Biological research: impact of biosocial research on health and policy

In this video today, I'm going to be talking about research that brings and society. This is sometimes called bio-social research.

So, in the first video what I'm going to be talking about is what kinds of biological data we might have in social surveys that enables us to do this kind of research, and then give examples of research questions that we could answer with these data and show how they might contribute to understanding of health and to policy.

It's important to know I'm just talking about what are called biomarkers, so indicators of biological processes. I'm not talking about genetics today. There's a second part of the talk, another video, in which I'll talk about how you analyze these biological data, but in this video, I'm really focusing on why we might want to do it.

I think Pam Heard really sums this up well why she says is that in medical research, often people tend to have one single variable to capture the whole of our social life. Are you poor or not? And in social sciences what we often do is to have a single variable that tries to capture every aspect of people's health. Over the last 12 months have you been good, fair, or poor? But neither of these ways of measuring people's social lives or people's health are really adequate to capture the richness of them. What we really need is data, surveys, that bring together the rich dimensions of people's health and the rich experiences of people's social and economics lives, in order to get a much better understanding of how society impacts on health and health impacts on people's ability to contribute to society. When we have data that's theoretically based, empirically well measured, on both health and society, then we can create a better understanding of these two concepts, and we can identify how to improve them through policy.

So, the kinds of data I want to talk about a called biomarkers. A biomarker is a characteristic that's objectively measured and evaluates the kind of whole of a biological process. It can be all sorts of things, so it could be somebody's height, someone's blood pressure, or measures extracted from blood or other tissues such as saliva, or hair. What's really important to remember is although these are objective and therefore not subject to self-report bias and other kinds of biases because people are telling us about things, there might still be measurement error. So, if you think about

measuring height, if our respondent was really tall and our interviewer really small they might not be able to reach the top of their head, so they might be at not be able to see what the measurement says very accurately. If I respondent had a large bun or tall hat or shoes, then that might give us an inaccurate measure of their height. With blood pressure, often when you go to the doctors to get your blood pressure measured, that can actually make your blood pressure get higher. It's known as the white coat syndrome, and it's exactly the same in surveys. The first blood pressure measure we take often is much higher than normal for that person. So when we analyze blood pressure data we might ignore the first measure and just use the second one, or we might take an average across them. With blood, assuming the person's consented and the person taking it has taken the blood well, then we need to think about how it's processed in terms of the quality of the data that we might get. So, for example, often blood is sent through the post and then frozen and defrosted and analysed, and all of those processes might harm the quality of the blood, and hence the measures that we can take from it. And these are the sorts of things we need to think about when using these data. So yes, they were objective, and that gives us lots of benefits which I'll talk about in a minute, but they still might have errors.

So, what do biomarkers measure? Well the first most obvious thing when you go to your doctor, they might give you a blood test to measure whether or not you have a particular disease. So, there's a measure in our blood which tests whether or not we're intolerant to sugar, hba1c, and that's an indicator of whether or not we have diabetes. And there are a range of blood tests that were tell the doctors and surveys whether or not someone has a disease. The next thing we look for in biomarkers is risk factors, so you haven't actually got a disease yet but you're kind of on the pathway towards them. So, for example high blood pressure or high cholesterol are really big risk factors for heart disease, so in surveys we might be looking for those to be able to identify earlier in the pathway on the road towards somebody getting heart disease. If we're interested in how people's social lives affect their health, then what we're really interested in is how social stress might kind of get under the skin in order to affect your health. And then we're interested in things like cortisol which is often called a stress hormone which rises when you're in under stress, and then kind of circulates around your body to make you fight or flight. But if that doesn't happen, if you're under stress a lot of the time and your cortisol is rising, then that might start to damage some of your organs and other systems in ways that lead to long term health problems. Another stress pathway that

