Australian National University

THE AUSTRALIAN BELIEFS AND ATTITUDES TOWARDS SCIENCE SURVEY 2018

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Australian National Centre for
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Preferred citation

Lamberts, R (2018) *The Australian Beliefs and Attitudes Towards Science Survey – 2018*. The Australian National University. Canberra, Australia

CONTENTS

INTRODUCTION

This report provides an overview of the results of the second of two national surveys of Australian beliefs and attitudes towards science. The first *Australian Beliefs and Attitudes Towards Science Survey* (the ABAS[1]) was completed in mid-2017. The 2018 *Australian Beliefs and Attitudes Towards Science Survey* (henceforth referred to as the ABAS-2018) both updates and expands upon the ABAS from 2017, and provides further original data to compare with previous Australian public beliefs and attitudes research[2,3].

In the ABAS-2018, seven new open-ended questions were included to explore 'why' participants answered some key questions the way they did. Open-ended-questions are unavoidably more resource-intensive to record and analyse than questions with finite response options. As the budget and timeline for 2018 was the same as 2017, some of the original 2017 questions were removed, and the number of respondents changed from 1,200 to 1,000[4].

These modifications ensured the mean length of the ABAS-2018 interviews was approximately 20 minutes, which is comparable to 2017.

1 Lamberts, R (2017) *The Australian Beliefs and Attitudes Towards Science Survey.* The Australian National University. Canberra, Australia

2 Lamberts, R (2017) *The Australian Beliefs and Attitudes Towards Science Survey*. The Australian National University. Canberra, Australia

3 Lamberts, R., Grant, W.J & Martin, A (2010) Public opinion about science. ANUpoll No.8, Canberra, The Australian National University. http://politicsir.cass.anu.edu.au/sites/politicsir.anu.edu.au/files/2010-12-07_ANUpoll_science_0.pdf

4 In addition, to balance the incorporation of these respondent-generated answers against timely and cost-effective data collection and analysis, responses to the new 'why' questions were ultimately captured under grouped categories. These categories were generated from responses gathered from the first 100 interviews, a number sufficient to ensure saturation in response options was reached.

KEY FINDINGS

The results of the second iteration of the ABAS once again provide many reasons to be optimistic about the Australian public's beliefs about, and attitudes towards, science. Although some of the details vary from 2017, in 2018 people again report they are most interested in science, medicine and technology topics, with sports news and politics once more receiving more 'not at all interested' ratings than any other topics.

Other broadly positive attitudes towards science observed in 2017 continue in 2018, although there are still some areas in which public opinion is clearly divided. For example, in 2018, 55 per cent of respondents favoured or strongly favoured allowing access to experimental drugs before full clinical trials had shown them to be safe and effective. More than half of these respondents said this was because 'people should have a choice / that it could save lives'. In another example, a third of respondents in 2018 also said that eating GM foods is generally unsafe, with their most common concerns that GM foods are 'unnatural, unhealthy, harmful', or 'that they don't know what making GM foods involves'. This is offset somewhat by the 46 per cent who consider GM foods generally safe.

In the only entirely new question in the ABAS-2018, people were asked what sources of information they relied on to inform themselves about science. The top three most commonly mentioned information sources were all news-focused (either online, television or newspapers), with 'other television shows' and 'specialist websites' rounding out the top five.

As seen in 2017, Australians overwhelmingly consider that scientists, along with doctors and farmers, contribute enormously to society, but the relative prestige of science as a profession does not match this high level of perceived contribution.

Other highlights in 2018:

- Two thirds of Australians reported they felt at least 'fairly well informed' about science, with nearly 60 per cent of these respondents saying this was because they 'read about / take an interest in science'.
- Nearly 88 per cent said that overall science has made life easier with many attributing this to 'advances in technology and medicine, or general scientific progress'.
- Nearly 85 per cent of respondents said that all parents should be required to vaccinate their children, with 'the proven theory of herd immunity / stops diseases spreading or returning', the most commonly cited reasons for doing so.
- Among the 128 people who were against parents being required to vaccinate their children, 'it should be the family's personal choice' was the by far most common reason proffered (by nearly three quarters of this group of respondents).

There were some notable differences between the results in 2017 and 2018:

- In 2018, just over 44 per cent of respondents considered 'changing a baby's genetic characteristics to reduce serious risk of disease' to be appropriate use of technology, falling from nearly 60 per cent in 2017. The majority of respondents who approved considered this an 'appropriate measure to increase standard of life'.
- Fewer people were 'not at all interested' in politics in 2018, with the number of 'not at all interested' responses dropping from 31.8 per cent in 2017 to 19 per cent in 2018.
- The proportion of respondents opposed to the use of animals in research (42.8 per cent of the sample) dropped by more than 5 per cent from 2017 to 2018, with 90 per cent of these people opposed because they considered animal research 'cruel or unethical'. A similar number of respondents were in favour of using animals in scientific research, with nearly three quarters of them saying they favoured it because it was 'better to test on animals than humans'.

RESULTS – DESCRIPTIVE STATISTICS

The results presented in this section provide an overview of some core characteristics of the sample including the beliefs and attitudes towards science and technology in Australia in 2018[5], and associated comparisons with 2017 results. Details about the sampling strategy and the demographic characteristics of the sample can be found at Appendix A. Full data tables are available separately in the document *The Australian Beliefs and Attitudes Towards Science Survey 2018: Data Tables.*

Defining science for the survey

A broad definition of 'science' was used for the ABAS-2018. Before answering survey questions, respondents were told:

"Before we begin, you should know that when I talk about 'science' during the survey, this refers to science in a general and broad sense, and includes anything to do with science such as technology, health, research and other things."

Interest in popular topics

According to the survey, respondents are interested in science or science-related topics above all others (Figure 1). More than 50 per cent of respondents reported that they were 'very interested' in the five topics listed in Table 1. In the 2017 ABAS, these same topics also occupied the top positions but in a slightly different order.

Table 1: Interest in popular topics: Comparing 2017 with 2018

	% respondents 2018	% respondents 2017 (position)
'very interested'		
Health issues	68.5%	66.8% (1)
New medical discoveries	63.4%	63.7% (2)
New scientific discoveries	57.6%	60.5% (3)
Environmental issues	55.4%	51.2% (5)
New inventions and technologies	54.3%	56.6% (4)
'not at all interested'		
Sports news	36.5%	25.7% (2)
Politics	19.0%	31.8% (1)

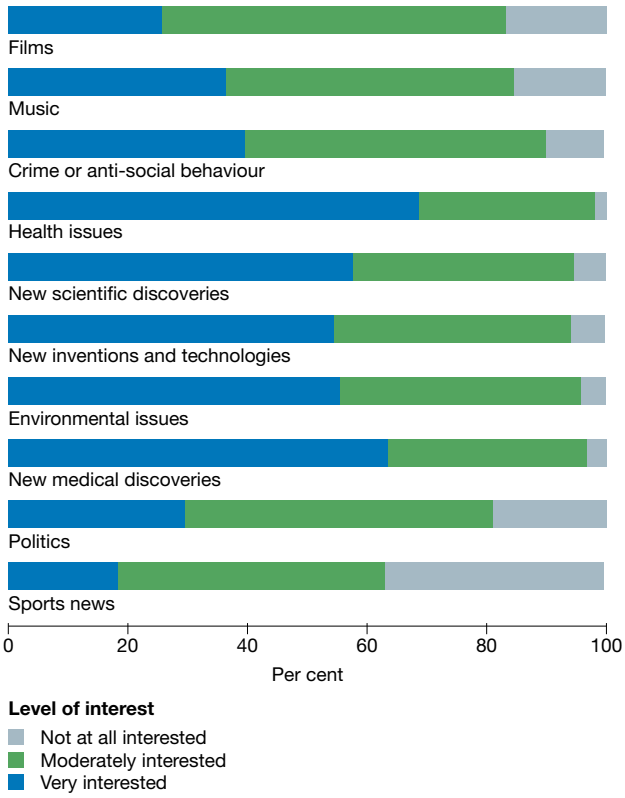

Figure 1: Interest in popular topics

5 total sample was 1000 people, data gathered between 14 February and 13 March, 2018

Responses to general statements about science

How well informed do people feel about science?

Just over half of all of respondents (53.9 per cent) felt they were 'fairly well informed' about science, with only 3 per cent considering themselves 'not at all informed' (Figure 2). This closely matches the proportions of people rating themselves this way in the ABAS in 2017 (55.8 per cent and 2.7 per cent respectively).

