Transcript

Trusting Statistics in Today's News

With so many contradictory statistics in the news, how do you know which COVID-19 stats are accurate? Who can you trust?

KATIE CHICOT: Hello, everybody. My name's Katie Chicot, and I'm a mathematician at The Open University. I'm a pure mathematician, but today we're talking about statistics. So for today's session Ask The Experts, we're talking about trusting statistics in the news, and I've got two statisticians with me here today.

I've got Kevin McConway and Kaustubh Adhikari, and they're going to explain to us a little bit about when and how we can trust statistics, and when, perhaps, we shouldn't. So first of all, I'll ask Kevin and Kaustubh to introduce themselves so we can learn a little bit about them and find out, first of all, we can trust them and their expertise. So Kevin, could you tell me a bit about your statistics background, and why should we trust you and when should we trust you?

KEVIN MCCONWAY: OK, Katie. Well, people have got to make up their own mind on that. So I'm Kevin McConway. I'm an Emeritus Professor of Applied Statistics at The Open University. Emeritus means I've retired from a lot of the things I used to do. I've been teaching and researching in statistics at The OU since 1980, so quite a long time. And I retired from that in 2016.

I still do research, but I don't have any teaching duties anymore. So I used to research. I think research is most relevant to this. I used to research in biological and biomedical applications of statistics, particularly. So I have worked in quite a lot of other things too.

And I also have had an interest for many years in the way that statistics are presented in the media. You know, in newspapers, and on TV, and so on. I used to work with the More or Less programme that The OU co-produces, and I've continued that. In fact, I do rather more of that, and I'll say more about this later on.

Since I retired, I do some training of journalists. I talk to journalists quite a lot. I talk to scientists about how they can work with journalists and so on. So that's me.

KATIE CHICOT: Fantastic. And do you have a specific part of statistics that you're an expert on, or would it be fair to say that you can kind of advise journalists on all parts of statistics?

KEVIN MCCONWAY: I would say I can advise journalists on pretty well all parts of statistics that they need to deal with. I'm not so much of an expert on predictive modelling that's been used quite a lot in relation to the pandemic. So if somebody asked me for an expert opinion on that, I know enough to know what I don't know, and I tell them-- I don't talk about that very much. Other aspects that come up in relation to what is reported on the media, yeah, I've worked in most of those areas, so I'm confident to do that.

KATIE CHICOT: Brilliant, so I'll be trusting you today. And now can I go over to Kaustubh, please? And can you tell us a little bit about your statistics background and which parts are your expertise?

KAUSTUBH ADHIKARI: Hi, Katie. I am Kaustubh Adhikari. I am a lecturer in statistics at The Open University. I did my PhD in biostatistics from the Harvard University, then I moved on to the **UK**. I did a

postdoctoral research in statistical genetics at University College London. And then last year, I joined Open University in statistics.

And I do my research primarily on statistical genetics. I do a lot of public engagement around that. But in addition, I also do public engagement about flawed statistics and misuse of statistics in today's media. So I do The Royal Institution Masterclass. I am now working with the BBC More or Less programme, and here I am today talking about the same thing.

KATIE CHICOT: Fantastic. So you've both got experience in teaching people when to trust and not just statistics, and what is a good and a bad statistic. I'm just going to say that this is a panel discussion, so in a little while, we'll be asking you to send in your questions. So you can send them in the social media chat or you can email them to stem-news@open.ac.uk, and your questions will appear over here on my screen.

So if you see me looking over here, I'm not being rude. I'm just trying to receive your questions, and I'll pass them on to our experts. OK. So first of all, can I come to you, Kevin, and ask you to give me some sort of advice about what are the systems of trust built into statistics reporting? You know, are there places we can go to that are trustworthy?

KEVIN MCCONWAY: Yep. I can do that, Katie. So just moving on. Hope everyone can see that. Before I do that, I'm going say a little bit about what statistics is anyway. That's because most people think they know what it means, and actually most people sort of do know what it means. But it's a bit more complicated than some people think.

The awkwardness is that statistics has got at least two meanings. You can talk about a statistic, a piece of numerical data. So statistics are several pieces of numerical data. But also the word is a bit like mathematics and physics. It's got an S on the end, but it's really singular.

And here's the dictionary definition. It's the branch of science or mathematics concerned with the analysis and interpretation of the numerical data and appropriate ways of gathering such data. And one thing that I think pretty well all statisticians would say they're experts in, that they know about, is variability and uncertainty in numerical data, because that's what we have to deal with all the time.

There is always variability in the stuff we deal with. And that's awkward, because the media are not that good with uncertainty. And it isn't surprising. They have to write stories that are brief and comprehensible, and it's harder to report about things that aren't certain on one way or the other.

It's difficult to say, well, on the one hand, this, on the other hand, that. And really, nobody's quite sure there's a margin of error, and so on. So what are the sort of questions I think you need to ask when you're saying, can I trust these statistics? I mean, first of all, there's the question, are these the right numbers?

Somebody quotes some numbers. Are they the numbers that they really measured? Did they measure it wrong and so on. So there are questions like that. But there are wider questions. You have to ask about how were the data collected, are they the right data to answer the question you're interested in.

And then there are kind of more subtle questions. Why is someone telling me this? Why are they telling me about this particular set of numbers and this particular analysis of the numbers? What don't we know? What are the people not telling me?

And a lot of that's common sense. But then there's things which are more technical. Is the method of analysis reasonable? And you might need some statistical skill to look at that. You can always ask questions. And then their statistical results, are they being interpreted appropriately?

Now, one thing that you have been hearing about a lot, I imagine, because there have been so many statistics about since this pandemic started, is models. Kaustubh is going to say more about this later, but here's a start on this. Statistics is a very broad field, and not every statistician is an expert in everything statistical.

