WEBVTT

NOTE duration:”00:21:53.9380000”

NOTE language:en-us

NOTE Confidence: 0.92264724

00:00:00.000 --> 00:00:02.035 I would now like to

NOTE Confidence: 0.92264724

00:00:02.035 --> 00:00:03.663 introduce our next Speaker,

NOTE Confidence: 0.92264724

00:00:03.670 --> 00:00:05.170 Doctor Nicholas Christakis Doctor.

NOTE Confidence: 0.92264724

00:00:05.170 --> 00:00:06.670 Christakis is a sociologist,

NOTE Confidence: 0.92264724

00:00:06.670 --> 00:00:08.014 an physician who conducts

NOTE Confidence: 0.92264724

00:00:08.014 --> 00:00:10.030 research in the areas of social

NOTE Confidence: 0.92264724

00:00:10.091 --> 00:00:11.919 networks and biosocial science.

NOTE Confidence: 0.92264724

00:00:11.920 --> 00:00:13.416 His current research is

NOTE Confidence: 0.92264724

00:00:13.416 --> 00:00:15.286 mainly focused on two topics.

NOTE Confidence: 0.92264724

00:00:15.290 --> 00:00:16.790 First, the social mathematical,

NOTE Confidence: 0.92264724

00:00:16.790 --> 00:00:18.290 an biological rules governing,

NOTE Confidence: 0.92264724

00:00:18.290 --> 00:00:19.634 have social networks form,

NOTE Confidence: 0.92264724

00:00:19.634 --> 00:00:21.650 and 2nd the social and biological

NOTE Confidence: 0.92264724

00:00:21.715 --> 00:00:23.770 implications of how these networks

NOTE Confidence: 0.92264724

00:00:23.770 --> 00:00:25.414 operates to influence thoughts,

NOTE Confidence: 0.92264724

00:00:25.420 --> 00:00:26.545 feelings, and behaviors.

NOTE Confidence: 0.92264724

00:00:26.545 --> 00:00:27.670 Doctor Crystal Kiss.

NOTE Confidence: 0.92264724

00:00:27.670 --> 00:00:30.900 Thank you for being here.

NOTE Confidence: 0.92264724

00:00:30.900 --> 00:00:31.725 Thank you all.

NOTE Confidence: 0.92264724

00:00:31.725 --> 00:00:33.650 Of course I can't see any of

NOTE Confidence: 0.92264724

00:00:33.721 --> 00:00:35.576 you and there are 268 of you.

NOTE Confidence: 0.92264724

00:00:35.580 --> 00:00:36.138 I see.

NOTE Confidence: 0.92264724

00:00:36.138 --> 00:00:37.812 It's a very odd experience using

NOTE Confidence: 0.92264724

00:00:37.812 --> 00:00:39.819 zoom to do this and I lately

NOTE Confidence: 0.92264724

00:00:39.819 --> 00:00:41.533 have not been using slides in

NOTE Confidence: 0.92264724

00:00:41.533 --> 00:00:43.063 order to communicate in a way

NOTE Confidence: 0.92264724

00:00:43.063 --> 00:00:44.400 I think is more effective.

NOTE Confidence: 0.92264724

00:00:44.400 --> 00:00:46.395 So I'm going to try to cultivate

NOTE Confidence: 0.92264724

00:00:46.395 --> 00:00:47.982 some visual images in what I'm

NOTE Confidence: 0.92264724

00:00:47.982 --> 00:00:49.600 going to talk to you about.

NOTE Confidence: 0.92264724

00:00:49.600 --> 00:00:51.266 I'm going to start with just a

NOTE Confidence: 0.92264724

00:00:51.266 --> 00:00:53.569 couple of brief remarks or to set the

NOTE Confidence: 0.92264724

00:00:53.569 --> 00:00:55.099 stage about the coronavirus pandemic.

NOTE Confidence: 0.92264724

00:00:55.100 --> 00:00:56.672 I suspect everyone on this audience

NOTE Confidence: 0.92264724

00:00:56.672 --> 00:00:58.130 will know these numbers already.

NOTE Confidence: 0.92264724

00:00:58.130 --> 00:01:00.234 Then I'm going to talk a little bit

NOTE Confidence: 0.92264724

00:01:00.234 --> 00:01:02.457 about the issue of waves of pandemics.

NOTE Confidence: 0.92264724

00:01:02.460 --> 00:01:05.781 And then I'm going to tell you a little

NOTE Confidence: 0.92264724

00:01:05.781 --> 00:01:09.069 bit about some of the work in my lab,

NOTE Confidence: 0.92264724

00:01:09.070 --> 00:01:11.541 including an app that we just released

NOTE Confidence: 0.92264724

00:01:11.541 --> 00:01:13.773 a soft launch earlier this week

NOTE Confidence: 0.92264724

00:01:13.773 --> 00:01:16.342 called who nala HUNALA that we think

NOTE Confidence: 0.92264724

00:01:16.410 --> 00:01:18.979 can be quite helpful and it's quite

NOTE Confidence: 0.92264724

00:01:18.979 --> 00:01:21.178 different than all the other apps

NOTE Confidence: 0.92264724

00:01:21.178 --> 00:01:23.374 that are available at the moment.

NOTE Confidence: 0.92264724

00:01:23.380 --> 00:01:25.210 So as you all know,

NOTE Confidence: 0.92264724

00:01:25.210 --> 00:01:28.045 the are not for a pathogen is felt to

NOTE Confidence: 0.92264724

00:01:28.045 --> 00:01:30.608 be something intrinsic to the pathogen

NOTE Confidence: 0.92264724

00:01:30.608 --> 00:01:34.199 or as it relates to the host as well.

NOTE Confidence: 0.92264724

00:01:34.200 --> 00:01:34.502 Uh,

NOTE Confidence: 0.92264724

00:01:34.502 --> 00:01:36.616 this is the number of new cases

NOTE Confidence: 0.92264724

00:01:36.616 --> 00:01:38.936 that can arise from a prior case.

NOTE Confidence: 0.92264724

00:01:38.940 --> 00:01:39.570 In, uhm,

NOTE Confidence: 0.92264724

00:01:39.570 --> 00:01:41.145 you know fully susceptible population.

NOTE Confidence: 0.92264724

00:01:41.150 --> 00:01:42.238 That is to say,

NOTE Confidence: 0.92264724

00:01:42.238 --> 00:01:44.296 no individual is immune to a pathogen

NOTE Confidence: 0.92264724

00:01:44.296 --> 00:01:46.837 and the end host hasn’t responded yet.

NOTE Confidence: 0.92264724

00:01:46.840 --> 00:01:48.646 We haven’t taken any actions were

NOTE Confidence: 0.92264724

00:01:48.646 --> 00:01:50.609 not pulling apart and living in

NOTE Confidence: 0.92264724

00:01:50.609 --> 00:01:52.359 like Hermits for example were

NOTE Confidence: 0.92264724

00:01:52.359 --> 00:01:54.039 interacting normally and it is

NOTE Confidence: 0.92264724

00:01:54.039 --> 00:01:55.743 estimated and there was a recent

NOTE Confidence: 0.92264724

00:01:55.743 --> 00:01:57.616 meta analysis just released by the

NOTE Confidence: 0.92264724

00:01:57.616 --> 00:02:00.230 land set a couple of days ago or

NOTE Confidence: 0.92264724

00:02:00.230 --> 00:02:02.302 a couple of weeks ago that they

NOTE Confidence: 0.92264724

00:02:02.302 --> 00:02:04.509 are not for this condition is.

NOTE Confidence: 0.92264724

00:02:04.510 --> 00:02:05.461 Probably around 3,

NOTE Confidence: 0.92264724

00:02:05.461 --> 00:02:07.363 maybe 2.4 somewhere in the range

NOTE Confidence: 0.92264724

00:02:07.363 --> 00:02:09.209 in the high choose probably,

NOTE Confidence: 0.92264724

00:02:09.210 --> 00:02:10.554 and that's quite high.

NOTE Confidence: 0.92264724

00:02:10.554 --> 00:02:12.910 Actually that is a high are not.

NOTE Confidence: 0.92264724

00:02:12.910 --> 00:02:15.630 The seasonal flu has and are not of

NOTE Confidence: 0.92264724

00:02:15.630 --> 00:02:18.957 about 1.3 Ebola of about 1.5 to one point 9.

NOTE Confidence: 0.92264724

00:02:18.960 --> 00:02:20.976 And of course a chicken pox

NOTE Confidence: 0.92264724

00:02:20.976 --> 00:02:22.320 around 3:00 to 6:00.

NOTE Confidence: 0.92264724

00:02:22.320 --> 00:02:24.276 And of course measles is the

NOTE Confidence: 0.92264724

00:02:24.276 --> 00:02:26.348 champion which has one of the

NOTE Confidence: 0.92264724

00:02:26.348 --> 00:02:28.103 highest arnotts estimated of around

NOTE Confidence: 0.92264724

00:02:28.103 --> 00:02:30.377 18 new cases for each new case.

NOTE Confidence: 0.92264724

00:02:30.380 --> 00:02:33.204 This so called are not of course is

NOTE Confidence: 0.92264724

00:02:33.204 --> 00:02:35.540 different than what is called the RE.

NOTE Confidence: 0.92264724

00:02:35.540 --> 00:02:37.056 The affective reproductive rate,

NOTE Confidence: 0.92264724

00:02:37.056 --> 00:02:39.703 which is the number of new cases

NOTE Confidence: 0.92264724

00:02:39.703 --> 00:02:41.817 that arise in a kind of more

NOTE Confidence: 0.92264724

00:02:41.817 --> 00:02:43.519 steady state of the epidemic.