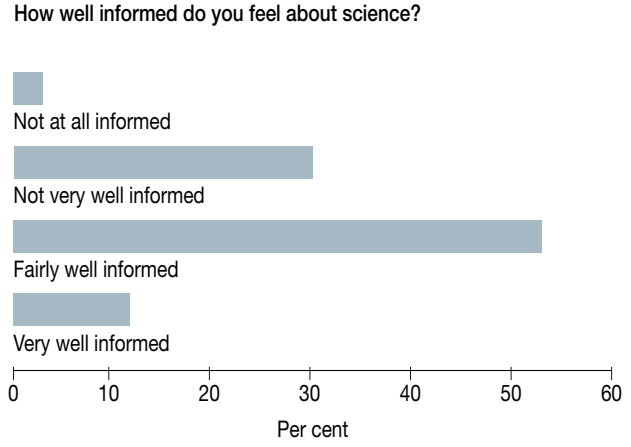

Figure 2: How well informed people feel about science?

As noted earlier, the biggest difference between the 2017 version of the ABAS and the ABAS-2018 was the inclusion of 'why' questions for a number of key topics.

In the first of these 'why' questions included in the ABAS-2018, respondents were asked why they gave the answer they did to the question about how well informed they felt they were about science.

Responses predominately fell into five categories:

1. I read about / take an interest in science
2. I don't know much about / am not interested in science
3. I work in a field related to science
4. I don't pay attention to everything science-related
5. I am / have formally studied science

To provide context to people's responses to how well informed about science they felt themselves to be, Table 2 presents 'why' responses mentioned by 10 per cent or more people.

Among those who reported feeling 'well informed' or 'very well informed', the most common reason they reported feeling this way was because 'I read about / take an interest in science'.

Two thirds of the people who considered themselves as 'not very well' or 'not at all informed' about science said this was because 'I don't know much about / am not interested in science'.

Table 2: How well informed do you feel about science: WHY? (reasons mentioned by >10% of respondents)

	% respondents
'well / very well informed' (n=658)	
I read about / take an interest in science	58%*
I work in a field related to science	20%*
I am / have formally studied science	12%*
'not very well / not at all informed' (n=335)	
I don't know much about / am not interested in science	66%**
I don't pay attention to everything science-related	12%**

*percentage of n=658 'well /very well informed' respondents
**percentage of n=335 'not very well /not at all informed' respondents

Sources of science

The ABAS-2018 introduced one entirely new question in 2018: 'What sources of information do you rely on to inform yourself about science?'. This was an open-ended question, and the responses in Figure 3 represent summary categories of responses generated from participants' answers.

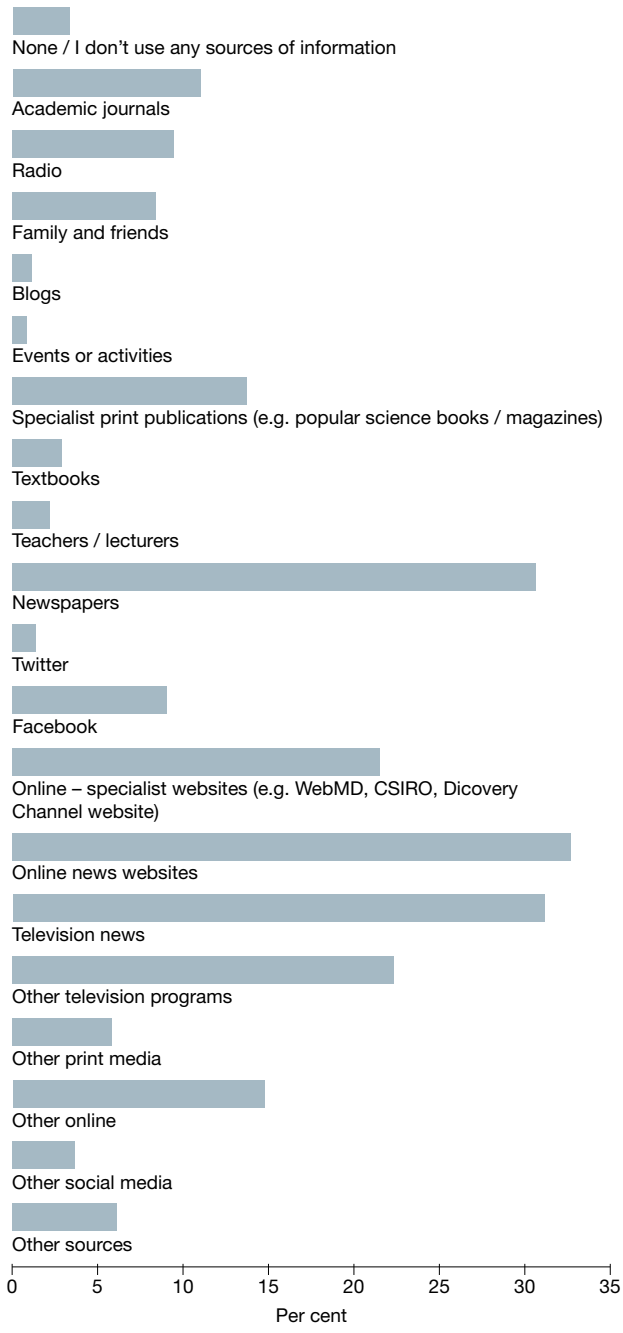

Figure 3: Sources respondents reported relying on to inform themselves about science

The top five most commonly mentioned sources of science were:

1. Online news websites 32.7 per cent
2. Television news 31.2 per cent
3. Newspapers 30.6 per cent
4. Other television programs 22.3 per cent
5. Specialist websites (e.g. WebMD, CSIRO, Discovery Channel website) 21.5 per cent

The ABAS-2018 revealed a number of key associations with these five most commonly used sources of science information[6]. The statistically-significant results of these associations are presented next.

Online news websites

Education

People with a Bachelor degree or higher were more likely to report using online news websites as a source of science information than respondents whose highest level of education was a diploma or less (X^2 = 21.276, df = 2, sig = 0.000, Cramer's V = .150, sig = 0.000).

Age

Respondents below the age of 65 were more likely to report that they used online news websites as a source of science information (X^2 = 65.662, df = 6, sig = 0.000, Cramer's V = .262, sig = 0.000).

How informed about science?

Respondents who rated themselves as being 'fairly well' or 'very well' informed about science were more likely to use online news websites as a source of science information (X^2 = 23.406, df = 1, sig = 0.000, phi = 0.156, sig = 0.000).

Climate change

Respondents who did not think there was solid evidence the Earth has been getting warmer over the past few decades were less likely to report using online news websites as a source of science information (X^2 = 17.736, df = 1, sig = 0.000, phi = –0.138, sig = 0.000).

6 Unless otherwise indicated, the associations reported in this section are based on the Chi-Square 'test for independence' statistical technique (indicated by the symbol X2). As well as the value of X2 for each association, the relevant degrees of freedom and significance levels are presented.

There is also a 'strength of effect' statistic included with each X2 value. The strength of the effect aids interpretation of X2 values, and the choice of statistic depends on the structure of the contingency table used to calculate X2. Here the strength of effect will be indicated using either the Phi coefficient or Cramer's V statistics, with an associated significance value as well.

As a rule of thumb, a value of .01 is considered as small effect for Phi, with medium beginning at .30, and large at .50. The strength-of-effect for Cramer's V can vary depending on the number of rows and columns in the contingency tables used when calculating X2. Unless otherwise indicated, the relevant strength-of-effect values here are the same as noted for Phi. Only statistically significant associations are reported.

Television news

Education

People with a Bachelor degree or higher were a little less likely to report using television news as a source of science information than respondents whose highest level of education was a diploma (X^2 = 10.357, df = 2, sig = 0.006, Cramer's V = .105, sig = 0.006).

Sex

Female respondents were more likely to report using television news as a source of science information than males (X^2 = 11.461, df = 1, sig = 0.001, phi = .109, sig = 0.000).

Age

Respondents aged 65 or older were more likely to report that they used television news as a source of science information (X^2 = 26.771, df = 6, sig = 0.000, Cramer's V = .167, sig = 0.000).

How informed about science?

Respondents who rated themselves as being 'fairly well' or' very well' informed about science were less likely to use television news as a source of science information (X^2 = 10.813, df = 1, sig = 0.001, phi = –0.106, sig = 0.010).

Newspapers

Age

Respondents aged 65 or older were more likely to report that they used newspapers as a source of science information (X^2 = 71.093, df = 6, sig = 0.000, Cramer's V = .273, sig = 0.000).

Other TV programs

Age

Respondents aged 55 or older were more likely to report that they used other television programs as a source of science information (X^2 = 41.787, df = 6, sig = 0.000, Cramer's V = .209, sig = 0.000).

