WEBVTT

NOTE duration:"00:28:20.1290000"

NOTE language:en-us

NOTE Confidence: 0.919523298740387

00:00:00.000 --> 00:00:02.526 Like to introduce our next Speaker,

NOTE Confidence: 0.919523298740387

00:00:02.530 --> 00:00:03.790 Doctor Edward Kaplan.

NOTE Confidence: 0.919523298740387

00:00:03.790 --> 00:00:06.310 Doctor Kaplan is William N Andrea,

NOTE Confidence: 0.919523298740387

00:00:06.310 --> 00:00:08.365 a beach professor of operations

NOTE Confidence: 0.919523298740387

00:00:08.365 --> 00:00:11.335 research and as a professor of public

NOTE Confidence: 0.919523298740387

00:00:11.335 --> 00:00:13.843 health and a professor of engineering.

NOTE Confidence: 0.919523298740387

00:00:13.850 --> 00:00:16.358 He's an expert in operations research,

NOTE Confidence: 0.919523298740387

00:00:16.360 --> 00:00:17.190 mathematical modeling,

NOTE Confidence: 0.919523298740387

00:00:17.190 --> 00:00:19.265 and statistics, who studies problems

NOTE Confidence: 0.919523298740387

00:00:19.265 --> 00:00:21.390 in public policy and Management.

NOTE Confidence: 0.919523298740387

00:00:21.390 --> 00:00:25.464 Doctor Kaplan, thank you for being here.

NOTE Confidence: 0.919523298740387

00:00:25.470 --> 00:00:27.255 Thank you very much and

NOTE Confidence: 0.919523298740387

00:00:27.255 --> 00:00:28.326 Good afternoon everyone.

NOTE Confidence: 0.919523298740387

00:00:28.330 --> 00:00:30.724 I recognize I am the last thing

NOTE Confidence: 0.919523298740387

00:00:30.724 --> 00:00:32.630 between you and happy hour,

NOTE Confidence: 0.919523298740387

00:00:32.630 --> 00:00:35.843 but nonetheless I hope you will bear with me.

NOTE Confidence: 0.919523298740387

00:00:35.850 --> 00:00:38.503 I am taking a somewhat different Ave

NOTE Confidence: 0.919523298740387

00:00:38.503 --> 00:00:40.918 into this entire area of work because

NOTE Confidence: 0.919523298740387

00:00:40.918 --> 00:00:43.729 I came to this not as a researcher,

NOTE Confidence: 0.919523298740387

00:00:43.730 --> 00:00:45.893 but rather is a member of Yale's

NOTE Confidence: 0.919523298740387

00:00:45.893 --> 00:00:48.020 Public Health Kovid Advisory Committee.

NOTE Confidence: 0.919523298740387

00:00:48.020 --> 00:00:50.309 I think some of you have heard

NOTE Confidence: 0.919523298740387

00:00:50.309 --> 00:00:52.680 about the work of this committee.

NOTE Confidence: 0.919523298740387

00:00:52.680 --> 00:00:54.495 It's been meeting quite intensively

NOTE Confidence: 0.919523298740387

00:00:54.495 --> 00:00:55.947 since the very beginning.

NOTE Confidence: 0.919523298740387

00:00:55.950 --> 00:00:58.764 Of March originally charged by Paul Jenison,

NOTE Confidence: 0.919523298740387

00:00:58.770 --> 00:01:00.790 now chaired by Stephanie Spangler,

NOTE Confidence: 0.919523298740387

00:01:00.790 --> 00:01:03.562 polls the director of Yale Health and

NOTE Confidence: 0.919523298740387

00:01:03.562 --> 00:01:06.429 Stephanie is device focus for health fairs.

NOTE Confidence: 0.919523298740387

00:01:06.430 --> 00:01:08.746 You recognize many of the people

NOTE Confidence: 0.919523298740387

00:01:08.746 --> 00:01:10.860 who are on this panel.

NOTE Confidence: 0.919523298740387

00:01:10.860 --> 00:01:11.260 Basically,

NOTE Confidence: 0.919523298740387

00:01:11.260 --> 00:01:14.060 we were tasked to advise the L

NOTE Confidence: 0.919523298740387

00:01:14.060 --> 00:01:16.227 presidents and senior officials on

NOTE Confidence: 0.919523298740387

00:01:16.227 --> 00:01:19.230 public health aspects of this we started

NOTE Confidence: 0.919523298740387

00:01:19.306 --> 00:01:21.735 right into the middle of a crisis,

NOTE Confidence: 0.919523298740387

00:01:21.740 --> 00:01:24.272 literally just days before the first

NOTE Confidence: 0.919523298740387

00:01:24.272 --> 00:01:26.590 cases in Connecticut and at Yale.

NOTE Confidence: 0.919523298740387

00:01:26.590 --> 00:01:28.440 Or announced we are continuing

NOTE Confidence: 0.919523298740387

00:01:28.440 --> 00:01:30.290 to work to this day,

NOTE Confidence: 0.919523298740387

00:01:30.290 --> 00:01:32.140 typically in well they used

NOTE Confidence: 0.919523298740387

00:01:32.140 --> 00:01:33.990 to be morning phone calls.

NOTE Confidence: 0.919523298740387

00:01:33.990 --> 00:01:36.186 Now their morning zoom sessions every

NOTE Confidence: 0.919523298740387

00:01:36.186 --> 00:01:38.811 morning at 7:00 o'clock to try and

NOTE Confidence: 0.919523298740387

00:01:38.811 --> 00:01:40.646 work and support University decisions.

NOTE Confidence: 0.919523298740387

00:01:40.650 --> 00:01:43.079 Here are a number of different committee

NOTE Confidence: 0.919523298740387

00:01:43.079 --> 00:01:45.459 issues that have been addressed today.

NOTE Confidence: 0.919523298740387

00:01:45.460 --> 00:01:48.204 You can read them on the slide yourself

NOTE Confidence: 0.919523298740387

00:01:48.204 --> 00:01:51.008 so I won't go through them all,

NOTE Confidence: 0.919523298740387

00:01:51.010 --> 00:01:53.682 but I just want to mention that the

NOTE Confidence: 0.919523298740387

00:01:53.682 --> 00:01:56.630 issues that are highlighted here in orange.

NOTE Confidence: 0.919523298740387

00:01:56.630 --> 00:01:58.886 Are all issues are that involved

NOTE Confidence: 0.919523298740387

00:01:58.886 --> 00:02:01.750 what I would call scratch modeling?

NOTE Confidence: 0.919523298740387

00:02:01.750 --> 00:02:03.698 That is to say,

NOTE Confidence: 0.919523298740387

00:02:03.698 --> 00:02:05.646 mathematical models were essentially

NOTE Confidence: 0.919523298740387

00:02:05.646 --> 00:02:08.557 created in real time and on the fly

NOTE Confidence: 0.919523298740387

00:02:08.557 --> 00:02:10.896 to try and help answer questions

NOTE Confidence: 0.919523298740387

00:02:10.896 --> 00:02:12.426 as they occurred.

NOTE Confidence: 0.919523298740387

00:02:12.430 --> 00:02:15.028 So you'll remember for example receiving

NOTE Confidence: 0.919523298740387

00:02:15.028 --> 00:02:17.227 emails from the administration about

NOTE Confidence: 0.919523298740387

00:02:17.227 --> 00:02:19.257 the capping of University advance.

NOTE Confidence: 0.919523298740387

00:02:19.260 --> 00:02:21.900 Initially it size 100 then down to size

NOTE Confidence: 0.919523298740387

00:02:21.900 --> 00:02:25.302 20 and then eventually all events were

NOTE Confidence: 0.919523298740387

00:02:25.302 --> 00:02:27.438 effectively canceled that actually.

