Transcript Details
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Shedding Light on the Sun's Role in Preventing COVID-19 Deaths

Announcer:
Coming to you from the ReachMD studios, you're listening to *COVID-19: On the Frontlines*. On this program, we'll hear from Dr. Richard Weller, a Professor of Dermatology at the University of Edinburgh in Scotland, who shares the results of his recent study focusing on the potential link between sunlight and the mortality rates of the COVID-19 pandemic.

Let's hear from Dr. Weller now.

Dr. Weller:
So this is a study that I had presented at the annual meeting of the British Association of Dermatologists—remotely, of course. We were interested in whether there was any link between sunlight and COVID deaths, and this really came up because a lot of my research in the past has been about the benefits of sunlight on cardiovascular health. And when COVID appeared on the scene, initially we were really thinking of it as being a respiratory flu-like illness, but by the time it started to spread in Italy and America, it was becoming very clear that having heart disease made you much more likely to suffer and die from COVID, so I began to wonder, well, maybe sunlight, which we know is good for heart disease, will reduce COVID deaths.

Now, I've previously done studies with colleagues looking at sunlight and blood pressure in America, and America has the advantage that it's a big place with a lot of different sunlight from one bit of it to another. It's difficult to mix up Alaska and Florida. Of course, using that range of sunlight and data recorded throughout the country, it's possible to do correlations between environmental sunlight and health outcomes. So, what we did was we used 2 main sources of data. We were looking at the COVID death data that was being reported in the states at county level, and then the other input we used was the mean daily ambient UV, and we can derive this from satellite data.

Now, the important point here was that we wanted to remove vitamin D from the equation, so we looked at data between January and April of 2020 as the pandemic began to rage through America, but we excluded the counties in which there was short enough UVB wavelengths of high enough energy to form vitamin D. So there's just over 3,000 counties in the United States, and we excluded the 20% of counties where there was short enough wavelengths and high enough energy to form vitamin D. So we looked at 80% of counties in America in what we call their vitamin D winter, and we then looked at the COVID deaths in those counties over that period of time, and we cross-referenced it with the amount of UV in those counties.

Now, of course, there's lots of confounders here, so we needed to put in lots of corrections. During the regression, UV against deaths is easy, but that is done after 2 months of data preparation. And there are 3 or 4 main things you need to do. The first thing is what's called a zero-inflated model. Most counties have no deaths at all, and that means that the variance is much greater than the mean, so you have to do a mathematical procedure called a zero inflation process to start with, a kind of logarithmic conversion of your data. You then need to correct at each county level for a couple of things. The first one is, what are your chances of catching COVID? For that you need to look at the number of people in that county. If you live in Manhattan, there's lots of people. If you live in rural Dakota, there's not many people, so you need to look at population density, and you also need to look at the number of cases in that county, so how many people there are and what proportion of those people have COVID. And you then need to look at other factors. In particular, we looked at how much public transport there is in each area because public transport is one of the ways you meet people. So we did a zero inflation. We then looked at the covariates for your chances of encountering somebody with COVID. And the next step was to calculate the confounding factors that make you more at risk of dying from COVID.

So we looked at your chances of meeting somebody with COVID. You then need to correct for the factors that make you more likely to die of COVID, so we looked at demographic factors within each county, we looked at the age structure of the county, the ethnicity—because people of Asian and African heritage are more likely to die of it. We looked at comorbidities, we looked at deprivation measures because poorer people are more likely to die, and we looked at long-term environmental factors like humidity, temperature, and particularly air pollution, because if there's more air pollution, you're more likely to die.

So, having corrected for all of those things—the mathematical zero inflation, factors affecting whether you're likely to meet somebody with COVID and then factors that affect your individual chances of dying of COVID—we then ran the regression model. And having run the regression model, we also did one other thing, which was to put in a random effect. We included and excluded states. The data was measured at a county level, but we then included and excluded state level because there's differences at state level. So, if you live in Louisiana, few people wear masks. If you live in Manhattan, you tend to wear a mask, so there are cultural behaviors. The methods of delivering healthcare can also vary state by state, so we included and excluded states just to check that there wasn't a state level effect here as well.

So the findings were really quite striking here. What we showed was that counties in their vitamin D winter, there was a negative correlation between UV and deaths from COVID. So, looking at these data in the 2,500 US counties over that period at the start of this year, we showed that when you had a mean daily UVA of 600 kilojoules per meter squared, there were about 65 deaths per million. Looking at places with a UVA level of 800, the deaths were around 30–35 deaths per million, so about a halving of deaths from COVID with that increase in UVA. So that was in the USA, but we then repeated the process in 2 other countries. We looked at the data in England, and we looked at the data in Italy, and in both countries we showed the same thing.

Now, these studies were done separately because the way you measure those confounders like population structure, age structure of populations, ethnicity, deprivation scores, England, Italy, and the USA all measure these things differently, so we couldn't pool the data. We had to do 3 separate studies, but in each study, we put the same correction factors in, and in each country independently we showed the same thing. More UVA correlated with reduced COVID deaths after correcting for all those factors. The one thing to add here is that England is less sunny than Italy and the United States, so in England our fall in COVID deaths, our halving of COVID deaths, occurred with the rise from 350–450 kilojoules per meter squared, whereas in Italy, the rise, as in America, was 600–800 to get a halving of deaths. For a given incremental rise in UVA, the benefits appeared to be greater starting from a lower level, such as England. I think what this probably means is there may well be a maximum benefit to this, but the effects are greater with a rise in light from a lower starting level.

Announcer:
That was Dr. Richard Weller from the University of Edinburgh. To access more episodes from *COVID-19: On the Frontlines*, and to add *your* perspectives toward the fight against this global pandemic, visit us at ReachMD.com and become Part of the Knowledge. Thank you for listening.