Specialist websites

Education

People with a Bachelor degree or higher were a little more likely to report using specialist websites as a source of science information than respondents whose highest level of education was a diploma (X^2 = 20.638, df = 2, sig = 0.000, Cramer's V = .148, sig = 0.000).

Age

Respondents aged 65 or older were less likely to report that they used specialist websites as a source of science information (X^2 = 27.419, df = 6, sig = 0.000, Cramer's V = .169, sig = 0.000).

How informed about science?

Respondents who rated themselves as being 'fairly well' or 'very well' informed about science were more likely to use specialist websites as a source of science information (X^2 = 44.503, df = 1, sig = 0.000, phi = .215, sig = 0.000).

On the whole, has science made life easier or more difficult?

Almost 9 out of 10 respondents (87.6 per cent) said that science has, on the whole, made life easier for most people, while 7.8 per cent said it has made life more difficult (Figure 4). This closely parallels the 2017 results for this question.

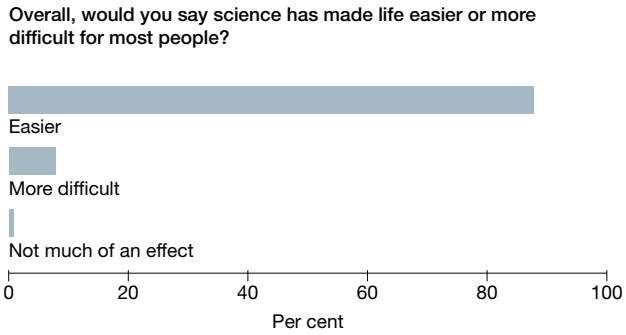

Figure 4: Overall has science made life easier or more difficult for most people?

For the ABAS-2018, respondents were also asked to tell us why they believed science had made life easier or more difficult for most people. Responses to this 'why' question could be broadly gathered into seven major categories:

1. Scientific progress / advances in general
2. Improved quality of life
3. Medical advances
4. It complicates things / unintended effect
5. Made things easier
6. Advances in technology
7. New inventions

Table 3 presents the 'why' responses that were given by 10 per cent or more of the sample, divided into two groups: those who felt science has made life easier, and those who felt science has made life more difficult. In the more difficult category, the most common reason proffered was that science complicates things and has unintended effects. Among those who thought science has made life easier, responses were more varied, with the most popular responses reflected by sentiments that science has led to progress / advances in general.

Table 3: Overall has science made life easier or more difficult: WHY? (reasons mentioned by >10% of respondents)

	% respondents 2018
'easier' (N=876)	
Scientific progress / advances in general	26%*
Improved quality of life	14%*
Medical advances	25%*
Made things easier	14%*
Advances in technology	16%*
'more difficult' (n=78)	
It complicates things / unintended effect	53%**

*percentage of n=876 'easier' respondents
**percentage of n=78 'more difficult' respondents

Childhood vaccination

When asked whether they agree or disagree with the statement 'all parents should be required to vaccinate their children', 84.2 per cent of respondents agreed. This is similar to 2017 (84.9 per cent). Also similar to the 2017 results, 12.8 per cent believed parents should be allowed to choose not to vaccinate (12% in 2017) (Figure 5).

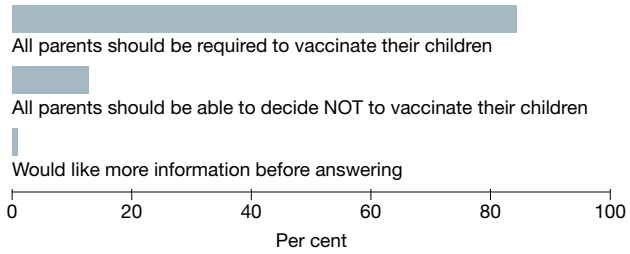

Figure 5 Attitudes to compulsory childhood vaccination

When asked why people responded the way they did to the question on vaccination, seven main reasons were provided:

1. Should be family's personal choice
2. Claimed risk of autism / disability
3. Reaction can be harmful / allergic in some cases
4. Don't trust vaccines / they don't always work / they're not necessary
5. Proven theory of herd immunity, stops diseases spreading or returning
6. Common sense, benefits outweigh risks, proven to work
7. Anti-vax movement is misguided

Of those who said vaccination should not be compulsory, nearly three quarters said it 'should be family's personal choice' (Table 4). On the other side, more than half of the respondents who supported compulsory vaccination for children cited herd immunity and other related ideas as a reason for their position.

Table 4: Should it be compulsory for parents to vaccinate their children: WHY? (reasons mentioned by >10% of respondents)

	% respondents 2018
'Childhood vaccination SHOULD be compulsory' (N=842)	
Proven theory of herd immunity, stops diseases spreading or returning	57%*
Common sense, benefits outweigh risks, proven to work	41%*
'Childhood vaccination should NOT be compulsory' (n=128)	
Should be family's personal choice	72%**
Reaction can be harmful / allergic in some cases	18%**
Don't trust vaccines / they don't always work / they're not necessary	12%**

*percentage of n=842 'SHOULD be compulsory' respondents
**percentage of n=128 'should NOT be compulsory' respondents

Appropriate use of genetic modification – altering babies to avoid disease

Perhaps the most notable difference in opinion between the 2017 ABAS and the ABAS-2018 concerned attitudes to the appropriateness of changing a baby's genetic characteristics to reduce the risk of serious disease (Figure 6).

In 2017, almost 60 per cent of respondents called this 'making appropriate use of medical advances', while just under one third of respondents said this intervention was 'taking medical advances too far'. In 2018, 44.4 per cent of respondents said that changing a baby's genetic characteristics to reduce the risk of serious disease was appropriate (a drop of more than 15 per cent). The number of respondents considering this to be taking medical advances too far rose by nearly 8 per cent to 40.2 per cent in the ABAS-2018.

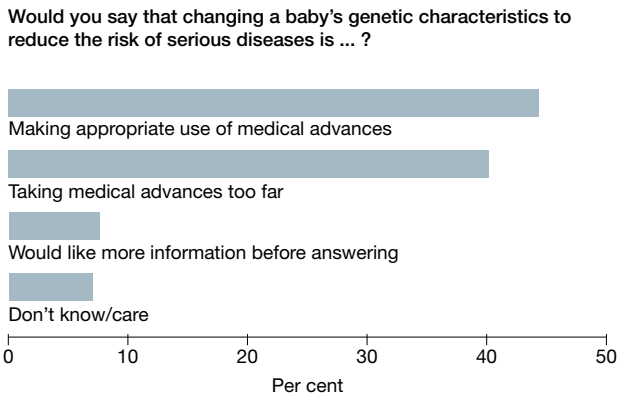

Figure 6: Changing a baby's genetic characteristics to reduce the risk of serious disease

When asked why they answered the way they did, among those who said changing a baby's genetic characteristics was an appropriate use of medical advances, there was one prevalent answer: this is an 'appropriate measure to increase standard of life' (86 per cent).

For those who said that changing a baby's genetic characteristics was taking medical advances too far, two reasons were popular. Fifty three per cent of these respondents said that it was unethical and / or unnatural to alter human genes. Thirty two per cent of them reported a non-specific, general rejection or disapproval of changing a baby's genetic characteristics to reduce the risk of serious disease.

There were another two other categories reported in response to the appropriateness of changing a baby's genetic characteristics to reduce the risk of serious disease, although these categories were mentioned by fewer than 10 per cent of respondents. For those in favour, nine per cent expressed 'general approval'. For those against, eight per cent said that 'even small changes could have significant consequences'.

Appropriate use of genetic modification – eating GM foods

These questions addressed people's attitudes to food safety in relation to the consumption of GM foods (Figure 7). In 2018, almost exactly the same proportion of respondents (46.0 per cent) considered it 'generally safe' to eat GM foods as did in 2017 (46.6 per cent). While still a sizable minority, the proportion of people who said that GM foods are 'generally unsafe' dropped from 39.6 per cent in 2017 to 33.1 per cent in the ABAS-2018.

It is worth noting that to the question relating to the safety of eating genetically modified foods, 20 per cent of respondents in the ABAS-2018 reported they either 'didn't know or care' about this (n=110 or 11 per cent) or 'wanted more information before answering' (n=92 or 9.2 per cent).