NOTE Confidence: 0.919523298740387

00:02:27.440 --> 00:02:29.335 Those recommendations Cam is the

NOTE Confidence: 0.919523298740387

00:02:29.335 --> 00:02:31.631 result of analysis that was conducted

NOTE Confidence: 0.919523298740387

00:02:31.631 --> 00:02:34.263 in a principled way trying to come up

NOTE Confidence: 0.919523298740387

00:02:34.263 --> 00:02:36.778 with appropriate crowd caps so that

NOTE Confidence: 0.919523298740387

00:02:36.778 --> 00:02:38.898 the probability that no transmission

NOTE Confidence: 0.919523298740387

00:02:38.900 --> 00:02:41.630 would occur in the event would be

NOTE Confidence: 0.919523298740387

00:02:41.630 --> 00:02:43.864 maintained at least 99% given the

NOTE Confidence: 0.919523298740387

00:02:43.864 --> 00:02:46.538 information that we had at the time.

NOTE Confidence: 0.919523298740387

00:02:46.540 --> 00:02:46.922 Again,

NOTE Confidence: 0.919523298740387

00:02:46.922 --> 00:02:50.360 this was done in the first week of March.

NOTE Confidence: 0.919523298740387

00:02:50.360 --> 00:02:51.788 Implications for the calendaring.

NOTE Confidence: 0.919523298740387

00:02:51.788 --> 00:02:54.302 Looking at the design of testing programs

NOTE Confidence: 0.919523298740387

00:02:54.302 --> 00:02:55.847 in a particular repeat screening

NOTE Confidence: 0.919523298740387

00:02:55.847 --> 00:02:58.060 and a number of other activities,

NOTE Confidence: 0.919523298740387

00:02:58.060 --> 00:03:00.196 some of which the committee didn't

NOTE Confidence: 0.919523298740387

00:03:00.196 --> 00:03:02.489 actually undertake but help to kick start,

NOTE Confidence: 0.919523298740387

00:03:02.490 --> 00:03:04.590 and they include the activities

NOTE Confidence: 0.919523298740387

00:03:04.590 --> 00:03:06.906 listed here so. Actually, it's been.

NOTE Confidence: 0.919523298740387

00:03:06.906 --> 00:03:09.370 It's been quite an experience to get

NOTE Confidence: 0.919523298740387

00:03:09.437 --> 00:03:11.684 to know the people on this committee

NOTE Confidence: 0.919523298740387

00:03:11.684 --> 00:03:13.677 from across the University and also

NOTE Confidence: 0.919523298740387

00:03:13.677 --> 00:03:15.924 to be involved in working on all

NOTE Confidence: 0.925802230834961

00:03:15.930 --> 00:03:17.946 of these issues in real time.

NOTE Confidence: 0.925802230834961

00:03:17.950 --> 00:03:20.630 Today I'd like to talk about two such

NOTE Confidence: 0.925802230834961

00:03:20.630 --> 00:03:23.317 projects and will start with a kick start,

NOTE Confidence: 0.925802230834961

00:03:23.320 --> 00:03:25.707 which actually has to do with this

NOTE Confidence: 0.925802230834961

00:03:25.707 --> 00:03:27.383 sludge sampling project that saw

NOTE Confidence: 0.925802230834961

00:03:27.383 --> 00:03:29.441 Domer mentioned when he spoke at the

NOTE Confidence: 0.925802230834961

00:03:29.441 --> 00:03:31.388 very beginning of the afternoon.

NOTE Confidence: 0.925802230834961

00:03:31.390 --> 00:03:34.070 And again, this is one of these ideas.

NOTE Confidence: 0.925802230834961

00:03:34.070 --> 00:03:36.436 It came about a couple of us.

NOTE Confidence: 0.925802230834961

00:03:36.440 --> 00:03:37.988 Were thinking what other

NOTE Confidence: 0.925802230834961

00:03:37.988 --> 00:03:39.536 ways could one manage?

NOTE Confidence: 0.925802230834961

00:03:39.540 --> 00:03:41.718 Uh, what could one gain information

NOTE Confidence: 0.925802230834961

00:03:41.718 --> 00:03:44.179 about the state of this outbreak,

NOTE Confidence: 0.925802230834961

00:03:44.180 --> 00:03:46.502 and the idea came up of

NOTE Confidence: 0.925802230834961

00:03:46.502 --> 00:03:47.276 environmental monitoring.

NOTE Confidence: 0.925802230834961

00:03:47.280 --> 00:03:50.184 The problem was is we didn't really know

NOTE Confidence: 0.925802230834961

00:03:50.184 --> 00:03:53.859 who in the University could do such a thing.

NOTE Confidence: 0.925802230834961

00:03:53.860 --> 00:03:56.128 The original proposal was actually to

NOTE Confidence: 0.925802230834961

00:03:56.128 --> 00:03:58.842 go to Union Station because of the

NOTE Confidence: 0.925802230834961

00:03:58.842 --> 00:04:00.732 frequent train travel between New

NOTE Confidence: 0.925802230834961

00:04:00.732 --> 00:04:03.511 Haven in New York and possibly study

NOTE Confidence: 0.925802230834961

00:04:03.511 --> 00:04:05.860 outflow into toilet swabs there anyway.

NOTE Confidence: 0.925802230834961

00:04:05.860 --> 00:04:08.590 Dan Weinberg, who also spoke earlier today.

NOTE Confidence: 0.925802230834961

00:04:08.590 --> 00:04:10.501 Uh, suggested to me that the Magic

NOTE Confidence: 0.925802230834961

00:04:10.501 --> 00:04:12.730 figure on campus with professor Jordan

NOTE Confidence: 0.925802230834961

00:04:12.730 --> 00:04:14.534 Patcha and environmental engineering,

NOTE Confidence: 0.925802230834961

00:04:14.540 --> 00:04:16.815 which turns out to be a world

NOTE Confidence: 0.925802230834961

00:04:16.815 --> 00:04:19.089 expert in these kinds of studies.

NOTE Confidence: 0.925802230834961

00:04:19.090 --> 00:04:21.190 I got in touch with Jordan.

NOTE Confidence: 0.925802230834961

00:04:21.190 --> 00:04:23.230 We had a discussion that same

NOTE Confidence: 0.925802230834961

00:04:23.230 --> 00:04:25.389 day we're now talking March 11th,

NOTE Confidence: 0.925802230834961

00:04:25.390 --> 00:04:28.009 and that led to a March 16th meeting with

NOTE Confidence: 0.925802230834961

00:04:28.009 --> 00:04:29.783 other researchers who quickly joined

NOTE Confidence: 0.925802230834961

00:04:29.783 --> 00:04:33.090 in some who would be doing sample collection.

NOTE Confidence: 0.925802230834961

00:04:33.090 --> 00:04:35.190 Some who are experts in the

NOTE Confidence: 0.925802230834961

00:04:35.190 --> 00:04:36.240 actual laboratory testing.

NOTE Confidence: 0.925802230834961

00:04:36.240 --> 00:04:37.640 Some people contributing analysis.

NOTE Confidence: 0.925802230834961

00:04:37.640 --> 00:04:38.340 Jordan suggestion.

NOTE Confidence: 0.925802230834961

00:04:38.340 --> 00:04:40.350 Everyone agreed that the actual target

NOTE Confidence: 0.925802230834961

00:04:40.350 --> 00:04:42.619 should be to wastewater treatment plant.

