IlLUminate Blog Transcript: Shin-Yi Chou and Ernest Lai – Will Confirmatory Bias Keep You from Getting COVID-19 Vaccine?

Recorded Oct. 2, 2020. Listen to it here.

[music]

ANNOUNCER: 00:02 This podcast is brought to you by Illuminate, the Lehigh business blog. To learn more, please visit us at business.lehigh.edu/news.

JACK CROFT: 00:14 Welcome. I'm Jack Croft, host of the Illuminate Podcast for Lehigh University's College of Business. Today is October 2nd, 2020, and we're talking with Shin-Yi Chou and Ernest Lai about their research examining how misinformation online has helped drive a decline in vaccination rates for measles, mumps, and rubella - or MMR - and what that might mean as a vaccine for coronavirus is developed. Dr. Chou holds the Arthur F. Searing professorship, and is the chair of the Department of Economics and Lehigh's College of Business. Her research focuses on health economics and applied econometrics. Dr. Chou also is a research associate at the National Bureau of Economic Research. Dr. Lai is an associate professor who holds the Class of '61 professorship in economics. His research focuses on using the tools of game theory and laboratory experiments to study strategic communication. Dr. Lai teaches game theory at the undergraduate and graduate levels, and is the director of the Ph.D. program of the College of Business. Welcome to both of you. It's good to have you with us today. To get started, as we were getting ready to record this, it was announced that President Trump and his wife Melania have tested positive for coronavirus. And the COVID-19 pandemic has really thrust the whole issue of vaccines front and center in the news over recent months. Today, more than 200,000 people in the United States, and more than a million worldwide, have died as a result of the coronavirus. We've also seen a resurgence online and in the media from the anti-vaccine movement, a movement that was fueled by a 1998 study published in the British medical journal The Lancet that has since been thoroughly discredited by the editors of the journal itself, as well as the scientific community. So let's start by talking about the origin story of the modern day anti-vaccine movement. Tell us about Andrew Wakefield and his role.

SHIN-YI CHOU: 02:26 First of all, I'm very happy to join this podcast, and to talk about this very important topic. So let's start with Andrew Wakefield's publications in 1998. So in 1998, a very prestigious medical journal based in U.K., The Lancet, published a paper led by Andrew Wakefield. So they studied twelve children, and they claimed that they found evidence of measles virus in their digestive systems that led to bowel disease and autism. However, a substantial body of subsequent studies based on more rigorous research protocols and larger samples couldn't support such linkage. So in 2004, this paper was partially retracted, and in 2010, the paper was fully retracted. Although Wakefield's study has been proven fraudulent, it fueled fears about vaccine safety in U.K., Europe, and United States. And especially after the publication of paper, and even after the paper was retracted, the public was presented with conflicting messages, ranging from celebrities' anti-vaccine speeches to emotional stories from parents of autistic children to assurances of vaccine safety from authorities. So it's sort of mimicking what we have seen today.

CROFT: 04:01 What was it that led the two of you, along with a former student as well, to begin looking at how it was that people form their views about vaccines and what affected them?

CHOU: 04:13 So, Ernie, you want me to talk about it?

ERNIE LAI: 04:15 Yeah.

CHOU: 04:16 Okay. So--

LAI: 04:17 By the way, I'm very happy to join the interview today. Yeah, I will let Shin-Yi-- because this was initiated by Shin-Yi and her student, right? I joined the project at a later point. So I will let you two talk about how you guys start looking at this problem, and then maybe I will talk a bit about my contributions.

CHOU: 04:40 Okay, sounds good. So initially, I was actually interested in understanding the increasing numbers of autistic children at that time. I remember I was a participant at a research forum on this particular topic 15 years ago, hosted at Lehigh University. The forum was open to the public, so there were a lot of parents who had autistic kids join the forum. During the Q&A, I remember clearly, some parents got very emotional and insisted the causal relationship between vaccine and autism. So that got me into this topic, and read more about this controversy. So my foremost student, Mengcen Qian, started examining the MMR vaccine non-uptake rate in the United States during her Ph.D. study. So we got some plots, and we were very puzzled by the increasing trend of MMR non-uptake rate in the U.S. after 2004. So essentially, that was the year when Wakefield paper was partially retracted. So I'm a health economist. I'm always interested in how health behaviors are developed. So I talked to Ernest about these sort of puzzling results. And Ernie is an experimental economist. I remember he said right away, "Well, your story may be driven by confirmatory bias." So that sounds very cool to me, so we started to conduct more in-depth analysis. So that's how we got together to study this very important topic.

