



Center for ELSI Research and Analysis



THE HASTINGS CENTER

Transcript for Genomics, Human Behavior, and Social Outcomes: A Discussion for Journalists, October 12, 2021

Speaker 1 Hi, all. Welcome to Genomics, human behavior and social outcomes. This is the first in a series of four online discussions for journalists this fall, produced by the Hastings Center in partnership with the Center for ELSI Resources and Analysis (CERA), a federally funded project that builds the community of research focused on ethical, legal and social implications of genetics and genomics. We are pleased to be joined by Amy Harmon, Eric Parens, Melinda Mills and Arbel Harper. We hope for strong participation from journalists, journalism students and journalism educators in the audience. Please type questions in the Q&A box at the bottom of your screen. We aren't using the chat function and members will not be audible or visible during the event, so please use the Q&A function. This event is being recorded and will be available on the Hastings Center website later today. It will also be available on the CERA website. Now I would like to introduce President Mildred Solman, leader of the Hastings Center, who will say more about the annual journalism discussion series.

Speaker 2 Thanks, Danny. Good afternoon, everybody. This event is the first in a yearly series that we're launching today called Bioethics for Journalists. It's part of the Hastings Center's Callahan Public Programs, which is an initiative established and supported by the Andrew and Julie Clan's Dean Family Foundation and the John and Patricia Kling and Steve Fund in honor of Daniel Callahan, a very important American philosopher and co-founder of the Hastings Center. I'd like to express my deep appreciation to the Klingsons doing family for their vision and support. I also want to say how much we appreciate mounting today's event in collaboration with the Center for ELSI Research and Analysis. The acronym CERA. This is a project that's led at Columbia University by Dr. Sandra Soo-Jin Lee, who heads the Division of Ethics at the Department of Medical Humanities and Ethics at Columbia. From its inception, the Hastings Center has had two equally important missions. We're a nonprofit, nonpartisan bioethics research institute producing scholarly analysis on a wide range of ethical questions in health, health care and the life sciences. We publish reports, peer reviewed articles, produce congressional briefings and own two journals where current issues and in bioethics are debated among experts worldwide. In other words, we're a think tank, but we're a think tank with a difference. The Hastings Center has a co-equal commitment to public engagement. We believe that in a democracy, educated citizens should participate in decisions raised by advances in biomedical innovation. They should know about and be able to consider policies to ensure fair access to the benefits of new technologies and to established guideposts capable of mitigating potential harms. And it's journalists who are absolutely essential to informed public engagement. And yet, as a profession, you are under increasing assault business models for journalism have changed dramatically, creating really big challenges. And now the proliferation of fake news has made it extremely difficult to figure out how to help people distinguish truth from illusion. So I have enormous respect for journalists. Our democracy depends on you and bioethics needs you to. We've launched this series to

support you in the work you do. We hope you'll find that the speakers we bring to you and the conversations we stimulate. Help you identify the ethical issues raised in health and science and identify them and then investigate them more comprehensively. The 2021 series, meaning everything we're going to do between now and December 31st, is called genomics in society, new developments, new questions, and this series is going to focus on the implications of new research in genomics. Today's event specifically is on new research on genomic influences, on traits like intelligence and educational attainment, an area of study that is rife with promise, but also with the potential for misunderstanding. So it really needs you to help the public understand and enter this space. It's my pleasure to introduce our distinguished moderator, Amy Harmon. She is a two-time Pulitzer Prize winning journalist for The New York Times. Amy covers the intersection of science and society. The Pulitzer Prizes she won were for the DNA Age, which examined ethical issues with DNA testing and also for a series in which she was a member of a team of reporters called How Race is Lived in America. Amy, thank you so much for agreeing to moderate today. We really appreciate your participation and your leadership, and now it's time for me to pass the baton to you.

Speaker 3 Thank you so much, Emily, for that introduction and thank you, everyone for coming. I realized yesterday when I was getting ready to kind of send the usual promotional tweet to remind people that this is happening, and I was going to say, no, I was looking forward to this panel. Like, That's kind of what what one says, right? And I realized that I couldn't exactly say that I was looking forward to it because there is this part of me that was kind of dreading it. And and that's not a comment on the panel itself because we have the best possible panelists for this event, which is titled Genomics, Human Behavior and Social Outcomes a discussion for journalists. And I don't think it's because I'm like the type to shrink from controversial topics. I was like, I think that this discomfort that I feel stems from my my own sense that I don't know journalistically the best or most responsible way to approach covering some of the issues that are growing out of this newest field called socially socio genomics. And I feel like if you if you asked me like how how I would approach covering genetically modified food or the, you know, the politics of the COVID vaccine rollout, I mean, these are topics that I have. I have an opinion on how to do that and this. But this this is hard and the stakes are really high. So I'm just going to I was asked to give a few like framing remarks. I'm going to just give very brief framing remarks and then I will introduce the amazing panel and then we will start to have a conversation that I really, you know, I just think really needs to to be started. And I'm really glad that we're here to do that today. Yeah. So the stakes are high. So I want to say something about that because I mean, we were talking about genomic influences on human traits that at least in our society as it is currently constructed, you know, really matter, like, really make a difference in terms of, you know, the amount of wealth or status or success or, you know, possibly even happiness that people are likely to accrue. And we're talking about educational attainment, how far you're going to go in school intelligence, sexual behavior, risk taking these types of things that are, you know, and they are also they are the same traits that have been used to in the past or justify eugenics or sterilization, genocide like the worst atrocities. Right. So so that so that really weighs on me when I am thinking about how to approach, talking to people and framing a story about this. And, you know, these are also the kinds of. Traits or ideas or stories that will make your editors eyes light up, right? And we, you know, there's a lot of pressure on us to make our editors eyes light up. And so it also is, you know, another reason we have to be really careful about it. And I guess just to say a few words about like the why now? Like, why are we why are we talking about this now? I think maybe a lot of people in the audience are journalists who already know this. But you know, many years ago, geneticists realized that there was not going to be a gene for the gene, for a particular trait that pretty much every