NOTE Confidence: 0.925802230834961

00:04:42.620 --> 00:04:45.734 Be cause this is a plant which is served

NOTE Confidence: 0.925802230834961

00:04:45.734 --> 00:04:48.247 serving the populations of New Haven,

NOTE Confidence: 0.925802230834961

00:04:48.250 --> 00:04:50.120 Hamden, East Haven and Woodbridge,

NOTE Confidence: 0.925802230834961

00:04:50.120 --> 00:04:52.166 and that the collection and detection

NOTE Confidence: 0.925802230834961

00:04:52.166 --> 00:04:54.425 of pathogens in Seward Sludge is

NOTE Confidence: 0.925802230834961

00:04:54.425 --> 00:04:56.500 something which is longstanding practice.

NOTE Confidence: 0.925802230834961

00:04:56.500 --> 00:04:58.817 We put together the two cross campus

NOTE Confidence: 0.925802230834961

00:04:58.817 --> 00:05:01.526 team and the first samples were already

NOTE Confidence: 0.925802230834961

00:05:01.526 --> 00:05:03.998 being collected on March the 19th,

NOTE Confidence: 0.925802230834961

00:05:04.000 --> 00:05:06.889 so less than two weeks from when the idea

NOTE Confidence: 0.925802230834961

00:05:06.889 --> 00:05:09.998 was first raised until the action started.

NOTE Confidence: 0.925802230834961

00:05:10.000 --> 00:05:12.256 And here is just a cover

NOTE Confidence: 0.925802230834961

00:05:12.256 --> 00:05:13.760 sheet of the article.

NOTE Confidence: 0.925802230834961

00:05:13.760 --> 00:05:16.010 Coming out that sod again mentioned

NOTE Confidence: 0.925802230834961

00:05:16.010 --> 00:05:18.859 earlier and I just think it's it's nice

NOTE Confidence: 0.925802230834961

00:05:18.859 --> 00:05:21.759 to look both of course to acknowledge all

NOTE Confidence: 0.925802230834961

00:05:21.759 --> 00:05:24.944 of the people involved in medical students.

NOTE Confidence: 0.925802230834961

00:05:24.950 --> 00:05:27.266 Other researchers from across the University,

NOTE Confidence: 0.925802230834961

00:05:27.270 --> 00:05:29.804 and you can really see how people

NOTE Confidence: 0.925802230834961

00:05:29.804 --> 00:05:32.180 from across Yale have come together

NOTE Confidence: 0.925802230834961

00:05:32.180 --> 00:05:34.598 to try and tackle this problem.

NOTE Confidence: 0.925802230834961

00:05:34.600 --> 00:05:37.302 So this is the East shore water

NOTE Confidence: 0.925802230834961

00:05:37.302 --> 00:05:38.074 pollution facility.

NOTE Confidence: 0.925802230834961

00:05:38.080 --> 00:05:40.010 40,000,000 gallons per day capacity.

NOTE Confidence: 0.925802230834961

00:05:40.010 --> 00:05:41.081 As I mentioned,

NOTE Confidence: 0.925802230834961

00:05:41.081 --> 00:05:44.078 it serves these four towns and the idea

NOTE Confidence: 0.925802230834961

00:05:44.078 --> 00:05:47.018 here was to start gathering samples daily.

NOTE Confidence: 0.925802230834961

00:05:47.020 --> 00:05:49.596 And the analysis I'll share with you

NOTE Confidence: 0.925802230834961

00:05:49.596 --> 00:05:52.362 today is based on data collected from

NOTE Confidence: 0.925802230834961

00:05:52.362 --> 00:05:53.950 March 19th until May,

NOTE Confidence: 0.925802230834961

00:05:53.950 --> 00:05:54.720 the first.

NOTE Confidence: 0.925802230834961

00:05:54.720 --> 00:05:57.415 You can see the little tag here.

NOTE Confidence: 0.925802230834961

00:05:57.420 --> 00:05:58.960 It says Yale sample.

NOTE Confidence: 0.925802230834961

00:05:58.960 --> 00:06:00.500 So here's what happens.

NOTE Confidence: 0.925802230834961

00:06:00.500 --> 00:06:00.885 Actually,

NOTE Confidence: 0.925802230834961

00:06:00.885 --> 00:06:02.810 there are two different replicas

NOTE Confidence: 0.925802230834961

00:06:02.810 --> 00:06:04.350 with two different primers,

NOTE Confidence: 0.925802230834961

00:06:04.350 --> 00:06:06.774 and so here what we see are the

NOTE Confidence: 0.925802230834961

00:06:06.774 --> 00:06:08.888 actual raw measurements of viral

NOTE Confidence: 0.925802230834961

00:06:08.888 --> 00:06:11.278 RNA copies per milliliter here.

NOTE Confidence: 0.925802230834961

00:06:11.280 --> 00:06:13.390 From these different primary replica

NOTE Confidence: 0.925802230834961

00:06:13.390 --> 00:06:15.078 combinations viewed overtime and

NOTE Confidence: 0.925802230834961

00:06:15.078 --> 00:06:17.050 just looking at these raw data.

NOTE Confidence: 0.925802230834961

00:06:17.050 --> 00:06:19.255 You can see that they're very noisy,

NOTE Confidence: 0.925802230834961

00:06:19.260 --> 00:06:21.248 but you can see the shape actually

NOTE Confidence: 0.925802230834961

00:06:21.248 --> 00:06:22.100 of an epidemic

NOTE Confidence: 0.92478996515274

00:06:22.168 --> 00:06:24.604 outbreak pretty much from start to finish.

NOTE Confidence: 0.92478996515274

00:06:24.610 --> 00:06:27.445 So how does one analyze noisy data like this?

NOTE Confidence: 0.92478996515274

00:06:27.450 --> 00:06:30.600 Well, the first thing to do is to smooth it.

NOTE Confidence: 0.92478996515274

00:06:30.600 --> 00:06:33.120 To do it in a very simple way,

NOTE Confidence: 0.92478996515274

00:06:33.120 --> 00:06:35.010 we're using something called low as,

NOTE Confidence: 0.92478996515274

00:06:35.010 --> 00:06:36.900 which is just a locally weighted

NOTE Confidence: 0.92478996515274

00:06:36.900 --> 00:06:38.160 regression scatter plot smoothing.

NOTE Confidence: 0.92478996515274

00:06:38.160 --> 00:06:39.735 It's a very common technique

NOTE Confidence: 0.92478996515274

00:06:39.735 --> 00:06:41.310 used for problems like this,

NOTE Confidence: 0.92478996515274

00:06:41.310 --> 00:06:44.730 and what we have on this first figure here.

NOTE Confidence: 0.92478996515274

00:06:44.730 --> 00:06:46.776 Are raw data and smooths both

NOTE Confidence: 0.92478996515274

00:06:46.776 --> 00:06:49.120 for the average RNA measurements,

NOTE Confidence: 0.92478996515274

00:06:49.120 --> 00:06:52.693 which are the blue dots and also for daily

NOTE Confidence: 0.92478996515274

00:06:52.693 --> 00:06:55.495 admissions to the Yale New Haven Hospital.

NOTE Confidence: 0.92478996515274

00:06:55.500 --> 00:06:57.744 But we stricted to residents of

NOTE Confidence: 0.92478996515274

00:06:57.744 --> 00:07:00.583 the same for towns that is served

NOTE Confidence: 0.92478996515274

00:07:00.583 --> 00:07:02.688 by the sewage treatment plant.

NOTE Confidence: 0.92478996515274

00:07:02.690 --> 00:07:05.078 And if you do the smooth,

NOTE Confidence: 0.92478996515274

00:07:05.080 --> 00:07:07.684 it's possible to re scale and reposition

NOTE Confidence: 0.92478996515274

00:07:07.684 --> 00:07:10.138 and you actually see that these

NOTE Confidence: 0.92478996515274

00:07:10.138 --> 00:07:12.258 sludge RNA measurements were peaking.

