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Lessons for Risk Communication in the Digital Age

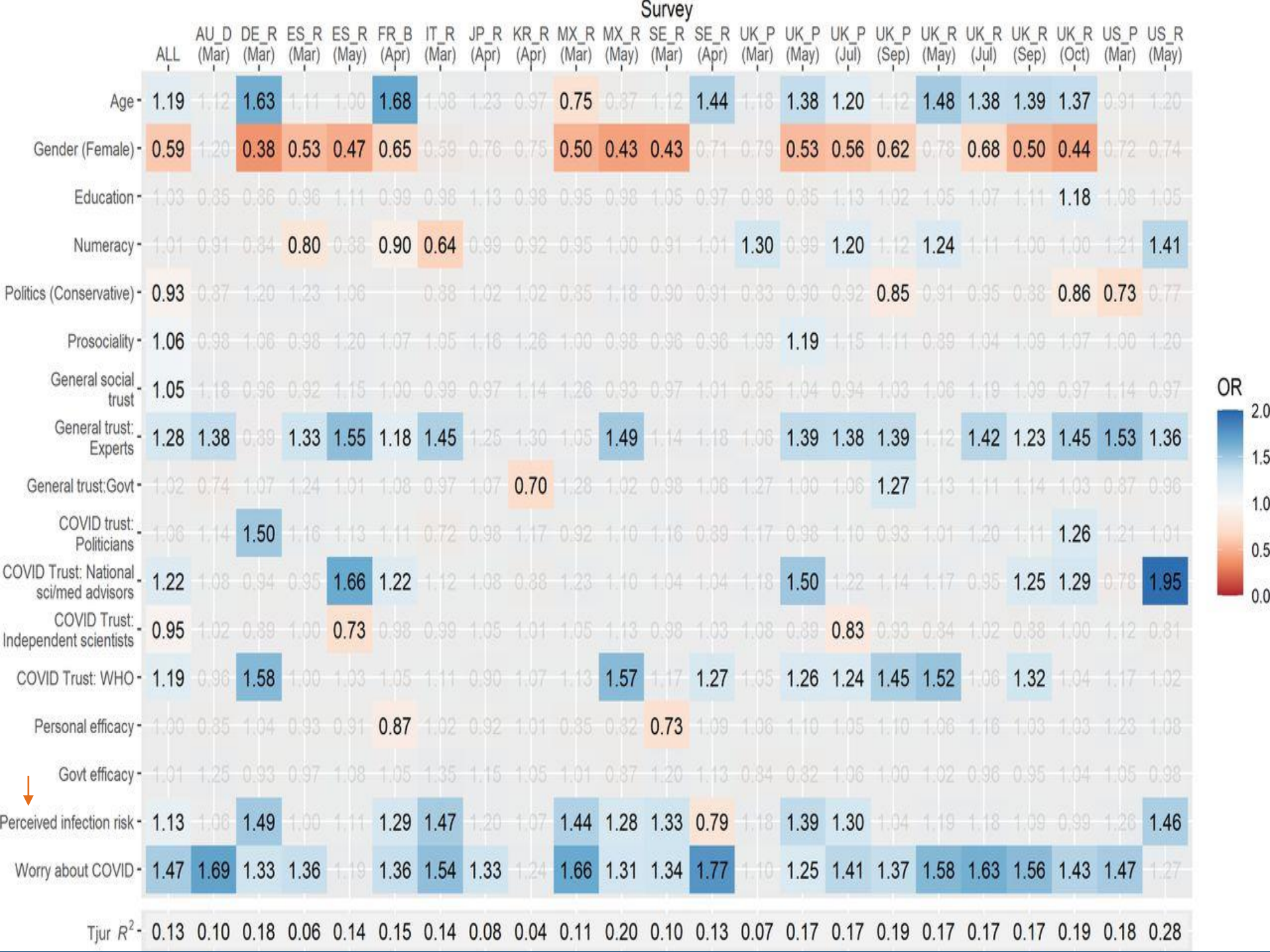
Sander van der Linden

**Professor of Social Psychology in Society
Cambridge Social Decision-Making Lab (CSDM)
Department of Psychology, University of Cambridge**

@Sander_vdLinden

BMJ Open Correlates of intended COVID-19 vaccine acceptance across time and countries: results from a series of cross-sectional surveys

John R Kerr ^{1,2} Claudia R Schneider ^{1,2} Gabriel Recchia ¹
Sarah Dryhurst ¹ Ullrika Sahlin ³ Carole Dufouil ^{4,5} Pierre Arwidson,⁶
Alexandra LJ Freeman ¹ Sander van der Linden ²



Risk Perceptions of COVID-19 Around the World



Journal of Risk Research >

Volume 23, 2020 - Issue 7-8: COVID-19 Special Issue

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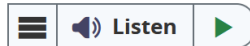
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Research Article

Risk perceptions of COVID-19 around the world

Sarah Dryhurst , Claudia R. Schneider , John Kerr , Alexandra L. J. Freeman , Gabriel Recchia ,
Anne Marthe van der Bles , ...show all

Pages 994-1006 | Received 15 Apr 2020, Accepted 16 Apr 2020, Published online: 05 May 2020

Download citation

<https://doi.org/10.1080/13669877.2020.1758193>



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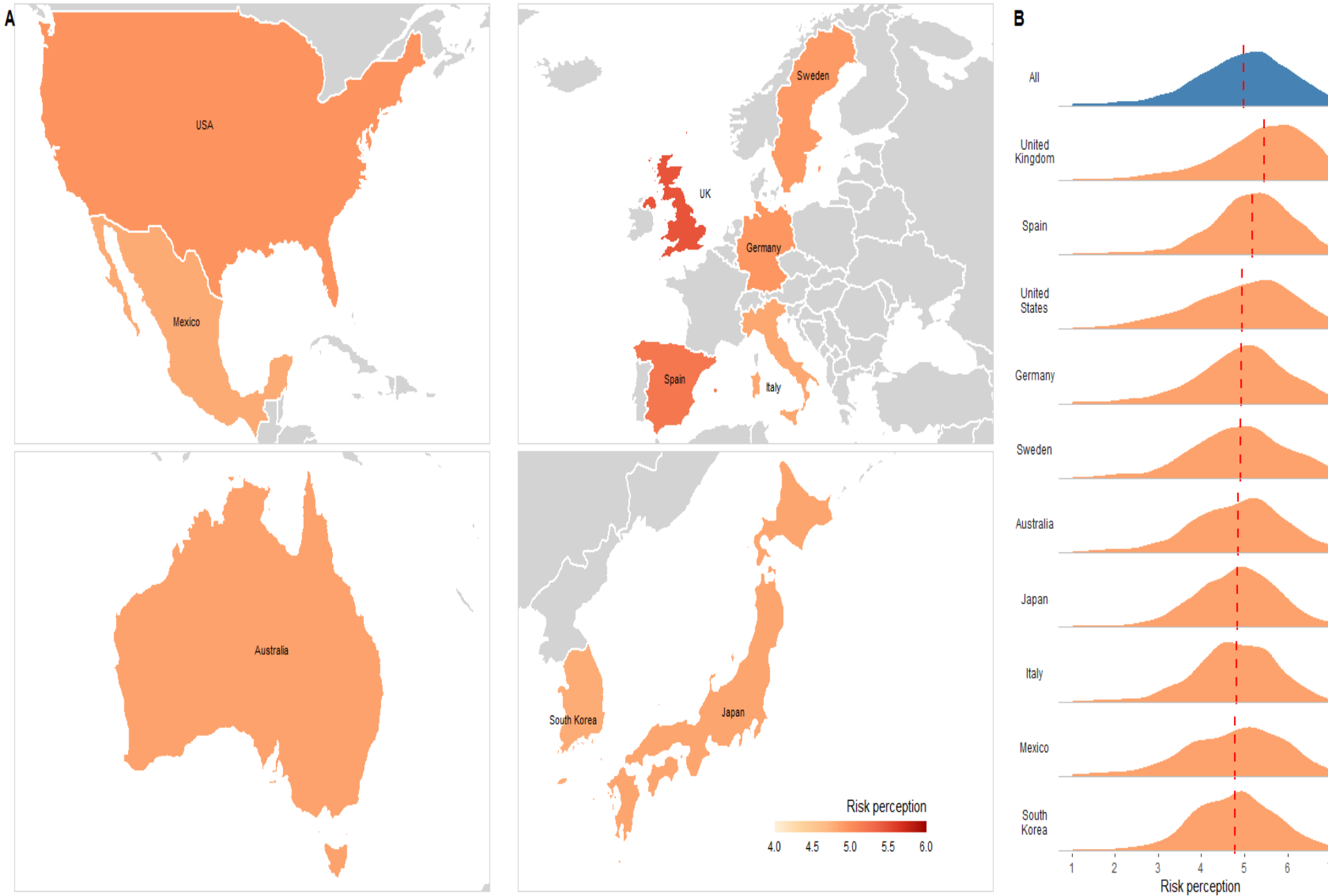
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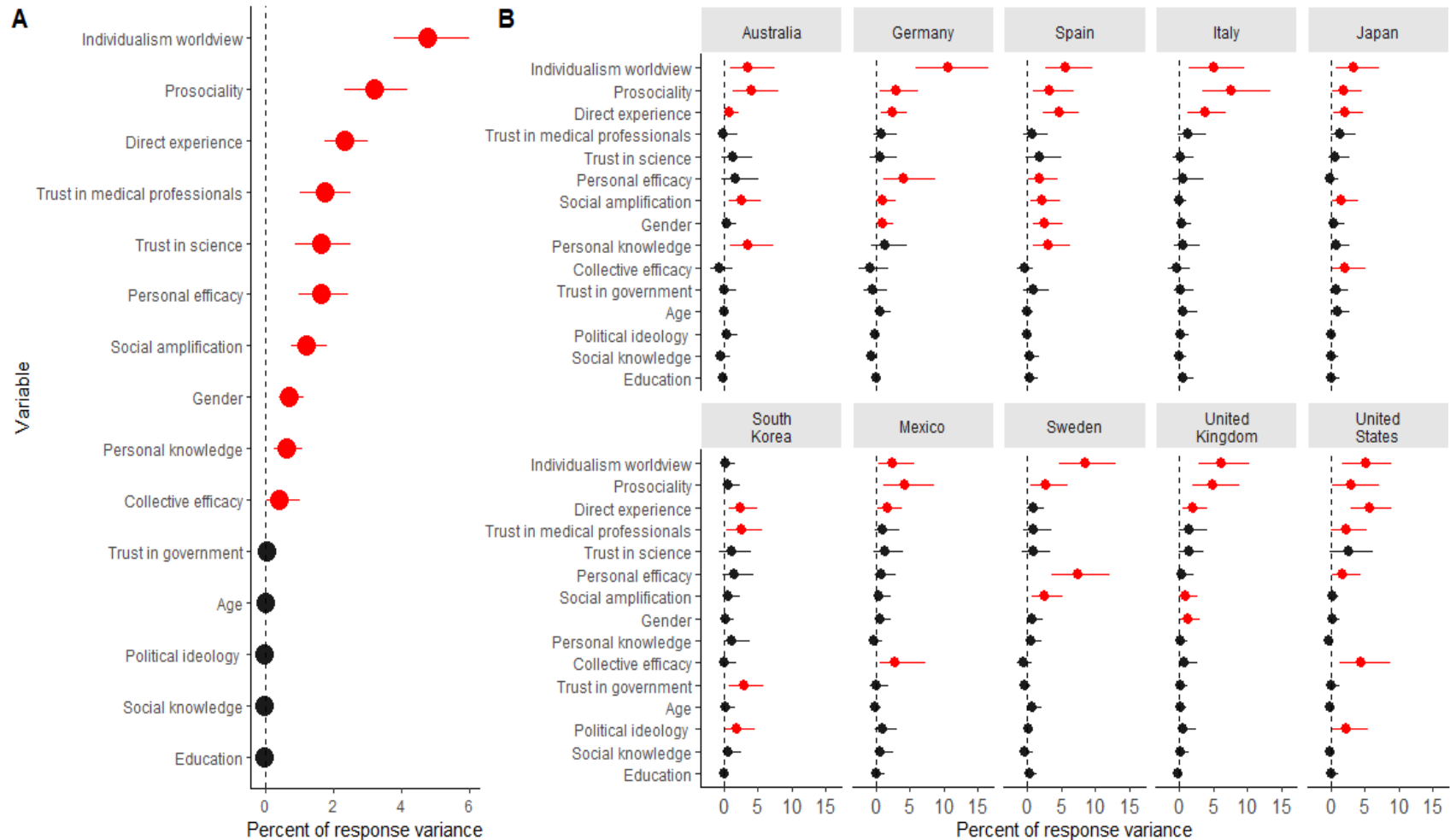
Abstract

