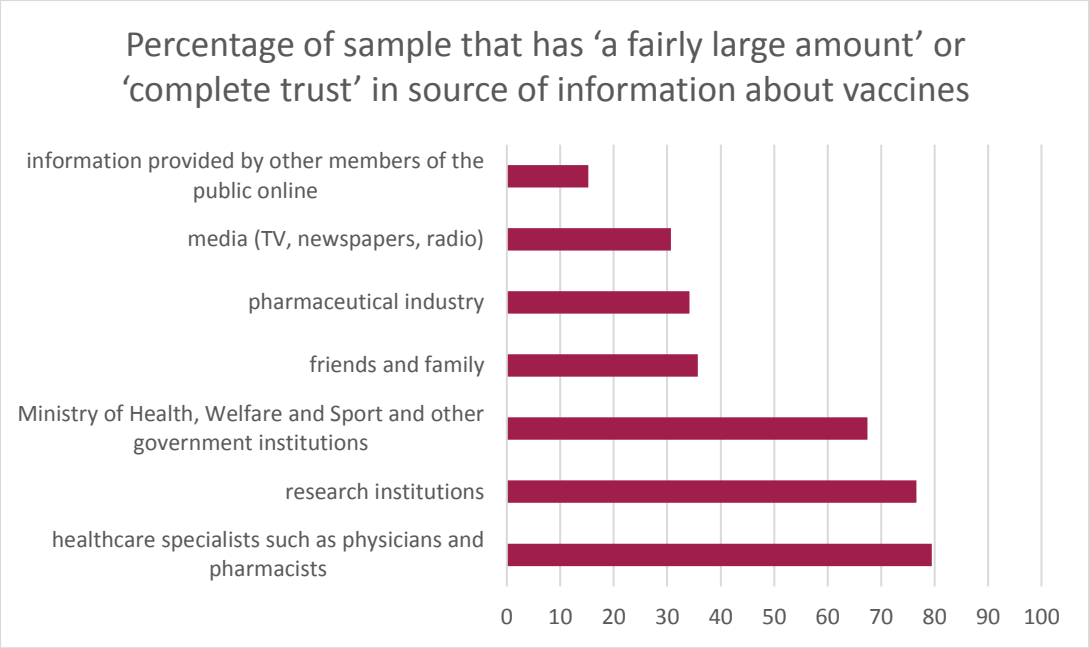
The survey questions are comparable to those posed in the quarterly surveys conducted by the Netherlands Institute for Social Research (SCP), which examine public trust in various institutions, but not in science (Dekker et al., 2018). The SCP presents its outcomes somewhat differently than we do, however. It reports the percentage of the population that has awarded a specific institution a score of 6 or higher, whereas the figures that we present above are averages. The SCP's outcomes compare reasonably well with our own. In both cases, the percentage of the population that has awarded a score of 6 or more to trade unions, newspapers and television is within a bandwidth of 61% to 66%. The two sets of scores are also similar when it comes to the Dutch Government and House of Representatives, both clearly at the bottom of the trust ladder. Compared with the SCP's survey, however, the respondents in our survey have somewhat more trust in courts of law and somewhat less trust in major corporations.

The Longitudinal Internet Studies for the Social Sciences panel (LISS) by CentERdata (Tilburg University) has distributed an (almost) annual Politics and Values questionnaire since 2008 that examines trust in 17 different institutions. If we look at the average score awarded to institutions, we see that, here too, science

has one of the highest scores. The Politics and Values questionnaire contains no further questions about science.

To find out more about trust in science, our survey also includes questions about the respondents' level of trust in various sources of information about climate change and vaccines. With regard to climate change, the respondents gave the highest scores to research institutions, with 70% saying that they had a 'fairly large amount' or 'complete trust' in this source. A large proportion (77%) also trust science as a source of information about vaccines, although healthcare specialists receive a somewhat higher score (80%). Also of note is the fairly large measure of trust in the relevant ministry and other government institutions with regard to vaccines (68%), and the considerably smaller percentage of respondents who trust these institutions to provide information on climate change (43%).





Looking at the responses to the questions above, we can conclude that the public places considerable trust in science: the scientific community still gets the highest mark for trust and is also regarded as one of the most reliable sources of information.

1.2 Public perception of science

To get a better idea of how the Dutch perceive science, we also asked the respondents other questions. We asked them which occupational groups and organisations they associate with science. The vast majority (78%-92%) see researchers at universities and businesses, medical specialists, Nobel laureates, and the engineers who designed the Delta Works as scientists. A smaller percentage (36%-55%) believe that scientists include meteorologists at the Royal Netherlands Meteorological Institute (KNMI), GPs, businesses that develop new materials for sportswear, automotive designers, and specialists who develop new teaching methodologies. A small minority (22%-23%) regard economists on television and in the newspapers as well as SCP researchers as scientists. These views are reasonably similar to the outcomes of the surveys held in 2012 and 2015. The biggest difference is that a slightly larger percentage of the respondents (about 6% more) regard KNMI meteorologists and GPs as scientists.

We included an open question asking the respondents what they associate with 'science'. Most of their associations are either positive or neutral. Mentioned most

frequently are such words as study/studies, knowledge, progress and university. The number of negative associations is small (below 2%). This percentage is, once again, comparable to the outcomes of the 2012 and 2015 surveys. The negative associations can be clustered into a number of groups. One such group focuses on research that takes a long time or that proceeds very slowly. Respondents also mentioned associations with falsification, fabrication and plagiarism (FFP), for example ‘plagiarism’, ‘Diederik Stapel’, ‘corruption involving businesses’ and ‘manipulation’. The third group of associations concerns the extent to which science is ‘true’ or ‘necessary’. The respondents used such words as ‘false certainty’, ‘obsolete in just a few years’, ‘contradictory’, ‘not always necessary’, and ‘not always innovative’.

Finally, we asked the respondents whether they expect science to contribute to solving problems in fourteen different areas. For example, we asked them whether they expected science to contribute to better air quality, a longer and healthier life for all, or elderly care. Notable here is that the percentage of respondents who believe that science will contribute ‘definitely’ or ‘somewhat’ to all fourteen areas has risen since 2015, with the increase ranging from:

- 3% for ‘Do you expect that science will contribute to better air quality’ (from 79% in 2015 to 82% in 2018) to;
- 15%-16% for ‘Do you expect that science will contribute to elderly care’ (from 40% to 55%) and for ‘Do you expect that science will contribute to enough work for all’ (from 18% to 34%).

The public’s perception of science thus appears to be reasonably similar to that found in the previous surveys, but the percentage of respondents who expect science to contribute to solving various problems has increased (slightly) in all areas.

1.3 Crossing paths with science

The Dutch cross paths with science in different ways. Thirty-nine percent of the respondents read about science in newspapers ‘very often’ or ‘regularly’. Twenty-eight percent listen to radio programmes or watch television programmes about science ‘very often’ or ‘regularly’, and another 28% watch or read information about science online ‘very often’ or ‘regularly’. Finally, 15% read popular science magazines ‘very often’ or ‘regularly’, and 24% say that they discuss science with friends or family ‘very often’ or ‘regularly’. Across all these questions, men tend to cross paths with science more often than women. The responses are reasonably similar to those in 2015, the sole exception being the percentage of respondents who read about science in the newspapers ‘very often’; in 2012 and 2015 that

percentage was around 47% but has now dropped to 39%. This decline may be related to the falling percentage of people who read newspapers in general. The extent to which the respondents consider science an important part of everyday life is also similar to 2015: 6% say ‘very important’, 23% ‘fairly important’, 48% ‘somewhat important’ and 23% ‘unimportant’.

1.4 Conclusion

Based on the preceding, we can say that the public still has considerable trust in science. Science still gets the highest mark for trust and is regarded as one of the most reliable sources of information. People have mainly positive or neutral associations with science, and the percentage who believe that science will contribute to solving various problems has risen (slightly) in all areas.

2 Are scientists perceived as competent, reliable and honest?

As indicated in our 2012 report, *Trust in Science in the Netherlands*, trust is not easy to define (Tiemeijer et al., 2013). It is a complex concept that has different meanings and nuances (Resnik, 2010). For example, it can refer to the relationship between people (Harrison McKnight & Chervany, 2001) or one person's attitude towards another person, a group or an institution (KNAW, 2013). Whether scientists can be trusted to deal scrupulously with their research or whether they can be trusted to work independently are also different aspects of trust.

In this study, we examine trust in science by asking a representative sample of the Dutch population what they think of various characteristics associated with scientists. Harrison McKnight and Chervany grouped the characteristics described in the literature into four categories: benevolence, competence, integrity and predictability (Harrison McKnight & Chervany, 2001). Three of these four categories match the aspects that the Royal Netherlands Academy of Arts and Sciences (KNAW) cites in its report *Trust in Science*: intentions/benevolence, competence and integrity (KNAW, 2013). In this study, we group the various aspects into the following three categories:

1. **Competence**: the perception that scientists have the ability or power to do what needs to be done (Harrison McKnight & Chervany, 2001).
2. **Reliability**: we broadened the 'predictability' category (the perception that scientists' actions are consistent enough to be forecast in a given situation, Harrison McKnight & Chervany, 2001) to 'reliability', allowing us to include a question about the extent to which scientists can be trusted to provide truthful information.
3. **Integrity** (combined with benevolence): the perception that scientists do the right thing and fulfil promises (Harrison McKnight & Chervany, 2001).

The questionnaire has statements addressing these three aspects. To avoid influencing the respondents unduly, we decided to present two statements in each case (one positive and one negative) and to ask the respondents which statement came closest to their own view (response options: 'I agree completely with statement A'; 'I lean towards statement A'; 'I lean towards statement B'; 'I agree completely with statement B'; 'don't know'). We discuss the results in this chapter.