NOTE Confidence: 0.92478996515274

00:07:12.260 --> 00:07:14.885 This is 3 days before the local

NOTE Confidence: 0.92478996515274

00:07:14.885 --> 00:07:16.660 admissions data were peeking.

NOTE Confidence: 0.92478996515274

00:07:16.660 --> 00:07:19.316 You might have thought that there would be

NOTE Confidence: 0.92478996515274

00:07:19.316 --> 00:07:22.065 a longer lead time than just three days.

NOTE Confidence: 0.92478996515274

00:07:22.070 --> 00:07:24.408 Certainly if you compare the RNA measurement

NOTE Confidence: 0.92478996515274

00:07:24.408 --> 00:07:27.139 in the sludge data had actual covert cases,

NOTE Confidence: 0.92478996515274

00:07:27.140 --> 00:07:29.499 you see much more of a displacement,

NOTE Confidence: 0.92478996515274

00:07:29.500 --> 00:07:31.971 but remember the kovid cases or following

NOTE Confidence: 0.92478996515274

00:07:31.971 --> 00:07:33.899 from testing delays and also many,

NOTE Confidence: 0.92478996515274

00:07:33.900 --> 00:07:36.024 many people who are hospitalized don't

NOTE Confidence: 0.92478996515274

00:07:36.024 --> 00:07:38.446 actually get diagnosed for Cove it until

NOTE Confidence: 0.92478996515274

00:07:38.446 --> 00:07:40.658 after they've been admitted to the hospital.

NOTE Confidence: 0.92478996515274

00:07:40.660 --> 00:07:43.524 So there are all sorts of reasons for

NOTE Confidence: 0.92478996515274

00:07:43.524 --> 00:07:46.945 why you would expect the longer lag here.

NOTE Confidence: 0.92478996515274

00:07:46.950 --> 00:07:50.230 But perhaps a more interesting way to look

NOTE Confidence: 0.92478996515274

00:07:50.230 --> 00:07:54.005 at this information is in this last figure.

NOTE Confidence: 0.92478996515274

00:07:54.010 --> 00:07:56.691 What we have here in this block

NOTE Confidence: 0.92478996515274

00:07:56.691 --> 00:07:59.187 curve is actually what I'll refer

NOTE Confidence: 0.92478996515274

00:07:59.187 --> 00:08:01.297 to as the transmission potential

NOTE Confidence: 0.92478996515274

00:08:01.297 --> 00:08:03.710 for a mathematical model,

NOTE Confidence: 0.92478996515274

00:08:03.710 --> 00:08:05.840 which is a SARS covariance

NOTE Confidence: 0.92478996515274

00:08:05.840 --> 00:08:07.544 transmission potential which explicitly

NOTE Confidence: 0.92478996515274

00:08:07.544 --> 00:08:09.840 takes into account the variation

NOTE Confidence: 0.92478996515274

00:08:09.840 --> 00:08:11.644 infectious infectiousness by time.

NOTE Confidence: 0.92478996515274

00:08:11.650 --> 00:08:14.758 Since infection an one thing I will

NOTE Confidence: 0.92478996515274

00:08:14.758 --> 00:08:17.840 mention is that this curve was not.

NOTE Confidence: 0.92478996515274

00:08:17.840 --> 00:08:19.124 Calibrated to the sludge.

NOTE Confidence: 0.92478996515274

00:08:19.124 --> 00:08:21.696 Data in the sense of any kind of

NOTE Confidence: 0.92478996515274

00:08:21.696 --> 00:08:23.430 a least squares point by point

NOTE Confidence: 0.92478996515274

00:08:23.430 --> 00:08:25.359 fit or something like that.

NOTE Confidence: 0.92478996515274

00:08:25.360 --> 00:08:27.187 Whether this is a model that was

NOTE Confidence: 0.92478996515274

00:08:27.187 --> 00:08:28.751 informed by early transmission dynamics

NOTE Confidence: 0.92478996515274

00:08:28.751 --> 00:08:30.917 that had been originally estimated in

NOTE Confidence: 0.92478996515274

00:08:30.917 --> 00:08:33.208 China but then updated for Connecticut,

NOTE Confidence: 0.92478996515274

00:08:33.210 --> 00:08:35.457 and I'm going to go through those

NOTE Confidence: 0.92478996515274

00:08:35.457 --> 00:08:36.810 details and roll them.

NOTE Confidence: 0.92478996515274

00:08:36.810 --> 00:08:38.340 And the only real calibration

NOTE Confidence: 0.92478996515274

00:08:38.340 --> 00:08:40.288 exercise involved was trying to figure

NOTE Confidence: 0.92478996515274

00:08:40.288 --> 00:08:41.380 out looking backwards.

NOTE Confidence: 0.92478996515274

00:08:41.380 --> 00:08:43.348 When did this local outbreak start?

NOTE Confidence: 0.92478996515274

00:08:43.350 --> 00:08:44.064 So basically,

NOTE Confidence: 0.92478996515274

00:08:44.064 --> 00:08:46.563 it's a matter of just sliding this

NOTE Confidence: 0.92478996515274

00:08:46.563 --> 00:08:48.908 curve to the left and to the right,

NOTE Confidence: 0.92478996515274

00:08:48.910 --> 00:08:50.870 but in terms of the peak in

NOTE Confidence: 0.92478996515274

00:08:50.870 --> 00:08:52.850 the timing and everything else.

NOTE Confidence: 0.92478996515274

00:08:52.850 --> 00:08:54.704 It actually just fits this curve

NOTE Confidence: 0.92478996515274

00:08:54.704 --> 00:08:56.450 almost obviously soft little bit here,

NOTE Confidence: 0.92478996515274

00:08:56.450 --> 00:08:58.550 but it fits it really quite well

NOTE Confidence: 0.92478996515274

00:08:58.550 --> 00:08:59.450 without the calibration.

NOTE Confidence: 0.92478996515274

00:08:59.450 --> 00:09:01.669 So that actually gives us reason to

NOTE Confidence: 0.92478996515274

00:09:01.669 --> 00:09:03.649 think that something is going on here.

NOTE Confidence: 0.92478996515274

00:09:03.650 --> 00:09:06.350 So what actually is going on with this curve?

NOTE Confidence: 0.92478996515274

00:09:06.350 --> 00:09:08.534 Where is it coming from and how could

NOTE Confidence: 0.92478996515274

00:09:08.534 --> 00:09:10.846 it perhaps help us understand why the

NOTE Confidence: 0.92478996515274

00:09:10.846 --> 00:09:12.551 separation between the RNA signal

NOTE Confidence: 0.92478996515274

00:09:12.616 --> 00:09:14.527 on the slides in the admissions to

NOTE Confidence: 0.92478996515274

00:09:14.527 --> 00:09:16.798 hospital is 3 days when some people

NOTE Confidence: 0.92478996515274

00:09:16.798 --> 00:09:19.373 might have expected that to be a

NOTE Confidence: 0.92478996515274

00:09:19.373 --> 00:09:20.709 much longer lead time?

NOTE Confidence: 0.928790152072906

00:09:20.710 --> 00:09:23.214 So to do this, we go back to

NOTE Confidence: 0.928790152072906

00:09:23.214 --> 00:09:25.290 the basics and Epidemiology.