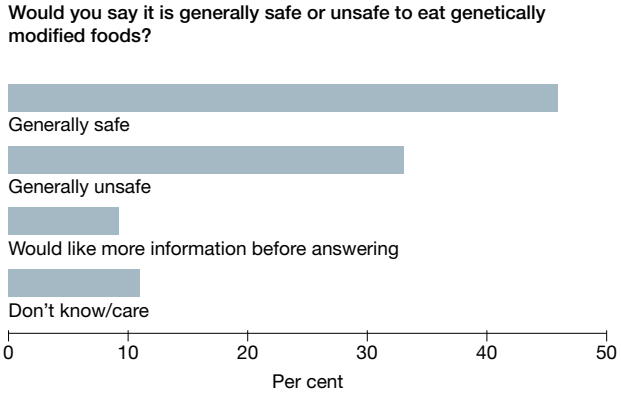

Figure 7: Is it safe to eat genetically modified foods?

Ten main categories of 'why' answers were reported by respondents for this question:

- Unnatural, unhealthy, harmful effects, don't know what's involved
- Hesitant because not enough research done
- We are already eating GM foods and it seems to be safe
- I trust the scientific research / the approval process
- Word-of-mouth
- Wary of corporate profit aspect
- Nothing has proven it to be unsafe
- Can help address food shortages
- Continuation of existing processes
- Generally think it's safe

In Table 5, responses nominated by at least 10 per cent of respondents are presented.

Among the third of respondents who considered eating GM foods to be unsafe, by far the most common reasons given (62 per cent) centred around concerns about the unknown, referring to things like 'Unnatural, unhealthy, harmful effects, don't know what's involved'.

Table 5: Is it generally safe to eat GM foods?: WHY? (reasons mentioned by >10% of respondents)

	% respondents 2018
'eating GM foods is generally SAFE' (N=460)	
We are already eating GM foods and it seems to be safe	25%*
I trust the scientific research / the approval process	25%*
Continuation of existing processes	13%*
Generally think it's safe	13%*
Nothing has proven it to be unsafe	12%*
'eating GM foods is generally UNSAFE' (n=331)	
Unnatural, unhealth, harmful effects, don't know what's involved	62%**
Hesitant because not enough research done	15%**
Word-of-mouth	12%**

*percentage of n=460 'generally safe' respondents
**percentage of n=331 'generally unsafe' respondents

For the 460 (46 per cent) who considered eating such foods to be 'generally safe', a quarter of them said this was because they had' trust in the scientific research / approval process', or mentioned the fact that 'we are already eating some GM without negative effects'.

Support for scientific advances: Animals in research and access to pre-trial drugs

In 2018, respondents were asked to rate the extent to which they supported two of the scientific advances also considered in 2017, both on a five point scale from 'strongly oppose' to 'strongly favour' (Figure 8 and Figure 9).

For ease of comparison to the ABAS from 2017 and previous Pew poll research (see Lamberts, 2017), statistical tables presented in this section combine 'strongly oppose' and 'oppose' categories, and 'strongly favour' and 'favour' (Table 6 and Table 7).

Animals in scientific research

In ABAS-2018, a smaller proportion of respondents (42.8 per cent) either 'opposed' or 'strongly opposed' using animals in scientific research than in 2017 (48.1 per cent). There was a corresponding increase in the proportion of people who 'favoured' or 'strongly favoured' this, rising from 47 per cent in 2017, to just over half (50.3 per cent) in the ABAS-2018. Figure 8 presents the full range of responses to this question in 2018.

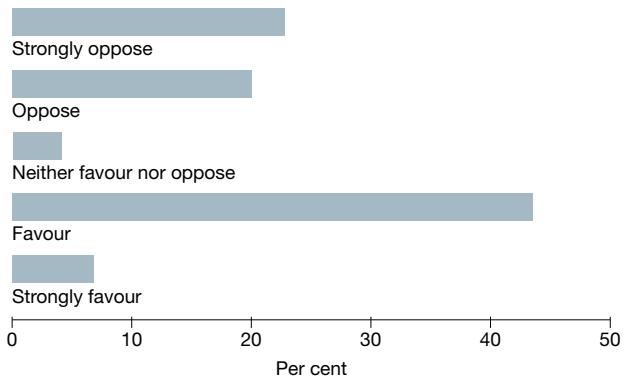

Figure 8 Are you in favour of the use of animals in scientific research?

Responses were combined into three categories for analysis of the 'why' competent of this question. The categories were: people who 'favour' or 'strongly favour' the use of animals in scientific research, people who 'oppose' or 'strongly oppose', and those who 'neither favour nor oppose'.

When asked 'why did you answer that way?", there were four reasons reported by 10 per cent or more of respondents in at least one of the three combined categories (Table 6). These were:

- Benefits humankind / advances science
- Better to test on animals than human beings
- It's cruel / unethical
- Depends which animals are used / being tested

For those opposed, one reason eclipsed all others, with 89 per cent saying that it is 'cruel and / or unethical' to do research on animals. Among those in favour, by far the most common reason reported was that it was 'better to test on animals than humans beings' (73 per cent). This was the most common reason given by those neither for nor against as well (41 per cent).

Table 6: Are you in favour of the use of animals on scientific research? WHY? (reasons mentioned by >10% of respondents)

	% respondents 2018
'Favour / strongly favour'* (N=442)	
Better to test on animals than human beings	73%*
Benefits humankind /advances science	26%*
Depends which animals are used / being tested	19%*
'Oppose /strongly oppose (n=428)	
It's cruel / unethical	89%**
'Neither favour nor oppose' (n=41)	
Better to test on animals than human beings	41%***
It's cruel / unethical	29%***
Depends which animals are used / being tested	29%***

*Percentage of the n=442 'favour / strongly favour' respondents
**Percentage of the n=428 'oppose / strongly oppose' respondents
***Percentage of the n=41 'neither favour nor oppose' respondents

Allowing access to experimental drugs before clinical trials have shown the drugs to be safe and effective

As in 2017, slightly more than half of the people sampled in 2018 'favour' or 'strongly favour' allowing access to experimental drugs before clinical trials have shown them to be safe and effective (at 55 per cent in ABAS-2018, a slight rise on 2017), with 4.6 per cent 'neither favouring nor opposing', and 38.3 per cent 'opposing' or 'strongly opposing' this (almost exactly the same as in 2017) (see Figure 9 for a full breakdown of responses).

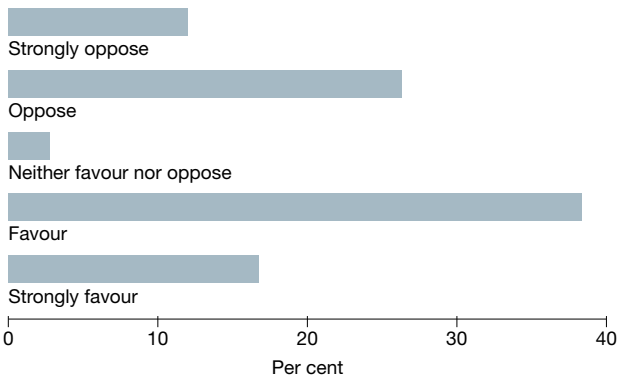

Figure 9: Are you in favour of people accessing drugs before full clinical trials are completed?

When people were asked why they responded the way they did for this question, ten broad reasons were provided:

- Oppose on moral / safety grounds
- Oppose – unethical pharma practices, targets poor / desperate people
- Oppose – don't know if drug is effective
- Decide on a case-by-case basis
- Clinical trials should be done first
- Favour – people should have the choice / could save lives
- Favour – other testing processes take too long / too much red tape
- Favour – because it gets results / better than testing on animals
- Favour – provided it is safe and participant is fully aware of risk
- Favour – personal / family health reasons

Once again, 'why' analyses were conducted on combined groups of responses, and only the 'why' responses that were mentioned by at least 10 per cent of respondents in the merged categories are reported. For this question, there were two merged groups: people who 'favour' or 'strongly favour' being allowed to access drugs before full clinical trials are completed, and those who 'oppose' or 'strongly oppose'.

When asked 'why' they answered the way they did, six of the 10 reasons were mentioned by at least 10 per cent of respondents in one combined category or the other (Table 7). The proportion of people in favour of allowing access to experimental drugs before full clinical trials are completed was one of the more unexpected results of the ABAS in 2017. It was therefore important that the ABAS-2018 help us understand why people responded this way.

The most common reason reported by respondents who were in favour was that 'people should have a choice' / that releasing drugs early 'could save lives' (58 per cent). On the other hand, two thirds of those who were opposed said they did so on 'moral / safety grounds'.