complex behavioral trait and most medical disease predisposition traits are going to be polygenic. The weighted sum of thousands of variance throughout the genome and that that would require a lot of genomes to try to get at what those variants are. And so now there are a lot of genomes and the same databases of genomes like the UK Biobank and 23 and me that that are being used to query to try to sort of zoom in on someone's risk of heart disease are being used to generate polygenic risk scores that aren't related to, as we've said and our panelists will describe more you know what it means to be educational attainment, how far you're going to go in school. And I guess I see I see at least two, maybe three, you know, key journalistic challenges to this. And one of them, one of them is that there is a lot of dissent within the field itself within socio genomics and geneticists who who are population analysis and socio genome, says the people who get up who work with this data, I think, are not settled within themselves on how how the data should be passed, when it's when it's being parsed reliably. And I just will just give one example of that, which is, you know, it's Paige Harden, who is a psychologist at the University of Texas, has just written a book, and many of us may have read the excellent Gideon Louis Krauss profile of her in The New Yorker a few weeks ago. So she's written a book, which I do think everyone should read who's planning on covering this called the genetic lottery? And you know, she makes a really impassioned case for why polygenic risk scores for educational attainment in particular, should be used to sort of think about how society is structured unequally. That genetic luck, as she calls it, should be factored into Locke. Just like, you know, parents, we we all sort of are more familiar. We're thinking that, well, you know, it's not what your parents wealth. It's not you didn't earn it like your and to some degree, lucky and that we might we might think about redistributing wealth based or resources based on that and that and that she's sort of arguing that we should also take genetics into account now that we can measure it more more precisely. But then there will be people who, I mean, if you if anybody has followed, there's just been some discussion of Page's book on Twitter in the last few weeks and another socio genome assessed at University of Wisconsin at Madison. Jason Fletcher, who has done work with this himself, you know, jumped in and sort of challenged the idea that, you know, whether you should you really look at the genome wide association study results themselves as his representative or can you really only count on that between siblings within within family jewels results? And it begins to sound technical, but there is like there's there's really a lot of debate about about that issue. And so as journalists, you and I think we're maybe used to being able to call, you know, you write about a study, you you interview the author, you call up someone who's familiar with the work that wasn't involved in the study. And and they, you know, they give you kind of like the what the field thinks about this. And usually it's like, Yeah, this is a really the end is a really important study because it was on the cover of nature. So it's it's not that you don't have to decide that much. I mean, there may be there may be people with different, different views. And you know, you try to find someone with a more critical view also. But it's I feel like in this case, it's it's less settled and that's just one. And that's sort of now I was just talking about sort of within population disputes about how to how to parse devices that are taking place within a particular ancestry group. There's another important divide that we will we will speak to are both. We're lucky to have a population geneticist also on our panel. But, you know, it's really about how to whether these results can be informative about different populations, but ancestral populations of people of Europe, people of European descent as people. African descent, obviously, it's like it gets into all the touchy, super touchy issues about race, but also, you know, more probably ancestry. And there's anyway, we will get into it in the panel, but I'm just trying to sort of outline some of the that. That's another challenge for us as journalists to have to sort of figure out some. But some people are saying, Oh, this doesn't really apply to between population. We don't have to think about that. We don't have to look at the different, you know, how these these results look differently in different

populations and others are not or are not saying that. So, OK. And so and then the second challenge, I think for us is like, let's say there is some thing that is really we need to be writing about this and we need to be the science. There is some degree to which these results are real and matter. And, you know, so then it's sort of like. And this is where Eric comes home, you know, should we be also interviewing ethicists when we write our stories about in our sort of straight science study stories? Do we how do we, you know, this is not about, like, what drug can best? You know, how your heart disease predisposition can, you know, be better predicted by these results. This is about, you know, how far are you likely to go in school? And that's kind of, I mean, the idea of people having scores for that or, you know, even groups of people having scores, that is. More by Paige Harden would argue, is like is important and, you know, like encouraging for potential social equality issues, but it's also really creepy. So I'm just so happy that there is a third challenge. I'm almost done. I'm just going to hand it over to the panelists. But I guess I would just say so. I dipped my toe into this. A few two or three years ago now, everything pre-pandemic was a blur. But I wrote a story when the, you know, the alt right was ascendant about how white supremacists were kind of taking research results from human population genetics and some of some of these socio genomics results and sort of distorting them and extrapolating from them. And, you know, trying, you know, as has been known throughout history, to use them to sort of justify their views of racial hierarchy. And one of my frustrations with that story was getting. Geneticists to talk about it like, I mean, on the record. And so because it's so touchy and it's so it's because it's hard and I came to understand why it's hard. There's not like the always the silver bullet answer to this, but I do think that's changing. And so so my story actually ended up being partly about like why, why human geneticists were not really talking about this stuff. But I think that is changing. And and so and we have this panel here where people are going to be talking about it. I want to do this in my own my introduction remarks with to give you a sense of like of the stakes and how even the scientists. So for this panel, we had people were registering and it was said that it was, you know, I think the Hastings Institute made it clear that it would. This is for journalists, but lots of apparently lots of scientists also wanted to sign up. So geneticists were signing up or they were contacting me asking me if they could get in, you know, even though they weren't technically supposed to be the audience and we did limit it to journalists. So I guess anyone can watch the video, but one one of them wrote to me a question. And so this is from Robbie Widow, who's a postdoc at the Broad Institute and who is an author on several of you know, there are many authors, an author on the same sex sexual behavior study that will come up in our panel, I think, and also educational attainments study and some others. And he just wrote to me because I told them, like, you can, you're not going to be in the art, you can't be in the audience. But he said the one thing I'd really like to know is, he wrote, so it is very clear that the type of work that I and others do has the potential to hurt people if the communication or outreach is wrong or even if it's right. So should we be doing this work at all? As you know, even though I researched this stuff, I'm not totally sure. I'm very curious about what others think as well. Like you said in your post, that was referring to my tweet. The stakes are very high here, so I just I don't know that we will answer that question in this panel, but I just sort of use that as a starting point. And now I'm going to hand it over to these panelists, which are so Melinda Mills, who is a sociologist at Oxford and who does socioeconomic, and our Bill Harbeck, who is a population sciences at the University of Texas and her parents, who's a senior research scholar at Hastings. And they will each talk for about 10 minutes about sort of their relationship to this topic and the questions that concern them. And we'll have some discussion and we'll have your questions. Thanks. Handing over over to you, Melinda.