we often look at is based on inflammatory markers. These are analytes in the blood that show an inflammation. You might get them when you have an infection like a cold, or if you bump into something can get a bruise. These are perfectly normal kind of physiological responses to infection, but again, if stress carries on for a long time then that might lead to great damage to your physiological systems in ways that are harmful and later health problems. The fourth sort of biomarkers is novel markers. They're things that our biologists are experimenting with in order to better capture how our systems work. And they might hold a lot of promise for understanding social and biological factors, or they might not lead to anything. So, a key area for development is what's known as biological aging. So, can we identify simple ways of measuring the way our bodies age faster than chronologically we are, because those are the people that we might want to give the most help. So, 10 years ago we all focused on something called telomere length, which is the size, the end of your chromosome which protects your DNA from damage. Now we're thinking much more about epigenetics, and that's how the environment affects whether your genes get switched on or off in ways that are good or bad for your health. There were also a whole range of 'omics', so for example proteomics, and that's what happens when your genes tell your body to do something, often what they're doing is creating a protein that goes on to kind of lead to an effect in your body. So, there's a whole range of new things all the time that biologists are looking at that we in the social sciences might be able to make use of.

Having indicators of all these different risk factors and diseases is really helpful, but one thing we often want to do is kind of catch the whole of somebody's health, and so these factors are built into risk scores. So, a couple of really famous ones are the Framingham risk score for heart disease, or allostatic load, which is a measure of cumulative burden on your physiological system due to stress. And I'll talk about those a little bit in part two of this presentation.

So why is it that we might want to include biomarkers in social science research? So first of all, as I hope you've got a sense from the kind of indicators I've talked about, they might give us earlier, more precise measures of people's health before people are actually aware that they're ill, so an analyte in your blood might be heightened but you might not actually experience symptoms. They're objective as I said before, so they're not subject to things like self-report bias. And so, I'm going to give a couple of examples of how this might benefit us. First for thinking about

how people's health changes over their lifespan, and secondly thinking about how biomarkers together with what people tell us about their health, might help us understand why people go to the doctors or not, or why people take medication that they need or not. Secondly, I want to talk about that issue around how social life gets under the skin. So, what are the pathways through which your social life, your income, your family, and all those sorts of things might affect your health. Understanding the biological processes might help us with that. And the whole reason for doing this is if we understand these things better, we can identify intervention points for policies to improve people's health.

So, the first thing to note is that there's a natural kind of shape to our bio markers over our life. So, if you think about something like your lung function. When you're a child your lung function capacity develops, and eventually it reaches a peak, and then during middle age that kind of stays at that peak or maybe gradually declines, and then at an older age it declines a bit steeper. But if you've been disadvantaged in some way or perhaps been ill as a child, that peak might be lower, you might peak earlier, the decline might be steeper, and all of these things help us to think about at what stage in the life course we might want to intervene to promote health to perhaps lessen that decline or create a higher peak. So, one example of this is grip strength. So, grip strength is measured with a machine that you squeeze really hard to see how strong it is. And perhaps not surprisingly, grip strength as you can see in the graph is much higher for men than for women. Your grip strength is a really good indicator of frailty in later life and of early mortality, and so it's really good to measure this in populations and to see the shape of that development over life. So, you can see not only do men have higher grip strength than women, but they peak slightly later, but then they decline is slightly stronger. And so those sorts of things can help us to think about well when might we want to intervene if we wanted to change this pattern differently in men than women.

The second example I want to give is about how thinking about in a survey, what people tell us about their health, and then what measures in their blood also tell us, helps us to understand the way people behave when they're ill. So why might they differ? Well first of all, if you've got a raised level of something in your blood you might not be aware of it, or you might just feel a bit under the weather and put it down to kind of all sorts of things rather than being potential illness. Even if you are aware that you feel under the weather, whether or not you go to the GP and kind of try to do