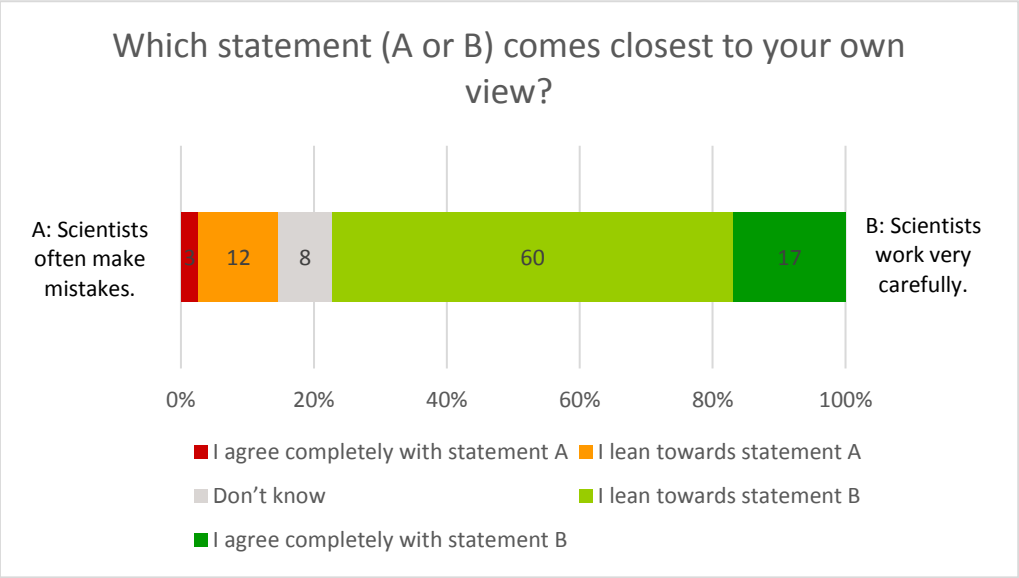
2.1 Competence

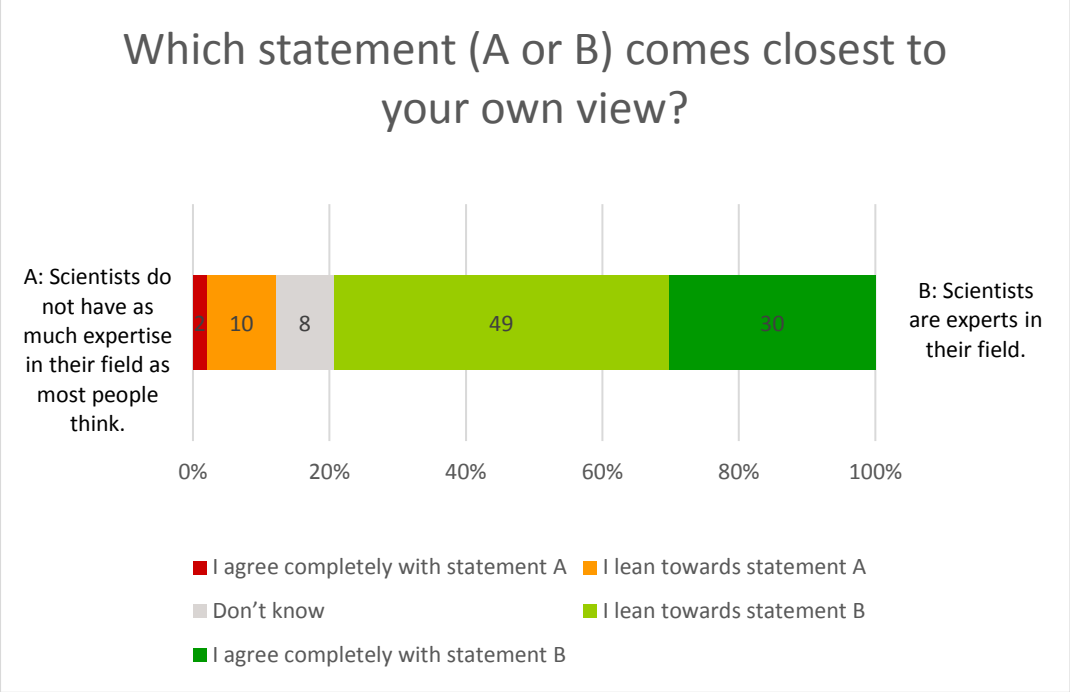
With regard to competence, we asked the respondents to consider two pairs of statements:

'Scientists often make mistakes'
versus
'Scientists work very carefully'

and

'Scientists do not have as much expertise in their field as most people think'
versus
'Scientists are experts in their field'.





In both cases, more than three quarters of the respondents 'lean towards' or 'agree completely with' the second, 'positive', statement. Some 12%-15% of the respondents 'agree completely with' or 'lean towards' the statements that scientists make a lot of mistakes or do not have as much expertise in their field as people think.

The results[2] show that more than three quarters of the Dutch population believe that scientists work carefully and are experts in their field. The majority of Dutch people therefore have a positive attitude towards scientists when it comes to competence.

Studies examining competence-related reasons for trusting scientists have also been conducted in other countries. Although the questions in these studies differ from our own, we mention the results here to help us paint a more general picture. A study in the United States asked respondents whether they trust scientists to report their findings accurately. Seventy-four percent place a great deal or some trust in scientists to report their findings accurately, 21% have little or no trust that they do, and 5% are not sure (American Academy of Arts & Sciences, 2018). A German study gave respondents various reasons for trusting scientists. One reason was 'because scientists are experts in their field'. Seventy-two percent of the respondents agreed completely or somewhat with this statement, 17% were

2 The percentages in the graph about scientists' expertise add up not to 100 but to 99. This is because the numbers have been rounded off. The percentages in other figures also do not always add up to 100%; again, this is because we have rounded them off to whole percentages.

undecided, 7% disagreed completely or somewhat, and 3% didn't know (Wissenschaft im Dialog, 2017).

The perception of scientists in the United States and Germany appears reasonably similar to that in the Netherlands: approximately three quarters of the population have a positive view of scientists when it comes to competence-related aspects.

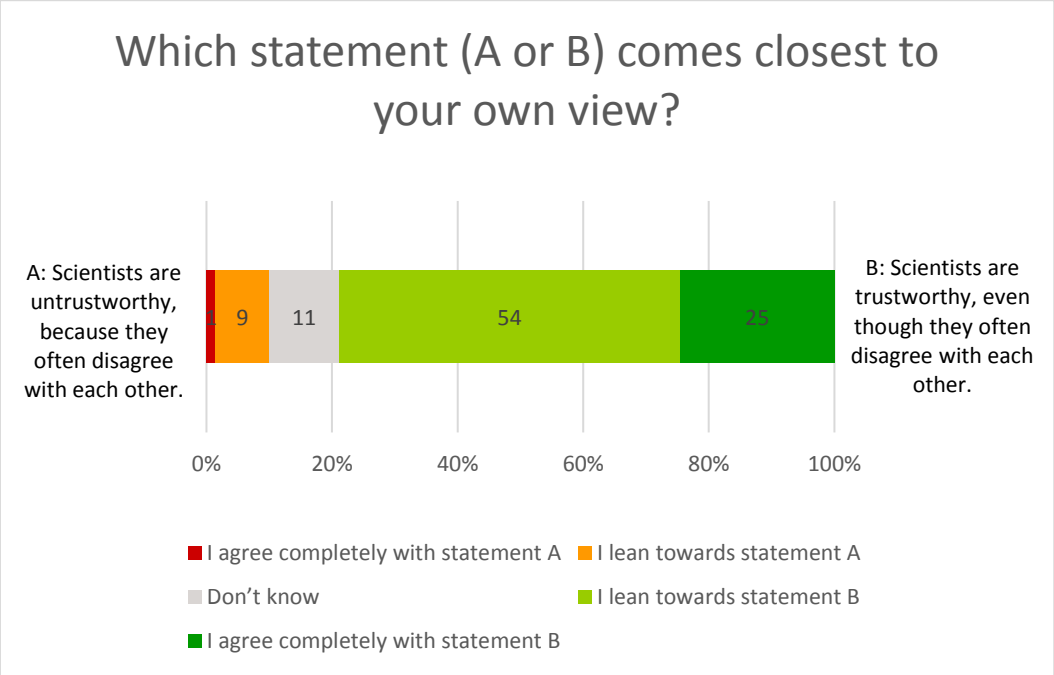
2.2 Reliability

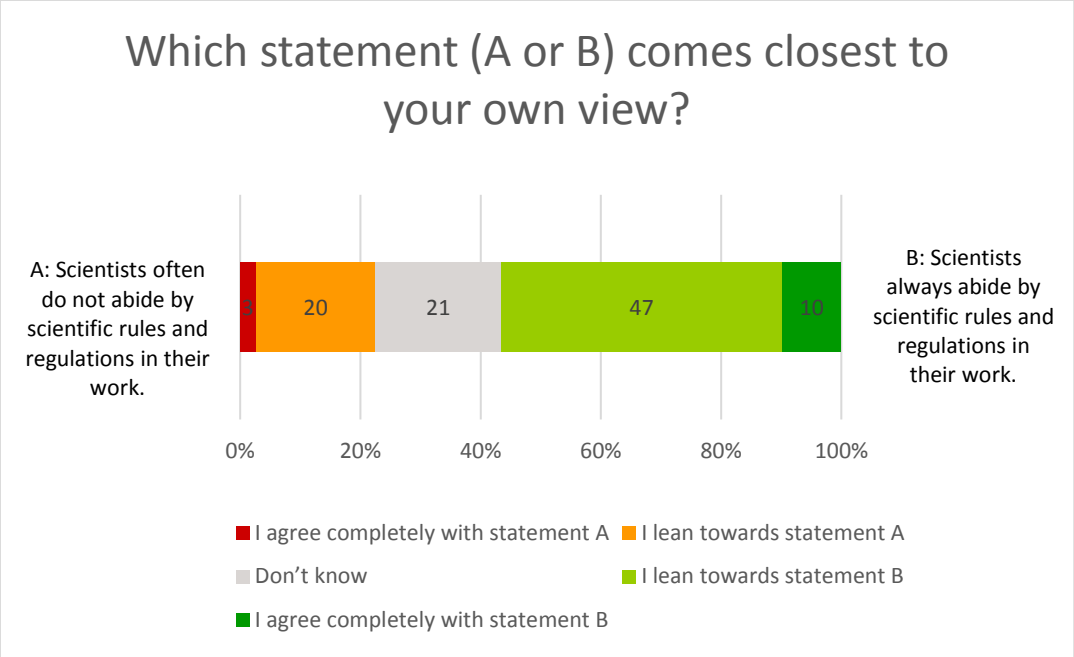
To examine the aspect of reliability, we once again asked respondents to consider two pairs of statements:

'Scientists are untrustworthy, because they often disagree with each other'
versus
'Scientists are trustworthy, even though they often disagree with each other'

and

'Scientists often do not abide by scientific rules and regulations in their work'
versus
'Scientists always abide by scientific rules and regulations in their work'.





The results show that the Dutch generally trust scientists, even though scientists do not always agree with each other: 79% 'agree completely with' or 'lean towards' this statement. Ten percent of the respondents agree that scientists are untrustworthy because they do not always agree with each other. The respondents' educational level is unimportant here. Even low-educated respondents, who generally have less trust in science (De Jonge, 2015), appear unperturbed by the fact that scientists do not always agree with each other.

A different picture emerges with regard to whether scientists abide by scientific rules and regulations in their work. A little more than half (57%) of the respondents agree with (or lean towards) the statement that scientists always abide by scientific rules and regulations in their work. A total of 23% think that scientists do not abide by scientific rules and regulations in their work. This was evidently a difficult question, however, as a large percentage (21%) indicated that they did not know.