NOTE Confidence: 0.92264724

00:02:43.520 --> 00:02:44.904 For every old case.

NOTE Confidence: 0.92264724

00:02:44.904 --> 00:02:46.634 So some people are immune.

NOTE Confidence: 0.92264724

00:02:46.640 --> 00:02:48.028 People are beginning to

NOTE Confidence: 0.92264724

00:02:48.028 --> 00:02:49.069 take responsive action,

NOTE Confidence: 0.89728874

00:02:49.070 --> 00:02:50.805 for example, were beginning to

NOTE Confidence: 0.89728874

00:02:50.805 --> 00:02:52.193 engage in physical distancing,

NOTE Confidence: 0.89728874

00:02:52.200 --> 00:02:54.804 and this would be known as the

NOTE Confidence: 0.89728874

00:02:54.804 --> 00:02:56.685 affective reproductive rate and the

NOTE Confidence: 0.89728874

00:02:56.685 --> 00:02:59.114 ariav courses can fall as an epidemic

NOTE Confidence: 0.89728874

00:02:59.114 --> 00:03:01.682 proceeds because of what we do or how

NOTE Confidence: 0.89728874

00:03:01.682 --> 00:03:03.873 we've been affected by the pathogen.

NOTE Confidence: 0.89728874

00:03:03.873 --> 00:03:05.978 I just a different parameter,

NOTE Confidence: 0.89728874

00:03:05.980 --> 00:03:08.234 something known as the case fatality rate.

NOTE Confidence: 0.89728874

00:03:08.240 --> 00:03:09.760 That's the fraction of people

NOTE Confidence: 0.89728874

00:03:09.760 --> 00:03:11.280 who died conditional on coming

NOTE Confidence: 0.89728874

00:03:11.338 --> 00:03:12.758 to medical attention course.

NOTE Confidence: 0.89728874

00:03:12.760 --> 00:03:14.405 Whether you come to medical

NOTE Confidence: 0.89728874

00:03:14.405 --> 00:03:16.421 attention or not depends on what

NOTE Confidence: 0.89728874

00:03:16.421 --> 00:03:18.570 kind of health care system you have,

NOTE Confidence: 0.89728874

00:03:18.570 --> 00:03:20.824 what patients do when they get symptoms,

NOTE Confidence: 0.89728874

00:03:20.830 --> 00:03:21.793 and so on.

NOTE Confidence: 0.89728874

00:03:21.793 --> 00:03:23.077 And sometimes people estimate

NOTE Confidence: 0.89728874

00:03:23.077 --> 00:03:24.727 something instead known as the

NOTE Confidence: 0.89728874

00:03:24.727 --> 00:03:25.995 symptomatic case fatality rate.

NOTE Confidence: 0.89728874

00:03:26.000 --> 00:03:26.969 The SCF are,

NOTE Confidence: 0.89728874

00:03:26.969 --> 00:03:28.907 which is what fraction people die,

NOTE Confidence: 0.89728874

00:03:28.910 --> 00:03:30.520 conditional on developing a symptoms.

NOTE Confidence: 0.89728874

00:03:30.520 --> 00:03:32.584 We think this is still much

NOTE Confidence: 0.89728874

00:03:32.584 --> 00:03:34.579 more debated than they are not.

NOTE Confidence: 0.89728874

00:03:34.580 --> 00:03:37.009 We think this numbers between 0.5 and

NOTE Confidence: 0.89728874

00:03:37.009 --> 00:03:40.808 1% or perhaps as low as zero point 3%.

NOTE Confidence: 0.89728874

00:03:40.810 --> 00:03:43.183 Now the case fatality rate for the

NOTE Confidence: 0.89728874

00:03:43.183 --> 00:03:45.430 seasonal flu is about zero point,

NOTE Confidence: 0.89728874

00:03:45.430 --> 00:03:47.908 1% ignoring other features, just on average.

NOTE Confidence: 0.89728874

00:03:47.910 --> 00:03:50.423 About one out of 1000 people who

NOTE Confidence: 0.89728874

00:03:50.423 --> 00:03:52.528 get the seasonal flu will die.

NOTE Confidence: 0.89728874

00:03:52.530 --> 00:03:54.994 We think that this disease is between

NOTE Confidence: 0.89728874

00:03:54.994 --> 00:03:58.329 5 and 10 times as bad as that and the

NOTE Confidence: 0.89728874

00:03:58.329 --> 00:04:00.498 Stars to the epidemic we’re having

NOTE Confidence: 0.89728874

00:04:00.498 --> 00:04:03.535 right now is about a 10th as deadly

NOTE Confidence: 0.89728874

00:04:03.535 --> 00:04:06.020 as the SARS one epidemic from 2003.

NOTE Confidence: 0.89728874

00:04:06.020 --> 00:04:07.785 The case fatality rate for

NOTE Confidence: 0.89728874

00:04:07.785 --> 00:04:09.920 SARS of one was about 10%.

NOTE Confidence: 0.89728874

00:04:09.920 --> 00:04:11.760 That was a much deadlier.

NOTE Confidence: 0.89728874

00:04:11.760 --> 00:04:13.992 Condition and the 1918 influenza A

NOTE Confidence: 0.89728874

00:04:13.992 --> 00:04:16.520 pandemic had a case fatality rate.

NOTE Confidence: 0.89728874

00:04:16.520 --> 00:04:19.496 We think about four to 5%.

NOTE Confidence: 0.89728874

00:04:19.500 --> 00:04:21.072 So these two parameters there are

NOTE Confidence: 0.89728874

00:04:21.072 --> 00:04:23.420 not or the RE something about the

NOTE Confidence: 0.89728874

00:04:23.420 --> 00:04:25.076 transmissibility of the disease,

NOTE Confidence: 0.89728874

00:04:25.080 --> 00:04:27.024 and the fatality of the disease

NOTE Confidence: 0.89728874

00:04:27.024 --> 00:04:29.009 could be put on two axes,

NOTE Confidence: 0.89728874

00:04:29.010 --> 00:04:31.110 and you could plot every respiratory

NOTE Confidence: 0.89728874

00:04:31.110 --> 00:04:33.132 pandemic for the last 100 years

NOTE Confidence: 0.89728874

00:04:33.132 --> 00:04:34.256 on these two axes,

NOTE Confidence: 0.89728874

00:04:34.260 --> 00:04:36.557 and then you could see well, how?

NOTE Confidence: 0.89728874

00:04:36.557 --> 00:04:38.192 How does this pandemic compared

NOTE Confidence: 0.89728874

00:04:38.192 --> 00:04:39.173 to previous ones,

NOTE Confidence: 0.89728874

00:04:39.180 --> 00:04:41.148 and when you do this exercise,

NOTE Confidence: 0.89728874

00:04:41.150 --> 00:04:44.270 it's actually kind of alarming.

NOTE Confidence: 0.89728874

00:04:44.270 --> 00:04:46.292 Of the worst pandemic we've had

NOTE Confidence: 0.89728874

00:04:46.292 --> 00:04:48.436 in terms of how transmissible it

NOTE Confidence: 0.89728874

00:04:48.436 --> 00:04:51.308 was and how deadly it was is 1918

NOTE Confidence: 0.89728874

00:04:51.382 --> 00:04:53.247 in the upper right corner.

NOTE Confidence: 0.89728874

00:04:53.250 --> 00:04:56.114 The second worst we had was in 1957,

NOTE Confidence: 0.89728874

00:04:56.120 --> 00:04:57.910 which had sort of Intermediate

NOTE Confidence: 0.89728874

00:04:57.910 --> 00:04:58.626 Intermediate Lethality,

NOTE Confidence: 0.89728874

00:04:58.630 --> 00:04:59.746 an intermediate transmissibility,

NOTE Confidence: 0.89728874

00:04:59.746 --> 00:05:01.978 and this disease is probably slightly

NOTE Confidence: 0.89728874

00:05:01.978 --> 00:05:03.422 more transmissible and slightly

NOTE Confidence: 0.89728874

00:05:03.422 --> 00:05:05.450 more deadly than the 1957 pandemic,

NOTE Confidence: 0.89728874

00:05:05.450 --> 00:05:07.250 so it's getting up there.

NOTE Confidence: 0.89728874

00:05:07.250 --> 00:05:09.224 It's above the 1957 pandemic and

NOTE Confidence: 0.89728874

00:05:09.224 --> 00:05:11.910 not as bad as the 1918 pandemic.

NOTE Confidence: 0.89728874

00:05:11.910 --> 00:05:14.520 However, the point is, it's bad.

NOTE Confidence: 0.89728874

00:05:14.520 --> 00:05:17.040 This is bad and I think what we

NOTE Confidence: 0.89728874

00:05:17.040 --> 00:05:20.073 have to accept is that this moment

NOTE Confidence: 0.89728874

00:05:20.073 --> 00:05:21.465 in historical time.

NOTE Confidence: 0.89728874

00:05:21.470 --> 00:05:23.806 That we all happen to live in is

NOTE Confidence: 0.89728874

00:05:23.806 --> 00:05:26.426 a moment when a new species of

NOTE Confidence: 0.89728874

00:05:26.426 --> 00:05:28.386 pathogen has entered our species.

NOTE Confidence: 0.89728874

00:05:28.390 --> 00:05:31.238 There's a new germ out there that is

NOTE Confidence: 0.89728874

00:05:31.238 --> 00:05:33.927 is going to have its way with us.