Speaker 4 Thanks. Thank you very much, Amy. And it's nice to see everybody see everybody, but at least to address you in relation to this. So I think it's good. Amy's given an introduction to sort of tell you about what socioeconomic is. And I think what it is is really introducing ideas from molecular genetics into social behavioral sciences. So I'm in demography and sociology, and so the things we study are often educational attainment, income, well-being and I study reproduction. So when you have children and your first child. And so they're usually what's called complex behavioral outcomes. But there's a lot of medical outcomes as well that are complex, such as BMI or type two diabetes or, you know, other traits like that. So. And as Amy said, I'm I don't need to go through and explain what a polygenic score is, you know, so it's just many different genetic contributions, and I'm sure that will come up because that has been the large discussion. So why am I doing this and why are socioeconomic like, why are we doing this in the first place? And I think, you know, you had the GWAS study. So these are genome wide association searches, and you can think about them as genetic discoveries where you search across the genome. And we find many, poorly so many different genetic variants that are associated, so correlated related to the outcomes that we're studying. And I think as of 2019, you just had this explosion in types of data in computational possibilities and statistical techniques to study it. And I come from a background of demography, of studying fertility. So when you have your children, how many children you have in sexual behavior, what ages and all of these different aspects. And so for me, I was looking at things largely from a socially deterministic lens. So everything was related to, you know, people are having children later or earlier in relation to their social environment in relation to child care, contraception, work life, reconciliation. And it became increasingly clear that, you know, as individuals shifted. Having children till later, they were having infertility problems, and so something could have been happening in relation to genetics related to infertility or endometriosis of these other traits, you know, that could have resulted in these people being infertile. Then on the other side, we had teenage pregnancies in certain areas and groups, and we found a study we published in 20 just a few months ago in Nature Human Behavior. You know, it was related to, you know, addictive traits, risk self-control genetically. So I was interested from it, you know, studying decades on this topic, from social sciences to look, well, what are the biological components that came from that side? And I think when we talk about these polygenic scores with multiple genetic variants, I think it's really important. And Amy already discussed, I think there is there's some disagreement, definitely within the socioeconomic community. You know, about these things. And it's not just I don't think it's just us, I think it's in the general genetics community. So, you know, often many of us don't think of it as an individual predictor as it as it is supposed in some books and by some people. You know, Robert Plowman, who wrote blue print, you know, famously talked about it as you know, we can have educator precision education policy and we can reflect on that later. But there's a few problems with that because, you know, if you look at the polygenic score for educational attainment and you do a scatter plot of educational attainment attainment by years of education, you'll see, you know, if you get into the top 10 percentile, you know the ability to predict it at an individual level differs from between, you know, between the fifteenth and the 100th percentile. So, you know, just looking at that, if I was to tell you you could get on a plane and it's sort of, you know, it's between the 15th one, five and 100th percentile that it would crash. You probably wouldn't get in. So. So there's some technical aspects about why would be difficult to use this at an individual level. And I think, you know, Amy mentioned Jason Fletcher and others, and we have a paper coming out, hopefully soon in Nature Genetics, where we use sibling models and just say, you know, these these estimates that we have, it's a combination. It's genetic variation of these direct effects. It's demography, it's the population and assorted of mating, and it's what you get from your relatives. So these indirect genetic effects as well. So and then I guess looking at genetic correlations. So I've spoken about it a little bit more,

you know, genetic correlations. We often studies, we often look at a trait, let's say, such as educational attainment, and we see how genetically correlated is it with other traits. And you know, you'll see, for example, that what I study is timing for Spurs number of children and the genetic correlation that is extremely high with education and age at first birth, it's actually zero point seven four. So, so if you look at correlation, zero means no correlation. One means a high correlation. Two point seven four is really high. That's a genetic correlation. We know from social sciences that, of course, you know, you stay in school longer, you have children later. But this is a genetic correlation. So many socioeconomics, we're starting to realize and thinking, well, these genetic correlations are picking up a lot about the population in the environment. So, you know, as a as a social scientist, I started to then look at the data as well and think, Wow, there's a lot of sample selection. It's probably something biologically going on what they call pleiotropic. So one gene is associated with two or more traits, and all these correlations that we're picking up are genetic. But you know, is it is it that, you know, the genetics that predict age at first birth and educational attainment? The correlation is point seven for I'd be worried about applying that in a in a policy environment because, you know, is it is it picking up fertility or is it picking up education? And I guess also we look a lot at gene environment interplay. So there's been a lot of studies studies by people like Jason Boardman, Jason Fletcher, Dalton Connelly that have looked at these in detail. They look at policy changes and they see that, for example, in relation to taxes and smoking or in relation to changes in education, how that actually influences different groups using these scores. So there are some interesting applications, and we can focus on that later. If you like, you know, some people, we look at gene environment interaction studies. So there are certain mechanisms you can think about that some people who are highly religious or come from a household, you know, wealthier household, they have different opportunities. And they have less exposure to certain detrimental traits or outcomes. And some of these things might be triggered by their contexts, you might have a predisposition for addiction, but it lies dormant because it hasn't been realized so that this gene environment interaction, which we study often. And then just to to, you know, sort of conclude, as a demographer, I was really interested in the populations that's been that have been studied. And so we have something in communications biology where we examined, you know, the traits of the authors who look at these things, but also the populations that have been studied. You know, and we found, you know, it was really striking to me as a social scientist that a lot of these genetic studies just combined 50 datasets together from different countries and age groups. And and that would be very unusual for us to do so. So we looked at this and we saw actually that in 2019, all genetic discoveries to date from these guys come from three, 72 percent come from three countries the US, the UK and Iceland. So think about that. You know, this is where people are developing different drug discoveries and many things. So this is rooted in these populations. We also looked at them in terms of they were often older, they were more often female in the samples. And what does that mean? And I think Arbel is going to talk more about ancestry. And we also saw that you've heard it many times and it's overwhelmingly looking at ancestry now, whether that or looking at European ancestry now, whether that's a helpful term, we'll discuss. So I guess just to conclude, you know, I've given some caveats to this. So, you know, we've also studied we we saw that if you look at we've examined our different genetic estimates across different countries and across different cohorts, and we found very many different estimates. So environment seems to matter, and environment also seems to be picked up in these genetic test estimates that we're seeing. But despite all of that, it's an interesting frontier to look at. But I think that, you know, we're scientists, so we should always remain open to what we're finding. We should always remain open to a U-turn and our understanding we should always look for new techniques. And I think that's what we're doing at the moment. So it challenges our theoretical thinking. It allows us to ask new questions and, you know, it

allows us to get to those basics of nature and nurture, nature versus nurture. So I think it's, you know, an interesting field for me to be in and for many others at this moment because it's quite exciting. And you know, for me, it's not I don't see it as problematic if some of our thoughts are overturned. But I do see it as problematic if we're thinking about applying these kind of traits when technically we haven't dug into, what are we actually measuring? So what are these genetic correlations really measuring? So I'm going to turn it over to our bill now who have a different perspective as well. So thank you.