Our conclusion is that the vast majority of the Dutch population (almost four out of five persons) trusts scientists, even though scientists do not always agree with each other. More than half of the Dutch population believe that scientists always abide by scientific rules and regulations in their work, and almost a quarter think that is not the case. In addition, a large percentage of respondents say that they do not know.

Studies in other countries have also explored the extent to which people believe that scientists abide by rules and regulations in their work. A German study included the following statement: 'Someone might trust scientists because scientists

work according to rules and standard procedures'. Fifty-three percent agreed completely or somewhat with this statement, 28% were undecided, 14% disagreed completely or somewhat, and 4% did not know (Wissenschaft im Dialog, 2017).

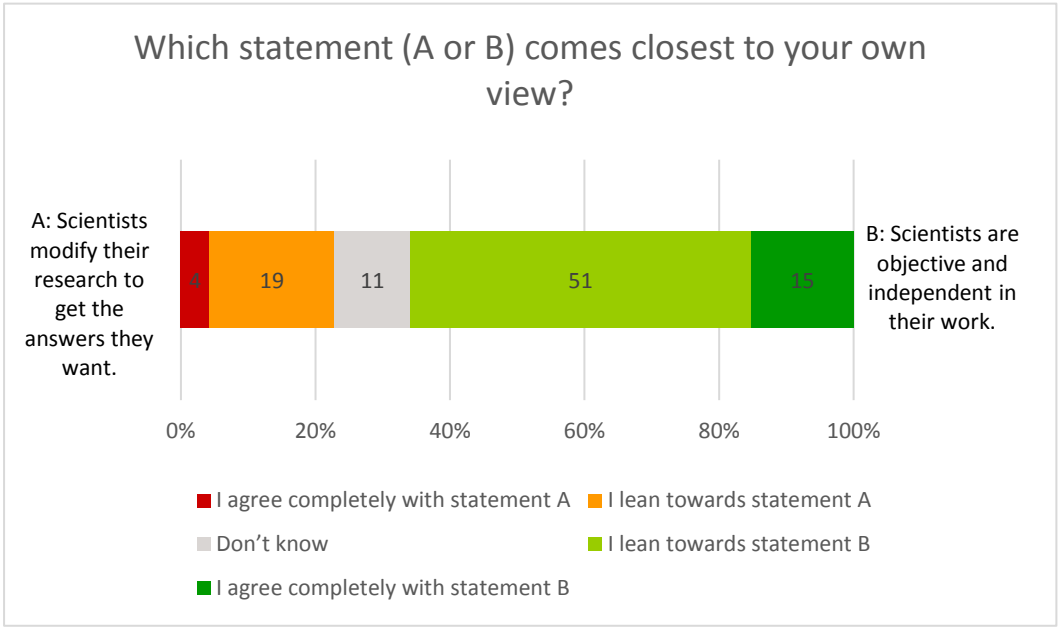
A British survey asked respondents 'How much, if at all, do you trust each of the following to follow any rules and regulations which apply to their profession?'. The respondents trusted researchers working for universities the most, with 90% saying that they had 'a great deal/fair amount of trust' in them. Researchers working for government or for private companies were regarded as less trustworthy on this point, with 74% and 60% of the respondents respectively saying that they had 'a great deal/fair amount of trust' that these researchers would follow the rules and regulations (Ipsos Mori, 2014).

Both the Dutch and the German study reveal the difficulty of answering a question about scientific rules and regulations. We must therefore question whether we can draw firm conclusions from these results. What is clear is that disagreement between scientists is not seen as a reason to distrust them.

2.3 Integrity

The third aspect that we considered was integrity. We presented the respondents with the following statements:

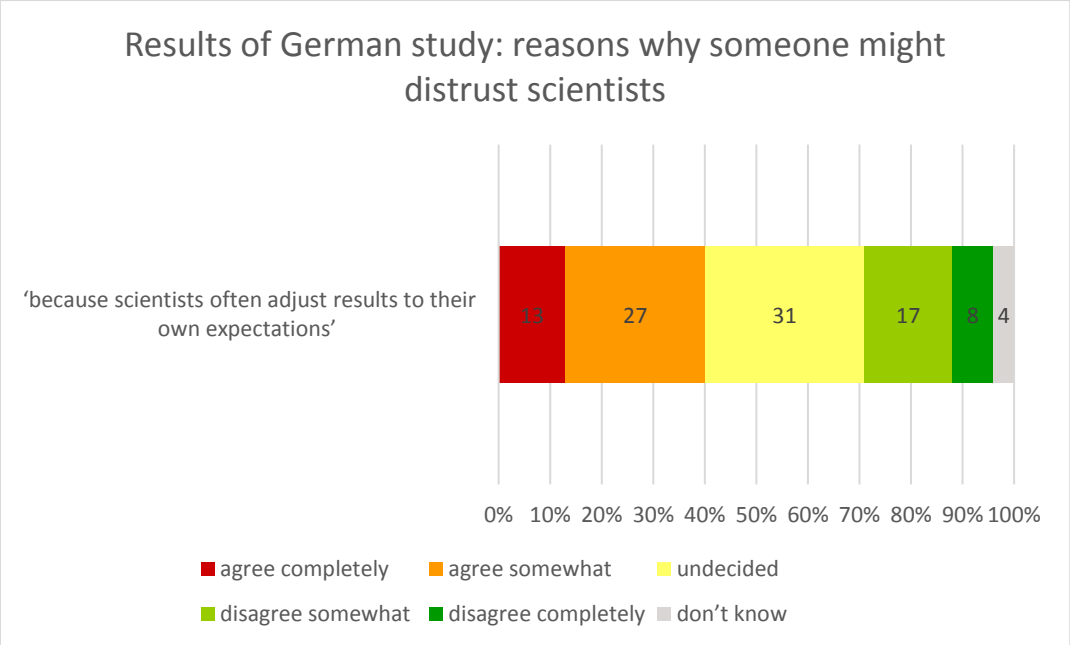
'Scientists modify their research to get the answers they want'
versus
'Scientists are objective and independent in their work'.



The majority of the respondents (66%) believe that scientists are objective and independent in their work. Twenty-three percent think that scientists modify their research to get the answers they want, and 11% don't know.

Although having 66% believe that scientists work objectively and independently seems like a positive outcome, we must bear in mind that almost a quarter (23%) of the Dutch think that scientists modify their research to get the answers they want.

The German study referenced earlier asked respondents to consider reasons why someone might distrust scientists, with one reason being 'because scientists often adjust results to their own expectations' (Wissenschaft im Dialog, 2017). The percentage of Germans who agreed with this statement (completely or somewhat) was larger than the percentage who disagreed with it (completely or somewhat).



In summary, almost a quarter (23%) of the Dutch population believe that scientists modify their research to get the answers they want and 40% of the German population believe that a reason to distrust scientists is because they often adjust results to their own expectations. The German question is more loosely worded, so it is not strange that this percentage is higher than in the Netherlands.

2.4 Competence, reliability, integrity, and correlations

If we consider the correlation between the statements provided in the foregoing sections and the score that respondents give for trust in science, we see a consistent, moderately significant positive relationship between the two. The strongest relationship is between the statements about trust despite scientists not always agreeing with each other (a correlation coefficient of 0.36) and the statements about scientists modifying research versus scientists working objectively and independently (correlation coefficient of 0.33). The British study also suggests that trust in scientists is associated with perceptions of their intentions more than with perceptions of their competence (Ipsos Mori, 2014).

In the previous section, we saw that almost a quarter (23%) of the Dutch think that scientists modify their research to get the answers they want. We looked at whether

the group that holds this view has any distinguishing features.[3] In terms of gender, age and knowledge of science, we see no differences between it and the overall sample. There are slight differences in educational level and social class, with the group having about 8% more low-educated and 6% fewer high-educated members than the average. As can be expected, a large percentage of this group (65%-68%) agree with the statement 'Scientists modify their research to get the results that government or business want'. A larger percentage than average also say that they have 'absolutely no' or 'little' trust in research institutions as a source of information about climate change or vaccines.

In addition, this group is notable in that it gives all institutions a lower than average mark for trust, with the scores being an average of 0.4 to 0.6 lower. To clarify: on average, the Dutch give trust in science a score of 7.07, whereas this group's score is 6.48. A similar difference can be found for the other institutions that the respondents were asked to score. This group not only has less trust in science but in all institutions, evidently. We also looked at this group's associations with science. As can be expected, the percentage of negative associations was somewhat higher than among the overall Dutch population. It is notable that almost all of the negative associations concerning falsification, fabrication or plagiarism can be traced to the members of this group.

2.5 Conclusion

The Dutch generally have a positive view of scientists. Almost 4 out of 5 (77%-79%) Dutch persons think that scientists work carefully, are experts in their field, and can be trusted even though they do not always agree with each other. Conversely, only 10%-15% think that scientists make a lot of mistakes, have less expertise than most people think, and cannot be trusted because they often disagree with each other. Although the majority of the Dutch believe that scientists are objective and independent in their work (66%), 23% also think that scientists modify their research to get the answers they want.

It is notable that almost one out of four Dutch persons (23%) think that scientists modify their research to get the answers they want. We therefore looked at whether this 23% have any distinguishing features as a group. What is striking is that, on average, this group gives all institutions a significantly lower mark for trust than the overall sample. It evidently has less trust not only in science but in all institutions.

3 Although almost a quarter (23%) think that scientists often do not abide by scientific rules and regulations in their work, we have not analysed this group further because the question turned out to be a difficult one that many people answered by choosing the option 'don't know'.

A further notable outcome concerns this group’s responses to an open question about its associations with science (or research). As can be expected, the percentage of negative associations is higher than among the overall Dutch population. Strikingly, almost all of the negative associations concerning falsification, fabrication or plagiarism can be traced to the members of this group.

3 Trust in cooperation between science and government/business?

Science receives the highest score for trust as an institution, and the Dutch Government and major corporations usually receive the lowest. The question that arises is: what happens to trust when scientists cooperate with government or business or when these parties make use of research results? We explore this question in more detail in this chapter. Below, we first address the extent to which the Dutch believe that scientists should investigate topics of importance to government or business.

The questionnaire presented respondents with different statements about the relationship between science and government. Respondents are not very positive about the statement ‘Scientists should focus mainly on investigating the topics that government considers important’: 39% ‘disagree (strongly)’ with the statement, 35% are ‘neutral’, and 19% ‘agree (strongly)’ with the statement. The rest of the respondents ‘don’t know’.

If we look at the statement ‘Scientists are well aware of what government wants and they investigate the topics that government considers important’, then the picture is much more positive: 10% ‘disagree (strongly)’ with the statement, 38% are ‘neutral’, and 34% ‘agree (strongly)’ with the statement. The remainder ‘don’t know’.