NOTE Confidence: 0.89728874

00:05:33.930 --> 00:05:36.352 It's going to spread in our species

NOTE Confidence: 0.89728874

00:05:36.352 --> 00:05:39.409 and and affect us and it is bad and

NOTE Confidence: 0.89728874

00:05:39.409 --> 00:05:41.133 without action many people would

NOTE Confidence: 0.89728874

00:05:41.133 --> 00:05:43.245 have died even with the actions

NOTE Confidence: 0.89728874

00:05:43.245 --> 00:05:44.828 we have taken about.

NOTE Confidence: 0.89728874

00:05:44.828 --> 00:05:47.418 100,000 people have already died.

NOTE Confidence: 0.9032909

00:05:47.420 --> 00:05:50.028 Now as a nation and as different districts,

NOTE Confidence: 0.9032909

00:05:50.030 --> 00:05:52.058 we have taken different sorts of

NOTE Confidence: 0.9032909

00:05:52.058 --> 00:05:54.075 actions that people have been sort

NOTE Confidence: 0.9032909

00:05:54.075 --> 00:05:55.893 of locked down in various ways.

NOTE Confidence: 0.9032909

00:05:55.900 --> 00:05:57.548 We've closed our schools,

NOTE Confidence: 0.9032909

00:05:57.548 --> 00:05:59.608 we've pathetically done some contact

NOTE Confidence: 0.9032909

00:05:59.608 --> 00:06:01.847 tracing and some testing we have had

NOTE Confidence: 0.9032909

00:06:01.847 --> 00:06:04.124 work from home orders or stay at home

NOTE Confidence: 0.9032909

00:06:04.124 --> 00:06:06.005 orders in most states in the union,

NOTE Confidence: 0.9032909

00:06:06.005 --> 00:06:07.630 and the point of this,

NOTE Confidence: 0.9032909

00:06:07.630 --> 00:06:09.260 of course, was to flatten.

NOTE Confidence: 0.9032909

00:06:09.260 --> 00:06:11.234 The curve was to reduce the

NOTE Confidence: 0.9032909

00:06:11.234 --> 00:06:13.254 intensity at any given moment of

NOTE Confidence: 0.9032909

00:06:13.254 --> 00:06:15.459 the number of cases that we have.

NOTE Confidence: 0.9032909

00:06:15.460 --> 00:06:17.430 But every single respiratory pandemic.

NOTE Confidence: 0.9032909

00:06:17.430 --> 00:06:19.397 The last century has come in waves.

NOTE Confidence: 0.9032909

00:06:19.400 --> 00:06:21.384 All we have done by flattening the curve

NOTE Confidence: 0.9032909

00:06:21.384 --> 00:06:23.348 is we've not eradicated the pathogen.

NOTE Confidence: 0.9032909

00:06:23.350 --> 00:06:24.760 We just stopped the transmission.

NOTE Confidence: 0.9032909

00:06:24.760 --> 00:06:26.446 The germ is still out there.

NOTE Confidence: 0.9032909

00:06:26.450 --> 00:06:28.148 It will come back to China.

NOTE Confidence: 0.9032909

00:06:28.150 --> 00:06:29.836 It will come back to us.

NOTE Confidence: 0.9032909

00:06:29.840 --> 00:06:31.250 It's going to come back.

NOTE Confidence: 0.9032909

00:06:31.250 --> 00:06:32.936 All of the rest atory pandemics,

NOTE Confidence: 0.9032909

00:06:32.940 --> 00:06:35.028 even the mild ones of the last 100

NOTE Confidence: 0.9032909

00:06:35.028 --> 00:06:36.799 years have come back and typically

NOTE Confidence: 0.9032909

00:06:36.799 --> 00:06:38.575 they come back in the fall.

NOTE Confidence: 0.9032909

00:06:38.580 --> 00:06:41.400 And this has to do with a variety of things.

NOTE Confidence: 0.9032909

00:06:41.400 --> 00:06:42.552 It has to do,

NOTE Confidence: 0.9032909

00:06:42.552 --> 00:06:43.992 and they typically come back

NOTE Confidence: 0.9032909

00:06:43.992 --> 00:06:46.032 every fall for two or three years

NOTE Confidence: 0.9032909

00:06:46.032 --> 00:06:47.820 before they kind of damp down.

NOTE Confidence: 0.9032909

00:06:47.820 --> 00:06:48.150 Uh,

NOTE Confidence: 0.9032909

00:06:48.150 --> 00:06:50.790 and and eventually end and if time permits,

NOTE Confidence: 0.9032909

00:06:50.790 --> 00:06:53.106 we can talk a little bit

NOTE Confidence: 0.9032909

00:06:53.106 --> 00:06:54.650 about why pandemics end.

NOTE Confidence: 0.9032909

00:06:54.650 --> 00:06:56.870 And this has to do partly

NOTE Confidence: 0.9032909

00:06:56.870 --> 00:06:57.980 with human behavior.

NOTE Confidence: 0.9032909

00:06:57.980 --> 00:07:00.200 You know, when the fall comes,

NOTE Confidence: 0.9032909

00:07:00.200 --> 00:07:02.050 the students return to school,

NOTE Confidence: 0.9032909

00:07:02.050 --> 00:07:03.530 adults return to work.

NOTE Confidence: 0.9032909

00:07:03.530 --> 00:07:04.640 We move indoors.

NOTE Confidence: 0.9032909

00:07:04.640 --> 00:07:06.395 So are are dense interactions

NOTE Confidence: 0.9032909

00:07:06.395 --> 00:07:08.150 the proximity which we interact

NOTE Confidence: 0.9032909

00:07:08.208 --> 00:07:09.820 with other people increases,

NOTE Confidence: 0.9032909

00:07:09.820 --> 00:07:11.014 which enhances transmissibility.

NOTE Confidence: 0.9032909

00:07:11.014 --> 00:07:13.402 There may be some environmental factors

NOTE Confidence: 0.9032909

00:07:13.402 --> 00:07:15.736 which affect the pathogen heat or humidity,

NOTE Confidence: 0.9032909

00:07:15.740 --> 00:07:17.960 or our responsiveness to the pathogen.

NOTE Confidence: 0.9032909

00:07:17.960 --> 00:07:21.290 So we might do better in the sunny weather.

NOTE Confidence: 0.9032909

00:07:21.290 --> 00:07:24.482 Our bodies might be more able to resist

NOTE Confidence: 0.9032909

00:07:24.482 --> 00:07:26.970 the pathogen is not sunny weather.

NOTE Confidence: 0.9032909

00:07:26.970 --> 00:07:28.164 And so on.

NOTE Confidence: 0.9032909

00:07:28.164 --> 00:07:28.960 And ultimately,

NOTE Confidence: 0.9032909

00:07:28.960 --> 00:07:30.838 one of the factors of parameters

NOTE Confidence: 0.9032909

00:07:30.838 --> 00:07:33.120 that we could think about is it

NOTE Confidence: 0.9032909

00:07:33.120 --> 00:07:34.735 bikini ologists In addition to.

NOTE Confidence: 0.9032909

00:07:34.740 --> 00:07:36.987 Well, there are a number of parameters,

NOTE Confidence: 0.9032909

00:07:36.990 --> 00:07:38.910 but In addition to the transmissibility,

NOTE Confidence: 0.9032909

00:07:38.910 --> 00:07:40.716 the R and the lethality that

NOTE Confidence: 0.9032909

00:07:40.716 --> 00:07:42.326 case fatality ratio is something

NOTE Confidence: 0.9032909

00:07:42.326 --> 00:07:44.046 known as the attack rate,

NOTE Confidence: 0.9032909

00:07:44.050 --> 00:07:46.006 which is the fraction of people

NOTE Confidence: 0.9032909

00:07:46.006 --> 00:07:47.903 who actually get the disease in

NOTE Confidence: 0.9032909

00:07:47.903 --> 00:07:50.007 the end and in the end for this

NOTE Confidence: 0.9032909

00:07:50.077 --> 00:07:52.399 pathogen it'll probably be above 50%,

NOTE Confidence: 0.9032909

00:07:52.400 --> 00:07:54.486 maybe a bit higher if we overshoot

NOTE Confidence: 0.9032909

00:07:54.486 --> 00:07:56.249 in ways we can discuss.

NOTE Confidence: 0.9032909

00:07:56.250 --> 00:07:59.958 If if there's time now in the 1957 pandemic.

NOTE Confidence: 0.9032909

00:07:59.960 --> 00:08:00.293 Nationally,

NOTE Confidence: 0.9032909

00:08:00.293 --> 00:08:02.291 about 25% of people got the

NOTE Confidence: 0.9032909

00:08:02.291 --> 00:08:03.290 disease were infected,

NOTE Confidence: 0.9032909

00:08:03.290 --> 00:08:05.294 but in some hard hit areas

NOTE Confidence: 0.9032909

00:08:05.294 --> 00:08:07.289 it was as high as 40%.

NOTE Confidence: 0.9032909

00:08:07.290 --> 00:08:08.950 I got the disease now.

NOTE Confidence: 0.9032909

00:08:08.950 --> 00:08:10.930 Our best estimates of how many

NOTE Confidence: 0.9032909

00:08:10.930 --> 00:08:12.648 people have gotten it already

NOTE Confidence: 0.9032909

00:08:12.648 --> 00:08:14.610 in the United States is low.