Table 7: Access to experimental drugs before full clinical trials are completed: WHY? (reasons mentioned by >10% of respondents)

	% respondents 2018
'Favour / strongly favour' (n=550)	
People should have the choice / could save lives	58%*
Because it gets results / better than testing on animals	20%*
Other testing processes take too long / too much red tape	13%*
'Oppose / strongly oppose (n=383)	
Oppose on moral / safety grounds	67%**
Clinical trials should be done first	26%**
Don't know if drug is effective	11%**

*Percentage of the n=550 who 'favour / strongly favour' access to drugs before full clinical trials

** Percentage of the n=383 who 'oppose / strongly oppose access to drugs before full clinical trials

Climate change

As in 2017, around 8 out of ten Australians (79.8 per cent or n = 798) believe there is solid evidence that the Earth has been 'getting warmer over the last few decades' (Figure 10). Seventeen per cent believe there is 'no solid evidence', up marginally from the 16.2 per cent who responded this way in 2017.

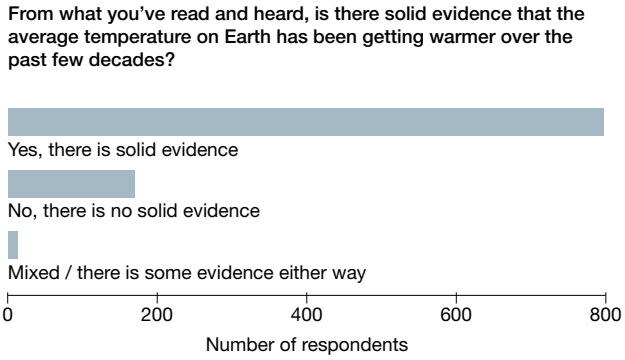

Figure 10: Is there solid evidence that the earth has been warming over the past few decades?

People who say there is solid evidence the Earth is getting warmer

All the statistics presented in this section are based on the n=798 ABAS-2018 respondents who said that there is solid evidence that the Earth is getting warmer.

Figure 11 shows that more than two thirds of these respondents (69.8 per cent) say the warming of the Earth is 'mostly because of human activity', which is a notable increase on the 2017 ABAS result of 53.6 per cent.

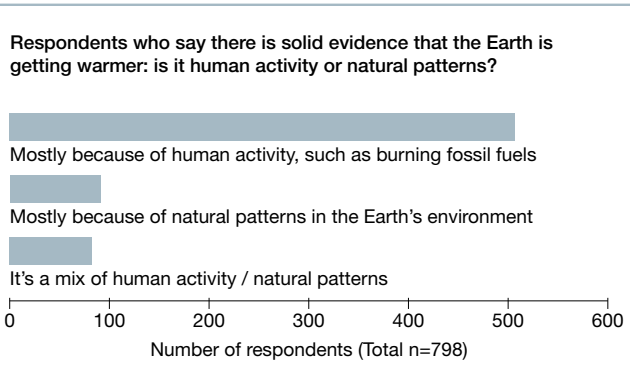

Figure 11: Why is the Earth getting warmer: human activity or natural patterns?

There are myriad reasons why these 798 respondents reported they believe the Earth has been warming, and they are almost identical to those offered in 2017. Table 8 presents the top five most frequently cited reasons in ABAS-2018, with the 2017 results (including their position in the top five in 2017) in the right hand column for ease of comparison.

Table 8: Top five reasons for Earth's warming given by people who believe there is solid evidence that the earth is warming. ABAS-2018 against ABAS (2017)

	% respondents 2018	% respondents 2017 (position)
(1) 'because of the negative effect of human activity'	35.7%	20.3% (2)
(2) 'because of scientific evidence or research'	30.0%	18.1% (3)
(3) 'because of the negative effect of greenhouse gasses'	20.9%	24.4% (1)
(4) 'because of my own observations about the environment'	14.3%	Not in top 5 in 2017
(=5) 'because of what I read or see in the media'	12.2%	9.1% (5)
(=5) 'historically there have been naturally occurring fluctuations in global temperature'	12.2%	10.8% (4)

People who say there is NO solid evidence the Earth is getting warmer

Seventeen per cent, or 170 respondents, said they believed there was no solid evidence that the average temperature on earth has been getting warmer over the past few decades. Their reasons for saying this are presented in Table 9, with the 2017 results (including their position in their top 5 in 2017), in the right hand column for ease of comparison.

Table 9: Top five reasons people who believe there is NO solid evidence do not the Earth is not. ABAS-2018 against ABAS (2017)

	% respondents 2018	% respondents 2017 (position)
(1) 'historically there have been naturally occurring fluctuations'	43.5%	25.6% (1)
(2) 'because of my own observations'	28.8	19.5% (2)
(3) 'incomplete or inconclusive scientific evidence	14.1%	10.3% (4)
(4) 'because the scientific evidence is contradictory'	8.2%	Not in top 5 in 2017
(5) 'scientific evidence fake or flawed	7.6%	8.2% (5)
(-) 'current changes are not significant compared to historical changes that have occurred'	Not in top 5 in 2018	12.3% (3)

Contribution and prestige of professions

In 2018, respondents were again asked to rate 16 professions on their level of 'contribution to the wellbeing of society', and how 'prestigious' they perceived them to be. Rating options for level of contribution were on a five point scale running from 'negative contribution' through to 'contribute a lot'. Ratings for perceptions of prestige ran on a four point scale from 'not at all prestigious' to 'very prestigious'.

Contribution

Respondents' ratings of the level of contribution the 16 professions make to the wellbeing of society are presented in Figure 12.

In the 2017 ABAS, the three professions that were most frequently rated as 'contributing a lot' were scientists, followed very closely by doctors and then farmers. In 2018, the top three were the same, although first and second place swapped (but still remained close), with doctors coming first (81.1 per cent), scientists second (79.7 per cent) and farmers again coming third (77.9 per cent).

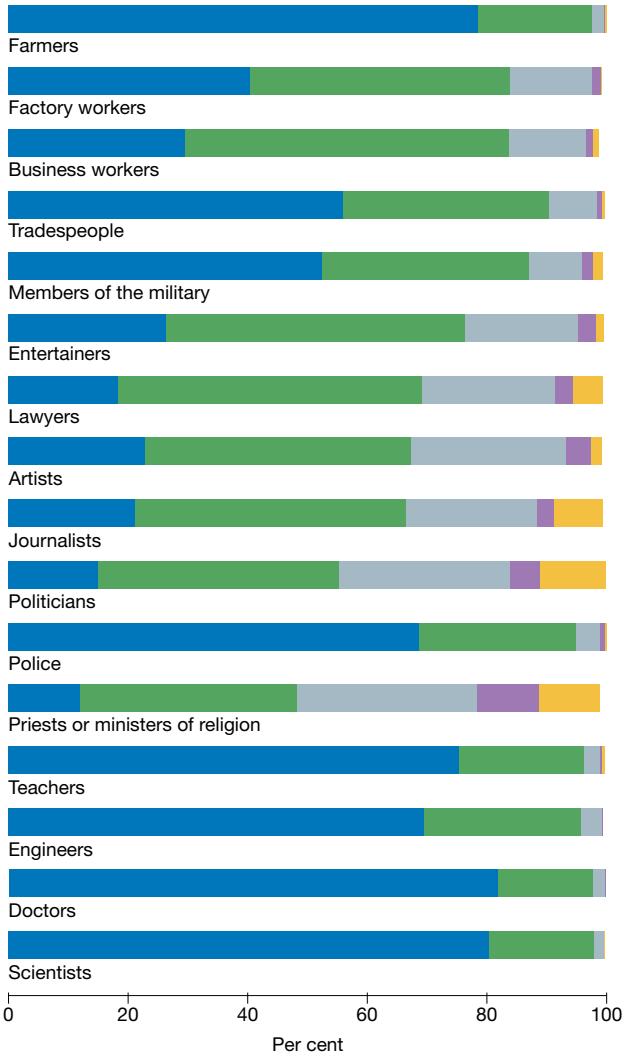

Figure 12: Level of perceived contribution to society of 16 professions

Prestige

Respondents' perceptions of how prestigious the professions were are presented in Figure 13.