In this article

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Risk Perceptions of COVID-19 Around the World



Risk Perceptions of COVID-19 Around the World



Journal of Risk Research >

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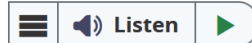
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Research Article

COVID-19 risk perception: a longitudinal analysis of its predictors and associations with health protective behaviours in the United Kingdom

Claudia R. Schneider , Sarah Dryhurst , John Kerr , Alexandra L. J. Freeman , Gabriel Recchia , David Spiegelhalter & Sander van der Linden ...show less

Pages 294-313 | Received 08 Feb 2021, Accepted 11 Feb 2021, Published online: 22 Mar 2021

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The (In)stability of risk perception

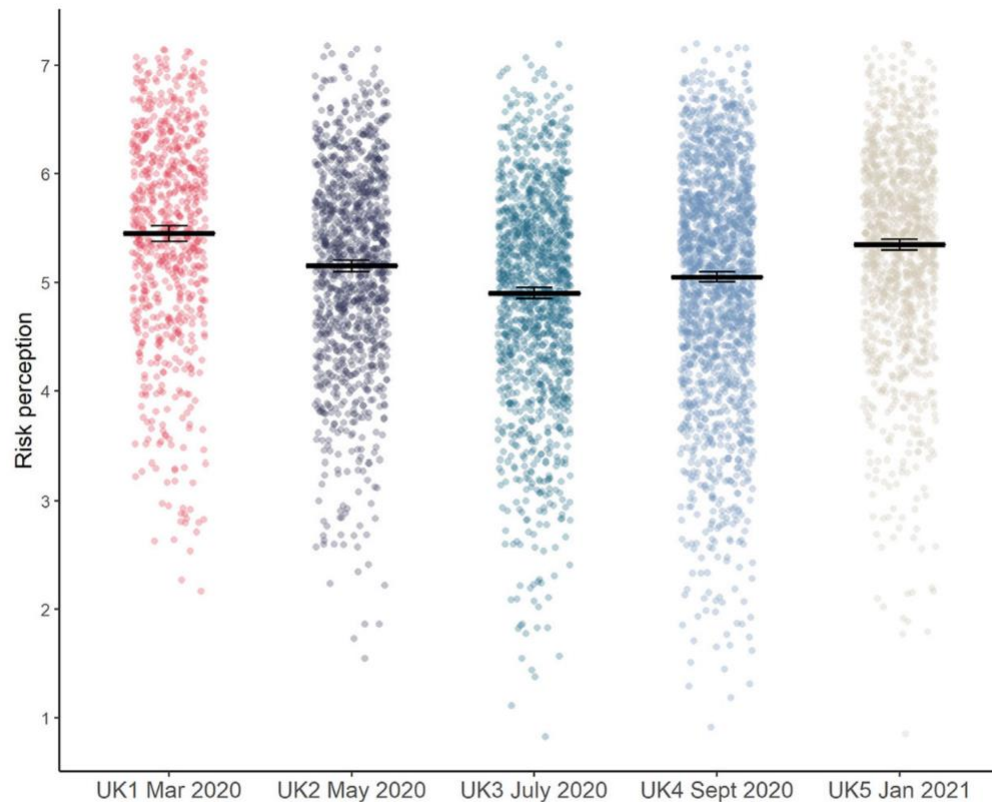


Figure 1. Risk perception over time in the UK.

Note: Y-axis denotes level of perceived risk (1-low to 7-high). X-axis denotes time points at which survey data was collected. The UK1 data from March 2020 (data depicted in red) serves as the baseline and has been reported in Dryhurst et al. (2020).

The (In)stability of risk perception

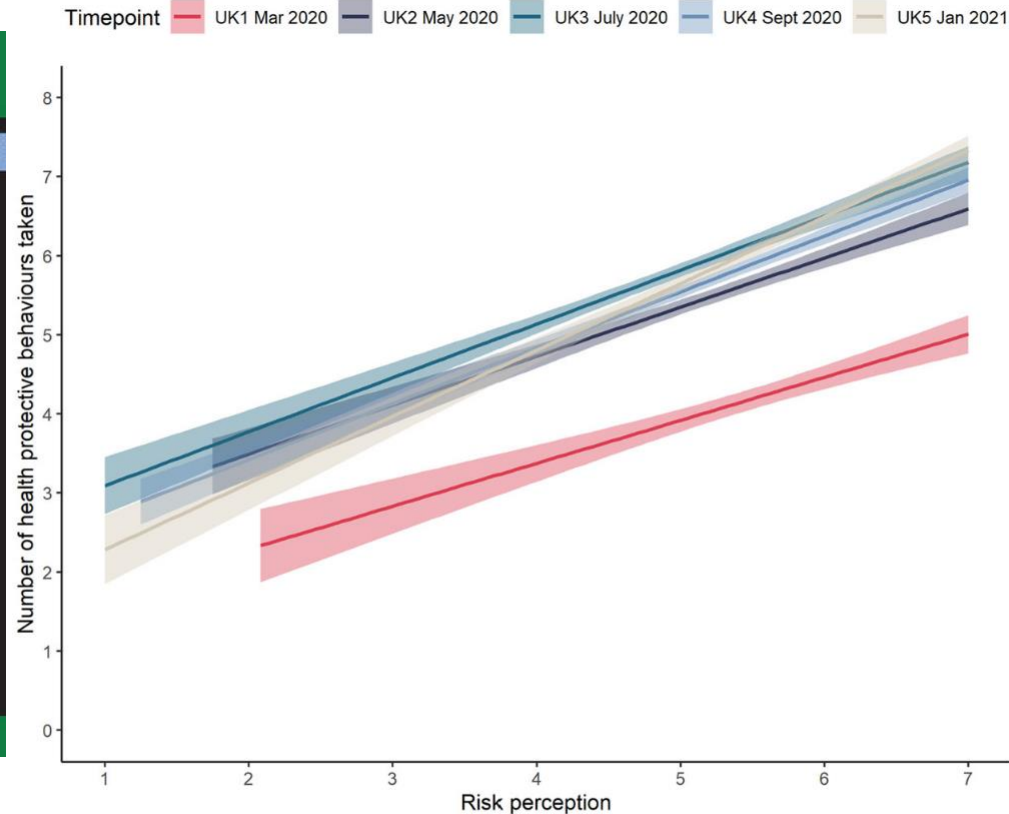
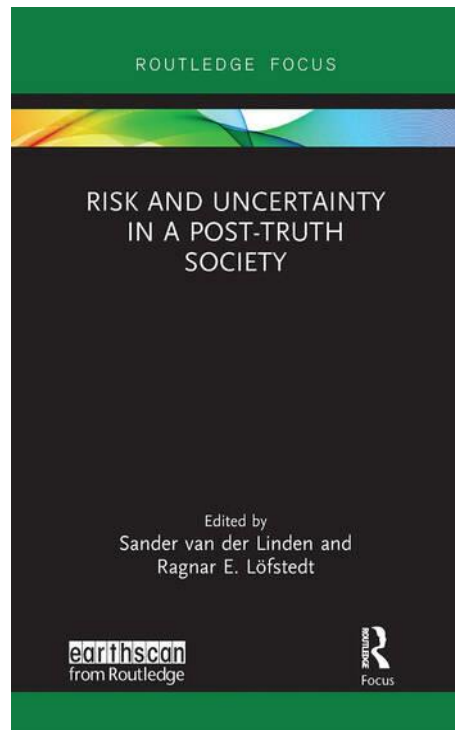


Figure 7. Plot of time by risk perception interaction on health protective behaviours.

Note: Y-axis denotes number of health protective behaviours taken (0-8). X-axis denotes level of perceived risk (1-low, 7-high). Survey time point depicted in color legend on top of the panel.