So in the current pandemic, quite a lot of numbers come from mathematical modelling. That is, mathematical models that often involve some statistics, it's usually based on some data. And the models are often predictive. That is to say, if we assume the following thing happens, then what might be the result? If we change the policy on something in this way, what might be the result?

So they're used with what if questions. However, there are other things which don't look like that. They come from various kinds of data analysis dealing with data not making these predictions, several things involve a mixture of the two. And the point is that I put almost nobody has deep expertise across the whole area. Actually, nobody has.

And the uncertainties in predictive modelling and in data analysis come up in different ways, and it's not always obvious to people who are reading the reports on this exactly where the limitations are and what the nature of the uncertainty is. I mean, I should say that even data analysis is based on a sort of mathematical model of the data in different ways.

And you've always got to remember that any kind of model, you know, if we're talking about a physical model of something that somebody has built, they're a simplified approximate representation of reality. They aren't reality. And a well-known statistician, George Box, kept on saying, essentially, all models are wrong, but some are useful.

And actually, I'd say the main skill of a statistician is to know which ones are useful and to recognise it's not the whole story. I mean, putting it another way, you'll have seen this phrase, the map is not the territory, the map is the model. Territories are real world. Map doesn't include everything.

OK, so I now want to move on to one particular aspect of trust, and this is something which is quite complicated and not always very well understood, the UK Government statistical system. So here's a lot of initials and things. Can you trust what government statistics say?

Well, on top of this, there's a body called the UK Statistics Authority, which was established in 2008. And the important thing is, although people working in it are civil servants, it's independent of the government. It's not responsible to government ministers. It's responsible directly to the UK parliament.

And that has various sort of different departments and subsets, one important part of which is the Office for Statistics Regulation. That's the regulatory arm of the UK Statistics Authority, and that deals with regulating public statistics, government statistics. One of the things it does is it produces a code of practise for statistics that you can read about on their website.

It has three pillars, as they call them, of which the first one is trustworthiness. And they say a lot about how government statistics must be trustworthy and explain how they can be trustworthy. It then goes on to talk about quality. They have to be high quality. That's obviously important.

And there has to be some value for money. That's clearly important. You know, government spending our money. But trustworthiness is what they put first. I think that's important. Now, another, probably the biggest part of the operation of the UK Statistical Authority is the Office for National Statistics, and this actually produces and disseminates an enormous range of statistical information on all sorts of things. Certainly not just COVID, though that is a part of it these days.

It's overseen by the Statistics Authority, and it's generally excellent on openness. It takes its independence very seriously. I'm not claiming it's perfect. Nothing's perfect. But it's excellent. So if you look on one of their data releases, one of their web pages about that, you'll find the name and the details of a statistician or an expert that you can contact about this if you want, and you'll get a reply, probably. Maybe not immediately.

And I think they've done an excellent job on statistics on all aspects of the current COVID-19 crisis. They're looking at it very broadly. Economic aspects as well as things about health, infection rates, et cetera, et cetera, et cetera. Now, of course the ONS does not produce all governments statistics. Many of them are produced or disseminated by other government departments, they all have their own statisticians, and by government ministers.

But the important point here is that the codes should still apply, and the Statistics Authority and the Office of Regulation can and do intervene. Here's just one example of that. This is the UK Statistics Authority showing its very polite teeth. This is a letter from Sir David Norgrove, its chair, to Matt Hancock, Secretary of State for Health and Social Care that was sent a couple weeks ago.

Here are just some quotes from it. I'm afraid, says Sir David, I'm afraid, though, that the figures are still far from complete and comprehensible. This is on testing, the things that you've seen on the news. The aim seems to be to show the largest possible number of tests, even at the expense of understanding, understanding what they're telling us.

More generally, the testing figures are presented in a way that's difficult to understand. I warmly welcome, of course, your support for the cold. You know, they're all polite to one another. But the testing statistics still fall short, and so they're widely criticised and mistrusted. And yes, Sir David is recognising the pressures, but he's saying the essential-- the data need to be trusted.

Now, it should be said that, since then, Matt Hancock has replied and he said, yeah, we'll do better in various ways. This may look terribly polite, but this is quite serious stuff in the way these correspondences go. So I want to finish by talking about what I've been up to during this period.

I've been doing several things. I've been trying to support public understanding, essentially by making public comments on the science and the statistics. I do quite a lot of this through the Science Media Centre, which is an organisation that kind of mediates between the scientific and statistical communities and the press by trying to help journalists understand what's actually being said by scientists, because they don't always get it. Scientists aren't always clear. And so we do a lot of that.

Declaration of interest, I'm actually one of the trustees of the SMC. They mainly address journalists, but anybody can look on their website and the materials there. I also have individual contact with journalists, because I've worked with them quite a lot, and sometimes with scientists who are working on this. And have also been working with other statisticians on certain aspects.

But I should say that things do go wrong. Here are a couple of examples. I've really only got time to talk about one of them. The Berlin study on viral loads and infectivity of children, I should say and infectivity, right? So what was that? Well, what happened was, this was a few weeks ago now.

A pre-print was published by a group led by an important clinic in Berlin. The person giving the address of correspondence is a very well-known German virologist and science communicator. It's a pre-print, that means it's a preliminary version of the research that could be amended later on. And, in fact, it was, as we'll see.

And what would normally happen with a pre-print, it'd be posted, scientists would comment on it. It would be revised, or if the scientists said it's a load of rubbish, it would disappear quietly, and eventually it might be published in a proper journal. But this is a pre-print.

Now, here's the bit that caused David Spiegelhalter, this statistician, you may have heard of, an I to really worry about this. They're saying the data they looked at indicate that viral loads in the very young don't differ significantly from those in adults. Viral load, the amount of virus in their throat when they do a swab test.