LAI: 06:29 Yes. Yes. Yeah. I think one of the most important findings in the paper is the asymmetric responses to what we call the positive information and negative information about vaccine. And so I think Shin-Yi and Mengcen was kind of puzzled by that findings. And then they come to me, and they talk to me, and I say, "Wow, this is pretty natural, right, from the perspective of confirmatory bias." And then I joined the project and point out what the literature is. And then I also built a little theoretical model to connect — because confirmatory bias was a bias at the individual level, how that translates into what we call aggregate observations about the change in the vaccine rates, or the response of the aggregate vaccine rates to different type of information. So I tried to build a theoretical model to link to, so that we have a robust formal framework to address that issues. And then Shin-Yi and Mengcen was solely responsible for the empirical parts and analyzed the data to tease out such an effect on the empirical fronts.

CROFT: 07:53 Okay. If we can talk a little about confirmatory bias, it sounds pretty obvious, and I'm guessing that it means that when we're looking at information, we're looking for things especially that confirm the bias we start out with. Is that correct?

LAI: 08:14 Yes. Yes. I think the idea traced back to, actually, Francis Bacon, right? He had a quote that the human understanding, when it has once adopted an opinion, will draw all things to support and agree with it. I think this is probably the first documentation. I

mean, it wasn't claimed, right, at that time. It was his observation. But then psychologists have documented this in the laboratory? And then there are many forms of it. And one form is basically just what Francis Bacon's quote is about, right? Once we form a position, form a belief, then we are becoming deaf to new information — in particular, those information that contrast our initial beliefs, right? We will be selectively selecting information, we will be selectively interpreting information that fits our prior narratives. So I think that is the main idea of confirmatory bias. And that has been documented by psychologists in the lab. And then in our study, we document that in the context of health decisions, using what we call the real-world data, right? The data was not obtained from the lab. So that is one of the contributions to the paper.

CROFT: 09:50 And what kind of data were you looking at? I believe the study talked about news coverage, online information searches. Was this the attempt to correlate what kind of things people — what kind of information was out there, broadly online, and then correlating that with either a rise or a fall in the MMR vaccination rates?

CHOU: 10:15 The primary data is the National Immunization Survey, and we look at the periods from 1988 to 2011. So we know the MMR non-uptake rate among the children surveyed. And in addition to this main data, we also supplement our data with many other measures. So we look at the role of three factors to facilitate our findings. So we look at the prevalence rates of relevant diseases. We look at the counts of relevant coverage in local newspapers. So for newspapers, we actually manually read through all the newspapers, news articles that are related to MMR vaccine controversy during this time period, and count the number of relevant coverage. And we are also interested in the intensities of relevant online searches. So for that one, we collect the data based on the Google trend. So all those are measured at the state level. And our underlying pre-assumption is that vaccination decisions of mothers with more frequent onsets of the diseases or more relevant newspaper coverage or more intense online searches of related topics are more strongly affected. So at the end, we find that online searches have stronger impact on the biases of college-educated mothers than does newspaper coverage and disease outbreak. And we also find that both positive and negative exposures of online searches have a significant effect, although the effect of negative exposures remains dominant.

CROFT: 12:12 And what do you mean by positive or negative exposures?

CHOU: 12:16 So for the online search — so positive means the information that asserts that the vaccine is actually safe and effective. So that's what we mean, the positive. So we went through the information, and then we grouped the information to positive and negative. Negative information means that the information asserts that the vaccine is not safe, is not effective.

CROFT: 12:50 Now, it seems kind of surprising at first blush that college-educated parents in particular would be the ones most susceptible to negative information, false information, about vaccines. And I was wondering if you could talk about why that would be.