Speaker 5 Thanks. Thank you, Amy. Hello, everyone. Before I sort of introduce my own research, I want to begin by saying how we like today to be part of this event to thank the organizers for making it happen. I definitely share and is looking forward, but not really looking forward sense, but I will get more into that. But just knowing that all of you are here and seemingly asking you about the numbers that in itself shows that there's considerable interest in accurately and responsibly reporting this area of research and related the aspects and consequences. So I'm a population geneticist at UT Austin. My research group studies how evolutionary processes such as natural selection shape genetic variation and how our genetic variation in turn maps to trait variation. So beyond basic science, for its sake, I think a lot about how evolutionary populations approach their population of statistical genetics can inform applications for human health and well-being. But up until a few years ago, I didn't really have any particular interest in DNA's, let alone ideology or behavioral or social outcomes. In fact, you just seemed to me like this nightmare of data to be working with because, you know, essentially, as the name suggests, a genome wide association studies only tell us about correlations. And you know, that correlation is not causation. You know, saying is actually at the root of many of the issues that we're grappling with today. But this know serious of research finding by myself and my colleagues really led me led research. Sorry just to take this central stage in my research. And so I want to sort of tell you and give you a little bit of background about how how this research about evolutionary questions sort of. Let's let my research to be intertwined with this age. They just politics cause that social tolerance. So I will take this step back because I don't want to assume that everyone knows exactly what we mean when we say, Gee, what's the project or so? So genome wide association studies, you know, just associate genome types in various places in the genome, the entire genome. So they associate genetic variants with human traits. And then perhaps one of the key findings that we have from I think it in to us is that many traits that we care about, including behavioral traits, are almost always highly pathogenic or complex, meaning that the bulk of heritable variation in the trade is through to not one or a few genes, but about a combination of thousands of genetic variants, a far small individual effects. So why this is the case that the biology of this psychological complexity is in itself a fascinating question for another day, but for today we want to sort of like learn about that heritable variation attributed to. High blood pressure, breast cancer, schizophrenia and also substance abuse or educational attainment. This observation of high poly, Jane, is that he is really bad news because what it means is that there is no single gene or five genes that have this large effect on a trait that we can. We can understand the mechanism through or target an intervention through where interventions are relevant. But instead, there are this kind of effects all over the that are spread all over the genome. And it's incredibly difficult to pin down biological mechanisms when the trait when traits are so complex. But that is a three hour. And. Yeah, so this sort of observation in itself shifted the focus of human geneticists such as myself from finding the gene for the trade to essentially thumbing over all of this tiny correlations to get meaningful predictions in the form of so-called apologetics exports. So simply put, apologetics quality is exactly that it's identical for a particular trait, is generated by somebody over the G1, estimated effects of a bit of variance and doing that for all the variants that are carried by individual to predict their traits are being that their

risk of schizophrenia over the years, that they are faithful. And and now many to my own, you know, kind of this resolution as though years before any application of public scores or clinical risk prediction or for or the use was suggested for social science research or policymaking, but social and behavioral outcomes. Years before that, a population geneticist such as myself have studied natural selection, acting on complex traits by sort of detecting shifts in biology explorers that happen over time or across populations. And the clearest example was of such an expression that that is consistent with natural selection was that of a high college and explore across European subpopulations. And what my colleagues and I found is that there we, we our work sort of cast out into this previously identified by example by showing that the signals were nearly absent when we were using this newer, cleaner data from the UK Biobank. And the reason is that variance. But the effect estimates for genetic variants were biased due to population stratification. So the biases were usually very small. But when we sum over all of them and they act in some systematic way, it can lead to very wrong conclusions. So I would be happy to dig deeper into population stratification or population structure and a little later. I think it should be of interest, since the inconvenient truth is that we don't know how big of an effect or how big of a problem this is for a given gene was this day and age. And there are good reasons to suspect that it's still a major factor that influences G as a project to work for social and behavioral outcomes. So the bottom line, though, is that we showed that even tiny biases in effect size estimate can lead to this, you know, usually a wrong conclusion when they are summed up in a project score. And this, you know, this research finding was from only a couple of years ago, and it's looking at the traits that's supposedly very close to the metal, biologically much more so than, you know, behavioral or social traits that we think about. It's like very, very much mediated by the environment and social context. So, you know, how is like the poster child of apologetic trade research? And we we thought that we had the best time along this great. And yet only two years ago, we found that two of the largest studies that detect the largest U.S. that were available that were that previously showed this results or led to this arrest show were the work also conducted by this large proportion or two of this juicy, juicy U.S. hives suffered from systematic biases. So, you know, while our initial focus was on this like relatively narrow point on the failure to reproduce evidence for natural selection acting on hype, our work made a much more general point about the sensitivity of probability scores to our population structure and also illustrated one reason why project scores actually have limited portability across groups and in this case, across. And so in the hopes that this system in the context of today's discussion. Let me just skip ahead and say that, you know, high prediction accuracy if, for example, a biology score for educational attainment. Is to an unknown extent. Could it could be due to the politics or just being highly caught or sorry, genetic ancestry being highly correlated with things like income? As we most certainly know that that it is. So this study was sort of the turning point of my research. I realized how far the science left from the proposed applications of Blockchain Explorer. And so this shifted my own attention from just the evolutionary applications to really thinking about how objects or thought made use of will be used in broader contexts and. And that really opened my eyes to the fact that that those problems are somewhat inherent to us. So. I also began to sort of realize how accepting it would be for non-experts to ignore this fact of this, you know, technical sounding difficulties when they hear about a genetic predictor of trade and just think about this as a black box that represents the direction that took effect once genotype on their phenotype. And, you know, sort of representing a propensity that maps to some biological mechanism that we don't understand. But but that's what it represents. Is that not the case? And to the extent that we we don't know whether that's the case where you apologize for it and we should be, you know, more suspicious, I guess, when we're talking about transit, so heavily involved mediation. But by being violent. So, you know, since its work, we've also shown that even within homogeneous ancestry groups, the associations

that we get between genetics and a pretty heavily dependent of the virus, I'd rather be part of the of the Jewish participants. So we found that the prediction accuracy of pathogenic sports varies markedly depending on characteristics such as age, sex, socioeconomic status of the individuals which are included in the glass and the individuals for which the prediction is conducted. So all of this, you know, goes to highlight somewhat underappreciated obstacles to a broad use of quality, of course, and to their interpretation. So today wasn't projects for this central stage in my research, but this is really not because I'm now suddenly a lover of correlation, mostly because I've sort of learned how how important highlighting the windfalls, but also the pitfalls of this. A fire using G.M. product exports. So this is a field where, you know, the applications are many steps ahead of where this science and in in many cases, I believe that many steps ahead of what the science could even eventually tell us. OK, so I think at this point, I can turn this. Turn it over to to Eric.