Based on these results, they have to caution about reopening schools and kindergartens. That was being considered in Germany at the time, and of course, it's being considered elsewhere, here as well. And so they're making a statement about public policy on the basis of some statistics differ significantly. That's a statistical term.

And they end up saying children may be as infectious as adults. Now, that was misreported in Germany and here, as children are as infectious as adults. Now, statisticians have looked at this, and they said, hang on. The first bit isn't even true.

They did find a significant difference, but then they did another rather dubious, in fact, I'd say wrong an inappropriate statistical analysis that said, actually, let's forget the fact we found that they differ, and we'll say that they don't. And other statisticians have put this across in a polite way, like you do.

But it was being so much used politically that David Spiegelhalter and I felt we had to say something a bit more public, so we did. And to cut a long story short, a huge fuss ensued. There were long behind the scenes discussions with the authors and so on.

But in the end, the thing was replaced by a new and much improved version, and it's been used more sensibly in debates since then. So I think that worked. Anyway, that's all I've got to say for the minute, so that's all from me. Thank you.

KATIE CHICOT: Well, thanks for that, Kevin. So I think I've got a bit of a sense of a-- like, a structure of trust, if you like, within statistics. I'm going to move over to Kaustubh now to tell us a little bit about statistics publications. So I just want to give you a chance to share your slides, Kaustubh.

I know we've had a couple of questions come in already, but I'll ask them after you've had a chance to talk. But just to remind people that you can submit your questions through the social media chat box or by sending it to stem-news@open.ac.uk. So we are going to be putting your questions to the experts. But before that, I will give Kaustubh a chance to tell us a little bit about what are the other systems that allow us to trust statistics publications.

KAUSTUBH ADHIKARI: Hi, Katie. So I will talk about that. But before that, I wanted to highlight the bit that Kevin said about the distinction between data analysis and modelling, just to carry on with what we were discussing. So I will briefly give an example of the difference between data analysis and modelling and show how this has impacted the news coverage that we have seen around COVID.

So I will very briefly explain the difference between the two. So data analysis is just looking at the data we have in hand, and it looks at making a summary of the data, maybe explain the relationship between various factors that are present in the data. Whereas modelling is something that wants to go more deeper and prepare mathematical models so that we can propose theory about how the natural process generates that data.

And that natural process, for example, could be climate. So we could use the model to guess how new data would look like, so we can try to forecast the weather for tomorrow by using those kind of models. So this is primarily used to make predictions about the future.

And then we can verify that by looking at new data at future times. So this is, of course, much more difficult. And this, we can see through an example that I have on men's 100 metres sprint times from Wikipedia. So if we look at the season's best times for every year and we plot that against the time, then we see that this decreases quite nicely.

And, in fact, we can try to model this relationship by a linear equation, which is something that we might have seen at school, a simple arithmetical model that says that time decreases over years in this relationship. So every year, the time decreases by 0.009 seconds.

And that's all good. We have a data, we have an analysis, and we have shown that the best running time every year is decreasing over time to the present. But we can then think about this is a model, which probably won't be so appropriate, as I will show, and we can try to make predictions about the future, or we could make forecasts.

So that process is called extrapolation, where we go beyond the normal range of the data and track and make forecasts. So here, extrapolation step would be to ask, if the best run time is decreasing over the years, when will it hit zero? And that would mean that the sprinter's essentially Superman and they are just running it in a flash.

But to solve this question is, again, a quite basic arithmetic. And we can solve this equation to say that in year 3096, this will hit zero, this linear relationship. And at that point, our best sprinters will become Superman. Now, of course, you can ask, does this actually make sense? Is this a reasonable forecast to me?

And the answer is obviously not, because the human body won't be able to do that. But this is an example of how modelling can go wrong, and you can make extreme forecasts which actually doesn't make sense realistically. So I will use this as a basis of explaining why this huge media attention that we saw in mid May about the headline saying 19 million Brits already being infected with COVID-19 and show how this is an example of bad extrapolation.

So this was a big headline news, which was based on a scientific publication appearing in the Journal of Clinical Practise by researchers at the University of Manchester and other UK institutes. And they made huge headlines because their research suggested that all these people who have had the virus and with COVID can return to work, and therefore the UK economy can be last to reopen, and therefore, it was called a game changer.

So we can look at what they did, which was essentially a large extrapolation. And we can see where exactly they got wrong, and this is a nice example of doing flawed statistical analysis. So their results were based on this simple relationship between two things, average daily infection rate in 149 local authorities in the UK, and they analysed against within those communities, the total reported cases were 1,000 people.

So on 8th of April, they looked at this data and they showed that this kind of follows a linear relationship, if you wanted to model it that way. And based on this model, they tried to calculate, again, if you extended that linear relationship all the way to zero, when would the daily infection rate be zero?

And by using extrapolation, calculated that would happen when there are 6.6 reported cases per 1,000 population in a hypothetical community. And this is hypothetical, because in their data, there was no real community which had that. Now, you can ask the same question, of whether this is biologically possible.

And it's actually not biologically possible. The assumption is not realistic because in any community, does this transmission will still be possible as long as some people are infected and some people are at risk of infection? So this assumption of doing this extrapolation was not realistic.

But then they used this to make further assumptions, which led them to that conclusion. So the second assumption was that you can say disease transmission has stopped when everyone is infected. So if we say that disease transmission had stopped when 6.6 people are infected, that means that all 1,000 people in the community are actually infected.

So if you do this conversion rate fact when your survey is showing that 6.6 people are infected, all 1,000 people are infected, you can use this conversion rate to look at the reported numbers for UK on 8th of April, which were 400,000 people confirmed to be infected with COVID-19, and you use a multiplier to calculate that 90 million people were actually infected.