Another statement put forward in the questionnaire was ‘Government should more, when making decisions, take the outcomes of scientific research into account’. The respondents were very positive about this statement; only 2% said ‘no’, 3% ‘don’t know’, 32% ‘yes’ and 57% ‘depends on the topic’. The respondents, it emerges, believe that scientists should not be *obliged* to investigate topics that government considers important, but they understand that scientists do so and would like more government decisions to take the outcomes of scientific research into account (depending on the topic concerned).

The questionnaire also presented respondents with different statements about the relationship between science and business. They were reasonably positive about the statement ‘Scientists should listen more to what business people would like them to investigate’: 38% ‘agree (strongly)’ with the statement, 38% are ‘neutral’, and 17% ‘disagree (strongly)’ with the statement. The rest of the respondents ‘don’t

know'. The responses paint a similarly positive picture for the statement 'Scientists are already well aware of the business sector's priorities': 36% 'agree (strongly)' with the statement, 37% are 'neutral', and 12% 'disagree (strongly)' with the statement. The remainder 'don't know'. The Rathenau Instituut's 2015 survey also presented the following statement: 'You should not trust scientists if their research is paid by industry'. Thirty-two percent of the respondents 'agreed (strongly)' with this statement, 37% were 'neutral', 19% 'disagreed (strongly)' and 12% 'didn't know'. The public thus believes that scientists are well aware of what businesses consider important to investigate and that it is acceptable for them to let their choice of research topic be guided by this. At the same time, distrust increases when research is financed by the business sector.

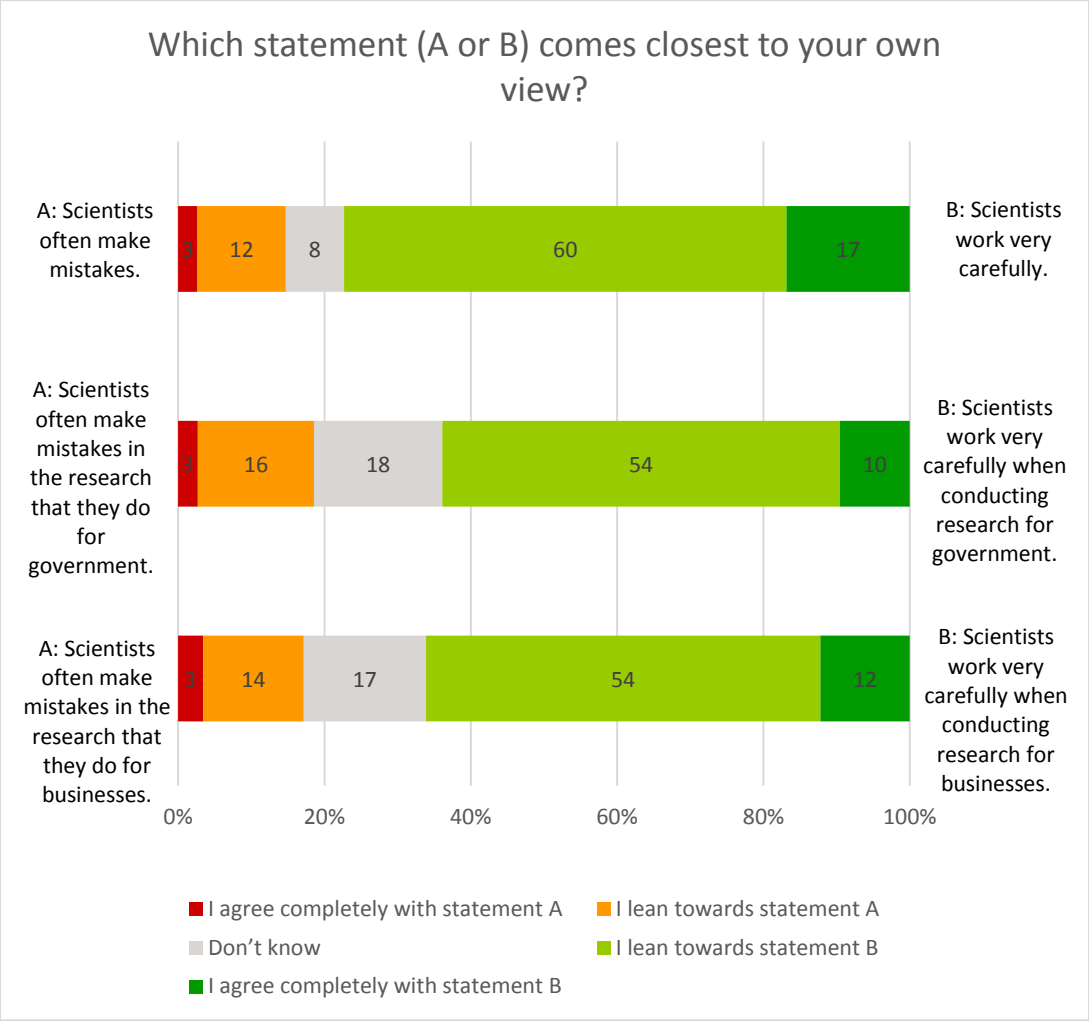
The picture that emerges of the relationship between science and government and science and business is contradictory. In an earlier study, *Contested science*, we saw that public trust in evidence-based policy is anything but a foregone conclusion when government uses research results to substantiate decisions in controversial areas (such as the HPV vaccine) (Blankesteijn et al., 2014). To refine this picture, we included various statements about scientists who undertake research for government or businesses. We once again made use of the three aspects of trust that are the focus of this study (competence, reliability and integrity). At the same time, we also included statements about government and businesses paying for research. Our hope was that these questions would reveal something about trust in these institutions as well.

3.1 Competence

To investigate how the Dutch perceive scientists' competence when they work for government, we presented the following statements:

'Scientists often make mistakes in the research that they do for government'
versus
'Scientists work very carefully when conducting research for government'.

Regarding research assignments that scientists undertake for businesses, we presented the same statements but replaced the word 'government' with 'businesses'.



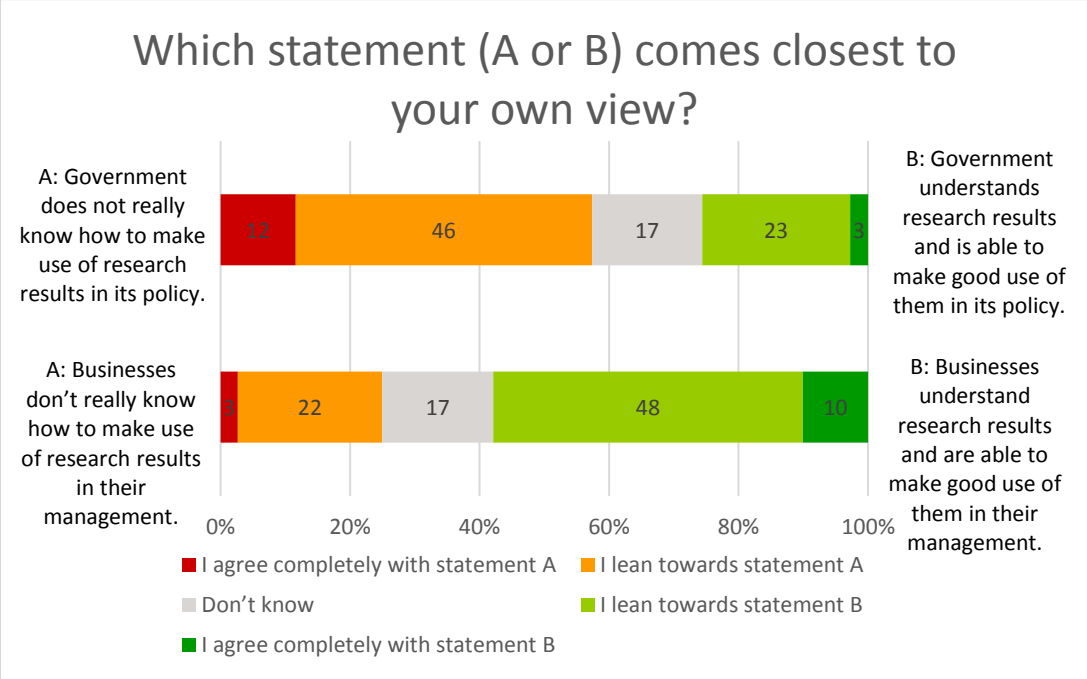
The results show that the percentage of respondents who 'agree completely with' or 'lean towards' the first statement is slightly larger than for the statement about scientists in general, rising from 15% to 17% in the case of research undertaken for businesses and to 19% in the case of research for government. The percentage that 'agrees completely with' or 'leans towards' the second statement is smaller. There is further a sharp rise in the 'don't know' category.

To examine the respondents' perceptions of government and business competence within the context of contract research, we also included statements about government and business expertise. They were:

'Government does not really know how to make use of research results in its policy'
versus
'Government understands research results and is able to make good use of them in its policy'

And:

'Businesses don't really know how to make use of research results in their management'
versus
'Businesses understand research results and are able to make good use of them in their management'.



The results show that 58% of the respondents believe that government does not really know how to make use of research results in its policy. Their view of businesses is considerably more positive: 25% of the respondents think that businesses do not really know how to make use of research results in their management, as opposed to 58% who believe that businesses do understand such results.

In summary, the Dutch believe that scientists work carefully even when carrying out research for government or businesses. The percentage who believe this is somewhat smaller than the percentage who believe this about 'scientists in general'; there is, moreover, a sharp rise in the 'don't know' category. There is a smaller increase in the percentage who think that scientists who work for government or businesses make a lot of mistakes. Regarding government and business competence, it is notable that more than half of the Dutch (58%) believe that government does not really know how to make use of research results in its

policy. The Dutch thus appear to have little confidence in government competence in this regard.

3.2 Reliability

To examine reliability, we included statements in the questionnaire exploring whether the perception that scientists abide by rules and regulations changes when they work for government or business. The statements were:

'Scientists often do not abide by scientific rules and regulations when they work for government'
versus
'Scientists always abide by scientific rules and regulations when they work for government'.