NOTE Confidence: 0.9032909

00:08:14.610 --> 00:08:15.609 So for example,

NOTE Confidence: 0.9032909

00:08:15.609 --> 00:08:17.274 if you look at Sweden,

NOTE Confidence: 0.9032909

00:08:17.280 --> 00:08:19.604 they just released a quite good study.

NOTE Confidence: 0.9032909

00:08:19.610 --> 00:08:21.857 Sweden has had less severe sort of

NOTE Confidence: 0.9032909

00:08:21.857 --> 00:08:23.567 social or physical distancing than

NOTE Confidence: 0.9032909

00:08:23.567 --> 00:08:26.336 we've had about 4% of Swedes using a

NOTE Confidence: 0.9032909

00:08:26.336 --> 00:08:28.081 national Sero prevalence study just

NOTE Confidence: 0.9032909

00:08:28.081 --> 00:08:30.117 released this week have been infected.

NOTE Confidence: 0.9032909

00:08:30.120 --> 00:08:31.620 And they have been mixing

NOTE Confidence: 0.9032909

00:08:31.620 --> 00:08:33.120 more than we've been mixing.

NOTE Confidence: 0.90805906

00:08:33.120 --> 00:08:35.820 As you know, in New York it was about

NOTE Confidence: 0.90805906

00:08:35.820 --> 00:08:38.087 21% of New Yorkers in a rather good

NOTE Confidence: 0.90805906

00:08:38.087 --> 00:08:39.620 sort of representative sample of

NOTE Confidence: 0.90805906

00:08:39.620 --> 00:08:41.215 New Yorkers have become infected,

NOTE Confidence: 0.90805906

00:08:41.220 --> 00:08:43.313 and other studies around the United States

NOTE Confidence: 0.90805906

00:08:43.313 --> 00:08:45.480 of high quality that have been done

NOTE Confidence: 0.90805906

00:08:45.480 --> 00:08:47.304 show relatively low fractions of people

NOTE Confidence: 0.90805906

00:08:47.359 --> 00:08:49.319 have yet been exposed to the epidemic,

NOTE Confidence: 0.90805906

00:08:49.320 --> 00:08:53.496 so we have quite a way to go still.

NOTE Confidence: 0.90805906

00:08:53.500 --> 00:08:56.956 You know, before we before we reach the

NOTE Confidence: 0.90805906

00:08:56.956 --> 00:09:00.408 final attack rate that we're likely to get.

NOTE Confidence: 0.90805906

00:09:00.410 --> 00:09:03.050 So the disease is going to come back

NOTE Confidence: 0.90805906

00:09:03.050 --> 00:09:05.566 more people are going to get infected.

NOTE Confidence: 0.90805906

00:09:05.570 --> 00:09:07.800 Unfortunately, we're going to have

NOTE Confidence: 0.90805906

00:09:07.800 --> 00:09:10.030 more deaths with this condition.

NOTE Confidence: 0.90805906

00:09:10.030 --> 00:09:13.110 What can we do to predict the course of this?

NOTE Confidence: 0.90805906

00:09:13.110 --> 00:09:15.118 Oh, and I should say that I think

NOTE Confidence: 0.90805906

00:09:15.118 --> 00:09:17.228 that I've been flip flopping on my

NOTE Confidence: 0.90805906

00:09:17.228 --> 00:09:19.220 opinion as to the likelihood of

NOTE Confidence: 0.90805906

00:09:19.220 --> 00:09:21.120 successful development of a vaccine.

NOTE Confidence: 0.90805906

00:09:21.120 --> 00:09:22.962 So some days I'm optimistic some

NOTE Confidence: 0.90805906

00:09:22.962 --> 00:09:23.883 days I'm pessimistic.

NOTE Confidence: 0.90805906

00:09:23.890 --> 00:09:25.738 I'm not an expert on vaccines,

NOTE Confidence: 0.90805906

00:09:25.740 --> 00:09:28.220 but what I suspect is that no matter

NOTE Confidence: 0.90805906

00:09:28.220 --> 00:09:30.357 how fast we go on the vaccine,

NOTE Confidence: 0.90805906

00:09:30.360 --> 00:09:32.592 it's likely that plus or minus six months

NOTE Confidence: 0.90805906

00:09:32.592 --> 00:09:34.426 the vaccine will be widely available

NOTE Confidence: 0.90805906

00:09:34.426 --> 00:09:36.256 around the same time we otherwise

NOTE Confidence: 0.90805906

00:09:36.315 --> 00:09:38.367 would have gotten herd immunity anyway,

NOTE Confidence: 0.90805906

00:09:38.370 --> 00:09:40.164 so I don't think the vaccine

NOTE Confidence: 0.90805906

00:09:40.164 --> 00:09:42.060 is going to change the story.

NOTE Confidence: 0.90805906

00:09:42.060 --> 00:09:44.769 Very much unfortunate.

NOTE Confidence: 0.90805906

00:09:44.770 --> 00:09:46.672 How can we predict the course

NOTE Confidence: 0.90805906

00:09:46.672 --> 00:09:47.623 of this epidemic?

NOTE Confidence: 0.90805906

00:09:47.630 --> 00:09:49.886 Can we develop some tools that help us

NOTE Confidence: 0.90805906

00:09:49.886 --> 00:09:52.174 to confront how we might emerge from

NOTE Confidence: 0.90805906

00:09:52.174 --> 00:09:53.839 the lockdowns that we're currently

NOTE Confidence: 0.90805906

00:09:53.896 --> 00:09:55.531 engaged in and might anticipate

NOTE Confidence: 0.90805906

00:09:55.531 --> 00:09:57.826 the course of the epidemic in the

NOTE Confidence: 0.90805906

00:09:57.826 --> 00:10:00.122 fall when it comes back my love.

NOTE Confidence: 0.90805906

00:10:00.130 --> 00:10:02.230 Has been doing quite a few projects

NOTE Confidence: 0.90805906

00:10:02.230 --> 00:10:03.130 in this regard.

NOTE Confidence: 0.90805906

00:10:03.130 --> 00:10:04.986 We have a in the midst of developing

NOTE Confidence: 0.90805906

00:10:04.986 --> 00:10:06.977 New Haven wide sero prevalence study

NOTE Confidence: 0.90805906

00:10:06.977 --> 00:10:08.822 that will follow people longitudinally.

NOTE Confidence: 0.90805906

00:10:08.830 --> 00:10:10.630 Our work if we launch it,

NOTE Confidence: 0.90805906

00:10:10.630 --> 00:10:12.110 will have some different features

NOTE Confidence: 0.90805906

00:10:12.110 --> 00:10:14.242 than some of the other studies that

NOTE Confidence: 0.90805906

00:10:14.242 --> 00:10:16.024 have been done around the world.

NOTE Confidence: 0.90805906

00:10:16.030 --> 00:10:18.130 Some features that we think offer some

NOTE Confidence: 0.90805906

00:10:18.130 --> 00:10:19.030 interesting research opportunities,

NOTE Confidence: 0.90805906

00:10:19.030 --> 00:10:21.730 but I'm not going to talk about that today.

NOTE Confidence: 0.90805906

00:10:21.730 --> 00:10:22.030 Instead,

NOTE Confidence: 0.90805906

00:10:22.030 --> 00:10:24.430 I want to talk about two other things.

NOTE Confidence: 0.90805906

00:10:24.430 --> 00:10:26.306 One is a work that exploits the

NOTE Confidence: 0.90805906

00:10:26.306 --> 00:10:27.730 use of human movement.

NOTE Confidence: 0.90805906

00:10:27.730 --> 00:10:30.338 We had a paper just published in nature.

NOTE Confidence: 0.90805906

00:10:30.340 --> 00:10:32.601 About two weeks ago that took advantage

NOTE Confidence: 0.90805906

00:10:32.601 --> 00:10:35.353 of a big data that track the flow

NOTE Confidence: 0.90805906

00:10:35.353 --> 00:10:37.508 of people through Wuhan in China

NOTE Confidence: 0.90805906

00:10:37.508 --> 00:10:39.728 throughout the whole of China are

NOTE Confidence: 0.90805906

00:10:39.728 --> 00:10:41.779 up through sort of late February,

NOTE Confidence: 0.90805906

00:10:41.779 --> 00:10:43.970 so we had data on 11.5 million

NOTE Confidence: 0.90805906

00:10:44.041 --> 00:10:45.737 transits using phone data.

NOTE Confidence: 0.90805906

00:10:45.740 --> 00:10:47.840 So people paying the tower when

NOTE Confidence: 0.90805906

00:10:47.840 --> 00:10:49.240 they were in Wuhan,

NOTE Confidence: 0.90805906

00:10:49.240 --> 00:10:51.442 and then they relocated to another

NOTE Confidence: 0.90805906

00:10:51.442 --> 00:10:54.464 part of China and such data can be used

NOTE Confidence: 0.90805906

00:10:54.464 --> 00:10:56.940 to track the flow of human beings,

NOTE Confidence: 0.90805906

00:10:56.940 --> 00:10:59.214 even if you don’t know who’s

NOTE Confidence: 0.90805906

00:10:59.214 --> 00:11:01.140 infected or who is not.

NOTE Confidence: 0.90805906

00:11:01.140 --> 00:11:02.930 The movement of people, which,

NOTE Confidence: 0.90805906

00:11:02.930 --> 00:11:04.650 depending on data availability,

NOTE Confidence: 0.90805906

00:11:04.650 --> 00:11:07.970 could be tracked in basically in real time.

NOTE Confidence: 0.90805906

00:11:07.970 --> 00:11:08.891 Can be used.