Now, is this a reasonable assumption to make or is this a reasonable calculation to do? And that's obviously not true, because the first step, which was the extrapolation, was already being made on unrealistic assumptions to begin with. So that is an example of bad or flawed statistical analysis.

And how can we say for sure that this is bad statistical analysis? Because we can to do verification with new data. So as Kevin was mentioning, the UK's Office of National Statistics, they had their own surveys and they are relatively reliable. Their surveys showed that only about 100,000 people were infected at any given time between late April and early May, which is a strong contradiction to the results of the study.

But this is not something that you saw making any headlines. And, in fact, if you remember that by mid May, the government had already started reducing lockdown restrictions. So this is an example of flawed statistics potentially influencing government policy and potentially influencing all our lives.

This is not to say that that specific paper had a huge influence, but this is just an example of how flawed statistics can influence public policy, can influence medical dissertations, and have an impact. So I'll end my presentation there and I'll open it up for questions. Thank you

KATIE CHICOT: Thank you, Kaustubh. That has raised a lot of questions for me. So just so the three of you know, we're all on camera now. We can all be seen. And we have already had some questions come in. But I think just before I pass over-- and this is quite similar in content, really.

But just before I pass over to one of those, I think I'm getting the idea that the Office for National Statistics is my go-to trustworthy beacon. And so I kind of wondered, why aren't those statistics being used in the government's daily briefings? Is there a reason for that, Kevin?

KEVIN MCCONWAY: Well, I mean, it's not that they're not involved in providing the data for that. A lot of the stuff that's being done by the Office of Statistics Regulation and others is to get the people who are producing these varied statistics working together.

And if you look at some of the reports from the ONS, or numbers of people, numbers of deaths, numbers of people that are infected, and things like that, they include comparisons of these different sources of data. But one reason that the ONS data are not leading on this is that most of the ONS data are based on things like registrations of deaths, their death data.

That means that they're relatively accurate. They're checked a lot. But it takes time for people to register deaths. You know, somebody unfortunately dies, and the death needs to go through a registration process, be reported to the ONS.

And that happens quite quick, but it doesn't take no time at all, so they tend to be lagging a bit compared to-- and this is sort of aimed to get everything out really quickly. You know, I think you could argue that accuracy is better than too much speed. But, you know, people have different views on that.

KATIE CHICOT: OK, I am going to move over some of the public questions, and there is quite a consensus of a question asking here, so I'll have to do it. So there's concern about media exaggeration, that there's too much media exaggeration. And there's a question as to, is there a way to control the media exaggeration.

And there's a suggestion here as well. Could we even publish a ranking of journalists by statistical competence to try and make them make more of an effort? And I think, Kevin, because you're involved in the Science Media Centre, perhaps I will put that question to you as well.

KEVIN MCCONWAY: Yeah, OK. I mean, I'm concerned about media exaggeration. I mean, I should say, let's look before the crisis. My view is that there used to be more a lot more of this about than there is. That actually, the reporting of science has got better over the years.

I'm not saying it's perfect. You know, I'm not saying it's always good. But it's better than it was. But I think things have got slightly out of hand, and I think there are lots of reasons for that. One is this pressure-- one is that it's all become much more newsworthy.

And because it's more newsworthy, this is an oversimplification, but I think that many science or health journalists working for the major broadcasters or working for major national newspapers, to be honest, including the tabloids, know what they're talking about. But a lot of the debate has been taken over by political correspondents, by people who-- journalists who work in different ways, they don't necessarily understand the statistics, or the science, or anything like that.

They understand a particular kind of interaction with politicians, and that's the way they behave. And I think exaggerations can come in that way. Rubbishing of perfectly good statistical arguments can come in that way and so on. This question about, could we publish a ranking of journalists, well, that would be kind of interesting.

It's not been done, and, you know, I could give you my personal opinion, but I won't now. All science journalists I know have occasionally produced really poor reports. And there are lots of reasons for that, given the pressure they have to work under, given the speed they have to respond, because we want them to respond quickly.

So none of them is perfect. Some of them are better than others, and I really don't want to come out with names here now. I'll forget the best one.

KATIE CHICOT: Oh, no. I think that might-- that's something to avoid just now.

KEVIN MCCONWAY: I mean, it is something that the Royal Statistical Society has been interested in, and they give annual awards for excellence in statistical journalism. And, you know, they're only annual, so they won't have done it in relation to the crisis yet, because they still haven't given out the gongs for last year.

Eventually, we'll find out who the Royal Statistical Society thought were really good on this stuff and who they didn't. And if you look, you look on their website, past examples of really good reporting of statistical things. And there's some excellent stuff there. But it's not all like that.

KATIE CHICOT: OK. We have a question from Emily, who is studying chemistry. And a couple of other people have said this as well, which is, we have reports of the number of deaths, a number of infections. But there never seems to be reports on the proportion of the population impacted.

And a couple of people said, would this not be better. You know, why are they not giving us this information. Well, the question is in two parts, it's, would that be a better question, and the other part of the question was, what's the worst area of statistics reporting in the media.

Now, my feeling, it probably is COVID-19. So I wanted to ask Kaustubh. Do you think that COVID-19 has impacted on the publication process, and has also impacted on the statistics reporting? And then as a rider to that question, do you think this other way of reporting the data, as in proportionally instead of absolute numbers, would be better? So if I can pass that to you, Kaustubh.

KAUSTUBH ADHIKARI: Yeah. Thanks, Katie. So I'll answer your question about publications around COVID-19 first. And the answer is a resounding yes, that it has impacted the scientific publication strategy, and then I'll come to the other question about numbers. So I'll first say it back.