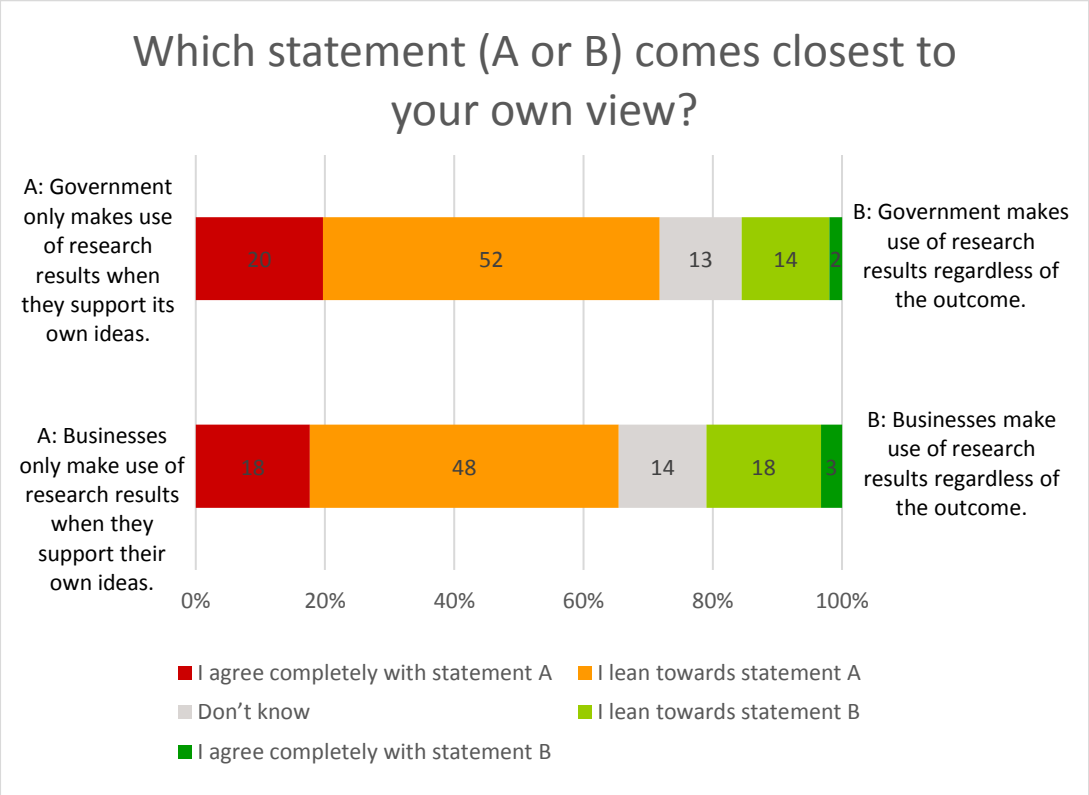
Another version of these statements was also included in which the word 'government' was replaced by the word 'businesses'.

Notably, the percentage of respondents who believe that scientists always abide by scientific rules and regulations when they work for government is higher than the percentage who believe that scientists 'generally' always abide by scientific rules and regulations, i.e. 64% as opposed to 57% respectively. This is striking because in the British survey referenced earlier, the respondents were less trusting that scientists working for government would follow rules and regulations than scientists in general (Ipsos Mori, 2014). Another notable point is the relatively large percentage who 'don't know'.

The questionnaire also included statements addressing the reliability of government and business in contract research. The statements were:

'Government only makes use of research results when they support its own ideas'
versus
'Government makes use of research results regardless of the outcome'.

Another version of these statements is included in which the word 'government' is replaced by the word 'businesses'.



The results show that the majority of respondents think that government and businesses only make use of research results when those results support their own ideas.

To summarise, the majority of the Dutch population think that scientists will abide by scientific rules and regulations even when they work for businesses and government. The percentage who believe this of scientists who work for government is larger. In addition, a majority think that government and businesses make use of research results only if those results support their own ideas.

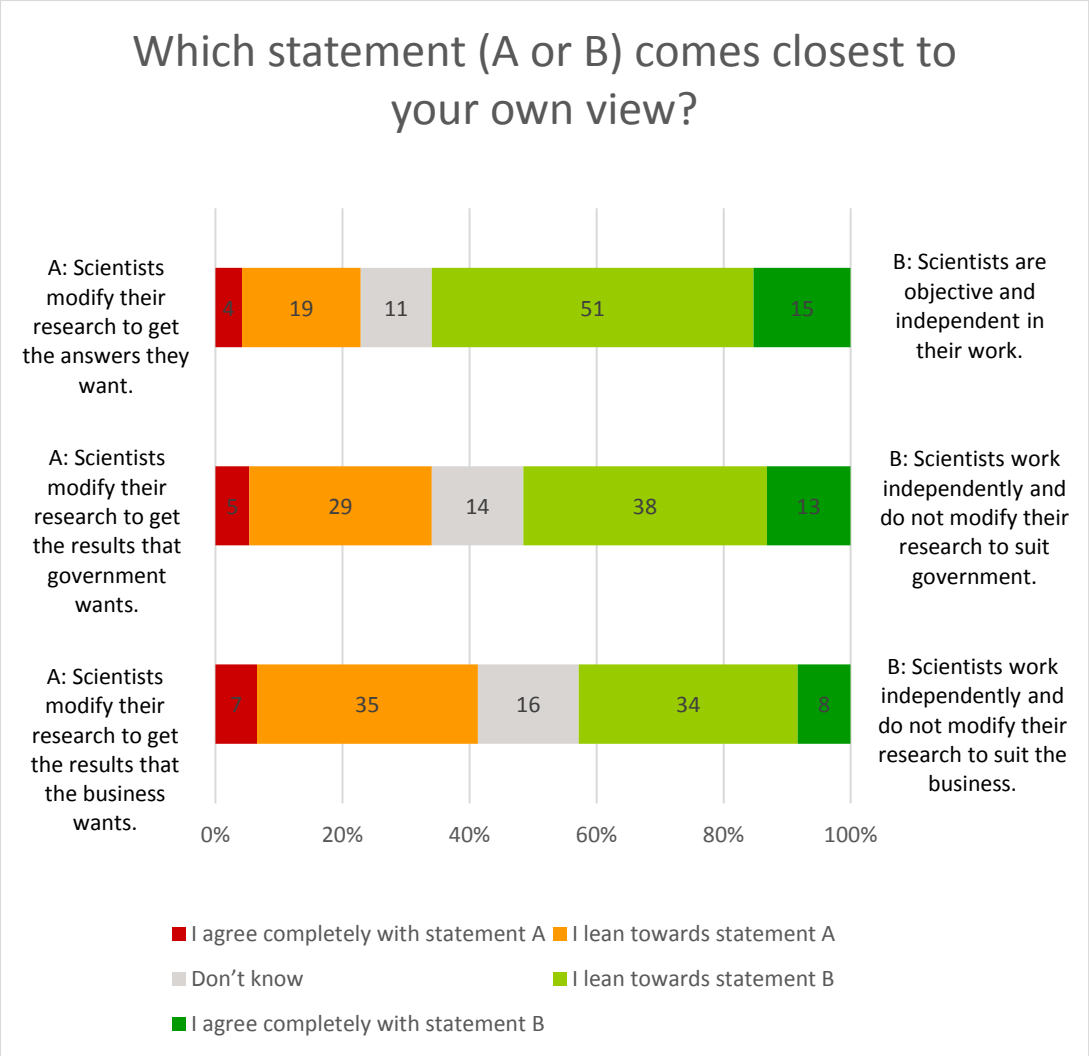
3.3 Integrity

The previous chapter revealed that, although the majority of the Dutch believe that scientists are objective and independent in their work, almost a quarter think that scientists modify their research to get the answers they want. To examine whether this perception remains the same when scientists work for government or business, we presented the following statements:

'Scientists modify their research to get the results that government wants'
versus
'Scientists work independently and do not modify their research to suit government'

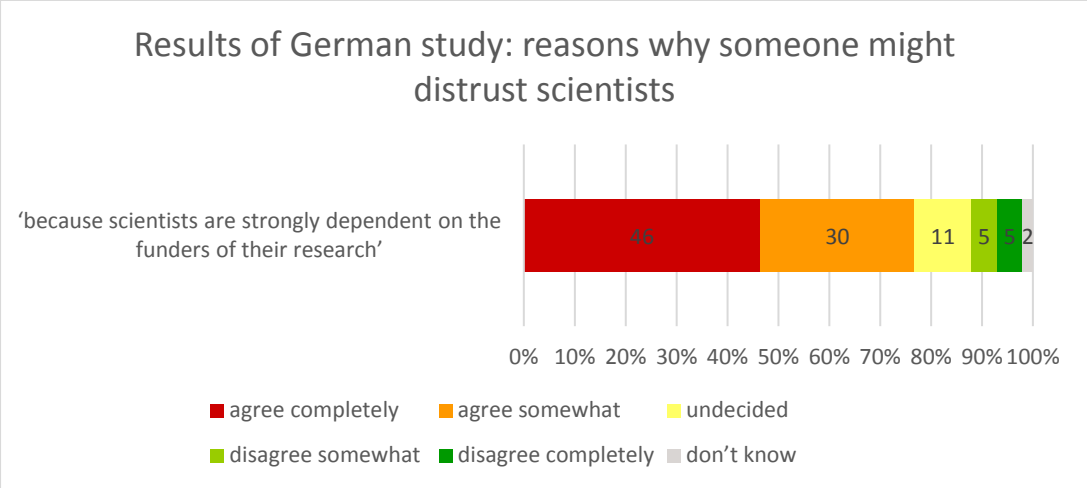
We presented the same statements but replaced the word 'government' with the word 'businesses' to examine what the respondents think of scientists doing contract research for businesses.

As the results show, the percentage who believe that scientists are objective and independent falls when scientists work for government or businesses. We saw that 23% of the respondents think that scientists modify their research to get the answers they want. Regarding government contract research, 34% of the respondents think that scientists modify their research to get the results that government wants. The picture is even more negative regarding research for the private sector: 42% think that scientists modify their research to get the results that the business wants. Conversely ('taking a positive view'), more than half of the Dutch (51%) believe that scientists work independently and do not modify their research to suit government. This percentage falls below 50%, to 42%, when research is carried out for a business.



International research

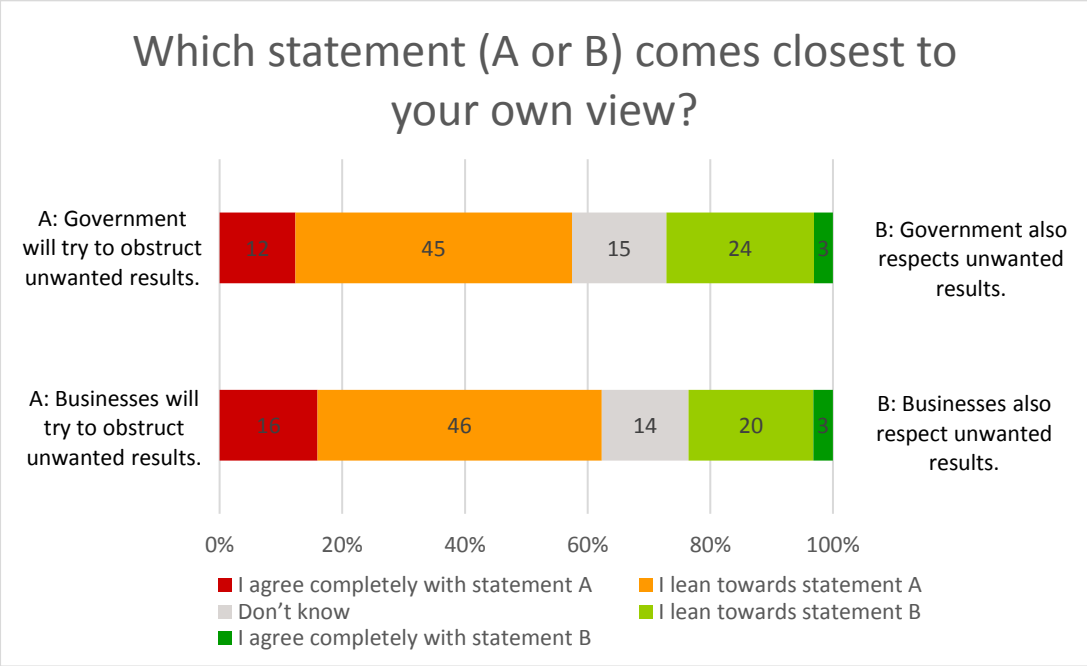
Research abroad has also examined integrity within the context of contract research. The US study referenced earlier asked respondents whether they trusted scientists to report findings even if they went against the sponsor of the research. Fifty-one percent of the respondents said they had 'a great deal' or 'some' trust that scientists would do so, 42% 'not too much' or 'no trust at all', and 7% were 'not sure' (American Academy of Arts & Sciences, 2018). The German study examined integrity in a different manner. It listed different reasons why someone might distrust scientists. One of these was 'because scientists are strongly dependent on the funders of their research' (Wissenschaft im Dialog, 2017). The results, shown below, reveal that more than three quarters (76%) of Germans believe that a reason to distrust scientists is because they are strongly dependent on the funders of their research.