CHOU: 13:12 I will start, and Ernie can join anytime. So I think more educated parents have ways to obtain information faster and form their own beliefs. But when the information turns out to be erroneous, they will stick to the misinformation they believe in. So it shows us that the first perception when they formed the beliefs, it's quite important, the

information that was floating at that time. So we have to keep in mind that Wakefield's report was retracted 12 years after it was first published. So in our case, it would not be easy to change that belief formed during such a long time. So college-educated moms, they obtained information faster, and they formed their own beliefs. And in 12 years, they stick to this information that turns out to be erroneous, right? So we find that exposures to negative information strengthen the biases of the college educated mothers more than the exposures to positive information attenuated them. So it suggests that the effects of information linger when people amplify incoming information that confirms their erroneous beliefs. So once they formed their beliefs, they just follow through and stick to the information.

LAI: 14:47

It's not so much about the educated groups or parents are more vulnerable to false information. It just so happens the information that they acquire, right? They are faster in acquiring information than the less educated, right? They are less savvy in collecting information. It just so happened the first set of information they acquired was not accurate, was false. And then, under the confirmatory bias, that sticks. Then it translates into the outcome that they are more vulnerable to the false information. So there are two separate concepts or issues here, right? They are better at absorbing information, and it so happened the information that they absorb initially turned out to be wrong. Yeah. So it's like we have to see this by combining the absorption of information by the more educated parents with confirmatory bias, and that explains the findings.

CHOU: 15:49

Yes.

CROFT: 15:51

The Lancet journal article was completely repudiated in 2010, and I know your initial research went through 2011. But I was looking--there's the Center for Countering Digital Hate online, and they've just issued a new report, I think within the last week, that the number of social media accounts held by anti-vaccine activists have increased by 7 to 8 million since just last year, 2019, and that there are 31 million people following anti-vaccine groups on Facebook, with 17 million people subscribing to similar accounts on YouTube. So here we are now,10 years removed from that original false impression that people formed, and it still is growing by large numbers. How do you explain that continued growth?

LAI: 16:54

I don't have an explanation for that, but it is something that seems to be consistent with one of our finding, which is we find that the negative exposures to information has a stronger effect than the positive exposure. But if we restrict our sample to online information only, then even the positive exposure has a pretty significant effect, right? We don't see that among the traditional media, the paper media, like the newspaper. So again, I don't have an answer for the growth. But if you think of this as the battlefield, then this anti-vaccines movement people, they choose the right battlefield, right? The online arena is the medium of information where positive information regarding vaccine, right, has an effect on the immunization decisions. So if I want to focus our resources on tackling the counter party, the advocacy of a vaccine, then it seems that the online platform booster is the right battlefield, right? So I think this is kind of a rational phenomenon, right? So they choose the right battlefield. The marginal return of tackling the other camp through the traditional media, is not that effective. It doesn't have as much effect than the online platform, right? So that's my take. But I don't really have a concrete explanation for the growth.

CHOU: 18:50

Yeah. Yeah. I think the point is that nowadays, people really turn to the online platform to gather information. So it's true that more people follow the anti-vaccine groups. But for other group, like pro-vaccine groups, we probably will see the increased number as well, because it's just a trend of how people obtain information. But it's also highlights the importance of controlling and regulating that the correct information posted through the social medias.

CROFT: 19:37

Yeah, I recently had read a report from CNN talking to both officials at the CDC and looking at [social media] where – and people at the CDC were admitting that they have not done a good enough job of getting information out there about the coming coronavirus vaccine, in particular, and that in the absence of them having a public education campaign with what the facts are, that that void has been filled online by all kinds of false and even just pretty crazy information, ranging from the vaccines are part of a CIA plot to take over the world, that it's going to leave an invisible digital trackable tattoo on you, that it will hideously disfigure your face, and maybe my personal favorite, that Dr. Anthony Fauci, the CDC's leading expert on infectious diseases and a leading vaccine advocate, is actually Satan. How do you even begin to counter that kind of attack on scientific information and health information?