The scientific publication process is something that's relatively meticulous. We want it to be meticulous, and is therefore time consuming, because the scientists should collect data systematically, analyse writing it formally, submit to a journal where peer reviewers, which are other scientists, they will check it, probably they will make critiques.

And based on all of this, the journal editors will decide whether to publish this article or not. So all of this is quite systematic, but it takes time. Whereas around COVID-19, we definitely see an urgency, which made scientists to speed up research and publication so that their work, if properly done, can influence or improve medical treatment, can improve public health strategies, government policy.

And we do need scientists' input on all of these things. But given the urgency, if you're trying to rush things too much, we have to remember that mistakes are made more easily when they're in haste. So the other side of this is that once we actually make a mistake in an analysis and put it out, that mistakes are not easily rectified.

And there is a very good website called Retraction Watch which looks at a flawed analysis or flawed publications. And they've recently mentioned this, that the journal only took three days to accept the paper. And you can imagine that in such a short time, there was probably not a lot of scrutiny.

But it has been two months since Retraction Watch has reported to this journal asking them about these flaws, and they haven't done anything about it. So this is the problem that we have in science

around COVID-19. And what some scientists have done, or a lot of scientists have done, is to move to this system called pre-prints, which Kevin was mentioning as well.

And this was in place already for a while, but now it's getting much more popular that scientists are writing up things quickly and submitting to these websites, which are repositories where you can submit your articles, even before publication. So while they are going through the regular process in journals, other scientists can read them, critique them, and, if necessary, use them.

But this also means that scientists can announce their results to the world or to the media and influence policy without going through the process of checks and without reading from publication. So this, for example, is a very well known depository called medRxiv, and they look at papers for medical sciences.

And as you can see, there have been more than 5,000 articles on the website already. Someone estimates that there has been, so far, about 20,000 articles published on COVID-19 already. So you can think that all this huge number of articles, there would probably definitely be some articles that are questionable, and we have looked at a few already.

But what this has led to also is that these kind of articles, either pre-print or published, they have had an incorrect amount of influence in public policies. I'll talk about this particular example, because this became very well known. This was done by respectable scientists at Harvard and published in very prestigious medical journals, The Lancet and The New England Journal of Medicine.

Which, in the rush to get data about COVID, the scientists did not do the study themselves, but they used data from a company. And, in fact, a company, Surgisphere, provided fraudulent data. So this became widely seen news time, kind of an academic scandal when it was found out that the company did not produce data methodical and properly.

And it led-- these publications, because they were very respected, it led governments and the World Health Organisation to change COVID-19 policy prematurely based on this publication. And eventually, these papers were retracted from these journals, but they had already, by that time, wrongly influenced official policy.

So the concern of scientists is that it [INAUDIBLE] published data, the rush around COVID-19 publication makes everything much more risky. And we have looked at a few examples. So that was the first point. The second question, if I remember, is the fact that we should look at absolute numbers of cases and deaths or whether we should at proportions.

So this preference for absolute numbers comes from mathematical modelling of epidemics. And if you think about it, say, if I am infected, I will infect, maybe, say if the infection rate is three people, I will infect three people around me. Now, it doesn't matter so much how many other people in the neighbouring street are infected.

As long as I'm infected, I'm infecting three people around it. That's how it will increase exponentially. So at the initial stages of the pandemic where most people are still not infected, this is the better way to look at things, that you look at the absolute number of people.

And that's what scientists have done. And when they have looked at the absolute numbers of cases in various countries, the data increase is similar, which makes sense if that's the way to model it. But as time increases and the countries impose various restrictions, and also as more people get infected, then you get a substantial proportion of people in every country who are infected.

And at that point, it makes more sense to look at proportions of people who are infected, and that also gives you an idea of how widespread the virus is actually in your community. Because we look at a huge country like the US, and if you look at a small country like Belgium, in some senses, it makes more sense to look at the proportions.

But in some other aspects, for example, in modelling, it made more sense to look at absolute numbers. So I would argue that both are useful and both are useful in different ways to influence or inform the public concerns.

KEVIN MCCONWAY: Yeah, if I could just add a little bit to that on a couple of points. I mean, Kaustubh's quite right. It all depends on the context. I think it has sort of alarmed quite a few people that what certainly used to appear in the daily briefings, the data government briefings, was just the numbers. And that makes it hard to compare with other countries, for example, and it makes it awkward to look at different bits of the UK and see how they compare with one another and so on.

On the other hand, they make it kind of easy to make comparisons over time. So, you know, if you've got a time series, you've got figures for the whole of the UK on numbers of infections, hospitalizations, deaths, whatever, they're referring to essentially the same population, the population of the UK. And that kind of hasn't changed.

So it would look the same if you look at the rates. I mean, it's also true that you can actually find all this stuff by rates. It's not necessarily put across so prominently. You know, the ONS give rates as well as numbers on the stuff they publish. Other things, like this COVID symptom study, the thing that many people have volunteered to-- millions of people have volunteered to report on every day, they publish rates as well as numbers.

There are lots of people who are sort of unofficially putting together the government data and making sure it's all preserved in ways. And if you search around the internet, you can find them. And they generally publish rates as well as numbers. So it's kind of there.

I just mentioned a couple of other things to do with the journalism aspect. I mean, first of all, it was very interesting that people are saying, I mean, Katie, you said in the beginning, lots of people were saying they're really concerned and they aren't essentially trusting the media.

There's interesting stuff published by the Reuters Institute for the Study of Journalism, which is a department of Oxford University, on this. They do regular surveys, essentially, on who trusts whom. And the trust in the media has really plummeted over the last few weeks, and, you know, in an alarming way

Trust in scientists has not. But that's really quite alarming. And I think it's true to say that, really, so far, we can only speculate on why that's happened. It may simply be because it's so prominent and because a few really stupid things have been said.