To examine the integrity of government and business within the context of contract research, we included the following statements in the questionnaire:

'Government will try to obstruct unwanted results'
versus
'Government also respects unwanted results'.

The same statements were repeated with the word 'government' being replaced by 'businesses'.



The results reveal that, although about a quarter of the Dutch believe that government and businesses respect unwanted results, the majority think that government and businesses will attempt to obstruct such results.

In summary, we see that the Dutch do not have a very positive picture of the integrity of scientists when they perform contract research. A little more than half (52%) trust that scientists working for government remain independent and do not modify their research. Thirty-four percent think that scientists will modify their results in government's favour. These views change when scientists work for a business: 43% then think that scientists work independently, and 42% believe that they will modify their research. The Dutch also do not have a positive view of government and business integrity; the majority believe that government and businesses will attempt to obstruct unwanted research results.

3.4 Conclusion

The Dutch respondents' view of the competence and reliability of scientists who perform contract research for businesses or government is not very different from their general view of scientists. What they think of the *integrity* of the former is very different, however. A fairly large percentage of the Dutch believe that scientists will modify their research to get the results that government (34%) or the business (41%) wants. This is more than the 23% who think that scientists modify their research to get the answers they want.

The Dutch do not have a very positive view of government and business within the context of contract research: 57% think that government does not really know how to make use of research results in its policy; a sizeable majority (more than 60%) think that businesses and government will only make use of research results if they support their own ideas; and about 60% believe that government and businesses will attempt to obstruct unwanted results.

The results covered in this chapter are relevant to both scientists and government. Scientists who work for government and business should be aware that a sizeable percentage of the Dutch population (34%-41%) believe that they modify their research to get the results that their client wants. These outcomes are also relevant for government (and, to a lesser extent, for businesses). Government should be aware that a large percentage of Dutch citizens believe that research paid for by government is modified in its favour. The majority of the Dutch also, however, feel that government should more, when making decisions, take the outcomes of research into account.

4 Trust among different groups: age, gender and education

4.1 Who has trusts in science?

Not everyone trusts science to the same extent. Earlier studies by the Rathenau Instituut (in 2012 and 2015) have shown that the biggest (significant) differences lie in educational level and social status, factors that are closely related (De Jonge, 2015). That is also the case for this survey. Respondents who have a Master's degree, for example, give trust in science an average score of 7.68, whereas respondents with an initial vocational qualification (Dutch LBO/VBO/VMBO) give it an average of 6.48. Similar significant differences can also be found when we look at the respondents' social status.

As in 2015, the score someone gives for trust in science bears no relationship to his or her age or political orientation ('left wing' or 'right wing'). In other words, how old someone is or his or her political orientation (liberal vs conservative) does not influence the amount of trust he or she has in science.

We also examined how much the respondents know about science and whether their level of scientific knowledge is related to the amount of trust they have in science. Respondents who answered all of the science questions incorrectly gave the lowest scores for trust in science, an average of 5.15. Respondents who answered all the questions correctly gave the highest scores for trust in science, an average of 8.02. Between the two extremes, the more science questions respondents answered correctly, the higher the average score for trust in science. Looking at the correlation between the score for trust in science and the number of correct answers to science questions, we see a (moderately) significant relationship between the two (correlation coefficient of 0.37).

The score for trust in science also increases the more people cross paths with science in the media or by talking about science with friends. By way of illustration, people who 'very often' read about science in the newspapers gave an average score of 7.77 and people who 'never' do so gave an average score of 6.56. This is a significant difference. If we consider the correlation between how often people cross paths with science (in various media or by talking to friends about it), we once again see a (weak to moderate) relationship (a correlation coefficient ranging from 0.25 to 0.35).

Unlike the 2015 study, we found a significant difference between men and women this time: men now trust science more than women do. Men give an average score of 7.23 and women 6.91. That is a gap of 0.33, which is large compared with the differences between their trust scores for other institutions. The only institution that comes close is courts of law, where the difference is 0.21. The difference between women and men is much smaller when it comes to trust in other institutions. We analyse this striking difference in the following section.

In conclusion, we see that the more educated someone is or the better his or her social status, the more trust he or she has in science on average. We also see that people who know more about science also, on average, have more trust in science. The same goes for people who cross paths with science, be it in the media or by talking to friends about it. The connection between these aspects and trust in science naturally says nothing about cause and effect.

4.2 A closer look at trust and gender

Other studies that have examined public trust in science also report significant differences between men and women. Sweden's VA Barometer 2017/18 indicates that, alongside educational level, gender is the most important factor explaining differences in the public's confidence in research (Vetenskap & Allmänhet, 2017). The Barometer survey revealed a 13% difference in confidence in science between Swedish men and women in 2017/2018. The report states that this is the largest difference between men and women since this annual survey was first conducted. The percentage of women who are very confident in or have fairly high confidence in science has declined from 91% to 76%, whereas men have remained just under 90%. A recent survey in the United States (*Perceptions of Science in America*, 2018) also indicates that women are less likely than men to report a 'great deal' of confidence in scientists.

Other studies in the Netherlands have also revealed a significant difference between men and women with respect to trust in science. The most recent report of the SCP's Continuous Survey of Public Perceptions (*Burgerperspectieven 2018*|1) included questions about how much trust the public has in various sources of information on climate change and vaccines (Dekker et al., 2018). The respondents regard research institutions as the most trustworthy sources of information on climate change. With regard to vaccines, they trust healthcare specialists and then research institutions the most. The survey revealed an important difference between men and women with regard to science: women have significantly less trust than men in scientists. No significant gender difference has been detected for other sources of information, for example a government ministry or the media. The

one exception is healthcare specialists (regarding the question about vaccines): here too, men are significantly more inclined than women to see them as trustworthy sources of information.

While the reports discussed above offer no explanation for the differences between men and women, we looked more closely at this. Initially, we examined whether the gender difference in trust might have been caused by other factors. We know that the higher the respondent's educational level and social class and the better his or her knowledge of science, the more trust he or she will have in science. We therefore considered whether a difference in educational level might explain the difference in trust between men and women, and we also looked at social class and knowledge of science. None of these factors, however, revealed a significant difference between the groups of male and female respondents.

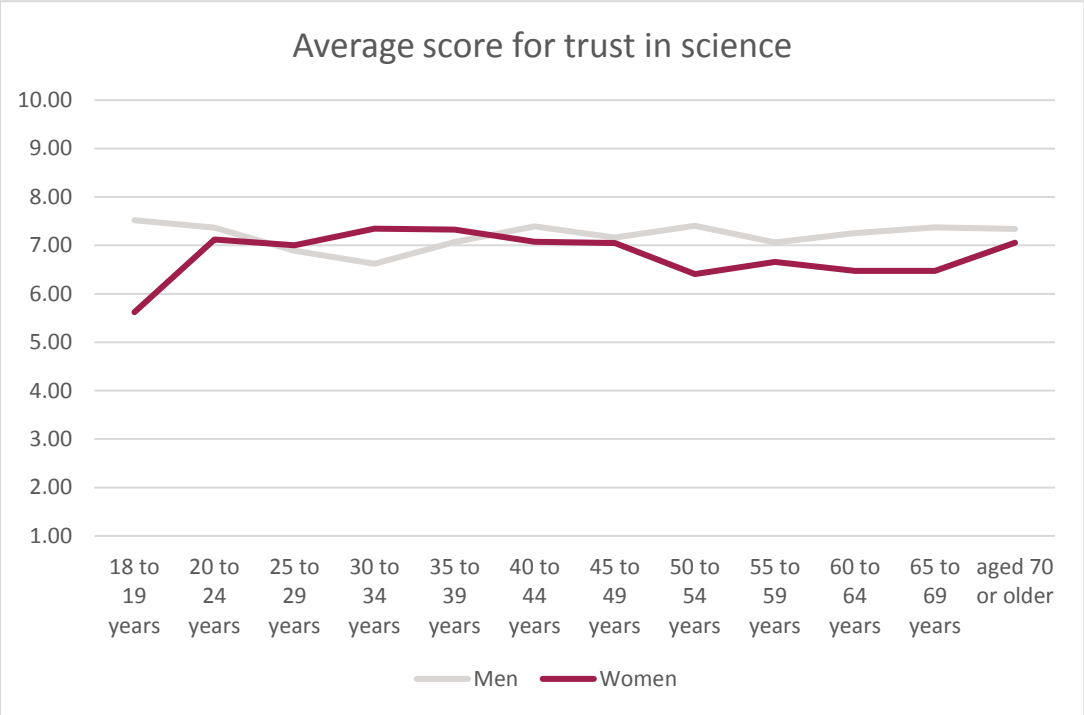
The questionnaires do indicate that men are more likely than women to cross paths with science; they are more likely to read newspaper articles about science and watch or listen to science programmes on television or radio. They also read or watch more information about science online and read science magazines more often. The question, then, is whether men are more positive about science because they cross paths with it significantly more than women do. To answer this question, we looked at the group of men and women who say that they read about science in the newspapers 'very often' or 'regularly', watch or listen to television and radio programmes about science 'very often' or 'regularly', or read science magazines 'very often' or 'regularly'. We discovered that even in these selected groups, there is a significant difference in the amount of trust that men and women have in science. Conversely, men and women who 'seldom or never' watch, read or listen to science reports, programmes and so on do not differ significantly in the amount of trust they have in science. Our conclusion, then, is that men are not more positive about science because they read, watch or listen to more information about it.