NOTE Confidence: 0.90805906

00:11:08.891 --> 00:11:10.733 We showed using a certain model

NOTE Confidence: 0.90805906

00:11:10.733 --> 00:11:12.548 to predict the intensity,

NOTE Confidence: 0.90805906

00:11:12.550 --> 00:11:14.656 location and timing of the pandemic.

NOTE Confidence: 0.90805906

00:11:14.660 --> 00:11:17.044 So there are tools you can use that

NOTE Confidence: 0.90805906

00:11:17.044 --> 00:11:19.587 rely on other sorts of information.

NOTE Confidence: 0.90805906

00:11:19.590 --> 00:11:21.010 For example human movement,

NOTE Confidence: 0.90805906

00:11:21.010 --> 00:11:23.140 and it doesn't have to be

NOTE Confidence: 0.89884126

00:11:23.207 --> 00:11:25.218 fun data. It could be tolling

NOTE Confidence: 0.89884126

00:11:25.218 --> 00:11:26.978 data on highways as cars,

NOTE Confidence: 0.89884126

00:11:26.980 --> 00:11:29.086 a shift from place to place.

NOTE Confidence: 0.8712325

00:11:31.240 --> 00:11:33.628 Sort of other kinds of Geo.

NOTE Confidence: 0.8712325

00:11:33.630 --> 00:11:38.198 Location data, air travel data, and so forth.

NOTE Confidence: 0.8712325

00:11:38.200 --> 00:11:40.240 So human movement can be used.

NOTE Confidence: 0.8712325

00:11:40.240 --> 00:11:42.221 Another kind of thing that can be

NOTE Confidence: 0.8712325

00:11:42.221 --> 00:11:44.575 done is is using searches and probably

NOTE Confidence: 0.8712325

00:11:44.575 --> 00:11:47.539 many of you are remember the so called

NOTE Confidence: 0.8712325

00:11:47.539 --> 00:11:49.753 Google flu trends that was proposed.

NOTE Confidence: 0.8712325

00:11:49.760 --> 00:11:52.140 You know 10 or 15 years ago.

NOTE Confidence: 0.8712325

00:11:52.140 --> 00:11:54.860 Now the idea there was the following idea.

NOTE Confidence: 0.8712325

00:11:54.860 --> 00:11:58.420 So right now what the CDC does or

NOTE Confidence: 0.8712325

00:11:58.420 --> 00:12:01.279 other monitoring agencies do and what?

NOTE Confidence: 0.8712325

00:12:01.280 --> 00:12:03.000 What doctor Weinberger's talk just

NOTE Confidence: 0.8712325

00:12:03.000 --> 00:12:05.413 talked about as well is you wait

NOTE Confidence: 0.8712325

00:12:05.413 --> 00:12:07.611 in a central location for data to

NOTE Confidence: 0.8712325

00:12:07.611 --> 00:12:09.359 accumulate and be reported to you.

NOTE Confidence: 0.8712325

00:12:09.360 --> 00:12:10.042 For example,

NOTE Confidence: 0.8712325

00:12:10.042 --> 00:12:12.088 testing data for people doing influenza

NOTE Confidence: 0.8712325

00:12:12.088 --> 00:12:14.289 testing or people showing up in an

NOTE Confidence: 0.8712325

00:12:14.289 --> 00:12:16.460 emergency room or death counts for example.

NOTE Confidence: 0.8712325

00:12:16.460 --> 00:12:19.012 And what that means is that you know

NOTE Confidence: 0.8712325

00:12:19.012 --> 00:12:20.993 some period of time distant from

NOTE Confidence: 0.8712325

00:12:20.993 --> 00:12:23.240 now two to three weeks from now.

NOTE Confidence: 0.8712325

00:12:23.240 --> 00:12:25.824 You might know where the epidemic is today.

NOTE Confidence: 0.8712325

00:12:25.830 --> 00:12:27.122 Well, that's frustrating because

NOTE Confidence: 0.8712325

00:12:27.122 --> 00:12:28.737 you're always behind the epidemic.

NOTE Confidence: 0.8712325

00:12:28.740 --> 00:12:32.148 You can never get out ahead of it.

NOTE Confidence: 0.8712325

00:12:32.150 --> 00:12:34.040 Well, Google flu trends was an idea.

NOTE Confidence: 0.8712325

00:12:34.040 --> 00:12:34.530 That's it.

NOTE Confidence: 0.8712325

00:12:34.530 --> 00:12:34.775 Well,

NOTE Confidence: 0.8712325

00:12:34.775 --> 00:12:36.245 maybe we can use something about

NOTE Confidence: 0.8712325

00:12:36.245 --> 00:12:37.709 people's behavior today like there

NOTE Confidence: 0.8712325

00:12:37.709 --> 00:12:39.169 searching behavior for flu symptoms.

NOTE Confidence: 0.8712325

00:12:39.170 --> 00:12:39.688 For example.

NOTE Confidence: 0.8712325

00:12:39.688 --> 00:12:41.501 Maybe that can tell us where the

NOTE Confidence: 0.8712325

00:12:41.501 --> 00:12:43.135 epidemic is today and their first

NOTE Confidence: 0.8712325

00:12:43.135 --> 00:12:44.455 paper by Larry brilliant group

NOTE Confidence: 0.8712325

00:12:44.507 --> 00:12:46.187 showed that that could be affected.

NOTE Confidence: 0.8712325

00:12:46.190 --> 00:12:48.150 Then there was a whole literature that

NOTE Confidence: 0.8712325

00:12:48.150 --> 00:12:50.240 emerged that sort of debunk that and said,

NOTE Confidence: 0.8712325

00:12:50.240 --> 00:12:50.780 well, no,

NOTE Confidence: 0.8712325

00:12:50.780 --> 00:12:52.940 there it won't be effective and so on.

NOTE Confidence: 0.8712325

00:12:52.940 --> 00:12:54.753 But that's an illustration of a set

NOTE Confidence: 0.8712325

00:12:54.753 --> 00:12:56.687 of tools like the movement of data

NOTE Confidence: 0.8712325

00:12:56.687 --> 00:12:58.337 that I just described you from.

NOTE Confidence: 0.8712325

00:12:58.340 --> 00:12:59.960 The other project we had done.

NOTE Confidence: 0.8712325

00:12:59.960 --> 00:13:02.579 It's an illustration of a set of tools that.

NOTE Confidence: 0.8712325

00:13:02.580 --> 00:13:05.016 Allow you to a survey or note

NOTE Confidence: 0.8712325

00:13:05.016 --> 00:13:07.574 where is the epidemic today based

NOTE Confidence: 0.8712325

00:13:07.574 --> 00:13:09.954 on what I'm seeing today?

NOTE Confidence: 0.8712325

00:13:09.960 --> 00:13:12.416 But we have another idea that I'm about

NOTE Confidence: 0.8712325

00:13:12.416 --> 00:13:15.481 to tell you about that allows you to tell

NOTE Confidence: 0.8712325

00:13:15.481 --> 00:13:18.010 where the epidemic will be in the future.

NOTE Confidence: 0.8712325

00:13:18.010 --> 00:13:19.936 So it's not just rapid notification,

NOTE Confidence: 0.8712325

00:13:19.940 --> 00:13:21.866 it's advanced warning of the epidemic.

NOTE Confidence: 0.8712325

00:13:21.870 --> 00:13:23.574 How does this work?

NOTE Confidence: 0.8712325

00:13:23.574 --> 00:13:25.668 Well, imagine you're the network of people.

NOTE Confidence: 0.8712325

00:13:25.670 --> 00:13:27.525 There may be many of you can

NOTE Confidence: 0.8712325

00:13:27.525 --> 00:13:29.019 cultivate in your mind's eye,

NOTE Confidence: 0.8712325

00:13:29.020 --> 00:13:31.244 a kind of image of such a network.

NOTE Confidence: 0.8712325

00:13:31.250 --> 00:13:33.210 Since I'm doing this talk without slides,

NOTE Confidence: 0.8712325

00:13:33.210 --> 00:13:35.712 I have to kind of try to do that.

NOTE Confidence: 0.8712325

00:13:35.720 --> 00:13:37.370 Their little dots that are people

NOTE Confidence: 0.8712325

00:13:37.370 --> 00:13:39.070 in lines that connect the people.

NOTE Confidence: 0.8712325

00:13:39.070 --> 00:13:41.509 Many of you have seen these images and you

NOTE Confidence: 0.8712325

00:13:41.509 --> 00:13:44.088 have this sense that there's a middle of it,

NOTE Confidence: 0.8712325

00:13:44.090 --> 00:13:45.480 which is a very densely

NOTE Confidence: 0.8712325

00:13:45.480 --> 00:13:46.592 interconnected group of people.

NOTE Confidence: 0.8712325

00:13:46.600 --> 00:13:47.990 And then it feathers out

NOTE Confidence: 0.8712325

00:13:47.990 --> 00:13:49.102 to the social periphery,

NOTE Confidence: 0.8712325

00:13:49.110 --> 00:13:50.500 where there are people who,

NOTE Confidence: 0.8712325

00:13:50.500 --> 00:13:51.068 let’s say,

NOTE Confidence: 0.8712325

00:13:51.068 --> 00:13:53.056 only have very few friends and whose

NOTE Confidence: 0.8712325

00:13:53.056 --> 00:13:54.529 friends have very few friends.