And also, Kaustubh said there is a problem with that paper that was only considered for three days at the journal. And yeah, that's a major problem. How can you consider something properly in three days? A journalist reporting on something like that would never get as long as three days. They'd get one or two days at the absolute most, during which time they'd be working on other things. They might only get a few hours.

Now, why do they do that? They do that because journalists compete in terms of how fast they can get the information in front of us. Now, that competition has got much worse over time. You know, if you go back many decades, they just had to get it into the next day's newspaper.

Now it's got to go up online in, you know, before the other guys put it up online. And that's because that's what they feel the public wants. I mean, you know, would people be happy with saying, actually, there's this new piece of research, there's this new piece of data, it's come out now, but we want to leave it for a couple of days to make sure there's been proper consideration of it before the journalists report it. I mean, that would improve accuracy, but is that what people want? I don't know.

KATIE CHICOT: I mean, I think it's clear that-- this must be a worrying time if you're a statistician, actually, because it's clear that there is a lot of bad statistics getting out there. But I would be sympathetic to a journalist who reported on a publication that was in a peer reviewed journal.

I mean, they are supposed to be able to take that. And we have got a question here from David who says, was the Manchester paper peer reviewed. Because fair enough, with the pre-prints, nobody's checked it. Would you have thought that any statistician looking at that extrapolation would say that's an unrealistic extrapolation, Kaustubh?

KAUSTUBH ADHIKARI: So, yes. The Manchester study was peer reviewed. And I had the slide up, which showed which journal it was published in. So, yes. As I was mentioning, that the problem is not restricted to pre-print papers. It's present everywhere in published and pre-print.

And sometimes, the publication is just rushed during COVID, so that allows more mistakes to happen. And the other question was whether a statistician looking at it will understand that this is an extrapolation, and I think that's true. In fact, I did write an open letter article about it where I mentioned other statisticians and epidemiologics who were quite active in Twitter to point out these articles' flaws.

And they have been active in general as a scientific community in pointing out many different flaws. But it will be probably a sensible thing for any journalist to spend a few minutes on Twitter or on Google and see what other scientists are saying. So that will probably help them invite a more balanced and informed article.

KATIE CHICOT: OK. I see. So we're not just looking at papers anymore. We're also looking at papers and the statistical community's opinion. So maybe we'll be following Kevin on social media and you, Kaustubh, to see what you say about these publications.

I have a question here from Martin who says, given that we've seen some flawed ways of estimating the number of cases in the UK, Kevin, have you any sense of what is a good way or a better way of estimating the total number of cases in the UK? Or perhaps you can tell us who's doing a good job of making that estimate?

KEVIN MCCONWAY: Well, that's actually slightly awkward to answer. You know, I was saying how what I like about the ONS, and I do like a lot of things about the ONS. If you're talking about the number of people who are infected at any one time, the ONS are running an infection survey, this in collaboration with Oxford University and Manchester University, a different bit from the people that Kaustubh was talking about in Manchester, incidentally.

And the trouble is that they're looking at survey data, and survey data takes a lot of time to collect. So the results on this are not as clear cut as they might be. It's still only in the pilot stages. But what they do is they take samples. The Office for National Statistics do a huge lot of sample surveys, so they know about sampling. They know about adjusting the results from sample service to allow for aspects of the sample that might not be quite representative enough of the population and so on.

So they absolutely know how to do that stuff. And what they've been doing is they've been taking samples, they've been taking people, households of people, across England. And so far it's only operating in England.

And they do two sorts of tests on them. I'll mainly talk about the swab test. It's one where they poke a thing in your throat, and then they check to see if there's any sign of the virus there. If it is, that means you're currently infected. And they use those to estimate how many people in the country are currently infected.

Kaustubh referred to this when he was talking about verifying the dodgy Manchester result. And I think they produce good estimates. However, it has to be said that there's a bit of controversy about that. I did mention the COVID symptom study, this thing run by Zoe and Tim Spector as the kind of academic lead on it and so on.

He's not a statistician, but he does know quite a lot of statistics. And I know that, for reasons that I don't utterly understand yet, he is not utterly happy about those results, and the infection rates they have extrapolated from their data are considerably higher than those coming out of the ONS infection survey.

I'm inclined to believe the ONS ones, because there are more people who are expert in dealing with survey data in that. But it has to be said, the position isn't yet clear. The infection survey results will get better as more people are involved, and they can do things like track how the infection rates have changed over time. And I think that's very valuable.

KATIE CHICOT: Yeah. Well, sorry. Can I just check, then? So this infection app just reports on symptoms, doesn't it? There's not symptoms which are subsequently verified by a test or verified by a test, or am I wrong?

KEVIN MCCONWAY: Some of them are. So, I mean, the app-- you know, what you'd do if you just use it is it asks you every day-- it asks you, have you had a test. But it also asks you, are you feeling well, and if you're not feeling well, it-- I don't know what it asks us.

I use it, and I've always been feeling well, luckily. But it asks you what your symptoms are. And they claim credit, and I think they deserve some credit, for getting a change to what are seen as the key symptoms of COVID-19 by adding the loss of a sense of smell and taste to that.

So, you know, they've done some useful things. But they also get people tested. So if you report something which shows-- I have a friend, for example, who had this, who show signs of having this thing, even before it was relatively easy, as it is now, to say, I've got a symptom, will you test me? You could go to a test Centre. They would test people.

So they are getting tests done as well, and they're using results from the testing process that's being run by the Department for Health and Social Care. So they do have testing data as well. It's not simply based on self report.