Speaker 6 Thanks so much. Ah, well, it's it is an honor to be with you and Melinda and Amy. And I was asked to talk a little bit about my experience of the last couple of decades at the Hastings Center doing work in this space that is the space of using genetics to try to understand complex behaviors in the in the 2000s. I led a project called Wrestling with Behavioral Genetics, and it brought together enthusiasts about and critics of behavioral genetics to explore the the scientific and the ethical territory. In 2004, just a year after the completion of the Human Genome Project, we produced a report and a book which described the state of the science. There was, at that time, some good news. Exploring genetic differences could, at least in principle, contribute to illuminating complex behaviors from autism and alcoholism. Given the twin adoption of family studies, it just wasn't any longer possible to deny that genes could help to explain observed or phenotypic differences. It's hard for some of us to remember how important it was to wrap our minds around the idea that it wasn't refrigerator mothers that were creating schizophrenia and autism. There was also, of course, a lot of lousy news on the science front at that time. As Dean Hamer announced in Science just a couple of years before we published our report, the results of the first molecular studies were at best, disappointing and inconsistent. They just were not, as promised, turning up single genes with large effect sizes. In that piece in science, Hemmer mentioned three strategies that might move the field forward. Remember, this is 2004. Two of those didn't pan out. But one of the ones he just heard at was Jim Wallace. And as we've been hearing a lot about that strategy is tech is being taken very seriously. It's going under if it's even if it's going in for some rather heavy fire. In that 2004 report and book week, I also tried to explain, I guess what's obvious now, which is that behavioral genetics touches on fundamental ethical ideas and values in so far as behavioral genetics is about behavior. It's always going to raise questions about freedom and responsibility. How free am I? To what extent are we learning anything about determinism? Of course, at this point, we know that genetic determinism is not. Genes don't determined by themselves much of anything at all. Not even PKU. And insofar as behavioral tax is necessarily about genetic differences among us, research like this is always going to invite questions about equality. Just how equal are we? What's the relationship between moral equality and that other kind of descriptive equality that we hear geneticists are in on about? So to the extent that we had a conclusion in those years, it was the really remarkably novel one, I'm sure you will all agree that this emerging science has potential for some very good uses and some very bad ones, and that it is incumbent upon those who do the research to communicate responsibly about what the science does and does not show. As Amy emphasized to start, that seems like still the order of the day. So today on co-leading with Michelle Meyer Dyson for a project called Wrestling with Social and Behavioral Genomics, a.k.a. Socio Genomics, and I want to underline that I am speaking today only for myself. The working group that I co-lead with Michele is very much

in the midst of wrestling with these matters, like the Wrestling With Behavioral Genetics Project. This one, Wrestling With Socioeconomics, also brings together enthusiasts about the science and critics of it to explore the scientific and the ethical territory. One thing that is new today relative to the earlier project is what we've been talking about this year was technology that or gestured at 2002. As we've already heard, critics would say, and I think fairly that guns are a very powerful street lamp to take to refer to the old image of the drunk looking for his keys. It is really quite amazing to have the techno scientific expertize to be able to identify correlations between single nucleotide polymorphisms and social outcomes. I don't mean by any stretch to decide to dismiss the importance of that, but I do want to recognize that we are in the throes of in the midst of are using this remarkable techno science that we may have exaggerated. The importance of whether that's the case or not is yet to be seen, of course. And another thing that's new or different from then is, of course, that there's an even larger distance between the genes that are being investigated and the phenotypes that are being studied. It's one thing to study the relationship between genes and a rather and rather close, you know, type like autism, and it's much, much harder to get from genes to something like educational attainment, as Melinda and Arbel have emphasized. So given this distance, it is, as far as I can tell, going to mean that it's going to be really, really hard to come up with causal stories that start with genes and end up with such wildly complex phenotypes. And it seems to me worth remembering that. Some researchers don't need to be able to explain why what's going on is going on to be able to make predictions about future outcomes. Amazon doesn't understand why I like the things I seem to like, but it's sometimes depressingly good at making predictions about what it's like or how it will behave. And I would grant that we are still waiting for an excellent example of Chihuahuas or pelican explorers being used for the sake of prediction. Even in the context of the most simple medical conditions. Moreover, I would mention that even if polygenic scores aren't going to live up to the dream of contributing to causal explanations or even to predictions of social outcomes, they might. In fact, as I think Belinda was alluding to or referring to, they might well contribute to doing better social science by controlling for genetic differences. And, you know, intuitively, that ambition of using GPS to polytechnic scores to control for genetic the role of genetics and social outcomes makes a lot of intuitive sense to me. There again, I, for one, am waiting for an excellent example of socio genome assessed using politics scores to control for genetics in a way that not only enables them to do better social science, but leads to social interventions that are as genuinely useful as they hope they will be. Most importantly, the thing that's really new in our country today, that wasn't the case that we were doing our next project is that we are in the midst of this reckoning with structural racism. The most fundamental ethical worries themselves about this kind of research are any different from they were from the ones that we wrestled with back in the day. What does socioeconomics mean for freewill and responsibility? Remains a question. There is interesting and important vignette based research touching on the question of the impacts of old fashioned genomic information about psychiatric conditions. As Matt Lebowitz and colleagues have pointed out, genetic information in the clinical context can appear to, in some people, induce a kind of prognostic pessimism. That is, there's reason to believe that such reason could reduce some person's sense that they have a free enough will so that they can get better. And similarly, some vignette based research by my colleague Lucas Matthew and colleagues and his colleagues suggests that if there were genetic information about education attainment, it could lead to students coming to believe that exerting their wills really couldn't do all that much to change their genetic destinies. All of that research, it seems to me, is very important, is ongoing, and we need to learn a lot more about. And I would recognize that. Results from genomic studies of this kind have been around for more than 50 years now, and I think it's hard for any of us to point to a kind of massive reduction in the attribution of personal or criminal responsibility in the light of these new

genetic findings. Now, whether that change in the future. Think about. So finally, what about socioeconomics and equality? This this does fill me and Amy and role, and I wouldn't be surprised if it filled the two with some dread. Just talking about this can be can fill us with some hesitancy, if not dread. We do live in a society that's not only plagued by structural racism, but where many at the top of the income distribution believes that they are there because they deserve to be. I'm Elizabeth Souhaité, and forgive me if I the pronunciation was wrong. A researcher at American University, Souhaité and her colleagues recently reported in the Journal of Politics that the top five percent of Americans were more likely than others to emphasize intelligence and hard work as explanations for their success, and that the top one percent were unique in emphasizing both their genes and their choices as closets. Of those traits, that is emphasized genes and their choices, not social structures, as explaining why they were where they were. Now, the people that Souhaité and colleagues surveyed were not relying on research from socio genomics to justify their place in the social hierarchy, but they could in the future. And moreover, the racists have, as Amy Harmon has already written about, latched on to such research to advance the views they had long before socioeconomics was on the scene. But it is indeed new. There's a new weapon that they can. Use to their purposes, regardless of how poorly they understand what the research actually says. So at the moment, it might be fair to say that I worry less about the negative impact on the perceptions of freedom and responsibility they once did. But I but my worry about equality is, if anything, grown. Does this mean I think socioeconomics research in general should be halted or banned? I'm open to the possibility that there are exceptions to the following rule, but as a rule of thumb, I don't think that bans are the way to go. For one thing, researchers have the right to investigate what they find inherently interesting. Thank God there are researchers like Robbie Wedo who are asking out loud. Fundamental questions about whether there are certain kinds of analysis that ought to be done. But for another reason that I worry about bands is that. It's very hard to know how to implement that, given as I think it was Amy who said the data are hanging around there, used in all sorts for all sorts of medical research, it's very difficult to know how one would altogether ban research of this kind. So what that leaves somebody like me with is the. Exhortation to researchers and to force journalists to communicate clearly about what the researchers are doing and why they're doing it and what they have and haven't found. And as Amy said, it means that you journalists are going to have to try to push back when the people who write your headlines seek to grab eyeballs. I understand that you folks in the audience probably aren't writing the. Headlines that can do so much damage, but I think it's time for all of us to push back. The good news for people trying to communicate responsibly is that there have been initiatives ongoing for at least a decade now. There's been a tradition of creating these frequently asked questions document. It frequently asked questions, documents or fake use, which aim at explaining in layperson's terms what such research has and what research it has not found. Social Science Genetic Association Consortium in general, and Michelle Meyer, Patrick Turley and Ben Dan Benjamin in particular, can take pride in getting that tradition off the ground when they led the way, creating the first as a cue on the first educational attainment study that got so much attention. And another fantastic. Example of doing fake news energetically and responsibly was created by the researchers at the road, including rugby. We know who did that study on same sex sexual behavior. The further good news and I'm about to wrap up, is that the working group that Michelle Meyer and I co-lead, or at least some subset of us are planning to create a template for researchers who want to create ethics for their studies. And I'll say that last thing I'll say is that those researchers and all of you in the reading and all of you in media who are interested can now go to a report, depository or repository of all of the cues that have been put together so far. That repository as a FAQs was created by Daphne Martschenko and her colleagues. You can now find that repository on the Hastings Center