Our questionnaire also asked respondents how important science is in everyday life. If we select the group that chose the responses 'very important' or 'fairly important', we see no (significant) difference between men and women. Women and men who regard science 'very' or 'fairly important' in everyday life have the same amount of trust in science. This is not true for the men and women who indicate that science is 'a little' or 'not' important in everyday life: in this group, there *is* a significant gender difference in trust.

Differences between men and women have also been found in studies examining trust in courts of law. The SCP's report *Vertrouwen in de rechtspraak nader onderzocht* (Dekker & Van der Meer, 2007) indicates that women have become more negative about courts of law over time (with no explanation for this having

been found). The report says that ‘a closer analysis shows that trust has declined sharply among older women (born before 1956) (-22%), whereas it has remained constant among older men. Trust has declined less sharply among younger women (-15%), the difference with younger men being notable but smaller (-7%). Interestingly, the changing impact of gender on trust in courts of law is not in evidence for other institutions.’

Inspired by this study, we examined whether the same might be true for science. Taking the average score for trust in science given by men and women and breaking this down into age categories, we see that men’s and women’s average scores are reasonably in step, but that, on average, women aged 50 and older give a lower score for trust in science than do men.



We see the same pattern if we look at data from the Rathenau Instituut’s 2012 survey: the scores given by men and women in the different age categories are largely similar, but on average, women aged 50 and older consistently give a lower score than men for trust in science. The data from the 2015 survey reveals a somewhat different picture. In general, the group of women aged 50 and older give a lower score than men for trust in science, but there is one exception: the group of women aged 60 to 64, who have somewhat more trust in science than men in the same age category.

If we divide the respondents participating in the different surveys (2012, 2015 and 2018) into two groups – respondents younger than 50 in one and respondents age 50 and older in the other – then we see that across all three surveys, there is a significant difference between men and women in the 50 and older category and no significant difference between men and women in the under 50 category.

Because we know that educational level and knowledge of science influence trust in science, we have looked more closely at these factors. The table below gives the percentage-wise distribution for educational level and knowledge of science for women and for men above the age of 50. The results show that, on average, women older than 50 are less well educated and also have less knowledge of science.

Table 1 Differences in educational level and scientific knowledge, men and women above the age of 50

		Women 50 and older	Men 50 and older
Educational level	% low level	38	29
	% medium level	41	36
	% high level	22	35
Knowledge of science	% 0-5 questions correct	40	25
	% 6-11 questions correct	60	75

To investigate whether this difference influences trust in science, we then looked at the group of high-educated men and women above the age of 50. In terms of trust in science, we still see a significant difference: high-educated women older than 50 give an average score of 7.18 for trust in science, whereas high-educated men older than 50 give a score of 7.70. There is a significant gender difference in this age group in the other educational levels as well. For example, low-educated women above the age of 50 scored trust in science an average 6.19, and low-educated men in the same age category a 7.12. We may conclude that educational level does not explain the difference in trust between men and women who are older than 50.

We looked in a similar manner at the respondents' knowledge of science but found that this was also not an explanatory factor. Women older than 50 who answered more than six knowledge questions correctly gave an average score of 6.81 for trust in science, and men who had done the same a score of 7.44. This difference is significant.

We also examined how much trust women above the age of 50 have in other institutions. It turns out that the discrepancy does not apply across the board. The largest (significant) differences (compared with men older than 50) concern science and courts of law. The scores that women older than 50 gave for these institutions were an average of 0.65 and 0.64 points lower respectively than those of men in the same age category. The differences between the average scores for trust in the other institutions is narrower, ranging from -0.02 to 0.32.

We may conclude that women older than 50 have significantly less trust in science than men in the same age category, but our study has not identified the precise reason for this difference.

4.3 How do different groups perceive the competence, reliability and integrity of scientists?

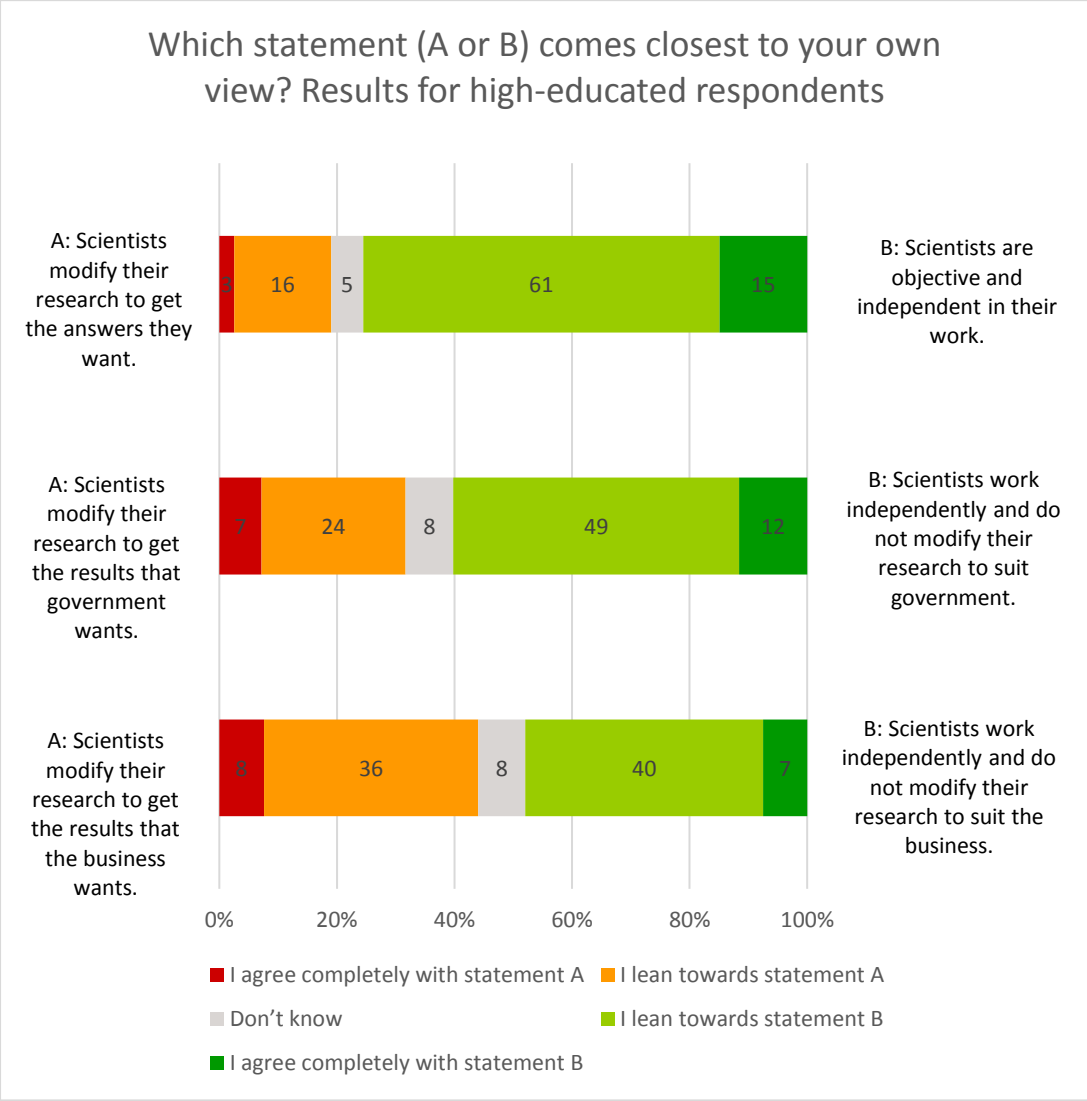
We have seen that the biggest differences in trust are associated with educational level (and social status). In the next section, we consider the extent to which these factors also influence public perceptions of the three aspects of trust, i.e. competence, reliability and integrity. We continue to examine these aspects in the second section but looking specifically at whether there are differences between men and women above the age of 50.

4.3.1 Differences in educational level

If we look at the different aspects of trust (competence, reliability and integrity), we see that high-educated persons agree (much) more often with the positive statements (the ‘B’ statements) than low-educated ones. For example, 89% of the high-educated respondents ‘agree completely with’ or ‘lean towards’ the statement that ‘Scientists are trustworthy, even though they often disagree with each other’; for the low-educated respondents, that is 66%. There are significant differences between the two groups in their responses to the statements about reliability and integrity, but not in their responses to the statements about competence. High-educated and low-educated respondents evidently hold similar views about the competence of scientists.

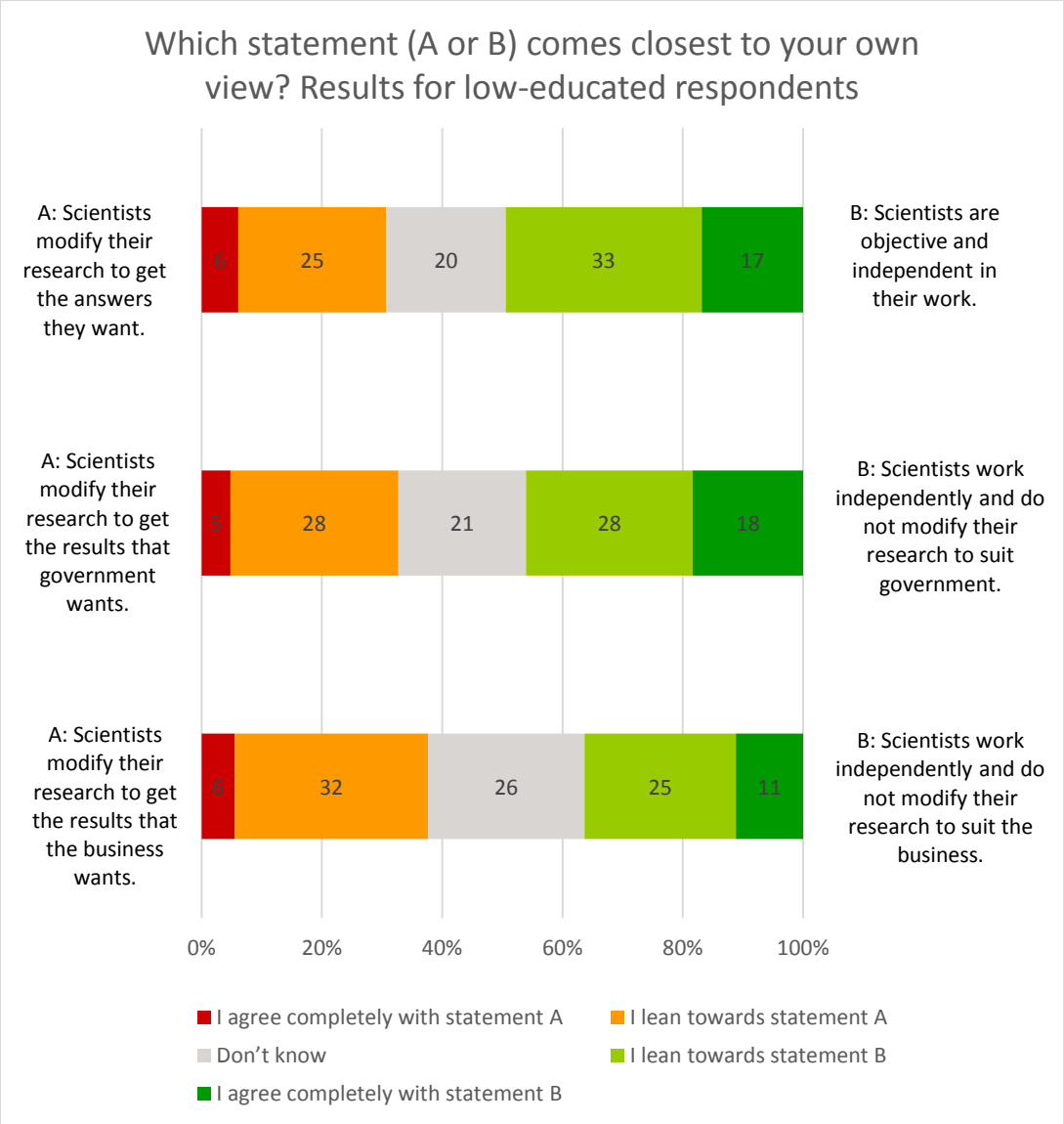
In the statements concerning competence, reliability and integrity in contract research, the integrity aspect stands out. The percentage of high-educated respondents who ‘agree completely with’ or ‘lean towards’ the statement ‘Scientists modify their research to get the answers they want’ is 19%. The percentage of high-educated respondents who ‘agree completely with’ or ‘lean towards’ the statement