NOTE Confidence: 0.928790152072906

00:09:25.290 --> 00:09:27.462 Jenny pets are earlier talked about

NOTE Confidence: 0.928790152072906

00:09:27.462 --> 00:09:29.714 how people estimate what it called

NOTE Confidence: 0.928790152072906

00:09:29.714 --> 00:09:31.186 generation times in exponential

NOTE Confidence: 0.928790152072906

00:09:31.186 --> 00:09:33.950 growth rates to try and put together

NOTE Confidence: 0.928790152072906

00:09:33.950 --> 00:09:35.990 estimates of the reproductive number.

NOTE Confidence: 0.928790152072906

00:09:35.990 --> 00:09:38.830 This is a graph which actually shows you

NOTE Confidence: 0.928790152072906

00:09:38.830 --> 00:09:41.717 what the details of that operation is,

NOTE Confidence: 0.928790152072906

00:09:41.720 --> 00:09:43.532 what you actually have here is

NOTE Confidence: 0.928790152072906

00:09:43.532 --> 00:09:46.318 a model of the age of infection

NOTE Confidence: 0.928790152072906

00:09:46.318 --> 00:09:47.827 dependent transmission rate.

NOTE Confidence: 0.928790152072906

00:09:47.830 --> 00:09:50.918 This is an age of infection dependent model.

NOTE Confidence: 0.928790152072906

00:09:50.920 --> 00:09:52.500 And the famous reproductive number

NOTE Confidence: 0.928790152072906

00:09:52.500 --> 00:09:54.706 are not that you've all heard about

NOTE Confidence: 0.928790152072906

00:09:54.706 --> 00:09:56.404 so many times today is actually

NOTE Confidence: 0.928790152072906

00:09:56.404 --> 00:09:57.959 the area under this curve.

NOTE Confidence: 0.928790152072906

00:09:57.960 --> 00:09:59.675 So a person who is infected at

NOTE Confidence: 0.928790152072906

00:09:59.675 --> 00:10:01.298 the beginning in a surrounded

NOTE Confidence: 0.928790152072906

00:10:01.298 --> 00:10:02.549 by susceptible individuals.

NOTE Confidence: 0.928790152072906

00:10:02.550 --> 00:10:04.428 The number of persons that initially

NOTE Confidence: 0.928790152072906

00:10:04.428 --> 00:10:06.021 infected person would in fact

NOTE Confidence: 0.928790152072906

00:10:06.021 --> 00:10:07.456 is actually found directly from

NOTE Confidence: 0.928790152072906

00:10:07.456 --> 00:10:08.970 the area under this curve.

NOTE Confidence: 0.928790152072906

00:10:08.970 --> 00:10:11.112 This turns out to be a very

NOTE Confidence: 0.928790152072906

00:10:11.112 --> 00:10:12.030 very important concept,

NOTE Confidence: 0.928790152072906

00:10:12.030 --> 00:10:13.752 and we're going to come back

NOTE Confidence: 0.928790152072906

00:10:13.752 --> 00:10:15.710 to it over and over again,

NOTE Confidence: 0.928790152072906

00:10:15.710 --> 00:10:17.432 both for this application for the

NOTE Confidence: 0.928790152072906

00:10:17.432 --> 00:10:19.679 one I'm going to describe next now.

NOTE Confidence: 0.928790152072906

00:10:19.680 --> 00:10:21.444 Originally in the very first paper

NOTE Confidence: 0.928790152072906

00:10:21.444 --> 00:10:23.640 that came out of Wuhan in the

NOTE Confidence: 0.928790152072906

00:10:23.640 --> 00:10:25.230 New England Journal of Madison.

NOTE Confidence: 0.928790152072906

00:10:25.230 --> 00:10:27.822 We are not was estimated at about 2.3

NOTE Confidence: 0.928790152072906

00:10:27.822 --> 00:10:30.480 but actually working with Connecticut data.

NOTE Confidence: 0.928790152072906

00:10:30.480 --> 00:10:33.216 Some of the same data that for us

NOTE Confidence: 0.928790152072906

00:10:33.216 --> 00:10:35.728 was talking about just moments ago.

NOTE Confidence: 0.928790152072906

00:10:35.730 --> 00:10:37.886 It turned out that in order to

NOTE Confidence: 0.928790152072906

00:10:37.886 --> 00:10:40.266 match the early rise in hospital

NOTE Confidence: 0.928790152072906

00:10:40.266 --> 00:10:42.106 admissions data in Connecticut,

NOTE Confidence: 0.928790152072906

00:10:42.110 --> 00:10:44.728 actually a larger are not was needed.

NOTE Confidence: 0.928790152072906

00:10:44.730 --> 00:10:47.592 It works out to be about 3.3 and you

NOTE Confidence: 0.928790152072906

00:10:47.592 --> 00:10:49.645 remember hearing from Nick Rousakis

NOTE Confidence: 0.928790152072906

00:10:49.645 --> 00:10:52.600 that that is in the neighborhood of

NOTE Confidence: 0.928790152072906

00:10:52.600 --> 00:10:55.253 where many of the more recent estimates?

NOTE Confidence: 0.928790152072906

00:10:55.260 --> 00:10:57.312 Of the reproductive number have have

NOTE Confidence: 0.928790152072906

00:10:57.312 --> 00:11:00.727 come in OK, so how do we get this thing?

NOTE Confidence: 0.928790152072906

00:11:00.730 --> 00:11:02.440 I call the transmission potential?

NOTE Confidence: 0.928790152072906

00:11:02.440 --> 00:11:03.660 That is to say,

NOTE Confidence: 0.928790152072906

00:11:03.660 --> 00:11:06.321 how is it that we figure out what

NOTE Confidence: 0.928790152072906

00:11:06.321 --> 00:11:08.932 this black curve is in the diagram?

NOTE Confidence: 0.928790152072906

00:11:08.940 --> 00:11:11.187 So here's how it works and we're

NOTE Confidence: 0.928790152072906

00:11:11.187 --> 00:11:13.652 going to follow what I call the

NOTE Confidence: 0.928790152072906

00:11:13.652 --> 00:11:15.437 scratch model in quotation mark.

NOTE Confidence: 0.928790152072906

00:11:15.440 --> 00:11:17.150 This has been published now

NOTE Confidence: 0.928790152072906

00:11:17.150 --> 00:11:18.518 in the amsam Journal,

NOTE Confidence: 0.928790152072906

00:11:18.520 --> 00:11:20.648 so the first step is we have

NOTE Confidence: 0.928790152072906

00:11:20.648 --> 00:11:22.280 this original time dependent.

NOTE Confidence: 0.928790152072906

00:11:22.280 --> 00:11:24.332 I should say age of infection

NOTE Confidence: 0.928790152072906

00:11:24.332 --> 00:11:25.358 dependent transmission rate.

NOTE Confidence: 0.928790152072906

00:11:25.360 --> 00:11:27.520 We call that. Lambda of eggs.

NOTE Confidence: 0.928790152072906

00:11:27.520 --> 00:11:29.837 The second ingredient we have to ask

NOTE Confidence: 0.928790152072906

00:11:29.837 --> 00:11:32.063 ourselves is what is the problems

NOTE Confidence: 0.928790152072906

00:11:32.063 --> 00:11:34.013 of infection at chronological time?

NOTE Confidence: 0.928790152072906

00:11:34.020 --> 00:11:34.365 Key.

NOTE Confidence: 0.928790152072906

00:11:34.365 --> 00:11:36.780 So the particular data I'm showing you

NOTE Confidence: 0.928790152072906

00:11:36.780 --> 00:11:39.438 here is actually from April the 9th,

NOTE Confidence: 0.928790152072906

00:11:39.440 --> 00:11:41.876 which is actually at the peak of

NOTE Confidence: 0.928790152072906

00:11:41.876 --> 00:11:44.130 the viral signal from the sludge.