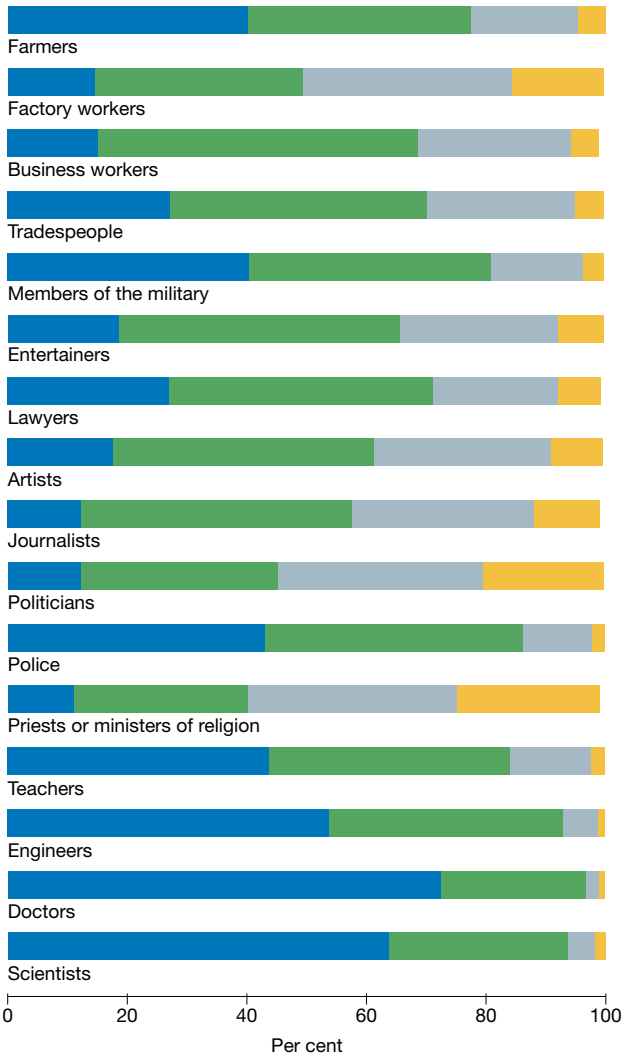

Figure 13: Level of perceived prestige of 16 professions

In 2018, the top three 'very prestigious' professions were similar to 2017 results, with doctors coming first (71.7 per cent), scientists second (63.0 per cent) and farmers again coming third (53.1 per cent).

The relationship between contribution and prestige

Finally in this section, the relationship between people's perceptions of the prestige of a profession, and their ratings of that profession's contribution to the wellbeing of society is examined. In essence, this section asks: *if a person considers a profession to be prestigious, to what extent would they perceive the profession as contributing to the wellbeing of society as well?*

If people considered prestige and contribution to society as closely connected, there would be a strong correlation between their prestige and contribution ratings (indicated by correlation values closer to 1.0)[7]. The ABAS-2018 correlations between ratings of prestige and contribution to the wellbeing of society for all 16 professions are presented in ranked order in Table 10, and in the adjacent column, the relative rankings of these same professions in 2017 are included for ease of comparison.

Table 10: Relationship between professions–ratings of prestige and contribution to wellbeing of society

Profession	ABAS-2018 (Spearman's rho*)	Position in 2017
Priests or ministers	0.616	1
Journalists	0.532	3
Politicians	0.501	4
Military	0.500	2
Artists	0.484	5
Lawyers	0.432	6
Entertainers	0.430	8
Police	0.425	7
Doctors	0.373	10
Business workers	0.369	11
Engineers	0.361	13
Tradespeople	0.344	15
Teachers	0.328	12
Factory workers	0.324	9
Farmers	0.285	14
Scientists	0.285	16

* all results statistically significant at p=.01

In both 2017 and 2018, this relationship between prestige and contribution was lowest for people's ratings of scientists. This means the belief that they contribute a lot to the wellbeing of society was not consistently related to high levels of perceived prestige. This correlation could also mean that those who considered science to be a prestigious profession did not necessarily see it as one that contributes a lot to society.

7 Spearman's rho correlation coefficients between prestige and contribution were used to examine the association. While there is no absolute rule for what constitutes a weak, medium or strong correlation result (coefficient), it is relatively uncontroversial to use the following rule of thumb: values from 0.1 to 0.29 are weak, 0.30 to 0.49 are medium, and 0.5-1.0 are strong. Although there are strong correlations between prestige and contribution ratings for some professions, most fall in the medium range.

The relationship between respondents' perception of prestige and contribution to society was once again notably strongest for priests, journalists, politicians and members of the military. People who rated these professions as contributing more to the wellbeing of society were also more likely to perceive these professions as prestigious. People who rated them low on contribution much were more likely to rate them low on prestige as well.

What science has done, and what it will do

In this section of the survey in 2018, respondents were once again asked about their level of agreement with a series of statements about what science has done, and what science will do in the future.

For both sets of statements, respondents were asked to indicate the extent to which they agree on a five point scale from 'strongly disagree' to 'strongly agree'.

What science HAS done

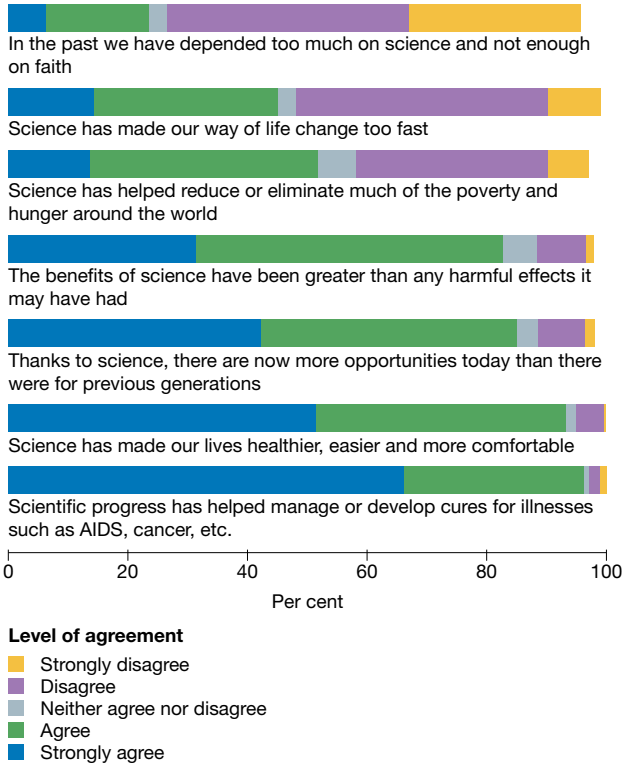

Figure 14: What science HAS done

The results for ABAS-2018 were consistent with those in 2017 (see Figure 14 for a graphical representation of all 2018 responses). The three statements with the most 'strongly agree' responses were:

- 'Scientific progress has helped manage or cure illnesses such as AIDS, cancer, etc.' at 65.7 per cent (slightly up from 62.9 per cent in 2017).
- 'Science has made our lives healthier, easier and more comfortable' at 51.1 per cent (almost the same as 2017 at 52.8 per cent).
- 'Thanks to science, there are now more opportunities today than there were for previous generations' at 42.0 per cent (a decrease of just over 4% on 2017 at 46.1per cent).

In the 2017 survey, there were two statements with which more than 10 per cent of respondents strongly disagreed. Nearly a third (32.1 per cent) strongly disagreed with the statement 'In the past we have depended too much on science and not enough on faith'. In 2018, this proportion dropped to 28.7 per cent, but it was still the statement with which most people strongly disagreed most frequently. In second place in 2018, as it was in 2017, was 'science has made our way of life change too fast'. However the proportion of people strongly disagreeing with this statement dropped from 10.1 per cent to 8.9 per cent in 2018.

Once again, a clear majority of respondents agree or strongly agree that the benefits of science have been greater than the harmful effects of science, rising from 80 per cent in 2017 to 82.1 per cent in 2018. Despite this, a significant minority (44.7 per cent) of respondents reported that science has changed our way of life too fast.

What science WILL do

Because of its future orientation, this section of the survey included one statement in addition to those in the previous section ('what science HAS done'): 'Science will be able to sort out any problem'.

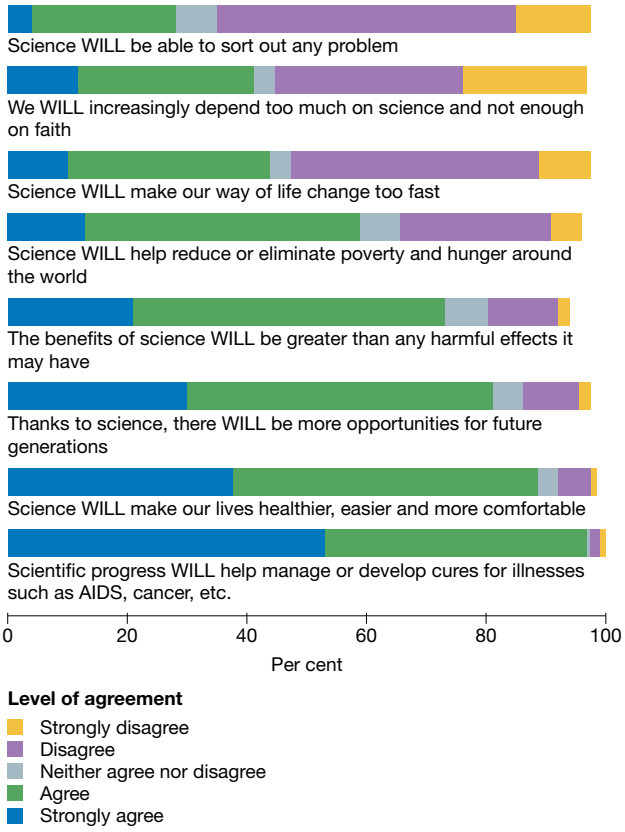

Figure 15: What science WILL do

In 2017, there were three statements with which more than 10 per cent of respondents strongly disagreed. This pattern continued in 2018, although the third statement fell just below the10 per cent threshold (Figure 15).