NOTE Confidence: 0.8712325

00:13:54.530 --> 00:13:56.562 So in the middle of the network you

NOTE Confidence: 0.8712325

00:13:56.562 --> 00:13:58.636 have people that are very popular and

NOTE Confidence: 0.8712325

00:13:58.636 --> 00:14:00.663 whose friends are very popular and as

NOTE Confidence: 0.8712325

00:14:00.663 --> 00:14:02.479 you get to the edge of the network,

NOTE Confidence: 0.8712325

00:14:02.480 --> 00:14:03.810 you don’t have those qualities.

NOTE Confidence: 0.8712325

00:14:03.810 --> 00:14:05.382 That sense of centrality in the

NOTE Confidence: 0.8712325

00:14:05.382 --> 00:14:07.005 network can be quantified in a

NOTE Confidence: 0.8712325

00:14:07.005 --> 00:14:08.049 variety of mathematical ways.

NOTE Confidence: 0.9244333

00:14:08.050 --> 00:14:09.863 In fact, the mathematics of that lies

NOTE Confidence: 0.9244333

00:14:09.863 --> 00:14:12.050 at the core of how Google you know

NOTE Confidence: 0.9244333

00:14:12.050 --> 00:14:13.710 the billions of dollars that were

NOTE Confidence: 0.9244333

00:14:13.710 --> 00:14:15.488 made by the founding of Google using

NOTE Confidence: 0.9244333

00:14:15.488 --> 00:14:17.024 the so called page rank algorithm.

NOTE Confidence: 0.9244333

00:14:17.024 --> 00:14:18.560 So you can figure out what

NOTE Confidence: 0.9244333

00:14:18.616 --> 00:14:19.708 is the central website.

NOTE Confidence: 0.9244333

00:14:19.710 --> 00:14:22.083 Or you can figure out who's this

NOTE Confidence: 0.9244333

00:14:22.083 --> 00:14:23.849 central person in a network.

NOTE Confidence: 0.9244333

00:14:23.850 --> 00:14:25.894 Now imagine is such a network that

NOTE Confidence: 0.9244333

00:14:25.894 --> 00:14:27.500 a pathogen begins strikes someone

NOTE Confidence: 0.9244333

00:14:27.500 --> 00:14:29.492 at random in the population and

NOTE Confidence: 0.9244333

00:14:29.492 --> 00:14:31.230 then begins moving across the

NOTE Confidence: 0.9244333

00:14:31.230 --> 00:14:32.920 ties through the social graph.

NOTE Confidence: 0.9244333

00:14:32.920 --> 00:14:35.258 You should have the intuition that it

NOTE Confidence: 0.9244333

00:14:35.258 --> 00:14:37.171 should reach central people in the

NOTE Confidence: 0.9244333

00:14:37.171 --> 00:14:39.730 network sooner in the course of the epidemic,

NOTE Confidence: 0.9244333

00:14:39.730 --> 00:14:41.945 popular people should be more

NOTE Confidence: 0.9244333

00:14:41.945 --> 00:14:43.717 likely to get infected.

NOTE Confidence: 0.9244333

00:14:43.720 --> 00:14:45.395 And popular people should get

NOTE Confidence: 0.9244333

00:14:45.395 --> 00:14:47.496 infected sooner in the course of

NOTE Confidence: 0.9244333

00:14:47.496 --> 00:14:49.296 the epidemic than unpopular people.

NOTE Confidence: 0.9244333

00:14:49.300 --> 00:14:51.337 That means if we can identify this,

NOTE Confidence: 0.9244333

00:14:51.340 --> 00:14:51.627 incidentally,

NOTE Confidence: 0.9244333

00:14:51.627 --> 00:14:53.349 is the same reason that popular

NOTE Confidence: 0.9244333

00:14:53.349 --> 00:14:54.834 people get better stock tips

NOTE Confidence: 0.9244333

00:14:54.834 --> 00:14:55.986 or more information sooner.

NOTE Confidence: 0.9244333

00:14:55.990 --> 00:14:57.154 'cause if information flows

NOTE Confidence: 0.9244333

00:14:57.154 --> 00:14:58.027 through the network,

NOTE Confidence: 0.9244333

00:14:58.030 --> 00:14:59.955 there are more central in the network

NOTE Confidence: 0.9244333

00:14:59.955 --> 00:15:01.717 they can acquire this knowledge just

NOTE Confidence: 0.9244333

00:15:01.717 --> 00:15:03.192 like they acquired germs sooner

NOTE Confidence: 0.9244333

00:15:03.192 --> 00:15:05.010 in the course of the epidemic.

NOTE Confidence: 0.9244333

00:15:05.010 --> 00:15:05.286 Actually,

NOTE Confidence: 0.9244333

00:15:05.286 --> 00:15:07.218 there's a side light on some work

NOTE Confidence: 0.9244333

00:15:07.218 --> 00:15:09.331 we've done in the lab on the

NOTE Confidence: 0.9244333

00:15:09.331 --> 00:15:10.535 evolutionary biology of friendship,

NOTE Confidence: 0.9244333

00:15:10.540 --> 00:15:12.142 where we argue that the spread

NOTE Confidence: 0.9244333

00:15:12.142 --> 00:15:14.215 of germs is the price we pay

NOTE Confidence: 0.9244333

00:15:14.215 --> 00:15:15.780 for the spread of information.

NOTE Confidence: 0.9244333

00:15:15.780 --> 00:15:17.526 That's a whole other topic anyway,

NOTE Confidence: 0.9244333

00:15:17.530 --> 00:15:19.648 so central people can be like

NOTE Confidence: 0.9244333

00:15:19.648 --> 00:15:21.510 Canaries in a coal mine.

NOTE Confidence: 0.9244333

00:15:21.510 --> 00:15:24.054 If we can find them and monitor them,

NOTE Confidence: 0.9244333

00:15:24.060 --> 00:15:25.890 they will tell us those people

NOTE Confidence: 0.9244333

00:15:25.890 --> 00:15:27.502 should get the epidemic should

NOTE Confidence: 0.9244333

00:15:27.502 --> 00:15:29.488 strike them earlier in the course.

NOTE Confidence: 0.9244333

00:15:29.490 --> 00:15:31.398 Then it strikes a random person,

NOTE Confidence: 0.9244333

00:15:31.400 --> 00:15:32.980 so identifying such people and

NOTE Confidence: 0.9244333

00:15:32.980 --> 00:15:35.255 monitoring them gives us a tool to

NOTE Confidence: 0.9244333

00:15:35.255 --> 00:15:37.460 forecast the future course of the epidemic.

NOTE Confidence: 0.9244333

00:15:37.460 --> 00:15:40.052 My lab about 10 years ago for the H1N1

NOTE Confidence: 0.9244333

00:15:40.052 --> 00:15:42.248 Pandemic showed that this was possible.

NOTE Confidence: 0.9244333

00:15:42.250 --> 00:15:43.502 It could be done,

NOTE Confidence: 0.9244333

00:15:43.502 --> 00:15:45.380 and now we've developed new tools

NOTE Confidence: 0.9244333

00:15:45.445 --> 00:15:47.347 in combination with a mean car.

NOTE Confidence: 0.9244333

00:15:47.350 --> 00:15:49.144 Posse's group in the at Yale

NOTE Confidence: 0.9244333

00:15:49.144 --> 00:15:50.041 Electrical Engineering using

NOTE Confidence: 0.9244333

00:15:50.041 --> 00:15:51.500 certain machine learning tricks,

NOTE Confidence: 0.9244333

00:15:51.500 --> 00:15:54.048 which I'll describe in just a moment.

NOTE Confidence: 0.9244333

00:15:54.050 --> 00:15:55.820 That allow us to deploy these

NOTE Confidence: 0.9244333

00:15:55.820 --> 00:15:58.289 ideas in the form of an app that is

NOTE Confidence: 0.9244333

00:15:58.289 --> 00:16:00.330 sort of like ways for coronavirus,

NOTE Confidence: 0.9244333

00:16:00.330 --> 00:16:01.522 where everyone anonymously and

NOTE Confidence: 0.9244333

00:16:01.522 --> 00:16:03.012 privately contributes a little information.

NOTE Confidence: 0.9244333

00:16:03.020 --> 00:16:04.184 This information is aggregated

NOTE Confidence: 0.9244333

00:16:04.184 --> 00:16:06.310 and then fed back to the users,

NOTE Confidence: 0.9244333

00:16:06.310 --> 00:16:08.558 just like when you use when you drive

NOTE Confidence: 0.9244333

00:16:08.558 --> 00:16:10.790 on the highway and you use ways,

NOTE Confidence: 0.9244333

00:16:10.790 --> 00:16:12.644 you report that there's a traffic

NOTE Confidence: 0.9244333

00:16:12.644 --> 00:16:14.678 accident or that there's a traffic jam,

NOTE Confidence: 0.9244333

00:16:14.680 --> 00:16:16.360 and then this informs people that

NOTE Confidence: 0.9244333

00:16:16.360 --> 00:16:18.480 are behind you on the highway and

NOTE Confidence: 0.9244333

00:16:18.480 --> 00:16:20.055 gives them something of value.

NOTE Confidence: 0.9244333

00:16:20.060 --> 00:16:21.854 You get something of value and

NOTE Confidence: 0.9244333

00:16:21.854 --> 00:16:23.050 you share with others.

NOTE Confidence: 0.9244333

00:16:23.050 --> 00:16:24.600 It's like a crowdsourced way.

NOTE Confidence: 0.9244333

00:16:24.600 --> 00:16:25.518 Of tracking traffic,

NOTE Confidence: 0.9244333

00:16:25.518 --> 00:16:27.660 but we have like ways for coronavirus.