NOTE Confidence: 0.928790152072906

00:11:44.130 --> 00:11:45.574 So at Time T,

NOTE Confidence: 0.928790152072906

00:11:45.574 --> 00:11:47.740 how many people in the population?

NOTE Confidence: 0.928790152072906

00:11:47.740 --> 00:11:49.184 What percentage have been

NOTE Confidence: 0.928790152072906

00:11:49.184 --> 00:11:50.628 infected for zero days?

NOTE Confidence: 0.928790152072906

00:11:50.630 --> 00:11:53.879 One days, two days, three days and so forth?

NOTE Confidence: 0.928790152072906

00:11:53.880 --> 00:11:56.040 And that's computed inside the model.

NOTE Confidence: 0.928790152072906

00:11:56.040 --> 00:11:58.936 It's given by this curve pie of 80.

NOTE Confidence: 0.928790152072906

00:11:58.940 --> 00:12:01.446 Notice at this point, by the way,

NOTE Confidence: 0.928790152072906

00:12:01.450 --> 00:12:03.949 that the epidemic is actually waning already.

NOTE Confidence: 0.928790152072906

00:12:03.950 --> 00:12:05.970 The reason is the maximum

NOTE Confidence: 0.928790152072906

00:12:05.970 --> 00:12:08.420 part of this curve is not.

NOTE Confidence: 0.928790152072906

00:12:08.420 --> 00:12:09.210 At Zero,

NOTE Confidence: 0.928790152072906

00:12:09.210 --> 00:12:11.580 which are people just becoming infected,

NOTE Confidence: 0.928790152072906

00:12:11.580 --> 00:12:13.256 time zero really correspond.

NOTE Confidence: 0.928790152072906

00:12:13.256 --> 00:12:15.351 Say incidence it to people

NOTE Confidence: 0.928790152072906

00:12:15.351 --> 00:12:17.725 who are infected about a week

NOTE Confidence: 0.928790152072906

00:12:17.725 --> 00:12:19.605 earlier and already you see

NOTE Confidence: 0.921558737754822

00:12:19.683 --> 00:12:21.458 a light coming in anyway.

NOTE Confidence: 0.921558737754822

00:12:21.460 --> 00:12:24.540 What you have is this fraction of people

NOTE Confidence: 0.921558737754822

00:12:24.540 --> 00:12:27.659 who are been infected for a duration a

NOTE Confidence: 0.921558737754822

00:12:27.659 --> 00:12:30.937 you have this as the age of infection,

NOTE Confidence: 0.921558737754822

00:12:30.940 --> 00:12:32.065 a dependent transmission.

NOTE Confidence: 0.921558737754822

00:12:32.065 --> 00:12:35.194 So what you have to do is multiply

NOTE Confidence: 0.921558737754822

00:12:35.194 --> 00:12:37.750 these two curves together and that

NOTE Confidence: 0.921558737754822

00:12:37.750 --> 00:12:40.727 gives you this great curve down here.

NOTE Confidence: 0.921558737754822

00:12:40.730 --> 00:12:42.680 And a transmission potential is

NOTE Confidence: 0.921558737754822

00:12:42.680 --> 00:12:45.130 the area under the Gray curve,

NOTE Confidence: 0.921558737754822

00:12:45.130 --> 00:12:47.530 which is given by this interval.

NOTE Confidence: 0.921558737754822

00:12:47.530 --> 00:12:49.530 So that's actually where that

NOTE Confidence: 0.921558737754822

00:12:49.530 --> 00:12:51.130 transmission potential comes from.

NOTE Confidence: 0.921558737754822

00:12:51.130 --> 00:12:54.330 And now you go back and you say,

NOTE Confidence: 0.921558737754822

00:12:54.330 --> 00:12:55.582 Well, wait a minute,

NOTE Confidence: 0.921558737754822

00:12:55.582 --> 00:12:57.460 you showed us a curve of

NOTE Confidence: 0.921558737754822

00:12:57.530 --> 00:12:59.130 transmission potential.

NOTE Confidence: 0.921558737754822

00:12:59.130 --> 00:13:00.330 Overtime, that's right,

NOTE Confidence: 0.921558737754822

00:13:00.330 --> 00:13:02.330 that's exactly what I did.

NOTE Confidence: 0.921558737754822

00:13:02.330 --> 00:13:04.906 Every point on this curve corresponds to

NOTE Confidence: 0.921558737754822

00:13:04.906 --> 00:13:07.929 finding an area under the appropriate curve.

NOTE Confidence: 0.921558737754822

00:13:07.930 --> 00:13:09.935 The age of infection transmission

NOTE Confidence: 0.921558737754822

00:13:09.935 --> 00:13:10.737 isn't changing.

NOTE Confidence: 0.921558737754822

00:13:10.740 --> 00:13:12.870 What's changing is how many people

NOTE Confidence: 0.921558737754822

00:13:12.870 --> 00:13:14.919 have been infected for how long,

NOTE Confidence: 0.921558737754822

00:13:14.920 --> 00:13:17.696 so you'll notice here that we have many,

NOTE Confidence: 0.921558737754822

00:13:17.700 --> 00:13:19.608 many more people at the beginning

NOTE Confidence: 0.921558737754822

00:13:19.608 --> 00:13:21.879 here on the at the beginning,

NOTE Confidence: 0.921558737754822

00:13:21.880 --> 00:13:23.630 the first State of observation

NOTE Confidence: 0.921558737754822

00:13:23.630 --> 00:13:25.380 here was on March 19th.

NOTE Confidence: 0.921558737754822

00:13:25.380 --> 00:13:26.915 These are people who are

NOTE Confidence: 0.921558737754822

00:13:26.915 --> 00:13:28.450 infected just right around them,

NOTE Confidence: 0.921558737754822

00:13:28.450 --> 00:13:30.334 but of course they're not transmitting

NOTE Confidence: 0.921558737754822

00:13:30.334 --> 00:13:32.268 very much because it takes time

NOTE Confidence: 0.921558737754822

00:13:32.268 --> 00:13:34.122 until a person actually transmits the

NOTE Confidence: 0.921558737754822

00:13:34.122 --> 00:13:36.127 virus and this curve is going down.

NOTE Confidence: 0.921558737754822

00:13:36.130 --> 00:13:38.884 Here is the same curve I showed you earlier.

NOTE Confidence: 0.921558737754822

00:13:38.890 --> 00:13:40.762 This corresponds to the peak period

NOTE Confidence: 0.921558737754822

00:13:40.762 --> 00:13:42.270 now corresponding to the end.

NOTE Confidence: 0.921558737754822

00:13:42.270 --> 00:13:43.494 Here you'll notice it.

NOTE Confidence: 0.921558737754822

00:13:43.494 --> 00:13:45.036 Actually, the incidence of infection,

NOTE Confidence: 0.921558737754822

00:13:45.036 --> 00:13:47.238 which much higher three weeks ago here

NOTE Confidence: 0.921558737754822

00:13:47.238 --> 00:13:49.014 and currently it's already very low,

NOTE Confidence: 0.921558737754822

00:13:49.020 --> 00:13:51.452 so we get a smaller and we get

NOTE Confidence: 0.921558737754822

00:13:51.452 --> 00:13:53.978 a bigger are you get a smaller

NOTE Confidence: 0.921558737754822

00:13:53.978 --> 00:13:56.360 and that's how this model works.