First, in 2018 20.7 per cent of respondents strongly disagreed with the statement 'We will increasingly depend too much on science and not enough on faith' (down from 22.6 per cent in 2017). In 2017, 15.2 per cent strongly disagreed with the statement 'Science will be able to sort out any problem', falling to 12.4 per cent in 2018. Finally, 'Science will make our way of life change too fast' was the third most common statement with which respondents disagreed in both 2017 (10 per cent) and 9.9 per cent in 2018.

KEY ATTITUDES, BELIEFS AND DEMOGRAPHICS – CHANGES BETWEEN 2017 AND 2018

A suite of statistically significant associations on responses between key demographics and beliefs / attitudes were reported in the 2017 ABAS report. This section revisits those associations, noting the differences between 2017 and 2018.[8]

Sex differences

In 2017, males were slightly more likely than females to feel 'informed' or 'very well informed' about science. This difference between male and female attitudes was noted again in 2018, but slightly decreased.

When it comes to eating GM foods, males once again were somewhat more likely to see this as 'generally safe', but this effect also decreased slightly in the ABAS-2018.

There was only one increase in the strength of effect between the sexes from 2017 to 2018. Males were slightly more likely to 'favour' or 'strongly favour' using animals in scientific research.

Finally, the weak effect of sex on the likelihood of agreeing that 'science has made our way of life change too fast' found in 2017 was not present in the ABAS-2018.

How informed do you feel about science?

Level of education

In 2017, people with the highest levels of completed education (Bachelor degree or above) were more likely to say they felt 'fairly well' or 'very well' informed about science. This was also the case among people with vocational education and training qualifications, but to a lesser extent. For people whose highest level of education was Year 12 or less, the pattern was reversed.

In 2018, those with the highest levels of completed education were still more likely to see themselves as 'fairly well' or 'very well' informed about science. However, in 2018 all respondents whose highest level of completed education was less than a Bachelor degree were less likely to report that they were 'fairly well' or 'very well' informed about science.

8 Associations and strength of effect were calculated using the Chi Square statistic described earlier in this report.

How has science affected our lives?

Four of the five significant associations noted under this category in the 2017 ABAS remained the same in 2018, but with slight decreases in strength of effect.

In 2018, people who felt 'not very well' or 'not at all' informed about science were still a little more likely to say that 'science has made life more difficult'.

People who reported feeling 'very well informed / fairly well informed' were again a little more likely to agree / strongly agree that 'science has made our lives healthier, easier and more comfortable'. However, they were no longer any more likely than others to suggest that 'the benefits of science have been greater than any harmful effects it may have had'.

In 2018, the 'very well informed / fairly well informed' were still more likely to disagree or strongly disagree that 'science has made our way of life change too fast' and that 'in the past we have depended too much on science and not enough on faith', though the strength of the effect was less pronounced in both cases.

Climate change

When respondents were asked in 2017 'from what you've read and heard, is there solid evidence that the average temperature on Earth has been getting warmer over the past few decades?', those who felt 'very well' or 'fairly well' informed about science were a little more likely than those who did not to say there is solid evidence to support this. The same pattern was present in the ABAS-2018 in 2018, although the effect was weaker.

Approval and appropriateness of scientific and medical advances

In 2017, people who said they were 'fairly well' or 'very well' informed about science were a more likely to favour / strongly favour 'the use of animals in scientific research', and less likely to feel that 'changing a baby's genetic characteristics to reduce the risk of serious diseases' was taking medical advances too far. In 2018, these associations were no longer present.

Food safety

Finally, in 2017, people who felt at least 'fairly well' informed about science were more likely to say that eating GM foods was 'generally safe'. This effect was still present in 2018, though it was weaker.

Education level

There were a number of changes compared to 2017 related to respondents' level of completed education and some of their beliefs and attitudes towards science.

In 2018, respondents with a Bachelor degree or higher were a little more likely to disagree / strongly disagree that 'science has made our way of life change too fast', and that 'in the past we have depended too much on science and not enough on faith' than they were in 2017. They also showed a slight increase in the likelihood they would agree that eating GM foods was 'generally safe'.

In 2018, people with a Bachelor degree or higher were a little more likely to agree / strongly agree that 'the benefits of science have been greater than any harmful effects it may have had', though this already small effect noted in 2017 was weaker still in 2018.

Similarly, they were still more likely to favour / strongly favour 'the use of animals in scientific research', though to a lesser extent than in 2017.

When it came to belief in evidence for climate change, when asked 'from what you've read and heard, is there solid evidence that the average temperature on earth has been getting warmer over the past few decades?', respondents with a Bachelor degree or higher were somewhat more likely to say 'yes, there is solid evidence' to a similar extent in both 2017 and 2018.

These respondents were again more likely to indicate they thought this was 'mostly because of human activity, such as burning fossil fuels'. In 2018, people with medium and low levels of completed education were slightly more likely to refuse to answer this question than those with the highest education levels.

Finally, two effects from 2017 were no longer present in 2018. According to the ABAS-2018 those with the highest level of completed education were no longer more likely to feel that 'science has made our lives healthier, easier and more comfortable', or that 'science has helped eliminate much of the poverty and hunger around the world' than other respondents.

APPENDIX – DATA COLLECTION AND SAMPLING STRATEGY

The DIIS-CPAS ABAS-2018 survey was conducted for The Australian National Centre for the Public Awareness of Science (CPAS), The Australian National University and The Department of Industry, Innovation and Science by the Social Research Centre (SRC), an ANU Enterprise business. The survey was administered to a nationally representative sample of the adult population of Australia, and was conducted by telephone (both landline and mobile).

The metropolitan component of the sample was 65.5 per cent, and the regional component, 34.5 per cent. The proportion of respondents broken down by state appears at Figure 17.

The SRC interviewed 1,000 people between 14 February and 13 March 2018 with a response rate of 39.8 per cent. The average interview length was 20.3 minutes. The survey's margin of error is ± 2.5 per cent.

Demographics

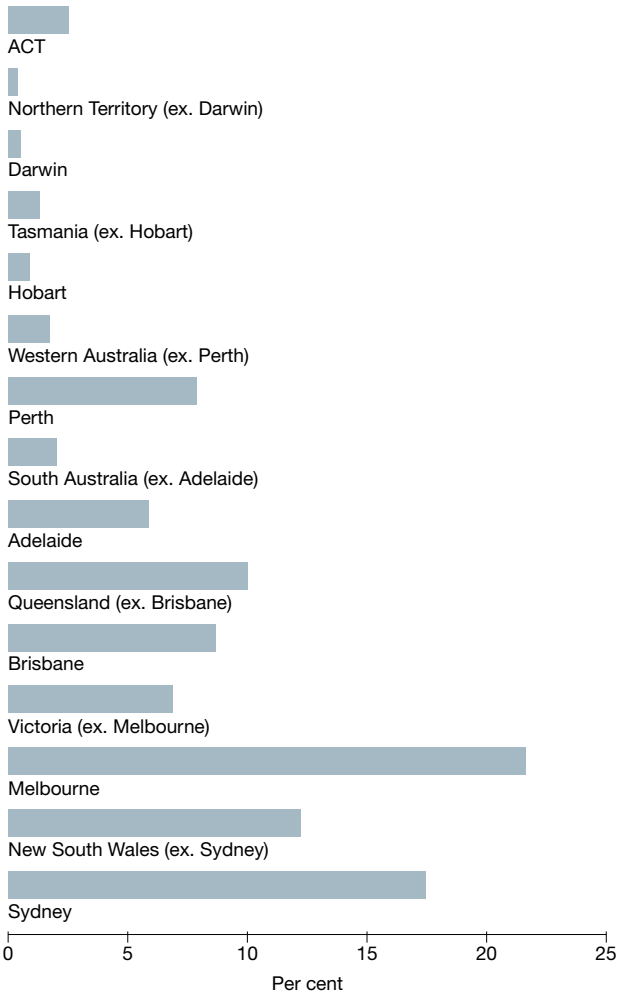

Figure 16: Respondents' place of residence

Sex

It is now appropriate and commonplace to ask participants for their gender rather than their sex in this kind of research. The decision to ask about sex rather than gender in the ABAS-2018 was made to allow direct comparisons with results from the ABAS in 2017, which itself was based on a core of questions from the ANUpoll in 2010[9] that asked respondents to nominate their sex.