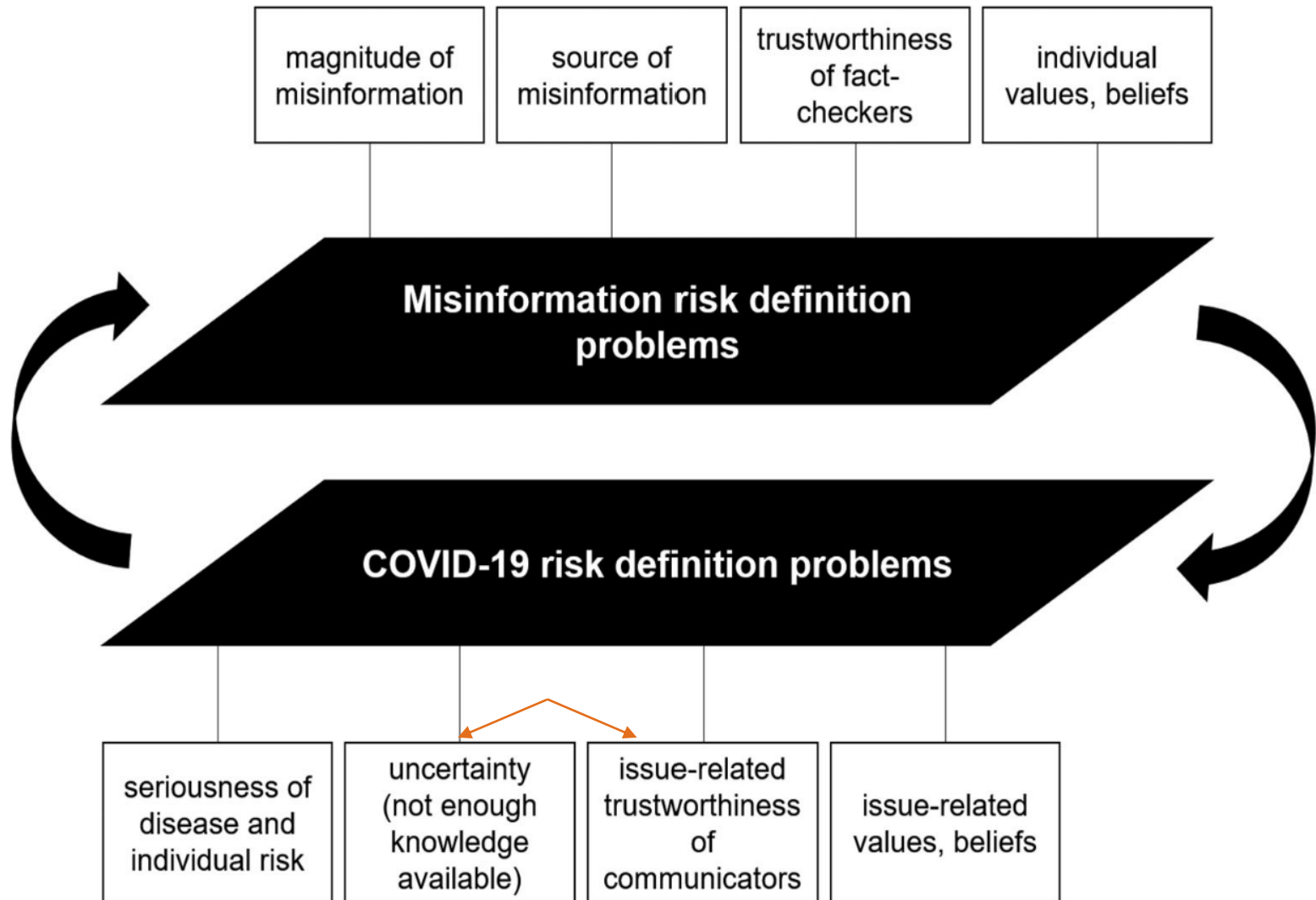


Figure 1. A multi-layered problem of risk definition in the context of the COVID-19 pandemic. (Note: This graphic does not aim to be all-encompassing.).

[nature](#) > [nature podcast](#) > [article](#)

NATURE PODCAST | 03 November 2020

‘Stick to the science’: when science gets political

HOW CAN SCIENCE HELP CREATE
TRUST IN SOCIETY?

Onora O'Neill interview



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COMMENT | 18 November 2020

Five rules for evidence communication

Avoid unwarranted certainty, neat narratives and partisan presentation; strive to inform, not persuade.

[Michael Blastland](#), [Alexandra L. J. Freeman](#) , [Sander van der Linden](#), [Theresa M. Marteau](#) & [David Spiegelhalter](#) 



Inform

vs

Persuade



Informed consent

Marketing

Public health? Science advisor?

The Five Rules

nature

COMMENT | 18 November 2020

Five rules for evidence communication

Recommendation	Description
Inform, not persuade	An overarching recommendation to communicate with aim of informing the decision-maker's choice, rather than pushing them towards a given option.
Offer balance, not false balance	Be clear about the benefits and costs or risks associated with decision options.
Disclose uncertainties	Clearly describe uncertainties around the evidence presented.
State evidence quality	Provide information about the quality of the evidence drawn upon.
Inoculate against misinformation	Identify and pre-empt circulating misinformation or misperceptions about the topic.

PROVE Framework

- **Pre-bunk** (Inoculate against misinformation)
- **Reliably Inform** (Inform, not persuade)
- **Offer balance** (Offer balance, not false balance)
- **Verify quality** (State evidence quality)
- **Explain uncertainty** (Disclose uncertainties)

The Risk of Transparency....

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RESEARCH ARTICLE | CORONAVIRUS



Model uncertainty, political contestation, and public trust in science: Evidence from the COVID-19 pandemic

S. E. KREPS AND D. L. KRINER



Journal of Risk Research >

Volume 24, 2021 - Issue 5: Evidence based uncertainty communication

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Original Articles

Evidence-based uncertainty analysis: What should we now do in Europe? A view point

Ragnar Lofstedt & Frederic Boudier

Pages 521-540 | Received 15 Feb 2017, Accepted 23 Feb 2017, Published online: 27 Apr 2017

Download citation

<https://doi.org/10.1080/13669877.2017.1316763>



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The Risk of Transparency....

That so-called “expert” was me



Claire Fox ✓ @Fox_Claire · Jan 21, 2021



FGS message from one of experts on @BBCNewsnight that even if you've had the **vaccine**, you should behave cautiously as though you haven't had it, surely fuels **anti-vaxx** conspiracies. Demoralising conclusion: what's the point? No balancing voice or probing questions #Newsnight Grrr



200



325



1,745



Communicating uncertainty about facts

PNAS Proceedings of the National Academy of Sciences of the United States of America

Keyword, Author,

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NEW RESEARCH IN Physical Sciences Social Sciences

RESEARCH ARTICLE

The effects of communicating uncertainty on public trust in facts and numbers



Anne Marthe van der Bles, Sander van der Linden, Alexandra L. J. Freeman, and David J. Spiegelhalter

PNAS April 7, 2020 117 (14) 7672-7683; first published March 23, 2020 <https://doi.org/10.1073/pnas.1913678117>

Edited by Arild Underdal, University of Oslo, Oslo, Norway, and approved February 20, 2020 (received for review August 7, 2019)



Dr Anne Marthe van der Bles

Uncertainty about facts: BBC and Unemployment

Home UK World Business Politics Tech Science Health Family & Education

Business Your Money Market Data Markets Companies Economy

UK unemployment falls to 1.44 million

24 January 2018 1350

f t w e Share



UK unemployment fell by 3,000 to 1.44 million in the three months to November, official figures show.

The number of people in work increased sharply in almost a year, and wages rose at their fastest rate since 2012, the Office for National Statistics said.

Table of contents

1. Main points for September to November 2017
2. Summary of latest labour market statistics
3. Things you need to know about this release
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Uncertainty about facts: BBC and Unemployment

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Business Your Money Market Data Markets Companies Economy

UK unemployment falls to 1.44 million

24 January 2018 1350



UK unemployment fell by 3,000 to 1.44 million in the three months to November, official figures show.

The number of people in work increased sharply in almost a year, as wages rose at their fastest rate since 2010, the Office for National Statistics said.

numbers. For example, for September to November 2017, the estimated change in the number of unemployed people since June to August 2017 was a small fall of 3,000, with a 95% confidence interval of plus or minus 77,000. This

Judgments about “facts” under uncertainty

van der Bles, van der Linden, Freeman, & Spiegelhalter (2020).

- **Participants:** 1122 people, recruited on Prolific Academic
 - Mean age = 37.72, SD = 12.12
 - 68.5% female, 31.2% male.
- **Design:** 3 x 3 between-subjects

Type of uncertainty communication

Topic

	No uncertainty (control)	Numeric	Verbal
Tigers (number tigers left in India)			
Climate (av. increase in global sea surface temp)			
Unemployment (number UK current unemployed)			

Judgments about “facts” under uncertainty

van der Bles, van der Linden, Freeman, & Spiegelhalter (in revision, PNAS).

Unemployment:

Recently, an official report came out with new information about the unemployment rate in the United Kingdom. This report stated that between April and June 2017, government statistics showed that an estimated 1,484,000 people in the UK were unemployed.

Unemployment:

Recently, an official report came out with new information about the unemployment rate in the United Kingdom. This report stated that between April and June 2017, government statistics showed that an estimated 1,484,000 people in the UK were unemployed (minimum 1,413,000 to maximum 1,555,000).

Unemployment:

Recently, an official report came out with new information about the unemployment rate in the United Kingdom. This report stated that between April and June 2017, government statistics showed that an estimated 1,484,000 people in the UK were unemployed. The report states that there is some uncertainty around this estimate, it could be somewhat higher or lower.

Judgments about “facts” under uncertainty

van der Bles, van der Linden, Freeman, & Spiegelhalter (in revision, PNAS).

Tigers:

Recently, an official report came out with new information about the number of tigers in India. This report stated that in 2015, there were an estimated **2,226 tigers** left in India. (**minimum 1,945 to maximum 2,491**). The report states that there is some uncertainty around this estimate, it could be somewhat higher or lower.

Climate science:

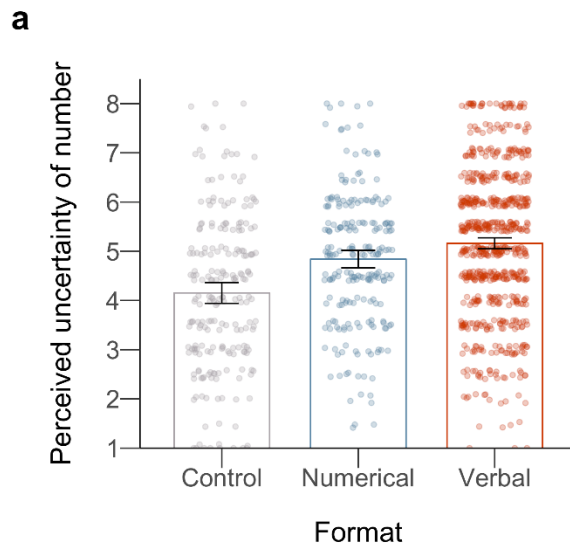
Recently, an official report came out with new information about global warming. This report stated that between 1880 and 2012, the earth's average global surface temperature has increased by an estimated **0.85°C** (**minimum 0.65 to maximum 1.06**). The report states that there is some uncertainty around this estimate, it could be somewhat higher or lower.