NOTE Confidence: 0.9244333

00:16:27.660 --> 00:16:28.482 So for example,

NOTE Confidence: 0.9244333

00:16:28.482 --> 00:16:30.126 when we saw all the politicians

NOTE Confidence: 0.9244333

00:16:30.126 --> 00:16:31.661 and celebrities that were getting

NOTE Confidence: 0.9244333

00:16:31.661 --> 00:16:33.871 that were in the news with getting

NOTE Confidence: 0.9244333

00:16:33.871 --> 00:16:35.616 sick from coronavirus early on,

NOTE Confidence: 0.9244333

00:16:35.620 --> 00:16:37.762 it was not just that they were

NOTE Confidence: 0.9244333

00:16:37.762 --> 00:16:38.680 rich and famous,

NOTE Confidence: 0.9244333

00:16:38.680 --> 00:16:40.976 so they were able to get tests and

NOTE Confidence: 0.9244333

00:16:40.976 --> 00:16:42.959 people cared what happened to them.

NOTE Confidence: 0.91899866

00:16:42.960 --> 00:16:44.766 They actually were getting sick more

NOTE Confidence: 0.91899866

00:16:44.766 --> 00:16:46.938 so Boris Johnson was out there shaking

NOTE Confidence: 0.91899866

00:16:46.938 --> 00:16:48.768 hands with all these other people.

NOTE Confidence: 0.91899866

00:16:48.770 --> 00:16:50.919 He was also spreading the germs exactly,

NOTE Confidence: 0.91899866

00:16:50.920 --> 00:16:52.870 which was irresponsible or Tom Hanks

NOTE Confidence: 0.91899866

00:16:52.870 --> 00:16:55.457 and his wife are all of these people.

NOTE Confidence: 0.91899866

00:16:55.460 --> 00:16:56.824 There are more connected

NOTE Confidence: 0.91899866

00:16:56.824 --> 00:16:58.188 so they get stricken.

NOTE Confidence: 0.91899866

00:16:58.190 --> 00:17:00.444 Earlier they were Canaries in a coal

NOTE Confidence: 0.91899866

00:17:00.444 --> 00:17:03.165 mine so our new app which were just

NOTE Confidence: 0.91899866

00:17:03.165 --> 00:17:05.268 released this past week on Monday

NOTE Confidence: 0.91899866

00:17:05.268 --> 00:17:07.739 were doing a soft launch this week.

NOTE Confidence: 0.91899866

00:17:07.740 --> 00:17:09.966 If you would like to use it

NOTE Confidence: 0.91899866

00:17:09.966 --> 00:17:12.508 you can go to who nala HUNAL,

NOTE Confidence: 0.91899866

00:17:12.510 --> 00:17:13.750 a.yale.edu and download it.

NOTE Confidence: 0.91899866

00:17:13.750 --> 00:17:15.610 We are asking that you not

NOTE Confidence: 0.91899866

00:17:15.674 --> 00:17:16.940 broadly advertised it.

NOTE Confidence: 0.91899866

00:17:16.940 --> 00:17:19.118 You can invite your friends but

NOTE Confidence: 0.91899866

00:17:19.118 --> 00:17:21.040 please don't broadly advertise it yet.

NOTE Confidence: 0.91899866

00:17:21.040 --> 00:17:22.540 We're still debugging it.

NOTE Confidence: 0.91899866

00:17:22.540 --> 00:17:25.718 If you find any bugs please email me or.

NOTE Confidence: 0.91899866

00:17:25.720 --> 00:17:27.645 Let us know and then we will.

NOTE Confidence: 0.91899866

00:17:27.650 --> 00:17:29.946 We're working on it and then next

NOTE Confidence: 0.91899866

00:17:29.946 --> 00:17:32.339 week we're going to do a kind of a

NOTE Confidence: 0.91899866

00:17:32.339 --> 00:17:34.611 big goof and try to get a lot of

NOTE Confidence: 0.91899866

00:17:34.611 --> 00:17:36.758 attention and try to get if we can.

NOTE Confidence: 0.91899866

00:17:36.758 --> 00:17:38.138 Hundreds of thousands of users.

NOTE Confidence: 0.91899866

00:17:38.140 --> 00:17:40.065 The more people that use the app,

NOTE Confidence: 0.91899866

00:17:40.070 --> 00:17:42.128 the better it can monitor what's happening

NOTE Confidence: 0.91899866

00:17:42.128 --> 00:17:44.206 in terms of the flu in your area.

NOTE Confidence: 0.91899866

00:17:44.210 --> 00:17:45.866 The app when you upload it,

NOTE Confidence: 0.91899866

00:17:45.870 --> 00:17:48.900 it only takes a on the first time you use it.

NOTE Confidence: 0.91899866

00:17:48.900 --> 00:17:51.318 You tell us some basic information

NOTE Confidence: 0.91899866

00:17:51.318 --> 00:17:52.930 about yourself and then.

NOTE Confidence: 0.91899866

00:17:52.930 --> 00:17:54.360 Every day you are pinned.

NOTE Confidence: 0.91899866

00:17:54.360 --> 00:17:56.355 If you, uh, if nothing is happening,

NOTE Confidence: 0.91899866

00:17:56.360 --> 00:17:57.504 you've had no symptoms.

NOTE Confidence: 0.91899866

00:17:57.504 --> 00:17:58.934 You haven't seen the doctor.

NOTE Confidence: 0.91899866

00:17:58.940 --> 00:18:00.572 You say no, no,

NOTE Confidence: 0.91899866

00:18:00.572 --> 00:18:01.388 you're done.

NOTE Confidence: 0.91899866

00:18:01.390 --> 00:18:02.558 If something is happening,

NOTE Confidence: 0.91899866

00:18:02.558 --> 00:18:03.726 you have some symptoms,

NOTE Confidence: 0.91899866

00:18:03.730 --> 00:18:05.732 or you've seen the doctor or you

NOTE Confidence: 0.91899866

00:18:05.732 --> 00:18:07.807 been out and about in some way.

NOTE Confidence: 0.91899866

00:18:07.810 --> 00:18:09.651 You might take a minute to answer

NOTE Confidence: 0.91899866

00:18:09.651 --> 00:18:11.133 and then you immediately get

NOTE Confidence: 0.91899866

00:18:11.133 --> 00:18:13.352 feedback in the form of your risk.

NOTE Confidence: 0.91899866

00:18:13.360 --> 00:18:15.172 Your told how much respiratory diseases

NOTE Confidence: 0.91899866

00:18:15.172 --> 00:18:17.352 there where you live based on a

NOTE Confidence: 0.91899866

00:18:17.352 --> 00:18:18.887 machine learning algorithm that takes

NOTE Confidence: 0.91899866

00:18:18.887 --> 00:18:20.576 advantage of lots of information not

NOTE Confidence: 0.91899866

00:18:20.576 --> 00:18:22.412 only from the CDC and other sources,

NOTE Confidence: 0.91899866

00:18:22.412 --> 00:18:23.580 but from our users.

NOTE Confidence: 0.91899866

00:18:23.580 --> 00:18:25.362 And then you're also told your

NOTE Confidence: 0.91899866

00:18:25.362 --> 00:18:26.882 individual risk based on where

NOTE Confidence: 0.91899866

00:18:26.882 --> 00:18:28.544 you are in the social network.

NOTE Confidence: 0.91899866

00:18:28.550 --> 00:18:30.010 For example, if your friends,

NOTE Confidence: 0.91899866

00:18:30.010 --> 00:18:30.372 friends,

NOTE Confidence: 0.91899866

00:18:30.372 --> 00:18:32.906 friends have the flu three weeks ago.

NOTE Confidence: 0.91899866

00:18:32.910 --> 00:18:34.728 This means your risk is different

NOTE Confidence: 0.91899866

00:18:34.728 --> 00:18:36.815 than some of his friends, friends,

NOTE Confidence: 0.91899866

00:18:36.815 --> 00:18:39.740 friends did not have the flu three weeks ago,

NOTE Confidence: 0.91899866

00:18:39.740 --> 00:18:42.340 or if your friends friends are very popular.

NOTE Confidence: 0.91899866

00:18:42.340 --> 00:18:44.545 Your risk is different than if my

NOTE Confidence: 0.91899866

00:18:44.545 --> 00:18:46.558 friends friends are not very popular.

NOTE Confidence: 0.91899866

00:18:46.560 --> 00:18:47.210 This information,

NOTE Confidence: 0.91899866

00:18:47.210 --> 00:18:48.510 which we validated mathematically.

NOTE Confidence: 0.91899866

00:18:48.510 --> 00:18:50.526 Another work is then combined and

NOTE Confidence: 0.91899866

00:18:50.526 --> 00:18:52.848 processed and fed back to you and

NOTE Confidence: 0.91899866

00:18:52.848 --> 00:18:54.684 you can monitor your risk everyday.

NOTE Confidence: 0.91899866

00:18:54.690 --> 00:18:55.785 Like I said,

NOTE Confidence: 0.91899866

00:18:55.785 --> 00:18:58.340 it’s anonymous and private and it is

NOTE Confidence: 0.91899866

00:18:58.416 --> 00:19:00.946 like ways for respiratory disease.

NOTE Confidence: 0.91899866

00:19:00.950 --> 00:19:03.382 Now and we and and we are also

NOTE Confidence: 0.91899866

00:19:03.382 --> 00:19:05.240 building from this a dashboard.