‘Scientists modify their research to get the results that government wants’ is considerably higher (31%, a 12 percentage point increase). The percentage who ‘agree completely with’ or ‘lean towards’ the statement ‘Scientists modify their research to get the results that the business wants’ is 44% (a 25 percentage point increase). This indicates a clear shift in high-educated respondents’ perception of integrity.



That shift is much less in evidence among the low-educated respondents. The percentage of low-educated respondents who ‘agree completely with’ or ‘lean towards’ the statement ‘Scientists modify their research to get the answers they want’ is somewhat higher – 31 % – than their high-educated counterparts. The percentage of low-educated respondents who ‘agree completely with’ or ‘lean towards’ the statement ‘Scientists modify their research to get the results that government wants’ is only a little higher than for the statement referring to scientists

in general (33%, a 2 percentage point increase). The percentage who ‘agree completely with’ or ‘lean towards’ the statement ‘Scientists modify their research to get the results that the business wants’ is 38% (a 7 percentage point increase).



Examining the significance of these figures, we see that high- and low-educated respondents tended to choose different answers for the first set of statements (‘Scientists modify their research to get the answers they want’ versus ‘Scientists are objective and independent in their work’ and ‘Scientists modify their research to get the results the government wants’ versus ‘Scientists work independently and do not modify their research to suit government’). Their answers do not, however, differ significantly for the third set of statements (‘Scientists modify their research to get

the results the business wants' versus 'Scientists work independently and do not modify their research to suit the business').

To summarise, we see that high-educated individuals are more likely to 'agree completely with' or 'lean towards' positive statements about reliability and integrity. There is no significant difference between high- and low-educated people in their perceptions of competence. Another notable outcome is the major shift in the view of high-educated individuals regarding integrity: whereas only 19% 'agree completely with' or 'lean towards' the statement 'Scientists modify their research to get the answers they want', this percentage rises to 31% for the statement 'Scientists modify their research to get the results government wants' and to 44% for the statement 'Scientists modify their research to get the results the business wants'.

4.3.2 Age- and gender-related differences

We saw above that, on average, women over the age of 50 trust in science less than men in the same age category. To explore why that is so, we looked at the responses of men and women older than 50 to the statements on competence, reliability and integrity. The first notable point is that women over 50 are much more likely to choose 'don't know' as their answer, compared with men over 50. The 'don't know' percentages range from 12% to 29% among women in this age category, and from 3% to 14% among men in the same category.

Closer analysis of the answers chosen by men and women over the age of 50 in response to statements about competence and reliability shows that they give similar answers. In that analysis, we disregarded those who chose 'don't know'. However, concerning the statements about integrity ('Scientists modify their research to get the answers they want' versus 'Scientist are objective and independent in their work'), the answers chosen by women over the age of 50 were significantly different to those chosen by men in the same age category. Women older than 50 are more likely than their male counterparts to 'agree completely with' or 'lean towards' the statement claiming that scientists modify their research, indicating that they have significantly less trust in the integrity of scientists.

Comparing the results for the statements about competence and reliability within the context of contract research, we see that men and women older than 50 once again give similar answers. That is otherwise for the statements about integrity ('Scientists modify their research to get the answers they want' versus 'Scientists are objective and independent in their work'). Women over 50 are more inclined to choose 'I lean towards statement A or B' and less inclined to choose 'I agree

completely with statement A or B'. Men and women respond similarly to the statement concerning the integrity of scientists working for a business, with women's answers not differing significantly from those of men above 50.

To summarise, we see that women older than 50 chose similar answers to those of men older than 50 for the statements about competence and reliability. The only statements for which they chose a significantly different answer were those concerning integrity. Women above 50 are more inclined to 'agree completely with' or 'lean towards' the statement that 'Scientists modify their research to get the answers they want'.

4.4 Conclusion

As corroborated by the earlier surveys, the present study (2018) shows that trust in science is related to educational level. Men and women in different age categories differ in terms of level of trust. There does not appear to be a gender difference in groups up to 50 years of age. On average, however, women above 50 give a lower score for trust in science than men in the same age category. This difference remains significant even after we correct for the existing difference in educational level between men and women of that age, or for the difference in scientific knowledge.

If we examine what high- and low-educated persons think about the different aspects of trust (competence, reliability and integrity), we see that high-educated persons agree significantly more often with the positive statements about reliability and integrity than the group of low-educated persons. There is no significant difference between high- and low-educated persons in their answers to the statements about competence. Another notable outcome is that the percentage of high-educated persons who 'agree completely with' or 'lean towards' the statement 'Scientists modify their research to get the answers they want' is only 19%, but that this percentage rises sharply when the statement is reworded to 'results that government wants' (31%) and 'results that the business wants' (44% of high-educated respondents).

Regarding how men and women above the age of 50 view the various aspects of trust (competence, reliability and integrity), we see that they give similar answers to the statements about competence and reliability but significantly different answers to the statements about integrity. Women above 50 are more inclined to 'agree completely with' or 'lean towards' the statement 'Scientists modify their research to get the answers they want'.

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Appendix 1 Methodology

The Rathenau Instituut has surveyed public trust in science in the Netherlands every three years since 2012. We developed the first survey in that year in cooperation with the WRR, acknowledging a commonly held assumption (at the Royal Netherlands Academy and in government) that trust in science was in decline. There was insufficient proof for this assumption, however, nor had such a decline been detected in other countries that had been surveying public trust in science for several decades (United Kingdom and United States). Why should that be otherwise in the Netherlands? It was clear that empirical evidence was needed to support the public and political debate on this subject.

For the first survey, we developed a questionnaire that, in addition to determining the level of public trust in science, also examined psychological backgrounds such as 'unease'. The second survey, carried out in 2015, used the same basic set of questions as the first but also looked at the public's engagement in science and, more particularly, in helping to set the Dutch national research agenda (e.g. which subjects should be studied and what was their value to society). The present survey, the third in the series, once again utilises the same set of questions, but has also added new ones. We were inspired in this regard by a striking paradox. The public regards science as important and expects it to make a major contribution to a long, healthy and, if possible, interesting life. To use the knowledge that science produces to achieve that long, healthy and interesting life, scientists must cooperate with business and government. The paradox is that when they do, and especially when they carry out research commissioned by government or business, public trust in them declines. We examined that paradox by asking our respondents detailed questions about the competence, reliability and integrity of scientists in various situations (working independently or working for government or business).

Many of the questions are the same as in the 2012 and 2015 surveys. Because the methodology and sampling are identical, responses to these questions can be compared over time.

All three surveys used NIPObase as the source of data for the random sample. NIPObase is a database of households willing to participate in surveys conducted by Kantar Public and Kantar TNS. This was also the group to which the Rathenau Instituut distributed its 2012 and 2015 surveys. The SCP's Continuous Survey of Public Perceptions (*Burgerperspectieven*) and the Eurobarometer survey also make use of this method, and of Kantar.

The database from which we draw our sample has data on approximately 140,000 individuals; about 120,000 of them are 18 years of age or older. The respondents complete the survey online. We recruit the panel mainly by means of traditional research instruments. Kantar Public queries individuals' willingness to take part in the panel in face-to-face and telephone interviews. Each of the surveys has made use of random sampling, so that every group in society has the same chance of being included in the sample. Respondents cannot register with NIPObase themselves.

The survey data was collected using Computer Assisted Web Interviewing. The sample consisted of N=1,331 persons, the aim being to obtain a sample representative for the Dutch population in terms of gender, age, household size, education, social class, and region. The sample was based on reference data taken from the 2017 Golden Standard (*Gouden Standaard*) and consists of persons 18 years of age and older.

Of the 1,331 panel members that we approached, a total of 838 completed the questionnaire. Owing to selective response, the composition of the response sometimes deviates from the composition of the population. We corrected for this by reweighting the data, with reference data being based on the Golden Standard. An overview of the sample's composition before and after weighting is provided in the table on the next page.

Differences between the unweighted sample and the reference data are small, with only small weighting factors being necessary:

- maximum weighting factor = 2.159765
- minimum weighting factor = 0.676536
- only 1 weighting factor is outside the range of 0.6-1-4.

The total weighting efficiency is 96.4%.

variables	reference data	unweighted	weighted
Gender	%	%	%
male	49	49	49
female	51	51	51
Age			
18-34 years	26	25	26
35-44 years	16	15	16
45-54 years	19	17	19
55-64 years	17	19	17
65 and older	22	24	22
Household size			
1 person	22	23	22
2 persons	37	39	37
3 persons	16	15	16
4 persons	17	15	17
5 persons or more	8	8	8
Educational level			
low (up to junior general secondary /Dutch MAVO)	23	23	23
middle (senior secondary vocational to university preparatory)	40	40	40
high (higher professional and upwards)	37	37	37
Social class			
A (high)	24	22	24
B1	23	21	24
B2	20	21	20
C	17	19	18
D (low)	14	17	15
Region			
3 largest Dutch municipalities	12	11	12
rest of the west/peripheral municipalities	33	32	33
north	10	10	10
east	21	22	21
south	24	25	24

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