Typical Dependent measures

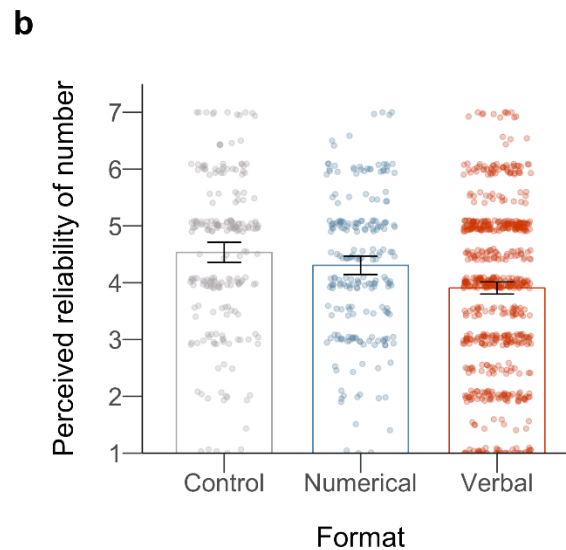
- Perceived uncertainty:
 - **To what extent do you think that this number is certain or uncertain?**
 - *7-point scale: very certain to very uncertain*
- Trust:
 - **To what extent do you think this number is reliable?**
 - *7-point scale: Not at all - very reliable*
 - **To what extent do you think the writers of this report are trustworthy?**
 - *7-point scale: Not at all - very trustworthy*

Results (collapsed)

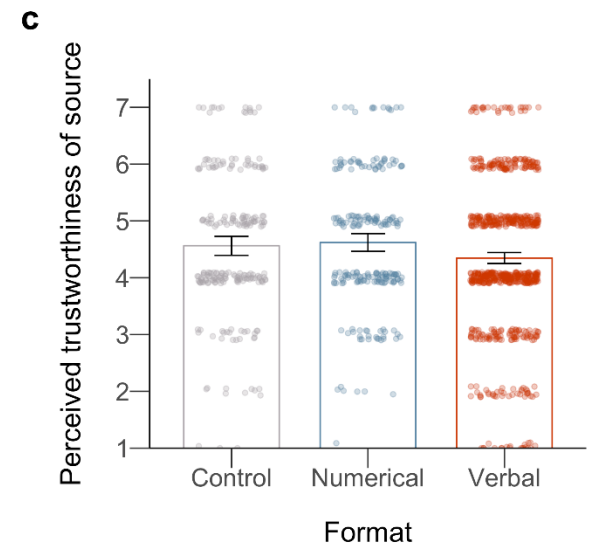
To what extent do you think this number is uncertain?



To what extent do you think this number is reliable?

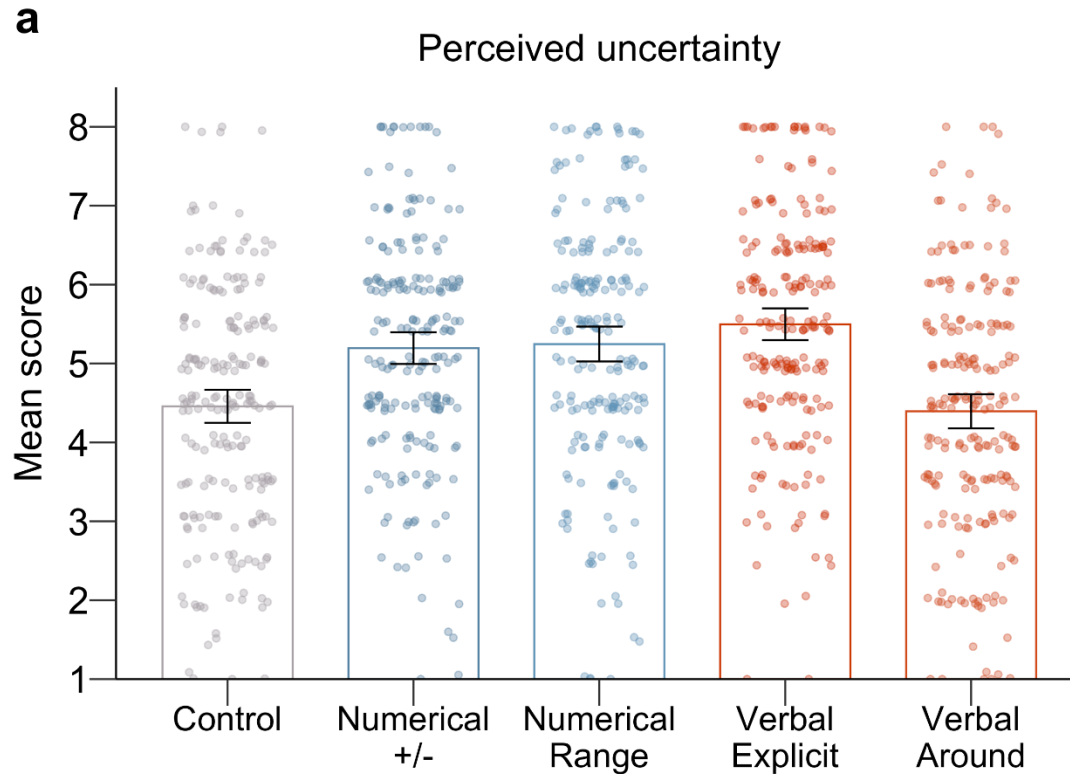


To what extent do you think the writers of the report are trustworthy?