In 2018, there were 474 males and 526 females in the sample.

Age

The age breakdown of respondents is presented graphically in Figure 17, and a comparison of the sample age categories with ABS data for 2016 is at Table 11.

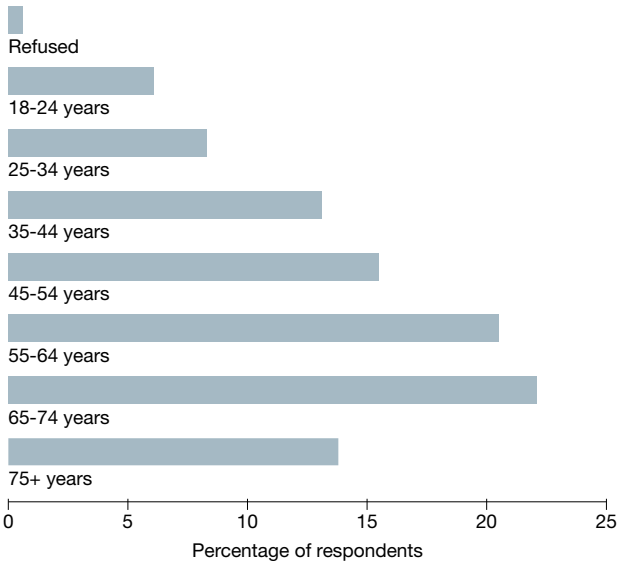

Figure 17: Age of respondents

9 Lamberts, R., Grant, W.J & Martin, A (2010) Public opinion about science. ANUpoll No.8, Canberra, The Australian National University. http://politicsir.cass.anu.edu.au/sites/politicsir.anu.edu.au/files/2010-12-07_ANUpoll_science_0.pdf

Table 11: Age of respondents–proportional comparison to the Australian population

Age category	% of Australian population[10]	% of sample ABAS-2018
18–24 years	8.7	6.1
25–34 years	9.3	8.3
35–44 years	11.5	13.1
45–54 years	14.5	15.5
55–64 years	20.9	20.5
65–74 years	21.8	22.1
75 + years	12.8	13.8

Country of birth

The majority of respondents were born in Australia (72.7 per cent), followed by The United Kingdom (9.4 per cent), then New Zealand (2.0 per cent). A full breakdown of respondents' country of birth is available in the supplementary document *Australian Beliefs and Attitudes Towards Science 2018: Data Tables.*

Education

The most common cluster of census-comparable level of education among respondents was an Advanced diploma, diploma, or Certificate III/IV (totalling 28.7 per cent) with Bachelor degree second (24.1 per cent). The full range of qualifications appears in Figure 18, with Table 12 presenting a comparison between the sample and Australian census data from 2011.

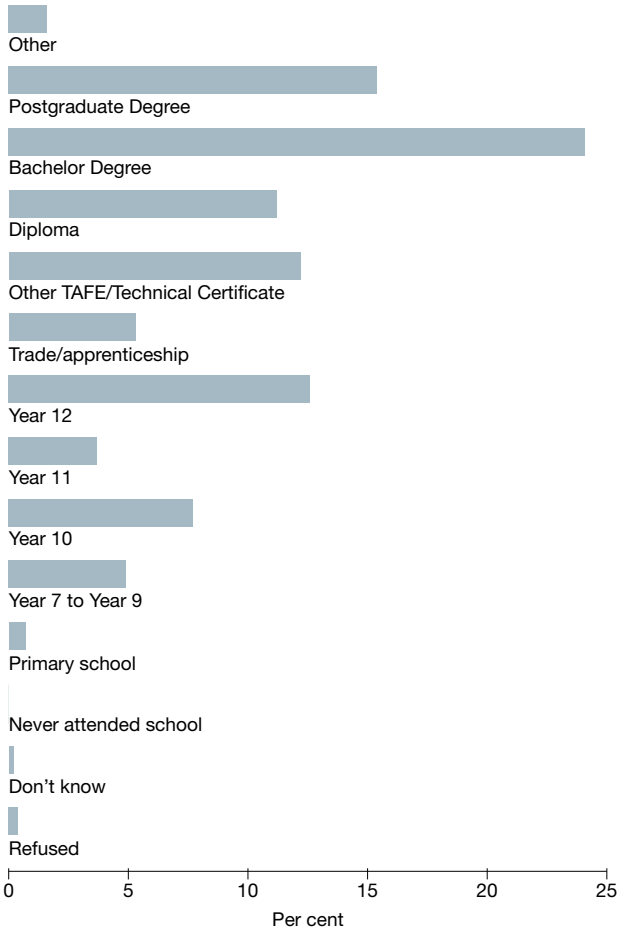

Figure 18: Highest level of education completed

Table 12: Highest level of education completed: ABAS-2018 sample compared to Australian population

Education level	Australia (2011 census)[11]	ABAS-2018 survey (2018)
Postgraduate degree, Grad diploma, Grad certificate	5.3%	15.4%
Bachelor degree	13.5%	24.1%
Advanced diploma, diploma, Certificate III/IV	23.3%	28.7%
Year 12	16.6%	12.6%
Year 11 and below	28.8%	17.6

10 31010DO002_201609 Australian Demographic Statistics, Sep 2016. Released at 11:30 am (Canberra time) Thurs 23 Mar 2017.

11 ABS data 2011 (Highest level of education from ABS.gov.au/census) for people 15 and older (ABAS-2018 only surveyed people 18+). Note also ABS summary table percentages from original source sheet do not add up to 100%.

We asked respondents with post-secondary, science-related qualifications (that is: Trade/apprenticeship, Advanced Diploma, Diploma, Certificate III/IV, Diploma, Bachelor Degree, or a Postgraduate Degree) to indicate what their main science-related field of study was.

Figure 19 shows that of the 317 people who met this condition in 2018, the most common field of science study was 'medical and health sciences' followed by 'engineering'. This mirrored the order revealed in the ABAS in 2017.

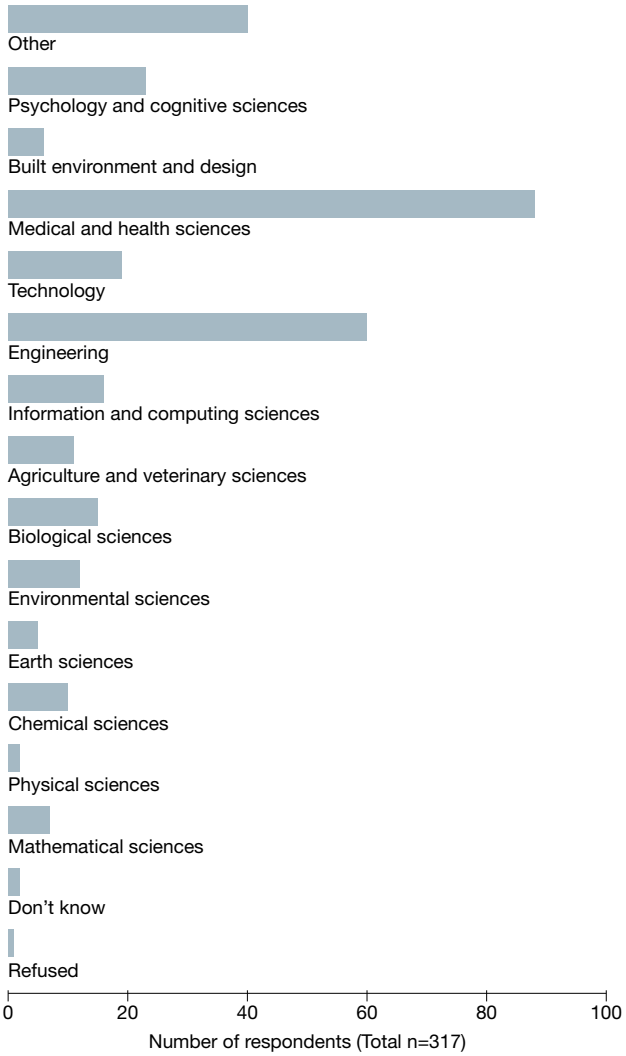

Figure 19: Main field of post-secondary science qualification

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