website. Maybe Danielle can put up a link to help people get to it. But again, that is. I hope I'm a useful research resource for journalists who want to communicate clearly about what such research has and has not found. Thank you. Over to you, Amy.

Speaker 3 Thank you all so much. That was that was amazing, and I have a million questions and I just want to encourage. I want to encourage the audience to put questions in the Q&A and no question is too basic. So, you know, I remember I was just thinking that not even really understanding what educational attainment was and actually in one of my editors at the times when I was writing about it, I think it was in 2018. Just, you know, we had to like, he really didn't want me to use that phrase because it was so like, What do you mean? Do you mean achievement? You mean like years of it was just, we tried to work out something that was a little more conversational. So please do ask your questions in the in the Q&A. I wanted to go back to Melinda. So Melinda, I want to be I want to remind myself to ask you, I really want to know, and I think the audience will really be interested in learning about how your work has been reported on. I think you have examples. Maybe, maybe not like the most the best example, you know, an example of a of a story about how it maybe it shouldn't be reported on. But before I ask you that, I just wanted to say, you know, so Eric is saying he has not seen an example of the great promise rate of socioeconomics, as I think is that it can help shape social policy. You can, you can, you know, make research results on all sorts of interventions that are supposed to help society or parts of society be more accurate. So is there an example? I mean, what, what or what is the closest that the field has come? Or, you know, or maybe about to approach if you can can give one or maybe just talk a little bit about how that would work. That makes sense.

Speaker 4 Sorry, are you talking to Eric for this?

Speaker 3 I know so. Oh no, sorry. When I was talking to you, I was saying he was posing this question. He kind of said this was offered this provocation, and he said, You know, this field is supposed to come up with, you're supposed to like the ideal is for I wrote it down better social science by controlling for genetic differences, right? So social science would be improved and society would be improved if we can if we can use results from their socioeconomic studies. But he said he hadn't seen a good example of that yet. And so I wondered if you might have, well, excuse me, I got that wrong.

Speaker 6 I haven't seen a great example.

Speaker 3 example. OK, fair enough. OK, well, Melinda, is there a good example or a great example or does any example that you might? I just wanted to sort of flush out for people. You know what that might look like?

Speaker 4 Yeah, so I'm not sure I want to get embroiled too much in using controlled variables. I'm not I'm not sure how interested this audience will be, but I might be surprised, but it's basically, you know, it's talking about, OK, so you add a whole bunch of predictors and variables and you want to explain an outcome like years of education. I agree. It's easier to understand. So years of education or when somebody is going to have a baby or, you know, levels of alcohol addiction or whatever, so you add a whole bunch of variables in the model. It's called multivariate, so often in the social sciences. We had the usual suspects, so you would have your things such as age, sex, ethnicity, which race in the US, you know, and all of these you know where you come from, your family background and all of these things. And you know, as I think it was, I read it in Page Harden's book. You know, those explain up to maybe 20 percent that you are square of

what you're looking at the social ones, social one. So, you know, and then, you know, you often add in, you can add in these genetic predictors. So that's the idea. And I agree with Eric that, you know, you can add these in and they can increase your explanation. But can they really do something? So, OK, I've increased my explanation. I now understand that when I add in a biological component, I increase my x x explanation. But I think it's one. It's interesting is when you get into the gene environment, studies, the gene environment, correlation studies, because then you can really figure out and you know, there's been some really interesting ones, particularly I mentioned it by Jason Fletcher and Jason Boardman that looked at the differences of taxes on tobacco, for example, and how some people that were just very addicted or, you know, they had these genetic predisposition to being addicted to smoking, you know, whatever you tax increase you introduced, for example, that that wouldn't influence that group. So I kind of think that discussion and control variables can get stalled because then it's always about how much more can we predict in the model? And I don't think that really gets us to understanding is we'll always get to the ceiling. And then, I guess in relation to reporting, yeah, I, you know, studying sexual behavior, timing and sexual behavior and children and fertility, I've been surprised. So, you know, you always and you saw it also with the same sex sexual behavior, regardless of all the great work they did. You know, you saw that it was reported, as you know, gene found genes found for that to predict same sex behavior. And for me, you know, you then you're put on this tabloid in the in the UK, we have these tabloids, you know, you put on there is no Oxford professor predicts teenage sex or something like that. You know, the genetic basis of there are all, you know, teenage pregnancies is genetic. You know, just those kind of things. And you know, and I got a rash of males physically written mails and emails, quite a few sex offenders. The way it was written up about you explained everything to me now, and I understand why I do what I do. So this sort of what Eric was talking about, people ascribing some sort of reality or truth to these things wasn't even what we were looking at. You know, I'm I'm talking too much, Amy. But but just, you know, so I think thinking about controls is maybe a dead end in some ways, and thinking about responsible reporting is really important because it does touch people in different ways. And then, you know, it comes back to the scientists often.

Speaker 3 OK, I decided I just wanted to follow up for a moment. I'm getting a lot of questions in the chat, which is the Q&A, which is great. So but on the butt, you mentioned the taxation tobacco people who are predisposed to be addicted to tobacco and the the implication of that I just want to make I just want to make sure this social policy implication is sort of explained because I mean that that seems like the most interesting, right or the idea. I mean, I think. Maybe in the future, if if the, you know, if the the potent, you know, depending on how robust the results are, this idea of educational interventions, I mean, there is this idea out there that, you know, you could have sort of precision education or, you know, just like you could have precision medicine or so. I mean, is the the taxation for tobacco? Maybe the best example right now? Or could you speak maybe a little bit more too?