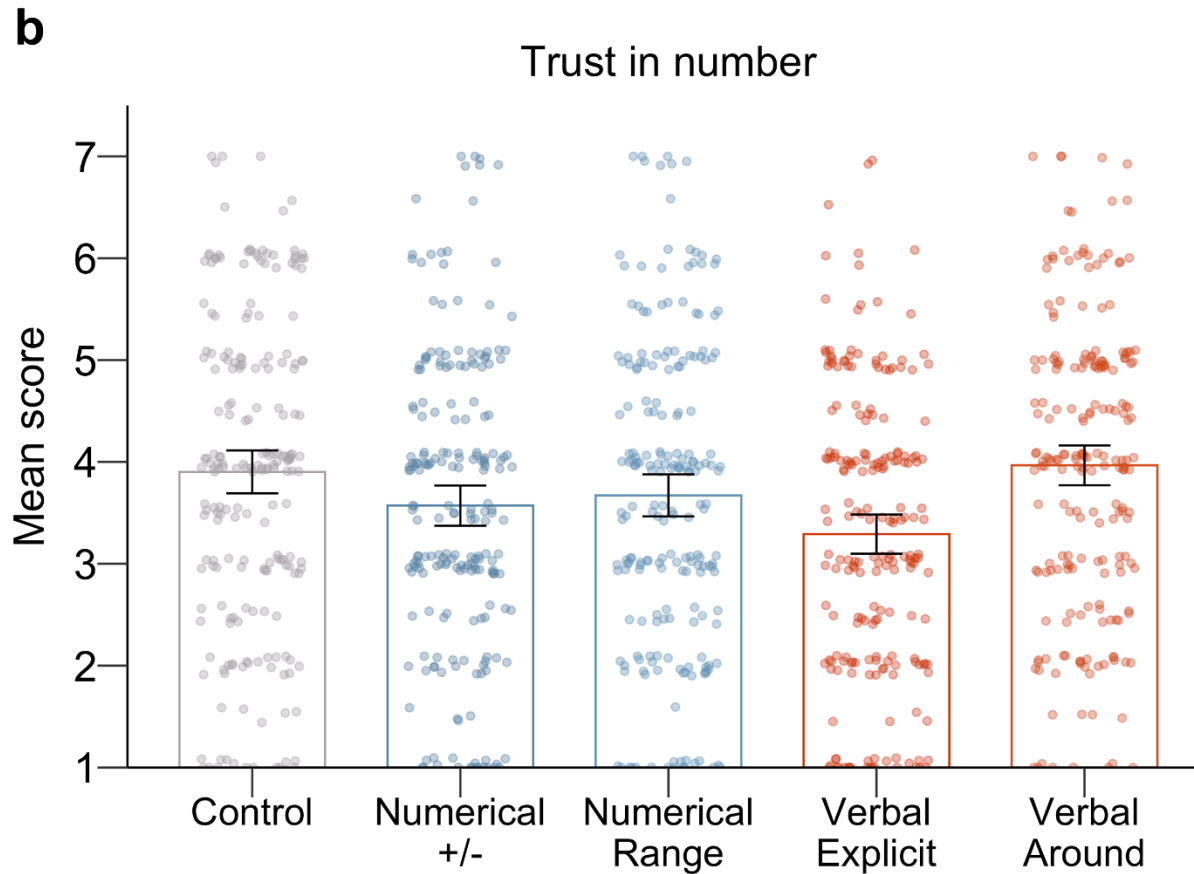


error bars: 95% CI

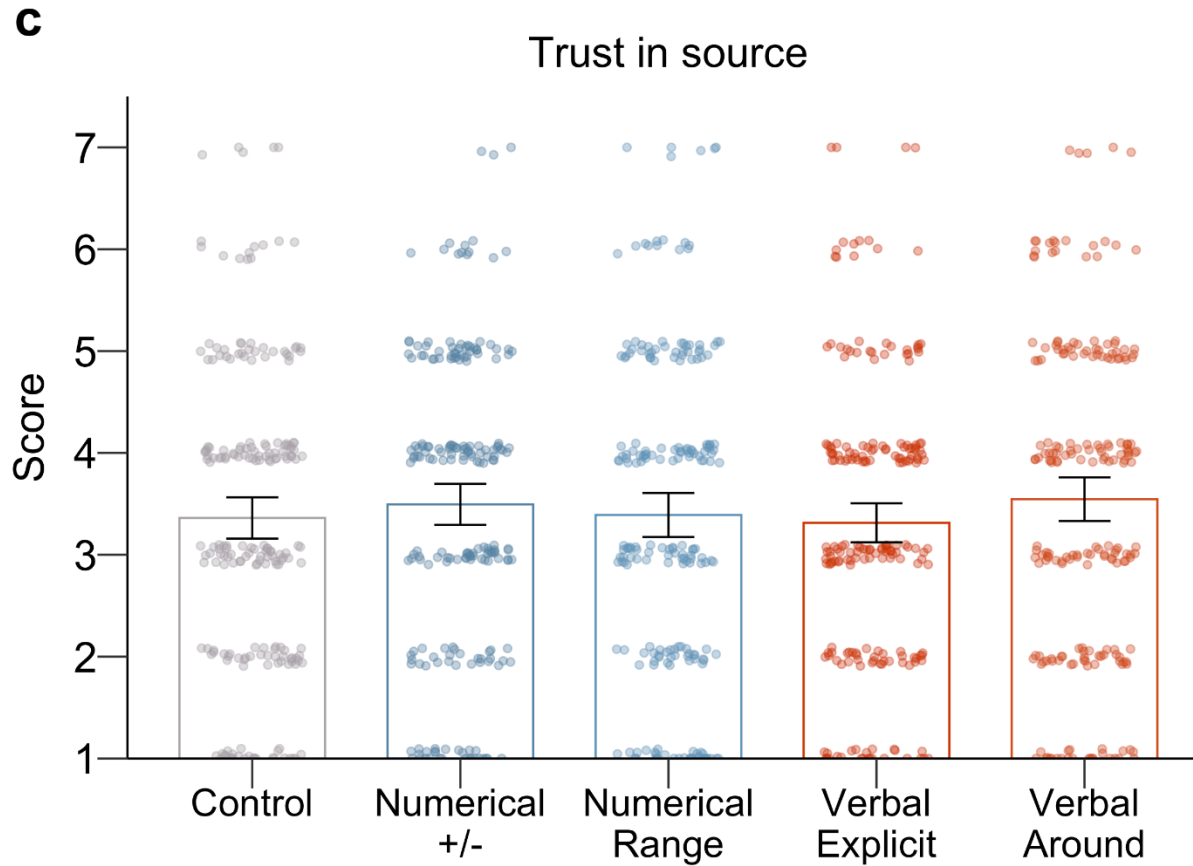
Results (uncertainty)



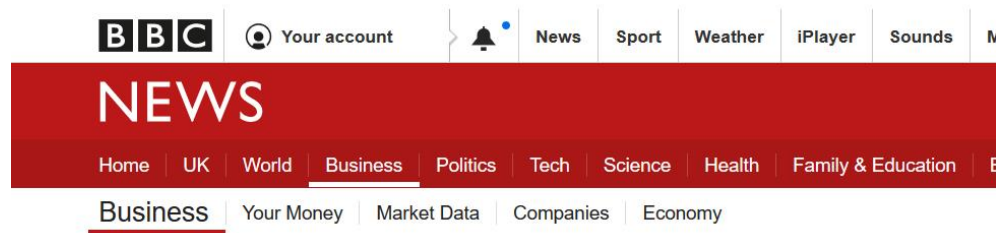
Results (trust)



Results (trust)



BBC (Digital Field Study)



UK jobs market 'shows signs of slowing'

15 October 2019



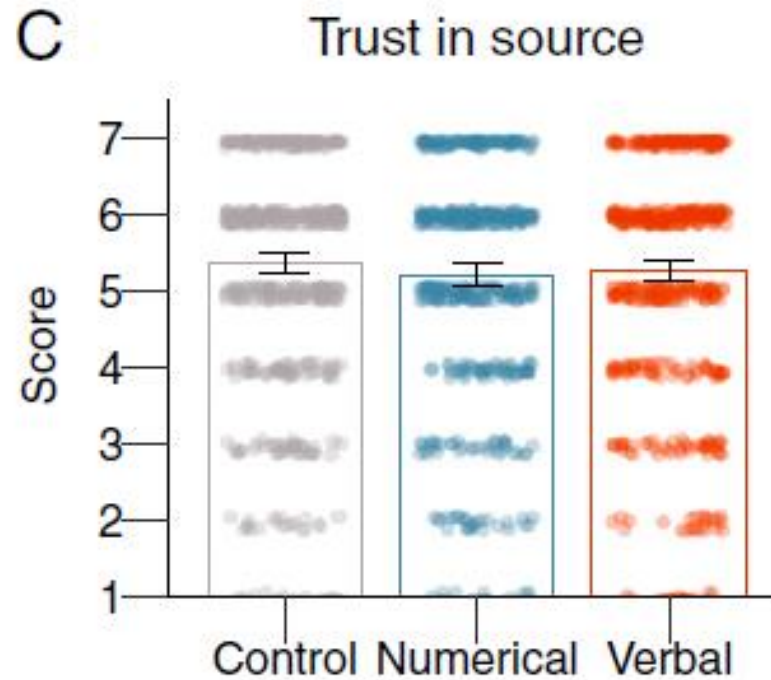
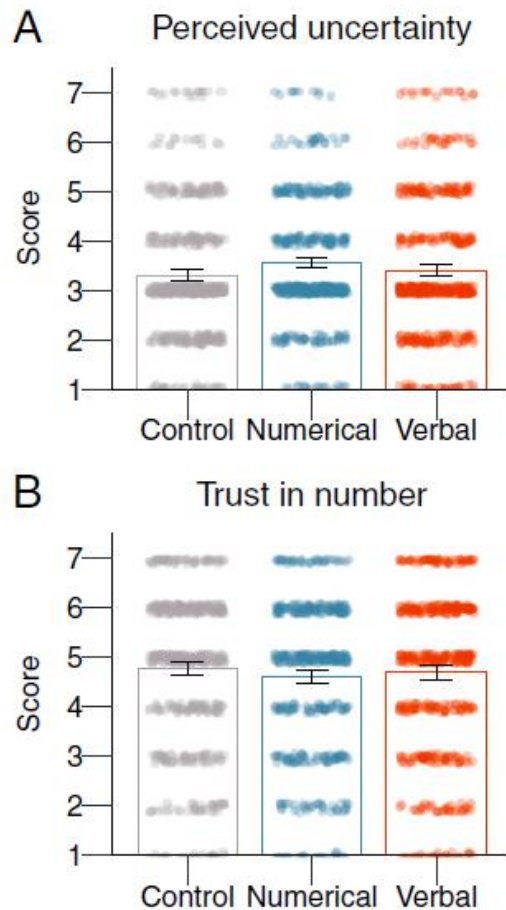
The **UK jobs market** is **showing signs of slowing**, after a surprise drop in the number of people in work. The unemployment rate unexpectedly rose to an estimated 3.9% (between 3.7%-4.1%) in the June-to-August period from 3.8%, after the number of people in work unexpectedly fell by 56,000, official figures **showed**. 15 Oct 2019



www.bbc.co.uk/news/business-50053747 Click here to take part in a short study about this article run by the University of

UK jobs market 'shows signs of slowing' - BBC News

BBC (Field Study)



Research questions



Dr John Kerr

- Compared to one-sided, persuasive messages, are communications following PROVE guidelines perceived as more trustworthy and do they elicit less psychological reactance?
- Exploratory: Are these effects moderated by prior beliefs?

Inform

vs

Persuade

Understand

vs

Believe

Better informed

vs

Changed behaviour

Information

vs

A message

Be trustworthy

vs

Be trusted

Standard communication

Evidence communication
(AKA PROVE)



COVID-19

[Vacuna recombinante]

Proteína S



MSD

Merck Sharp & Dohme
Postbus 581, 2003 PC
Haarlem, Países Bajos

Exp. Date:

[Home](#) > [Health A to Z](#) > [Coronavirus \(COVID-19\)](#) > [Coronavirus \(COVID-19\) vaccination](#)

Coronavirus (COVID-19) vaccine

The coronavirus (COVID-19) vaccine is safe and effective. It gives you the best protection against COVID-19.

Who can get the COVID-19 vaccine

The NHS is currently offering the COVID-19 vaccine to people most at risk.



How effective is the COVID-19 vaccine?

The 1st dose of the COVID-19 vaccine should give you good protection from COVID-19 from 3 or 4 weeks after you've had it.

But you need to have the 2 doses of the vaccine to give you longer lasting protection.

There is a chance you might still get or spread COVID-19 even if you have the vaccine.

This means it is important to:

- continue to follow [social distancing guidance](#)
- if you can, wear something that covers your nose and mouth in places where it's hard to stay away from other people

How safe is the COVID-19 vaccine?

The vaccines approved for use in the UK have met strict standards of safety, quality and effectiveness set out by the independent Medicines and Healthcare products Regulatory Agency (MHRA).

Any COVID-19 vaccine that is approved must go through all the clinical trials and safety checks all other licensed medicines go through. The MHRA follows international standards of safety.

Other vaccines are being developed. They will only be available on the NHS once they have been thoroughly tested to make sure they are safe and effective.

So far, millions of people have been given a COVID-19 vaccine and reports of serious side effects, such as allergic reactions or clotting problems, have been very rare.

Standard

The COVID-19 vaccine is safe and effective. It gives you the best protection against COVID-19.

Evidence

The COVID-19 vaccine is now being offered in the UK. This information is designed to help you make an informed decision about vaccination.

All medical treatments have potential benefits and potential side effects which should be considered.