But as far as I know, they haven't published their methodology. I hope I’m not maligning them. They haven't published their methodology for getting these estimates of numbers of people infected. And, you know, I would want to look at that, because I'm a statistician. I ought to understand it, but I haven't seen it yet.

KATIE CHICOT: Yeah. OK, we have another question here. And so this is again about reliability of data. How reliable are other countries' data? So you can see which of you would want to answer this.

Which countries do you think have reliable data, how easy is it, then, to compare data once you are confident of a country's data? And perhaps you could name and shame a couple of countries whose data you just don't trust.

KAUSTUBH ADHIKARI: Well, I can start answering this question, because I am from India, so therefore I am concerned about the situation in India. And I have seen scientists who work on the data coming from India who have expressed concern that there are separate ways in which their ability to work with this data is limited, primarily because this is also a problem to a certain extent, in the UK, but not as much.

Is that the testing infrastructure is not as well developed in these developing countries. So therefore, you can only do a handful of tests, say, every day or every week. So therefore, you're probably severely underestimating the number of people who are actually having the virus, and you're probably testing a faction of people who are actually reporting symptoms.

So there's probably a huge underlying reserve of people who are asymptomatic, but they have the virus and they have the capability of spreading the virus to more people, and therefore, the infection growing exponentially. So you might have seen in a lot of developing countries the rate of infection is actually going up very high.

The rate of deaths is also going up in these days, where some of the Western countries, their rate of death and the rate of infection has started to come down in these countries. It hasn't started to go down, but it is actually still increasing. So these are things that is definitely much more difficult to answer given the limitations that every country has in terms of their infrastructure for testing, for data collection, for reporting.

KEVIN MCCONWAY: Yeah. I mean, if I could just add to that. Yeah, I mean, there are clearly going to be issues with countries, and this may be more marked in some sub-Saharan African countries, for example, where the infrastructure just does not permit very many tests to be done.

But there are also differences between, you know, countries in Europe, countries in Western Europe that are all pretty prosperous. And I think there are kind of two different aspects here. One is that if you want to-- if you want to look at trends over time, you want to look, are infection rates falling, are death rates falling, are they going up again, you know, do we need to take some more lockdown action, whatever it might be.

You want that kind of series of numbers that's relatively consistent over time. And there's a sense in which, if nothing else changes, if they're collected in a way that, say, only includes half the cases, and they always only include half the cases, you can still see whether it's going up or down.

The problem is, and Kaustubh just referred to this, if a country changes its testing regime, so it's suddenly testing far more people than it used to be, as has happened in Britain, then you're going to find more cases just because you're looking harder. And that has been a problem over time.

There have also been problems with some countries in the way they define a case or define a death. There was a particular problem with that. There was, to be honest, I've forgotten all the details. It came up more or less in Spain, where basically things had to occur on a particular day, otherwise they weren't counted.

And therefore, compared to what was going on in other countries, there was undercounting. And there are also issues with how up to date the numbers are and whether they're all produced on the time timescale. So people might have heard a lot about the measurement of excess deaths.

This is the point that-- you know, the number of people who are reporting is having succumbed to COVID and died of something to do with COVID depends on how-- on whether you know they had the disease or how you decide that they might have had the disease. And that's done in different ways in different countries.

So what many people have said, and I would agree with this, is a key thing to do is to compare just how many deaths there are at a particular time and particular week from any cause, with the average number. You know, what usually happens in that week in previous years, and that's measure of the excess deaths, and that's done in different ways in different countries.

And they do show a lot. They do show a lot. But in Germany, Germany has very good health statistics. So there are issues that it's a federal country and they're dealt with slightly differently in all the different federal states. But they seem not to have speeded up their publication of excess deaths results.

They were always pretty slow on it. And they were pretty slow because they said, look, we want to get this right. And so they publish them really quite a long time in arrears. And they have not changed that, or they hadn't the last time I looked, which was fairly recently. So they do produce good data on excess deaths. It's just, like, several weeks behind what happens in all the other European countries, so you can't kind of compare it there.

And they have their reasons for doing that. They say, we'd rather be accurate than too fast. And there's something in that, but it means they can't be compared with what's going on here, or Italy, or France, who publish the things more promptly.

KATIE CHICOT: Yeah, absolutely. So we see Germany getting it right again. I just want to--

KEVIN MCCONWAY: Possibly. It all depends what the criteria are. Do you want a good number, even if you've got to wait two months for it? Well, maybe. Maybe not.

KATIE CHICOT: Maybe it's cultural preference, then, I should say. Maybe I'm just, as a pure mathematician, I just do like to know what's right. And I just want to remind everybody watching that you can post your question into the social media chat box, or you can email stem-news@open.ac.uk.

And even if we don't manage to answer your question now, we will answer your questions afterwards. We will respond to you by email. So definitely keep sending those questions.

KEVIN MCCONWAY: Katie, you've muted yourself.

KATIE CHICOT: Yes. Sorry. I was just pulling out the questions. So let's have a look at another question here. There's some comments here, actually. So there's a comment here from John, and he's talking about Wales. And it was being noticed that the reported number of deaths in-- I'm going to pronounce the Welsh name wrong, Powys, was low.

But it has no district general hospital, so nobody realised, actually, that they weren't looking at the deaths for a location so much as the deaths in a hospital. And so that locations for where the disease might be was being missed. And I did have a related experience myself where they've just published the postcode data, you can search by postcode, as to where there have been reported deaths.

And a local councillor was saying, we did think this tiny part of the town had a more aged population than the rest of the town. And it did occur to me that perhaps people weren't noticing care homes,

hospitals, and what have you. Have you noticed any of these other issues in reporting, where people have missed fairly obvious facts about where you might link deaths and illnesses?