Speaker 4 Well, there's I'm sure that bill or others can speak to that as well. I mean, there's the, you know, the BMI and the FTO gene. And there's there's there's you know, there's there's some there's some sort of studies are related to Alzheimer's or diseases, there's better relationships there. But I think in terms of addiction, you'll see probably. And I think Eric actually alluded to that you'll see perhaps more applications, policy related. Think about education, perhaps with dyslexia being able to target dyslexic children earlier, for example, for interventions, but for the reasons I think that that all three of us outlined in very different ways, we're not quite sure what's in the scores yet. You know, and I'm working on this and you said, you know, Robbie Vedo mentioned that and, you know, in

others. So we're really trying to reckon with what we're measuring when I see that there is a point seven four correlation with education, an agent first verse, I can't believe that's entirely genetic. I just can't, you know? And you know, and that's what we've said since about 2015 when we published this as well. So you have to be really healthy. You have to have some healthy skepticism about what you're measuring. So I wouldn't want that applied in a school, you know, for for for that reason. I don't know what's in it.

Speaker 3 OK. OK, well, so and I know what I said. Do you want to go back to Bill? Because there are few questions in the Q&A? And also, I just wanted to make sure to give you a chance to sort of spell out this. This idea that I mentioned in my introduction, which is that there does seem to be dissent discrepancies or different opinions, I guess, about how these scores can be applied to different populations if they're sort of like a sharp divide like, oh, you know, there's this idea like, oh, we're only looking at people of European descent who the scores are only relevant to people of European descent. I I think that you, you know, you were saying that that's not that's not necessarily true, although it's also not necessarily true that the score is reliable for people within European people of European descent. So if you can speak to that, I would also just going to read you. Somebody was asking about the Tujia studies that you, you found were flawed due to biases in the data. What traits were they studying? I just wanted clarification on that. And OK, yeah.

Speaker 5 Yeah, so. So I guess I'll get to your first question first, and even before that, I wanted to to follow up on some of the things that Eric mentioned. So, you know, you probably have to cut me off at some point and I'll be very accepting of that. So. So I guess I wanted to follow up on the Eric's point on. I think you ask questions. I think it's a great it's a great culture to to adopt and. And and we should all push ourselves to to demand and provide those, you know, not not only as a service to to the public that the reporters that want to report this science, but also, of course, forces researchers to grapple more deeply with this question of that. And I think the ones that Eric mentioned are good example of that. However, I, you know, I don't want the pressure to be created that, you know, frequently asked questions means like, you know, right answers or, you know, or answers that are free from the Diocese of the researchers. And I also don't want the pressure to be greater than I think it already has to some extent. And that writing detailed ethics, you know, meets, you know, some like legal release from responsibility or ethical, a really strong responsibility for how you you then independently communicate about the science or what you do in the paper. So. You know, so just to to take examples again without decreasing from the value of having the news themselves, but you know, the the U.S. for sexual orientation episode. So, you know, writing a very detailed explanation of how the actual Jewess is done on our customers of 23 and me and that response to this question of, you know, I believe it was. Have you ever had at least one sexual experience with a same sex partner and explaining, you know, how this is very different? You know, both. It's not quite me participants looking at people that respond like, you know, the bias that you get by looking at people that respond to this question. The difference in this phenotype of people, the question that people that are attracted to members of their own sex, you know, the organization of sexual orientation that sort of happens. Kind of the economizing, the phenotype, you know, all of that, you know, acknowledging that in the book, you should not mean that you are there, that you're not free to agree to communicate the research if again in the paper or abide by reporters later to reporters. You know, as you know, we thought we found the genetic basis of sexual orientation.

Speaker 3 And I'm just going to interrupt you our bell first because I want I would like to Erich to respond because actually, I was going to I was going to follow up on that. This

idea also. So the fact that sex as a reporter, I found them very useful and I would like to like thank you for for the authors that I know that people work really hard on those. But how but basically, I think our bill is asking this question. I mean, you could also see them as just a more subtle form of PR for the paper, you know? I mean, is that right? The researchers are asking the questions that how do we ensure that the questions that like the harder the hardest questions are included in those ethics, like, are these ethics enough? I mean, I think it's it's wonderful that there is a repository because they are really helpful and they spell out a lot of what's going on in the papers in lay language. And they do raise, you know, some of the key questions. But you understand.

Speaker 6 Excellent. So I. As our bill was speaking, this old acronym, oh, god came to mind, remember, once upon a time, as you know, Amy, there were these geneticists who believed, you know, one gene, one disease, right? We look back and we think, how could anybody have believed that simplistic a story? Well, today, I suppose, and always, right? There are people who imagine there's like this one ethical intervention and it's going to make everything right. That's plainly silly, right? Of course, ethics aren't going to fix things. They are one potentially very useful tool. And by the way, I thought marbles, concerns or caveats about them were right on target. Just because there was going to have that doesn't mean that the answers offered are right or bias free. And God knows it doesn't mean that anybody is released from the responsibility of trying to talk more broadly about these issues. And God knows the risk of commercialization is something to talk about for a long time. It's real. It's there. We should talk about it. Maybe I would push back on the PR bit. I mean. A skeptical and cynical as I am about pretty much everything. It's my impression that the people well, people, the people who did the have to choose, I'm talking about. Are genuinely trying to get the science and ethics right, and I don't think they imagine that they have, but I think they're trying and by the way, in saying that, I'm not saying that, you know, good intentions are enough. As Katherine Bliss would remind us, they aren't. However, I would push back on the good PR point.

Speaker 3 I mean, just I'm not meaning to impugn their motives, but they're. OK, we will we'll just we'll leave it at that. No, go ahead. No, I mean, I just wonder if they could take submissions of questions or if there could be some. There might be some way of making the Africa-EU process more open. But but I feel like we're getting into.

Speaker 6 I would love to talk to you about that because actually we are actively thinking about how to them recommendations. So thank you. That's a wonderful idea.

Speaker 4 But it's to pick up on commercialization. Please. I think we've been talking a lot about policy applications, and I think we should reflect on commercialization of it. So, you know, it could use these and policies. And I think it might not have escaped many people. But what happened with the same sex sexual behavior that an app was, you know, there was a product, it was released by a company saying, you know, we can do this with your genetic data to see how gay or lesbian you are, you know, so this is really the problem, and I've had it with my own research looking at fertility and infertility, you know, contacted by companies saying we'd like to use your poly gennych score, you know, in relation in our fertility clinics for IVF treatments. So, you know, so you're imagining these vulnerable people coming in for fertility treatment being sold something for three thousand, I think it was three thousand dollars to, you know, get their polygenic score on number of children overboard. So that's actually very, you know, it can get quite dangerous applications and irresponsible.