NOTE Confidence: 0.91899866

00:19:05.240 --> 00:19:07.179 So imagine that the state police in

NOTE Confidence: 0.91899866

00:19:07.179 --> 00:19:09.758 a in a state wanted to know which

NOTE Confidence: 0.91899866

00:19:09.758 --> 00:19:12.170 parts of the highway are dangerous.

NOTE Confidence: 0.91899866

00:19:12.170 --> 00:19:14.326 In principle they could take a years

NOTE Confidence: 0.91899866

00:19:14.326 --> 00:19:16.275 worth of reports or months worth

NOTE Confidence: 0.91899866

00:19:16.275 --> 00:19:17.875 of reports by citizens traveling

NOTE Confidence: 0.91899866

00:19:17.875 --> 00:19:19.100 on the highways,

NOTE Confidence: 0.91899866

00:19:19.100 --> 00:19:20.750 saying where are there traffic

NOTE Confidence: 0.91899866

00:19:20.750 --> 00:19:22.400 accidents and they could say,

NOTE Confidence: 0.8996187

00:19:22.400 --> 00:19:23.285 Oh my goodness,

NOTE Confidence: 0.8996187

00:19:23.285 --> 00:19:26.030 this part of the highway is very dangerous.

NOTE Confidence: 0.8996187

00:19:26.030 --> 00:19:28.010 Maybe we should put a redesign.

NOTE Confidence: 0.8996187

00:19:28.010 --> 00:19:29.660 That part of the highlight.

NOTE Confidence: 0.8996187

00:19:29.660 --> 00:19:30.944 So this is this.

NOTE Confidence: 0.8996187

00:19:30.944 --> 00:19:33.250 Our app will work the same way.

NOTE Confidence: 0.8996187

00:19:33.250 --> 00:19:34.438 We're building a dashboard

NOTE Confidence: 0.8996187

00:19:34.438 --> 00:19:35.626 that could be used,

NOTE Confidence: 0.8996187

00:19:35.630 --> 00:19:37.376 for instance by people running a

NOTE Confidence: 0.8996187

00:19:37.376 --> 00:19:39.194 hospital system that want to monitor

NOTE Confidence: 0.8996187

00:19:39.194 --> 00:19:40.699 what's happening in their area,

NOTE Confidence: 0.8996187

00:19:40.700 --> 00:19:43.012 or that could be used to to detect

NOTE Confidence: 0.8996187

00:19:43.012 --> 00:19:44.867 where is are the hot spots,

NOTE Confidence: 0.8996187

00:19:44.870 --> 00:19:46.360 and to see it's coming.

NOTE Confidence: 0.8996187

00:19:46.360 --> 00:19:48.130 We're seeing a spike in people

NOTE Confidence: 0.8996187

00:19:48.130 --> 00:19:49.957 who are central in the network

NOTE Confidence: 0.8996187

00:19:49.957 --> 00:19:51.715 and not a spike in average.

NOTE Confidence: 0.8996187

00:19:51.720 --> 00:19:53.508 People that difference between those things?

NOTE Confidence: 0.8996187

00:19:53.510 --> 00:19:55.172 The difference between the at risk

NOTE Confidence: 0.8996187

00:19:55.172 --> 00:19:57.596 people and the less at risk people when

NOTE Confidence: 0.8996187

00:19:57.596 --> 00:19:59.166 there's divergence in those curves,

NOTE Confidence: 0.8996187

00:19:59.170 --> 00:20:00.157 that's a harbinger.

NOTE Confidence: 0.8996187

00:20:00.157 --> 00:20:02.460 But the epidemic is going to spike

NOTE Confidence: 0.8996187

00:20:02.523 --> 00:20:04.227 that the 2nd wave has begun,

NOTE Confidence: 0.8996187

00:20:04.230 --> 00:20:04.874 for example,

NOTE Confidence: 0.8996187

00:20:04.874 --> 00:20:06.806 or that the lockdowns are beginning

NOTE Confidence: 0.8996187

00:20:06.806 --> 00:20:08.900 to foster a spread of the pathogen,

NOTE Confidence: 0.8996187

00:20:08.900 --> 00:20:10.724 and so of course the individuals

NOTE Confidence: 0.8996187

00:20:10.724 --> 00:20:12.625 who get this information can act

NOTE Confidence: 0.8996187

00:20:12.625 --> 00:20:14.190 accordingly on their own benefit,

NOTE Confidence: 0.8996187

00:20:14.190 --> 00:20:15.725 but collective decision makers can

NOTE Confidence: 0.8996187

00:20:15.725 --> 00:20:17.622 also now have some vision into

NOTE Confidence: 0.8996187

00:20:17.622 --> 00:20:19.157 what's happening in the system.

NOTE Confidence: 0.832709

00:20:21.460 --> 00:20:22.388 And I'll just stop.

NOTE Confidence: 0.832709

00:20:22.388 --> 00:20:23.548 I have two more minutes.

NOTE Confidence: 0.832709

00:20:23.550 --> 00:20:27.537 I'll shut up what I want to say is.

NOTE Confidence: 0.832709

00:20:27.540 --> 00:20:28.960 That to my eye,

NOTE Confidence: 0.832709

00:20:28.960 --> 00:20:31.900 there is no escape from this pathogen.

NOTE Confidence: 0.832709

00:20:31.900 --> 00:20:34.270 It will become endemic among us.

NOTE Confidence: 0.832709

00:20:34.270 --> 00:20:36.724 There are to our knowledge 7

NOTE Confidence: 0.832709

00:20:36.724 --> 00:20:38.805 coronavirus species that that afflict

NOTE Confidence: 0.832709

00:20:38.805 --> 00:20:41.395 us for that cause the common cold.

NOTE Confidence: 0.832709

00:20:41.400 --> 00:20:43.770 I think that those pathogens that

NOTE Confidence: 0.832709

00:20:43.770 --> 00:20:46.150 cause the common cold right now,

NOTE Confidence: 0.832709

00:20:46.150 --> 00:20:48.514 the Corona viruses are probably distant

NOTE Confidence: 0.832709

00:20:48.514 --> 00:20:50.543 echoes of previous introduction of

NOTE Confidence: 0.832709

00:20:50.543 --> 00:20:52.488 coronavirus pandemics into our species.

NOTE Confidence: 0.832709

00:20:52.490 --> 00:20:53.978 In the distant past.

NOTE Confidence: 0.832709

00:20:53.978 --> 00:20:56.737 I think what happens is these pathogens

NOTE Confidence: 0.832709

00:20:56.737 --> 00:20:59.419 tend to mutate to become milder.

NOTE Confidence: 0.832709

00:20:59.420 --> 00:21:01.804 Remember from the point of view of the

NOTE Confidence: 0.832709

00:21:01.804 --> 00:21:03.910 pathogen, it doesn't want to kill us.

NOTE Confidence: 0.832709

00:21:03.910 --> 00:21:05.996 It's better if it doesn't kill us.

NOTE Confidence: 0.832709

00:21:06.000 --> 00:21:08.200 So if we if we die too fast

NOTE Confidence: 0.832709

00:21:08.200 --> 00:21:09.590 we don't spread it.

NOTE Confidence: 0.832709

00:21:09.590 --> 00:21:11.080 So as time goes by,

NOTE Confidence: 0.832709

00:21:11.080 --> 00:21:11.676 in general,

NOTE Confidence: 0.832709

00:21:11.676 --> 00:21:13.166 pathogens mutate to become milder,

NOTE Confidence: 0.832709

00:21:13.170 --> 00:21:14.670 but unfortunately and then there

NOTE Confidence: 0.832709

00:21:14.670 --> 00:21:15.870 are two other coronaviruses,

NOTE Confidence: 0.832709

00:21:15.870 --> 00:21:17.956 the SARS 1 from 2003 and Murs,

NOTE Confidence: 0.832709

00:21:17.960 --> 00:21:19.450 the Middle Eastern respiratory syndrome,

NOTE Confidence: 0.832709

00:21:19.450 --> 00:21:21.550 which has a very low are not,

NOTE Confidence: 0.832709

00:21:21.550 --> 00:21:23.272 which is one of the reasons

NOTE Confidence: 0.832709

00:21:23.272 --> 00:21:25.092 this has not become pandemic and

NOTE Confidence: 0.832709

00:21:25.092 --> 00:21:27.227 then the one we're in right now,

NOTE Confidence: 0.832709

00:21:27.230 --> 00:21:29.435 which unfortunately is awful for us and.

NOTE Confidence: 0.832709

00:21:29.440 --> 00:21:31.318 It will spread and it will

NOTE Confidence: 0.832709

00:21:31.318 --> 00:21:33.965 kill many of us I think is the

NOTE Confidence: 0.832709

00:21:33.965 --> 00:21:35.933 sad truth until such time is.

NOTE Confidence: 0.832709

00:21:35.940 --> 00:21:38.004 Either we invent an effective vaccine

NOTE Confidence: 0.832709

00:21:38.004 --> 00:21:40.755 or we get herd immunity so it will

NOTE Confidence: 0.832709

00:21:40.755 --> 00:21:43.063 become endemic and we have to use

NOTE Confidence: 0.832709

00:21:43.063 --> 00:21:45.100 the best tools that we have to

NOTE Confidence: 0.832709

00:21:45.100 --> 00:21:46.990 cope with its existence among us.

NOTE Confidence: 0.832709

00:21:46.990 --> 00:21:47.640 Thank you.

NOTE Confidence: 0.79052943

00:21:51.710 --> 00:21:53.936 Thank you very much doctor Chris Nagus.