KEVIN MCCONWAY: I hadn't noticed the Powys one. It's very interesting. I think one thing which is not always very clear if you look at these reports by, you know, relatively small geographical-- or even though Powys is quite a big area, even quite a big area as is.

It's not-- you've got to look at the small print, often, to find out whether they're reporting where the death occurred or where the person lived, something like that. So if somebody dies in a hospital and you're actually reporting things by where the death occurred, then obviously, if there isn't a big hospital there, and people from that area would be treated in a hospital in another local authority, that's going to be an issue.

On the other hand, if what's reported is their home address, that would tell you more about what's actually going on in Powys, or an area like that. And to be honest, I'm not 100% sure these ones by postcode-- it is actually a bit bigger than postcodes. It's something called middle level output areas, which are a bit bigger than postcodes.

I think, but I'm not 100% sure, that they are done by where the person lived. Now, the thing is, that would mean that deaths in acute hospitals would be taken back to the place the person lived before they died. They wouldn't be recorded at the hospital.

But somebody who lives in a care home, it would be reported by where the care home is, because that's where they live. And so there'll be a difference between hospital deaths and care home deaths in relation to that stuff. And the next area to where I live in Milton Keynes has got really quite a large number of deaths.

And people have said that is because there's more than one care home there. I mean, I know, it's just down the road from me. There is. But I'm not utterly sure whether that's why it is, or was there a terrible outbreak in the community, they're not in care homes? I just don't know. You have to be careful and look. That's all I can say.

KATIE CHICOT: Yeah, absolutely. I have got-- we've probably just got time for one question before wrap up. I'm not sure. We'll see what pops through. But this is a question for you, Kevin, actually, and it's about the UK Statistics Authority.

So other than polite tellings off, does the oversight board have any powers to punish or prevent the spreading of misinformation? I mean, to me, that sounded like quite, you know, quite a burn. That sounded like, you know, that the British version of a very cutting remark. But do they have any actual powers to make people retract things or punish them for spreading false information?

KEVIN MCCONWAY: Well, only up to a point. Not really if it's another government department or another government minister. It's particularly awkward if it's another government minister, because remember, I said the UKSA is responsible to Parliament, and Parliament can, if it wishes, reprimand ministers and tell them off and things like that.

But, you know, that's not exactly a punishment. If we're talking about them criticising people in the in the government statistical profession who happen to be in the middle of the department, they sort of have more powers in relation to people like that, but it wouldn't really be a question of punishing them.

To be honest, it is more naming and shaming. But it is seen as something-- I mean, I mentioned that Matt Hancock had sent a reply to that letter that I was quoting. And it is essentially saying, well, we do

better, and here are a couple of things that we will do better. And we will, you know, that the head of the statistics profession in the Department for Health and Social Care will be in contact with the Office of Statistics Regulation and make sure we do this better later.

And there actually have been signs that they are doing better. The statistics they've been publishing on track and trace, which is one thing he said he'd do, they are now publishing those. And people are looking at those critically. They're saying, well, there are some good things and there are some bad things about how this is working.

So it does have an effect. But in the end, no. I don't think they can punish people, certainly not if they're government ministers. And they have no control at all over journalist. Journalists are regulated in a different way, and, to be honest, not very strongly.

KATIE CHICOT: So it is the power of embarrassment. OK, good. Good to know. But you also mentioned their track and trace, and we do have a comment here about contact tracing app. We're-- The Open University is going to be making and sharing a video on the contact tracing app, which we think you should all watch.

The link will be posted on Tuesday on Facebook and Twitter. It's already available on the OU STEM's YouTube page, the link. So our colleagues from the School of Computing and Communications will talk a little bit about the contact tracing app.

Well, actually, just before we do go, can I ask you about contact tracing, track and trace? Just how effective can it be? I don't know if you can put numbers on it, but how much faith can we put in it for reducing the spread of the virus? I

KEVIN MCCONWAY: I certainly couldn't put numbers on it, and I have not looked at this particularly closely. I think one thing that's kind of rather mistakenly said about the track and trace results so far, people are saying, well, look. You know, they're only getting in contact with 3/4 of the cases that have come up, so a quarter of them aren't being tracked at all.

And now on the one hand, it would clearly be better if they could get in touch with everyone or nearly everyone. But in practical terms, they're never going to get absolutely everyone. And, you know, it's a bit like the lockdown. The lockdown wasn't-- it was never understood that the lockdown could stop all transmission of the virus.

It couldn't, because some people had to work. You know, all sorts of reasons why infections would still go on. The aim was to reduce the rate of infection, and hopefully to reduce this R number, this reproduction number, so that it was well below 1.

And if it's kept below 1, infections would still occur, but the epidemic will kind of gradually peter out. And I think it's the same with track and trace if they get enough people, and it doesn't have to be everybody. And I could not put a number on how many they have to get. It will reduce the reproduction number, and it will therefore reduce transmission, and therefore, things will tend to peter out. They are never going to track everybody. It's impossible.

KATIE CHICOT: Yeah, absolutely. Well, I think we've come up to time, so I will now thank Kevin and Kaustubh for that, for sharing your experience. I'm not sure you've put my mind at rest. To be honest, you've made me more questioning and made me want to look up at the authorities more.

Perhaps-- I never did trust the headlines, so let's not worry about that, but I did trust journals. So now I have a question mark for myself. I want to say to people watching, if you've gotten any outstanding

questions, you can email them into STEM News at open.ac.uk, and Kevin and Kaustubh have kindly agreed to answer those.

So feel free to put them on even though you won't have them on air. But yes, thank you to everybody for listening. And thank you to Kevin and Kaustubh. I found it really interesting.

KAUSTUBH ADHIKARI: Thank you, Katie.

KEVIN MCCONWAY: Thanks very much.