NOTE Confidence: 0.921558737754822

00:13:56.360 --> 00:13:59.097 And that actually helps explain the mystery,

NOTE Confidence: 0.921558737754822

00:13:59.100 --> 00:14:01.711 because if you now put two curves

NOTE Confidence: 0.921558737754822

00:14:01.711 --> 00:14:03.420 on the same graph,

NOTE Confidence: 0.921558737754822

00:14:03.420 --> 00:14:05.766 both coming out of this model,

NOTE Confidence: 0.921558737754822

00:14:05.770 --> 00:14:08.410 the curve on the left which would be

NOTE Confidence: 0.921558737754822

00:14:08.410 --> 00:14:11.600 scared to the left axis is the actual

NOTE Confidence: 0.921558737754822

00:14:11.600 --> 00:14:14.390 incidence of SARS coronavirus two infraction,

NOTE Confidence: 0.921558737754822

00:14:14.390 --> 00:14:17.240 the curve to the right is

NOTE Confidence: 0.921558737754822

00:14:17.240 --> 00:14:18.665 the transmission potential.

NOTE Confidence: 0.921558737754822

00:14:18.670 --> 00:14:20.392 And the separation between the two

NOTE Confidence: 0.921558737754822

00:14:20.392 --> 00:14:22.685 curves is giving you the time lag

NOTE Confidence: 0.921558737754822

00:14:22.685 --> 00:14:24.129 from incidents to transmission

NOTE Confidence: 0.921558737754822

00:14:24.129 --> 00:14:25.790 potential to transmission potential.

NOTE Confidence: 0.921558737754822

00:14:25.790 --> 00:14:28.302 If you think about it is basically how

NOTE Confidence: 0.921558737754822

00:14:28.302 --> 00:14:30.539 much virus there isn't a community.

NOTE Confidence: 0.921558737754822

00:14:30.540 --> 00:14:33.244 It's sort of like a community viral load.

NOTE Confidence: 0.921558737754822

00:14:33.250 --> 00:14:35.634 If there was a way to actually measure

NOTE Confidence: 0.921558737754822

00:14:35.634 --> 00:14:37.989 that through viral testing in individuals,

NOTE Confidence: 0.921558737754822

00:14:37.990 --> 00:14:39.490 well effectively we're getting

NOTE Confidence: 0.921558737754822

00:14:39.490 --> 00:14:41.740 a signal of community viral load

NOTE Confidence: 0.921558737754822

00:14:41.809 --> 00:14:43.417 when we look at the sludge.

NOTE Confidence: 0.921558737754822

00:14:43.420 --> 00:14:46.124 So this is the answer to the mystery,

NOTE Confidence: 0.921558737754822

00:14:46.130 --> 00:14:48.850 because when we go back and say, Well,

NOTE Confidence: 0.921558737754822

00:14:48.850 --> 00:14:50.600 let's look at hospital admissions.

NOTE Confidence: 0.921558737754822

00:14:50.600 --> 00:14:51.820 Hospital admissions, of course,

NOTE Confidence: 0.921558737754822

00:14:51.820 --> 00:14:53.345 are also lag from incidents,

NOTE Confidence: 0.921558737754822

00:14:53.350 --> 00:14:55.261 but it turns out that there lag

NOTE Confidence: 0.921558737754822

00:14:55.261 --> 00:14:57.309 longer than the time from infection.

NOTE Confidence: 0.921558737754822

00:14:57.310 --> 00:14:58.530 Until this trans transmission

NOTE Confidence: 0.921558737754822

00:14:58.530 --> 00:14:59.750 potential moves they had.

NOTE Confidence: 0.921558737754822

00:14:59.750 --> 00:15:01.885 This is about a nine day lag.

NOTE Confidence: 0.921558737754822

00:15:01.890 --> 00:15:04.210 There's an extra 3 days here until you

NOTE Confidence: 0.921558737754822

00:15:04.210 --> 00:15:06.158 actually would see the admissions data,

NOTE Confidence: 0.921558737754822

00:15:06.160 --> 00:15:07.990 Peking, so that's an interesting story.

NOTE Confidence: 0.921558737754822

00:15:07.990 --> 00:15:10.534 It does tell you that you can understand

NOTE Confidence: 0.921558737754822

00:15:10.534 --> 00:15:12.557 what's going on in the sludge data,

NOTE Confidence: 0.921558737754822

00:15:12.560 --> 00:15:14.300 but it also answers the question

NOTE Confidence: 0.921558737754822

00:15:14.300 --> 00:15:16.810 as to why the lead time is perhaps

NOTE Confidence: 0.921558737754822

00:15:16.810 --> 00:15:18.736 not as large as people thought

NOTE Confidence: 0.923745512962341

00:15:18.807 --> 00:15:21.100 that it would be. Let's move on to

NOTE Confidence: 0.923745512962341

00:15:21.100 --> 00:15:22.320 a completely different problem.

NOTE Confidence: 0.923745512962341

00:15:22.320 --> 00:15:24.200 It's also related to some.

NOTE Confidence: 0.923745512962341

00:15:24.200 --> 00:15:26.790 Forest talked about an it has to

NOTE Confidence: 0.923745512962341

00:15:26.790 --> 00:15:29.475 do with repeat screening for the

NOTE Confidence: 0.923745512962341

00:15:29.475 --> 00:15:32.463 detection and control of this outbreak,

NOTE Confidence: 0.923745512962341

00:15:32.470 --> 00:15:34.402 and the emphasis here is really

NOTE Confidence: 0.923745512962341

00:15:34.402 --> 00:15:36.848 going to be on the detection

NOTE Confidence: 0.923745512962341

00:15:36.848 --> 00:15:39.008 and isolation of asymptomatic

NOTE Confidence: 0.923745512962341

00:15:39.008 --> 00:15:41.168 infections through viral testing.

NOTE Confidence: 0.923745512962341

00:15:41.170 --> 00:15:43.949 As we learn from Jenny Ann from

NOTE Confidence: 0.923745512962341

00:15:43.949 --> 00:15:46.390 others who spoke earlier today,

NOTE Confidence: 0.923745512962341

00:15:46.390 --> 00:15:49.043 most of the testing due date has

NOTE Confidence: 0.923745512962341

00:15:49.043 --> 00:15:51.609 been people who were symptomatic.

NOTE Confidence: 0.923745512962341

00:15:51.610 --> 00:15:54.250 As a consequence, you have cases.

NOTE Confidence: 0.923745512962341

00:15:54.250 --> 00:15:56.385 Driving tests as opposed to

NOTE Confidence: 0.923745512962341

00:15:56.385 --> 00:15:57.666 test discovering infections.

NOTE Confidence: 0.923745512962341

00:15:57.670 --> 00:15:59.810 With the advent of testing

NOTE Confidence: 0.923745512962341

00:15:59.810 --> 00:16:01.522 more more easily available,

NOTE Confidence: 0.923745512962341

00:16:01.530 --> 00:16:02.384 more frequent,

NOTE Confidence: 0.923745512962341

00:16:02.384 --> 00:16:04.946 the ability to test more frequently.

NOTE Confidence: 0.923745512962341

00:16:04.950 --> 00:16:07.116 We can turn that around and

NOTE Confidence: 0.923745512962341

00:16:07.116 --> 00:16:09.696 we can actually use testing to

NOTE Confidence: 0.923745512962341

00:16:09.696 --> 00:16:11.800 detect and isolate infections.

NOTE Confidence: 0.923745512962341

00:16:11.800 --> 00:16:14.635 The idea here is to gain actual

NOTE Confidence: 0.923745512962341

00:16:14.635 --> 00:16:16.389 control of transmission and

NOTE Confidence: 0.923745512962341

00:16:16.389 --> 00:16:18.217 to prevent local outbreaks.

NOTE Confidence: 0.923745512962341

00:16:18.220 --> 00:16:20.355 So it's not only about

NOTE Confidence: 0.923745512962341

00:16:20.355 --> 00:16:21.636 identifying individual patients.