CHOU: 20:58

Yeah, so I think it's really not easy. But I think in the case of a COVID-19 vaccine, I think the scientific community needs to step up to scrutinize, for example, the clinical trials conducted to test the effectiveness of vaccines. So I think the studies need to be transparent. They need to publish the data so that the entire scientific community can evaluate whether the study is rigorous or not, and whether the public can trust their findings or not. Looking back, if we look at the Wakefield studies, the Lancet is a very prestigious journal, and every publication needs to go through lengthy review process. But still, they still made an error by publishing Wakefield's reports. So coming back to the COVID-19 vaccine case, time is essence here, so we all want to have it as soon as possible. But we really need to make sure that the public trusts the vaccine. So the first information disseminated to the public is crucial. According to our study, the first perception, once planted, is hard to eradicate. And people are going to stick to the misinformation and erroneous belief about the vaccines. So I think here, the health authorities, at every level, need to take a significant role in disseminating transparent information. I think that's the key.

CROFT: 22:55

Right. And I think we can see that there — another recent survey within the past weeks by the Kaiser Family Foundation found that 62% of Americans are worried that a coronavirus vaccine is going to be rushed to approval without making sure it's safe and effective. So in terms of that first impression that people have, 62% of the American people have now formed that opinion of, "Oh, when this thing comes out, it's going to be rushed, and it won't have been properly vetted, so it may not be safe and effective." You're starting from a deficit in terms of trying to rebuild trust among the public right from the beginning now, it sounds like.

LAI: 23:48

Yep, and that's devastating, I think, given our findings, right? The first impression really matters, right? That was the first impression that the public got, right, then we can predict that they are fighting an uphill battle to really promote the safety of the vaccines. Yeah, personally, I don't have a solution for that, but I'm just pointing out that in the future, or whenever there's any occasions, the public officials or the scientists have to make sure that they convey the correct information, the accurate information. Otherwise, the effect would be devastating, not because the information

is wrong, but — let's say the initial information is inaccurate or wrong. But in addition to this lingering effect of that information, right, the whole entire negative information would have a very devastating effect that is hard to counter, right? So we have to be careful about what is the information that was first being released to the public, right, to ensure that they are proper and accurate.

CROFT: 25:05 Yeah. All right. And it sounds like that — we're all hoping it is soon that there is a safe and effective vaccine — that one of the keys to making this work would be to make sure that there is a coherent public education campaign with a large online component, I take it, from your research, that really emphasizes the points that both you and Dr. Chou have made about transparency, safety, effectiveness. Cost is probably a big one, too, for a lot of people. But to make sure that that information is out there, that it's authoritative, that it's honest, it's complete. That it's not enough to just release the vaccine and expect people are going to be lining up to get it.

CHOU: 26:06 Yes it is well said. It's very well said.

CROFT: 26:10 And the last question, I'm wondering — I know you're a health economist, and that research often has applications in broader ways, as well. And I'm wondering, particularly with this study, with all of the health decisions all of us face, and the way everybody goes online now to see what their options are, what are those broader health implications for the research you did with the vaccines?

CHOU: 26:42 So I think, based on this paper, if we're going to generalize to broader health fields, the takeaway message is that the health information does matter. So a lot of people say that the health information does not change the behaviors, but health information does affect the behaviors. And now we are dealing with COVID-19. This is the most serious, and the leading cause of death this year. But if we look beyond this year, there are a lot of other leading cause of death in the United States that we need to address. And actually, if you look at the leading cause of death, a lot of cause of deaths are modifiable through behaviors. So for example, heart disease is the leading cause of death in the United States. But if you look at the risk factors for heart disease, a lot of risk factors are modifiable. They can be modified through promoting healthy behaviors. So information definitely can play an important role here to modify people's behaviors and to promote more healthy individuals and healthy society down the road.

CROFT: 28:10 Well, that seems like a good place for us to wrap this up. I'd like to thank both of you for what's truly been an enlightening conversation today, and information I think all of us should be paying attention to, not just with the coronavirus, but for our health as we make informed and wise decisions, hopefully. So thanks so much for being here today.

CHOU: 28:36 Thank you very much.

LAI: 28:37 Thank you very much.

CROFT: 28:38 And I'd like to once again thank my guests, Shin-Yi Chou and Ernest Lai. The work they and their colleagues in the department of economics are doing is generating fascinating new insights, knowledge, and ideas for education in the field of economics. This podcast is brought to you by Illuminate, the Lehigh business blog. To hear more podcasts featuring Lehigh business thought leaders, please visit us at

business.lehigh.edu/news. And don't forget to follow us on Twitter, @lehighbusiness. This is Jack Croft, your host. Thanks again for listening.

[music]