something about it, might depend on all sorts of factors: how busy you are, if you're frightened of what might be wrong, with you all sorts of things. And then whether you tell the survey about these things might depend on the rapport you develop with the interviewer, or how truthfully you want to be about how ill or healthy you are. Understanding these different things using biomarkers can help us identify whether somebody has a need for health care independent of their awareness, their health seeking behaviour, their willingness to report things. But putting this information together can help us understand who manages their health problems well, and who manage this them badly and needs more help. So, in this graph, what we're looking at is a range of different ways of measuring whether or not somebody has diabetes. So, the first column on the left is the blood analyte that tells us whether or not someone has diabetes, which is known as hba1c. And as you can see about 4% of women and 6% of men have diabetes according to their blood levels. The next column tells us whether they told us in the survey that they had diabetes. Slightly more women told us they had diabetes than have the raised blood level, but slightly less men told us they had diabetes than those with the raised blood level, which might suggest that perhaps aren't seeking help and don't know that they have this condition. The third column from the left is about whether or not you're actually on diabetes medication. Now you don't need to be with diabetes, some people have diabetes and control it perfectly well through exercise and diet, but as you can see this is sort of similar level - slightly less in both cases for men and women, of those people on medication, to those people who have died or who tell us they have diabetes. The final column is somebody who has any one of those three things. So, either they have a high blood analyte that tells us that they have diabetes, or they've actually told us they've got diabetes, or they're on medication for diabetes. So, you can see that looking at one of those measures on its own, really doesn't tell us enough about who has diabetes and needs care.

When you put these different things together, you can start to identify those people who need more healthcare. So, the bottom bar of these two stacked bar charts tells us about those people who know they have diabetes, but their blood sugar levels are still too high, and that suggests they're managing it poorly. The next bar up tells us those people whose blood levels are too high, but aren't aware, or at least haven't told us that they have diabetes. And in both of those cases you can see that's more for men than for women, so that suggests there's something there about men who either don't manage their condition very well or don't go to their GP and get it diagnosed. The next bar up on both men and women is those people

actually who know they have diabetes and their blood sugar levels at the right level, so that's suggest they're managing it really well, and that seems to be about the same for men and women. And at the very top of the stacked bar are those people who are on medications for diabetes but don't tell us it in the survey. So that suggests there may be some degree of under reporting in self-report data about diabetes. Why people don't tell us they have diabetes when they clearly are being treated for it we don't really know, but that's something for people who designed surveys to think about. But in terms of healthcare you can see that we've identified a number of groups here who might need some support, and if we look at those groups by their education level for example we can see that those people who aren't managing their diabetes very well, those whose blood sugar levels are still raised, seem to be those with less education, and so that might help us to think about how we might target care for them.

A final example I want to give in this video is about how biomarkers can help us think about the pathways between people's social lives and their health in a different way. So, the example I want to give is about work and health. There's lots and lots of research that shows us that work, or people who work, are much healthier than people who are unemployed. And so, we assume from that that returning to work is going to improve your health. But is all work good for health? Again, there's this assumption that, and a lot of government policies that are trying to encourage people with health problems or in an unemployment back to work, assumes that's going to be good for their health. When we look at the literature about this it's often based on self-report data. So, people are asked questions about their job and they might say they don't have much control or it's not very interesting and things like that, and then they also might say that their health's not very good. So that might actually not be about the relationship between those two things but perhaps this person is a pessimistic person anyway. But if we use biomarker data we take away that self-report bias problem, because biomarkers are objective measures of people's health. And then we can investigate whether or not there's still this relation relationship between going back to work and health improvement. So what researchers in this study did is they looked at people's employment in one wave, and then they looked at their employment and health a year later to see whether or not health improved. And they're measuring how with allostatic load which is as I mentioned earlier, a measure of how stress over a long period of time my impact on your physiological systems. And in part two I'll talk about how to measure that. But here I just want to illustrate this point.

So, in this graph what we see is how people whose remain unemployed on the left-hand side compared with people who go back to work in different kinds of jobs. So, if you remain unemployed between two waves of data collection, your allostatic load is about 2.5. If you go back to a good job where you have control and you are satisfied with your work, the next bar along that's a much lower allostatic load which is a good thing. If you go back to a job where there's someone adverse thing about it, then that's better than being unemployed but naturally enough not as good as going back to a job where everything is really good for you. But finally, the far-right hand column shows if you go back to a job that has multiple adverse things about it, so you don't have much control, you're not satisfied, a whole range of things like that. And that seems to be much worse for you than remaining unemployed. So, this shows us that actually not all work is good for us, and it may be in thinking about policies that encourage people back to work both for kind of social reasons, to have employment, but also for health reasons, we need to think about the kinds of work that people go back to.

This was just an illustration of how biomarkers help us to think about the pathways between social factors, and health a little differently. Thank you.