Comparison of COVID-19 information and version adapted using PROVE criteria (see *Nature* article: [Five rules for evidence communication](#))

CURRENT: Coronavirus (COVID-19) vaccine	PROVE: Coronavirus (COVID-19) vaccination: making your decision	PROVE Criteria notes	
The coronavirus (COVID-19) vaccine is safe and effective. It gives you the best protection against coronavirus.	The coronavirus (COVID-19) vaccine is now being offered in the UK. This information is designed to help you make your own informed decision about vaccination, whether to accept the offer or not.	Inform not persuade	Dr. S.L. van der... I think this kind of wording may Dr. S.L. van der... Inform not persuade
	All medical treatments have potential benefits and potential side effects. You should weigh these up when making your decision.		Dr. S.L. van der... Formatted
How safe is the COVID-19 vaccine? The vaccines approved for use in the UK have met strict standards of safety, quality and effectiveness set out by the independent Medicines and Healthcare products Regulatory Agency (MHRA). Any coronavirus vaccine that is approved must go through all the clinical trials and safety checks all other licensed medicines go through. The MHRA follows international standards of safety. Other vaccines are being developed. They will only be available on the NHS once they have been thoroughly tested to make sure they are safe and effective. So far, millions of people have been given a COVID-19 vaccine and reports of serious side effects, such as allergic reactions, have been very rare. No long-term complications have been reported.	How safe is the COVID-19 vaccine? Rapid approvals process The vaccines approved for use in the UK have met strict standards of safety, quality and effectiveness set out by the independent Medicines and Healthcare products Regulatory Agency (MHRA). Any coronavirus vaccine that is approved must go through all the clinical trials and safety checks all other licensed medicines go through. However, the medicines regulators have provided 'rolling review' which means that they have been able to assess the data at it has come in and speed up the authorisation application assessment. The MHRA follows international standards of safety. Other vaccines are being developed. They will only be available on the NHS once they have been thoroughly tested to make sure they are safe and effective. So far, millions of people have been given a COVID-19 vaccine and reports of serious side effects, such as allergic reactions, have been very rare. No long-term complications have been reported.	Prebunking "Prebunking requires anticipating potential misunderstandings or disinformation attacks"	Alexandra Free... I worry about having this as the Alexandra Free... Since the safety information Alexandra Free... This is unsubstantiated, Dr. S.L. van der... or is this simply a fact? Theresa Marteau Formatted
How effective is the COVID-19 vaccine? The 1st dose of the COVID-19 vaccine should give you good protection from coronavirus. But you need to have the 2 doses of the vaccine to give you longer lasting protection.	Potential benefits of the COVID-19 vaccine The vaccines are designed to protect you against becoming ill with COVID-19. The vaccine available in the UK at the moment has been tested in over 10,500 volunteers aged 18-64 and over 3,500 over 65s, including many ethnicities and people with underlying health conditions. These volunteers were compared with the same number of people who got a	State evidence quality – use numbers "Audiences also judge the credibility of information based on the quality of the underlying evidence, more than its clarity, the usual priority for a communications department."	Dr. S.L. van der... benefits and risk with numeric John Kerr Punctuation added for Dr. S.L. van der... Quality of evidence

Standard

Current message

COVID-19 (coronavirus) vaccine

The COVID-19 vaccine is safe and effective. It gives you the best protection against COVID-19.

How safe is the COVID-19 vaccine?

The vaccines approved for use in the UK have met strict standards of safety, quality and effectiveness set out by the independent Medicines and Healthcare products Regulatory Agency (MHRA).

Any COVID-19 vaccine that is approved must go through all the clinical trials and safety checks all other licensed medicines go through. The MHRA follows international standards of safety.

Other vaccines are being developed. They will only be available on the NHS once they have been thoroughly tested to make sure they are safe and effective.

So far, millions of people have been given a COVID-19 vaccine and reports of serious side effects, such as allergic reactions or blood clots, have been very rare. No long-term health complications have been reported.

How effective is the COVID-19 vaccine?

The first dose of the COVID-19 vaccine should give you good protection from COVID-19. But you need to have the 2 doses of the vaccine to give you longer lasting protection.

There is a chance you might still get or spread COVID-19 even if you have the vaccine. This means it is important to:

- continue to follow social distancing guidance,
- if you can, wear something that covers your nose and mouth in places where it's hard to stay away from other people.

COVID-19 vaccine side effects

Most side effects of the COVID-19 vaccine are mild and should not last longer than a week, such as: a sore arm where the needle went in,

- feeling tired,
- a headache,
- feeling achy,
- feeling or being sick.

COVID-19 vaccine ingredients

The approved COVID-19 vaccines do not contain any animal products or egg.

Evidence

PROVE message

COVID-19 (coronavirus) vaccination: making your decision

The COVID-19 vaccine is now being offered in the UK. This information is designed to help you make an informed decision about vaccination.

All medical treatments have potential benefits and potential side effects which should be considered.

Rapid approval process

Any COVID-19 vaccine that is approved must go through all the clinical trials and safety checks all other licensed medicines go through.

However, the medicines regulators have provided 'rolling review'. This means that they have been able to assess the data as it has come in, to speed up the authorisation application assessment.

Potential benefits of the COVID-19 vaccine

The vaccines are designed to protect you against becoming ill with COVID-19.

The vaccines available in the UK have all been through similar testing. In a typical clinical trial, one of the vaccines has been tested in over 10,500 volunteers aged 18-64 and over 3,500 over 65, including many ethnicities and people with underlying health conditions. These volunteers were compared with the same number of people who got a dummy (placebo) injection.

During the course of the trial, people in both groups tested positive for Covid-19.

- 7 people who had the vaccine got COVID-19
- 156 people who had the dummy injection got COVID-19.

This means that there were 94% fewer cases of COVID-19 in those who have been vaccinated (86% in the over-65s). Researchers think that the vaccine will prevent somewhere between 89% to 97% of cases overall.

The other vaccines available were tested in very similar ways and with very similar outcomes.

It is not currently known how long protection lasts. The people vaccinated in the clinical trial will continue to be followed for 2 years.

There is a chance you might still get sick or spread COVID-19 even if you have the vaccine.

This means it is important to:

- continue to follow social distancing guidance,
- if you can, wear something that covers your nose and mouth in places where it's hard to stay away from other people.

COVID-19 vaccine side effects

Most side effects of the COVID-19 vaccine are mild and should not last longer than a week. In clinical trials, certain side effects were more common for people who received the vaccine compared to those who received a dummy (placebo) injection:

Side effect	Percent of people reporting side effect in clinical trial	
	Received a vaccine	Received a dummy injection
a sore arm where the needle went in	90%	19%
feeling tired	68%	36%
a headache	63%	36%
feeling achy	60%	20%
feeling or being sick	24%	7%

So far, 2.1 million people in the UK received at least the first dose of a COVID-19 vaccine and reports of serious possible side effects, such as allergic reactions or blood clots, have been very rare (between 3 and 5 reports per 10,000 vaccinations).

How vaccines work

Our natural immune system helps us fight infection from harmful bacteria or viruses by creating antibodies. Vaccines work by triggering our bodies to produce antibodies without the actual dangerous bacteria or virus itself being there.

There are lots of myths about the vaccine: you cannot get COVID-19 from the vaccine, it does not affect your DNA, nor your fertility. The vaccines also do not contain any animal products or egg.

Experiment I

- March 2021, prior to general vaccine roll out
- Representative, *unvaccinated* UK sample (18-50)
- $N = 1,959$



Standard communication

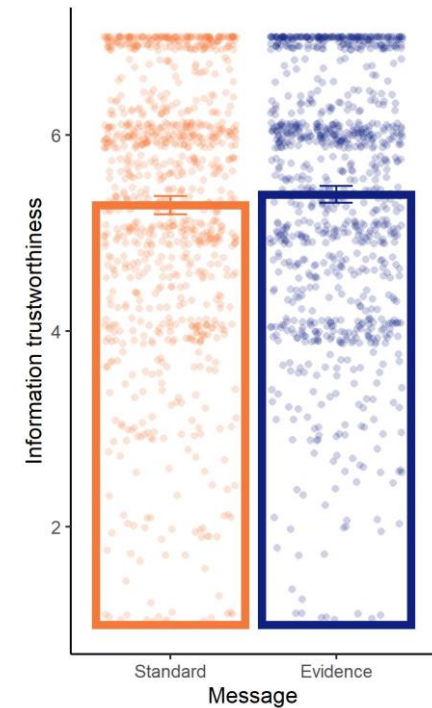
Evidence communication
(AKA PROVE)

Trustworthiness - Information



Please tell us to what extent you think the information you read was...

	Not at all						Very much
Accurate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reliable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trustworthy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

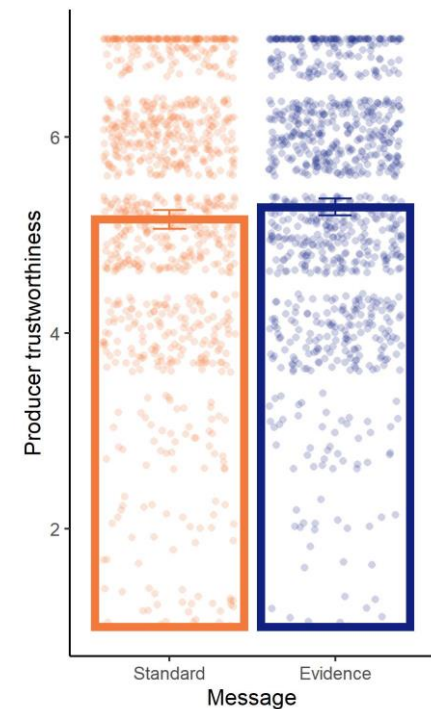


Trustworthiness - Producer



To what extent do you think the people who are responsible for producing this message are trustworthy?

Not trustworthy at all						Very trustworthy
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Reactance?

“an unpleasant motivational arousal that emerges when people experience a threat to or loss of their free behaviors.”

Triggered by a perception that their freedom of choice is threatened, leading to **emotional** (e.g. anger) and **cognitive** (e.g. counter-arguing) responses.

Reactance - Affective

How did this information make you feel? For each of the feelings below, please indicate on the sliding scales (from 'Not at all' to 'Extremely').

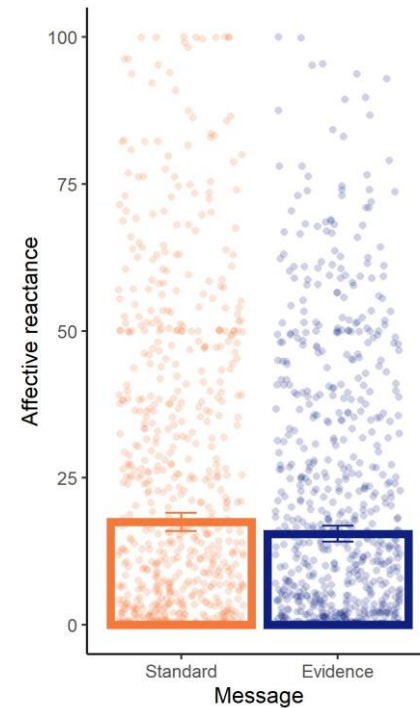
Not at all Extremely

Angry

Hateful

Bitter

Resentful

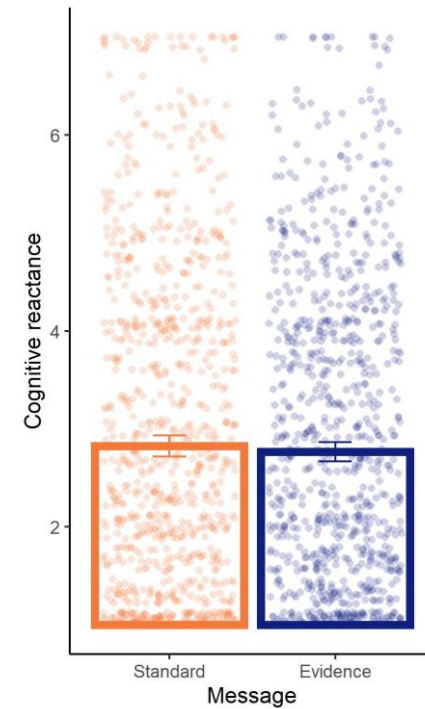


Reactance - Cognitive



Please answer the following questions about the information we showed you.