Speaker 3 I'm so glad you raised

Speaker 4 the question in this area,

Speaker 3 but can you spell out just what's? Maybe it's obvious, but what is wrong with that? What is wrong with somebody?

Speaker 4 So they're using it, doing wrong with? Yeah. So our bill, maybe you want to weigh in, but it because it's the same thing that would be wrong with using an educational years of education genetic score in a school. You know, so my poly gene explore that I've looked at for a number of children. So how many children you'll have and the timing of children, given that we don't, you know, we do these biological annotations and we find it's related to tissues, you know, in relation to sperm mobility, infertility, it's it's linked to endometriosis and things. But we actually it's not just for socioeconomic, by the way, but we actually don't know the biological mechanisms for many of these, you know, variants that we find. So yeah, I think it's it's then by selling it, it would. It's snake oil, you know, selling things to people just to be really clear about it because it won't. How would that help you when you're going for infertility treatment? You know, to to to know that you have a higher or lower polygenic score in relation to your number of children.

Speaker 3 So we only have eight minutes left. I want to go back to our bill because you didn't get to answer my other question about the population within population, between population porting of the scores. If so, and then after our bill answers that I could, maybe we can just I'll think about whether there's any last words you want to say on this.

Speaker 5 Yeah. So I think you know the. For example, in pictures they targets, recent book she she describes, you know, the wonderful things that we can learn, the wonderful uses that we can have from, from and projects, of course, within the population that says, you know, this says nothing about the power between population comparisons and, you know, touchy issue that Eric mentioned from the Social Science Genetic Association Consortium. There's, you know, they actually really think this set of projects or recently they are actually for, you know, makes the user signs that they're not going to use it, not going to use this project because outside of European individuals or individuals and we're not going to make population comparisons. So, you know, all these examples are examples of people that I'm sure that I have the the best of intentions at heart, but I think this is incredibly fraught and misleading. And it's also drive damage first and foremost because there's no such thing as a population. So there's, you know, there are people that have this incredibly, incredibly complicated, you know, family tree that joins them. So we all have this. You know, just a continuum of relatedness that that ties between us. You know, you can. And I think this is like more of a point worth mentioning of making that taking, you know, such discrimination. So you could also just decide on a court of arbitrary color where relatedness, where you will treat, you know, groups of genetic ancestry as independent labels. This is something that we often do with population genetics for essentially convenience of analysis. But those groups do not exist. Those distinctions do not exist in reality. And you know and. And driving them through will only say that there is such a thing as like a European individual where there are five ancestry labels, this in my mind, just replacing race labels with with the new word and contribute to essential innovation. So, you know, I don't think I think it's sort of sending the wrong message to say that you can't use a project or to predict the value of someone who's beyond this line in this arbitrary sense, the real, you know? And we we didn't really get to discuss the whole issue of politics for portability. The issues that the the fact that politics, of course, tend to be much less predictive and samples that differ from the sample were that you are supposed to perform. But you know, the samples can be different from the juicy sample in

genetic ancestry. They also differ of the U.S. sample in the environments that the experience and social exposure and other sources of exposure. And you know, we have no good sense at the moment of how each of these factors that contributes to the portability problem. And this is a really central problem in the application, of course, more broadly to to benefit, you know, all of the anatomy, you know, that traits that we're thinking about not just because of social outcomes, but also on biomedical outcomes. So, you know, I know I'm mentioning a lot of things that were near the end here, but but just to get to that that point, I think, you know, saying that objects or that you are capturing some causal direct effects on a trait, direct effects of quantitative type on a phenotype when you're looking within population, but then don't do that when you're looking at across populations is just not fraught scientifically from a few different reasons.

Speaker 3 OK. I mean, I feel like we need another panel just to talk about that issue. So maybe we can do that. But with three minutes remaining, I guess I do want to ask you all to if you have any quick concluding thoughts. And if not, we're good. There is a question in the in the in the Q&A that I'll read in case it helps to frame your thoughts, which is should genomic data, should genomic data be used to shape social policies centered around inequality? What are the ethical implications of doing so? I feel like we need another another panel for that as well, but that that's that's out there. So.

Speaker 4 Melinda, do you want to? I don't think I'm going to answer that last question, but maybe just to to sort of, you know, sort of summarize, I think that that I think it's important to say I'm just picking up on what Arbel said. You know, I think a lot of us aren't arguing that this is causal and we do a lot of downstream things to see, but it remains correlational. And I think that's just an important point. So that's not what Socioeconomics is doing. And I and I really think that this understanding the difference of how you look at roots is is kind of this difference between population geneticists and social science and social scientists as well that are used to looking at race, which is not a biological category. It's politically, socially, culturally constructed category. And then we're dealing with, you know, as you come in as a social scientist, you look at those ancestry categories in the first thing you think of as a Canadian, the first thing I thought of is like, what about immigration and all these mixed populations? The techniques don't even, you know, and they do now they're starting to counter that. But it doesn't fit in. It's it just repeating Arbor's point. It just doesn't fit into our social constructs of how human populations are, and I'll stop now.

Speaker 3 Eric, do you will give you the last word in our last minute here?

Speaker 6 Well, I would just like to try to say where I stand, I'm really eager to try to find a middle way between. Despair about socioeconomic research, the idea that it's inherently evil and it's going to go to hell in a handbasket on the one hand and on the other hand, what I take to be the kind of frankly extravagant hope and enthusiasm that one finds in this book that's been mentioned a couple of times. It's a very fine book, beautifully written by Page Hardened. I've tried to say why I don't buy her arguments in a post that I put on a bioethics forum not long ago. I think it's worth trying to find a middle way between undue despair and undue. Well, it's not easy, but I. That's what I'm trying to do.

Speaker 3 That's a perfect last word. So thank you all for coming. I'm sorry, we didn't get to all the questions in the Q&A, but we could talk about this for much longer and I wrote, Thank you to all the panelists. This is fascinating conversation.

Speaker 6 Thank you, Amy.

Speaker 4 I thank you. Bye.

Speaker 1 Thank you all for joining us today, and a special thanks to Amy, Eric, Melinda and Arbel. A recording of this discussion will be available shortly on [ELSIhub.org](https://elsihub.org) as well as the Hastings Center website, the Hastings Center, dot org and along with other resources, including the facts mentions that accused mentioned will be posted following today's event. You will receive an email with a survey about the event. Thank you so much for taking the time to complete the survey. Your answers will be used to help improve genomics and bioethics resources for journalists. Provided by the Hastings Center and the Center for ELSI Resources and Analysis, please join us on October 26 for the next discussion in the series. Law enforcement and genetic data with Sarah Zhang, a writer for The Atlantic. Ellen Wright Clayton, a professor at Vanderbilt University. And C.C. Moore, a genetic genealogist. We will notify you this week with registration information for the next event. Registration is restricted to journalists, journalism educators and journalism students. Thanks again and have a great rest of your day.