	No, not at all						Yes, very much so
Did you criticize the message you just saw while you were reading it?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you think of points that went against what was being said while you were reading the message?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While reading the message, were you skeptical of what was being said?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Vaccine intentions (secondary)



Would you take a COVID-19 vaccine (approved for use in the UK) if offered?

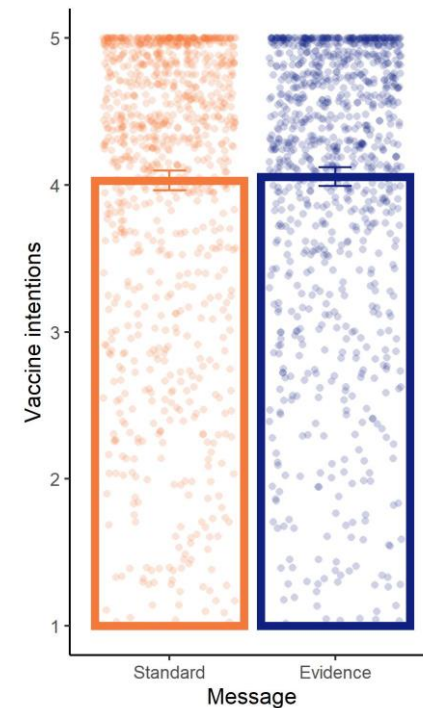
☐ Definitely

☐ Probably

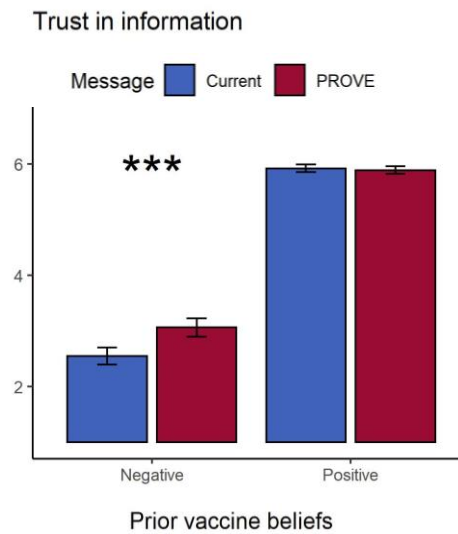
☐ I may or I may not

☐ Probably not

☐ Definitely not



Interactions



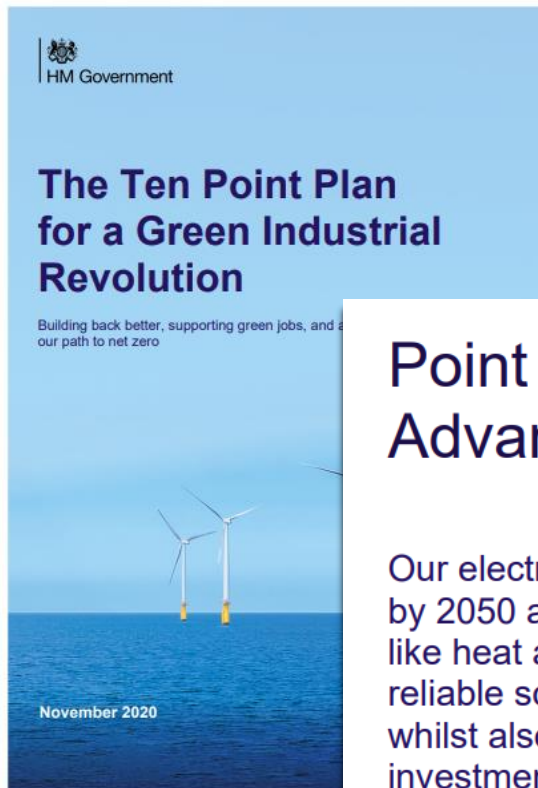
Experiment I - conclusions



- No main effect of message condition on measures of trustworthiness or reactance
- Among participants with negative prior beliefs the Evidence communication was considered **more trustworthy** and **elicited less reactance** than the Standard communication.



Nuclear power



Point 3: Delivering New and Advanced Nuclear Power

Our electricity system will grow and could double in size by 2050 as demand for low-carbon electricity in sectors like heat and transport rises. Nuclear power provides a reliable source of low-carbon electricity. We are pursuing large-scale nuclear, whilst also looking to the future of nuclear power in the UK through further investment in Small Modular Reactors and Advanced Modular Reactors.



DRAFT nuclear power plant messages for PROVE experiment – Winton Centre for Risk and Evidence Communication (23/0/2021).

Below we detail a 'Standard' message modelled on relevant text from the [Ten Point Plan for a Green Industrial Revolution](#) and the 2020 [Energy white paper: Powering our net zero future](#). We also detail an PROVE message edited to incorporate elements of the PROVE framework briefly flagged in the [notes](#) column.

Standard	PROVE	Notes
The government is in the final stages of deciding whether the UK should build a new nuclear power plant.	The government is in the final stages of deciding whether the UK should build a new nuclear power plant.	
The UK has committed to net-zero carbon emissions by 2050. This means replacing – as far as possible - fossil fuels with energy technologies which do not release carbon into the atmosphere.	Nuclear power has benefits and drawbacks. The UK has committed to net-zero carbon emissions by 2050. This means replacing - as far as possible - fossil fuels with energy technologies which do not release carbon into the atmosphere.	Balance
Nuclear power, which is safer , reliable and low-carbon source of power, has a key role to play, alongside other technologies such as renewables as the UK moves towards net-zero greenhouse gas emissions over the next 30 years.	Nuclear power is an energy-dense technology which means it provides large volumes of power from very little land area at low levels of carbon emissions. Nuclear power plants do not produce carbon emissions during operation: the heat produced by nuclear materials is used to boil water, creating steam to drive turbines.	Prebunking misconceptions
It is a technology which provides large volumes of power from very little land area at low levels of carbon emissions.	Another key benefit of nuclear power is that it can provide a consistent level of energy, whereas sources like solar and wind power are dependent on weather.	Uncertainty, evidence quality
A key benefit of nuclear power is that it can provide a consistent level of energy in response to consumer demand, whereas renewable sources of energy like solar and wind power are dependent on weather conditions. The UK needs a source of power that can ensure we can keep the lights on whatever the weather.	Building a new nuclear power plant could support jobs during construction. Estimates based on previous nuclear power plant builds suggest this could peak at around 10,000 jobs, but the evidence behind these estimates is of low quality. The quality of the evidence underlying this estimate is limited though, therefore although the exact impact of a new plant on employment is hard to judge at this time. OR: The exact impact of a new plant on employment is hard to judge though at this time, since the quality of the evidence underlying the given estimate is limited /since the quality of the underlying evidence is limited.	Balance, numeric uncertainty
A large-scale nuclear power plant will also support a peak of around 10,000 jobs during construction, as well as providing ongoing local jobs at a range of different skill levels.	A key benefit of nuclear power is that it can provide a consistent level of energy in response to consumer demand, whereas renewable sources of energy like solar and wind power are dependent on weather.	Uncertainty
The nuclear industry has set a goal to reduce the cost of nuclear new build projects by 30 per cent by 2030. This cost reduction would be passed on in the cost of the electricity produced by nuclear power.	However, a key drawback of nuclear power is that it is more expensive per unit of energy compared to than renewable sources. Government modelling suggests that in 2025 nuclear power will cost between £91 and £132 per megawatt hour compared to between £39 and £52 for onshore wind power and between £39 and £51 for solar power. The quality of the evidence underlying these figures is limited though, as they are modeled projections only.	Balance, acknowledging risks
The UK is therefore keen to weigh up the potential for large-scale new nuclear projects, subject to value-for-money, supported by development funding from the government.	The nuclear industry has set a goal to reduce the cost of nuclear new build projects by 30 per cent by 2030 to make the costs more competitive. However, one government report estimates that the future costs of renewable energy are likely to drop faster than the costs of nuclear power.	
Building a new, state-of-the-art nuclear power station in the UK would be an ambitious project, but could bring investment into the country, and providing jobs and wealth as well as helping to reduce carbon emissions and so help reduce climate change.	The UK nuclear industry has a strong safety record, however, the impact of any safety failures is far greater for nuclear power compared to other energy sources.	Prebunking misconceptions
As a reliable, low-carbon source of energy, nuclear power therefore has an important role to play in helping the UK achieve net zero by 2050.	A key important challenge of nuclear power is the need to operate and to store radioactive waste safely. Currently the most radioactive nuclear waste is stored in a purpose-built facility in the UK, with plans to build a larger underground facility in the future.	

Alexandra Free... I agree that we shouldn't put the

Alexandra Free... I moved this up to where it was

Alexandra Free... I subbed this to try to help match

Alexandra Free... Felt it important that the actual

Alexandra Free... Took Claudia's suggestion and

Claudia We could think of using the term

Claudia This would be another spot

Claudia If we wanted to cut one of the

John Kerr This suggested version

Claudia If we don't want to touch the

John Kerr Looking back at the

Alexandra Free... I read your points and tried to

Experiment II

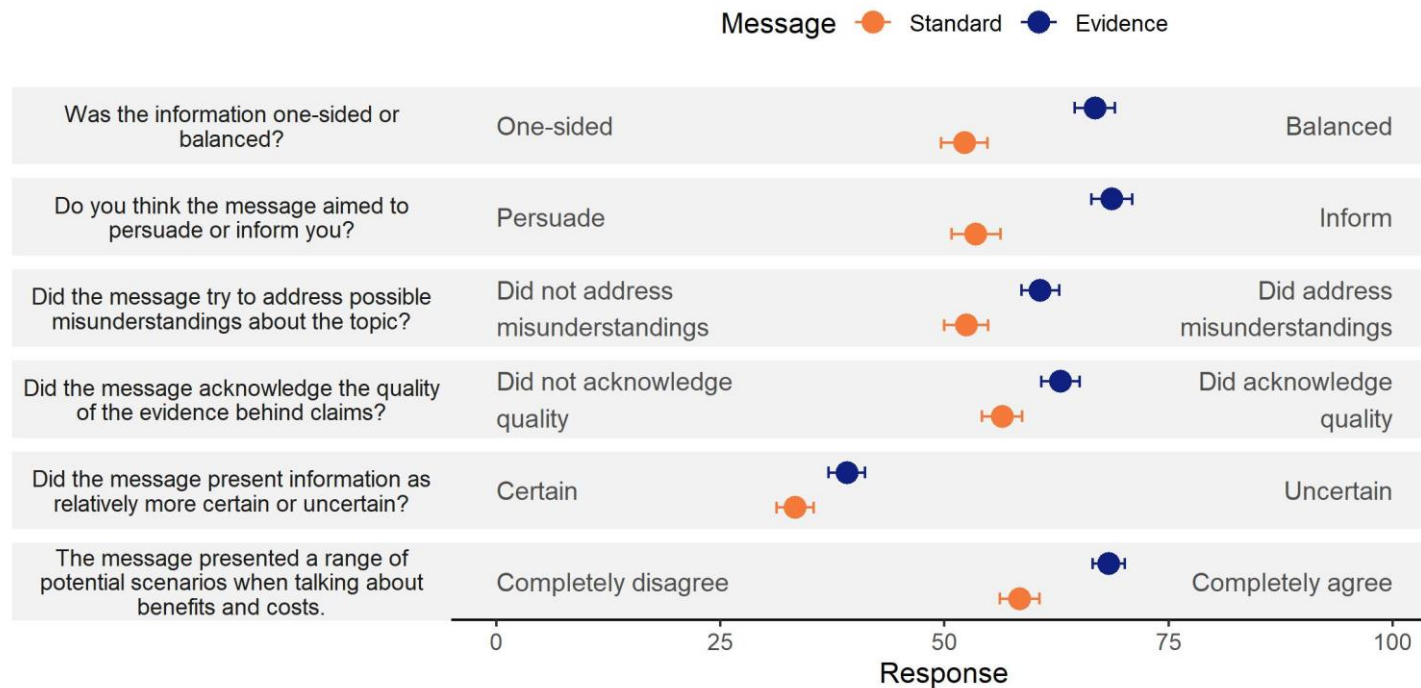
- November 2021,
- Representative UK sample
- $N = 1,034$



Standard communication

Evidence communication
(AKA PROVE)

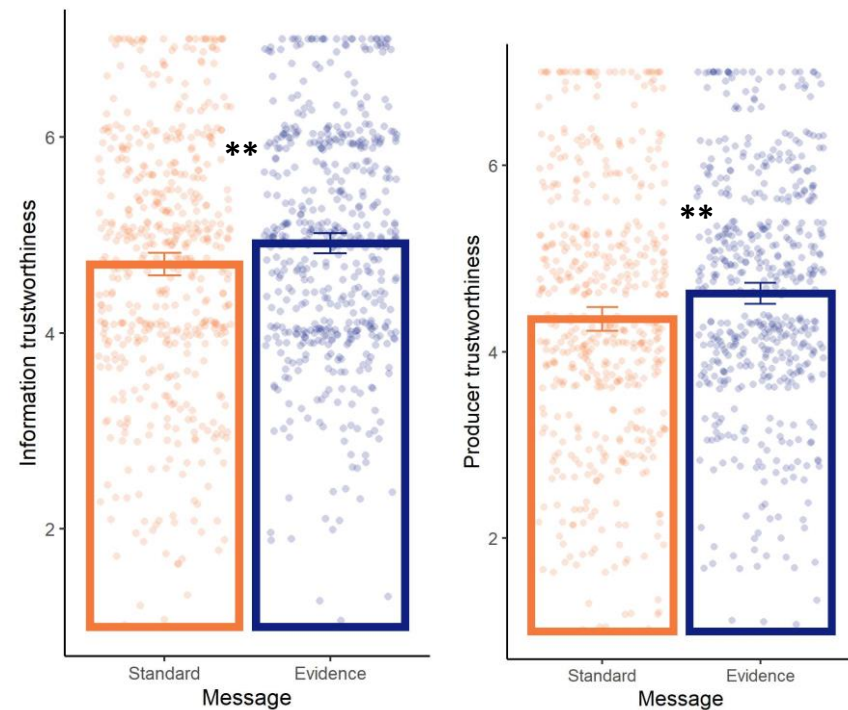
Manipulation check



Trustworthiness



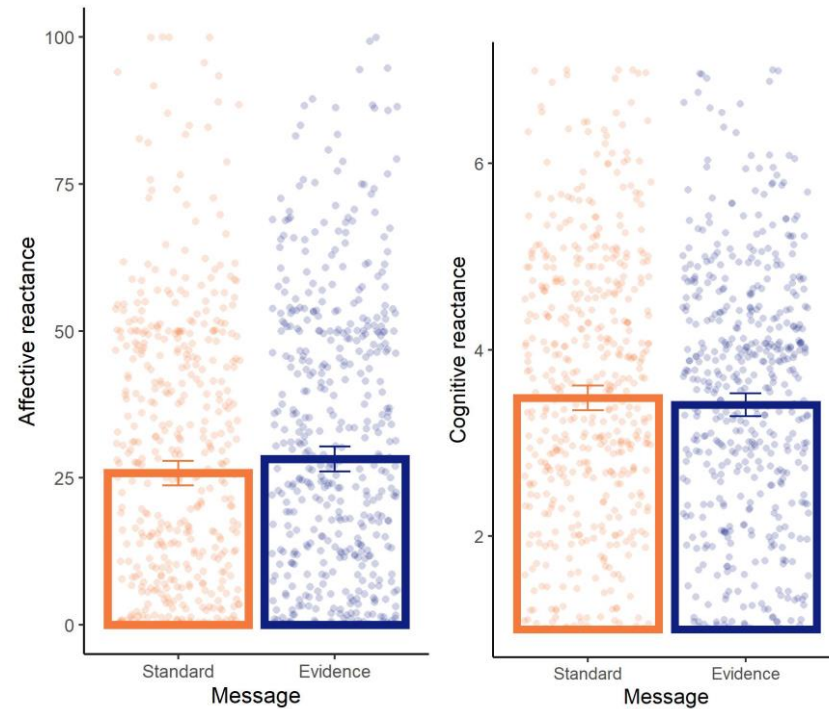
Significant effect of message
on perceived trustworthiness
of information and producers



Reactance



No main effect on affective
or cognitive reactance

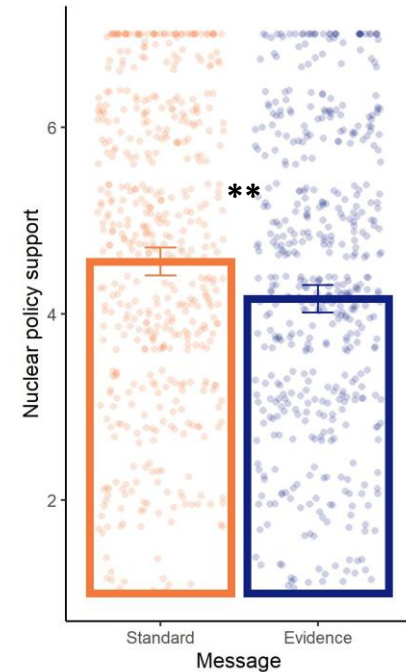


Nuclear policy support (secondary)



How much do you support or oppose plans to build a new nuclear power plant in the UK?

- ☐ Strongly oppose
- ☐ Oppose
- ☐ Somewhat oppose
- ☐ Neither oppose nor support
- ☐ Somewhat support
- ☐ Support
- ☐ Strongly support

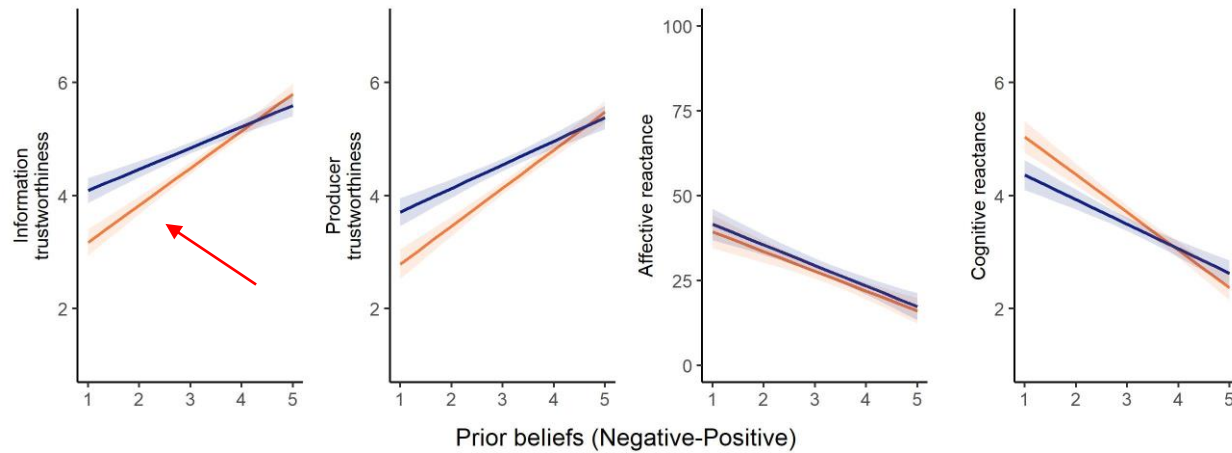




Interactions

- Effect of message moderated by prior beliefs

Message ■ Standard ■ Evidence





Experiment II - conclusions

- Evidence communication perceived as **closer to 'PROVE' criteria** than Standard.
- Evidence communication perceived as **more trustworthy** than standard.
- Among participants with negative prior beliefs, the Evidence communication was considered **more trustworthy** and **elicited less cognitive reactance** (but not affective reactance) than the Standard communication.



Take-away(s)

- Risk perception can be highly **dynamic**.
- **Misinformation** (especially via social media) can distort public risk perception.
- We need to offer **trustworthy** risk communications
 - Five rules for risk and evidence communication.

Conclusion

Thank you