NOTE Confidence: 0.923745512962341

00:16:21.640 --> 00:16:23.932 Most of these people actually would

NOTE Confidence: 0.923745512962341

00:16:23.932 --> 00:16:26.360 not have serious medical consequences.

NOTE Confidence: 0.923745512962341

00:16:26.360 --> 00:16:28.346 The issue is to block transmission

NOTE Confidence: 0.923745512962341

00:16:28.346 --> 00:16:31.015 and to do this in an efficient

NOTE Confidence: 0.923745512962341

00:16:31.015 --> 00:16:32.715 way requires intensive screening

NOTE Confidence: 0.923745512962341

00:16:32.715 --> 00:16:34.810 not once every six months,

NOTE Confidence: 0.923745512962341

00:16:34.810 --> 00:16:37.498 once every four months, once a month.

NOTE Confidence: 0.923745512962341

00:16:37.500 --> 00:16:39.032 It requires intensive screening,

NOTE Confidence: 0.923745512962341

00:16:39.032 --> 00:16:40.947 and so as I said,

NOTE Confidence: 0.923745512962341

00:16:40.950 --> 00:16:43.248 the focus here is to screen

NOTE Confidence: 0.923745512962341

00:16:43.248 --> 00:16:44.014 asymptomatic screen.

NOTE Confidence: 0.923745512962341

00:16:44.020 --> 00:16:45.136 For asymptomatic infections,

NOTE Confidence: 0.923745512962341

00:16:45.136 --> 00:16:47.740 the goal is to shorten the time

NOTE Confidence: 0.923745512962341

00:16:47.807 --> 00:16:49.637 from infection until the isolation

NOTE Confidence: 0.923745512962341

00:16:49.637 --> 00:16:52.090 of those people who test positive.

NOTE Confidence: 0.923745512962341

00:16:52.090 --> 00:16:54.010 This is all PCR testing,

NOTE Confidence: 0.923745512962341

00:16:54.010 --> 00:16:56.380 not antibody testing. This is all.

NOTE Confidence: 0.923745512962341

00:16:56.380 --> 00:17:00.508 Based on PCR and so this is written

NOTE Confidence: 0.923745512962341

00:17:00.508 --> 00:17:03.129 recently been written about.

NOTE Confidence: 0.923745512962341

00:17:03.130 --> 00:17:05.601 I'm hopeful home with how we form

NOTE Confidence: 0.923745512962341

00:17:05.601 --> 00:17:08.006 in another doctor that many of you

NOTE Confidence: 0.923745512962341

00:17:08.006 --> 00:17:10.421 know at the medical school is also

NOTE Confidence: 0.923745512962341

00:17:10.421 --> 00:17:12.566 cross appointed with the management

NOTE Confidence: 0.923745512962341

00:17:12.566 --> 00:17:15.190 school in focusing on how to actually

NOTE Confidence: 0.923745512962341

00:17:15.190 --> 00:17:17.290 do this at a large level because

NOTE Confidence: 0.923745512962341

00:17:17.356 --> 00:17:19.576 the logistics of rapid screening

NOTE Confidence: 0.923745512962341

00:17:19.576 --> 00:17:21.352 can easily become overwhelming,

NOTE Confidence: 0.923745512962341

00:17:21.360 --> 00:17:22.844 but nonetheless it's a

NOTE Confidence: 0.923745512962341

00:17:22.844 --> 00:17:23.957 very important activity.

NOTE Confidence: 0.923745512962341

00:17:23.960 --> 00:17:26.560 If the idea is to try an really

NOTE Confidence: 0.923745512962341

00:17:26.560 --> 00:17:28.799 curtail the spread of infection.

NOTE Confidence: 0.923745512962341

00:17:28.800 --> 00:17:30.660 So how does this work?

NOTE Confidence: 0.923745512962341

00:17:30.660 --> 00:17:30.998 Well,

NOTE Confidence: 0.923745512962341

00:17:30.998 --> 00:17:34.040 I'm going to kind of break this up into

NOTE Confidence: 0.923745512962341

00:17:34.121 --> 00:17:36.977 100 level courses to 200 level course.

NOTE Confidence: 0.923745512962341

00:17:36.980 --> 00:17:37.991 New graduate course.

NOTE Confidence: 0.923745512962341

00:17:37.991 --> 00:17:39.676 So here's the 100 level.

NOTE Confidence: 0.923745512962341

00:17:39.680 --> 00:17:40.308 Of course,

NOTE Confidence: 0.923745512962341

00:17:40.308 --> 00:17:42.192 let's all pretend that in fact

NOTE Confidence: 0.923745512962341

00:17:42.192 --> 00:17:43.669 Christmas runs about 2 weeks.

NOTE Confidence: 0.923745512962341

00:17:43.670 --> 00:17:45.512 And let's assume that we have

NOTE Confidence: 0.923745512962341

00:17:45.512 --> 00:17:46.740 a perfectly sensitive test.

NOTE Confidence: 0.923745512962341

00:17:46.740 --> 00:17:48.702 And let's assume that we schedule

NOTE Confidence: 0.923745512962341

00:17:48.702 --> 00:17:50.728 everybody to get screened once a week.

NOTE Confidence: 0.923745512962341

00:17:50.730 --> 00:17:53.484 So Dan is going to be screened on Mondays,

NOTE Confidence: 0.923745512962341

00:17:53.490 --> 00:17:55.632 and forest is going to be screened

NOTE Confidence: 0.923745512962341

00:17:55.632 --> 00:17:56.244 on Wednesdays,

NOTE Confidence: 0.923745512962341

00:17:56.250 --> 00:17:58.504 and I'm going to be screened on

NOTE Confidence: 0.923745512962341

00:17:58.504 --> 00:18:00.384 Sundays and basically once a week

NOTE Confidence: 0.923745512962341

00:18:00.384 --> 00:18:02.082 we're each going to be tested.

NOTE Confidence: 0.923745512962341

00:18:02.090 --> 00:18:03.926 If this test was perfectly sensitive,

NOTE Confidence: 0.923745512962341

00:18:03.930 --> 00:18:05.570 what's going to happen well

NOTE Confidence: 0.923745512962341

00:18:05.570 --> 00:18:07.210 where the infection would fall

NOTE Confidence: 0.923745512962341

00:18:07.276 --> 00:18:08.920 if one of us became infected?

NOTE Confidence: 0.923745512962341

00:18:08.920 --> 00:18:10.172 The infection knows nothing

NOTE Confidence: 0.923745512962341

00:18:10.172 --> 00:18:11.424 about the screening process.

NOTE Confidence: 0.923745512962341

00:18:11.430 --> 00:18:12.372 It's totally independent

NOTE Confidence: 0.923745512962341

00:18:12.372 --> 00:18:13.628 of the screening process,

NOTE Confidence: 0.923745512962341

00:18:13.630 --> 00:18:15.200 so on average it's going

NOTE Confidence: 0.923745512962341

00:18:15.200 --> 00:18:16.770 to fall in the middle.

NOTE Confidence: 0.923745512962341

00:18:16.770 --> 00:18:18.340 It would distribute itself uniformly.

NOTE Confidence: 0.923745512962341

00:18:18.340 --> 00:18:20.556 So what that means is that you would

NOTE Confidence: 0.923745512962341

00:18:20.556 --> 00:18:22.549 be detecting infections on average 3.5

NOTE Confidence: 0.923745512962341

00:18:22.549 --> 00:18:24.619 days after the person was infected.

NOTE Confidence: 0.923745512962341

00:18:24.620 --> 00:18:26.190 Some people you detect only

NOTE Confidence: 0.923745512962341

00:18:26.190 --> 00:18:27.760 some people you detect later,

NOTE Confidence: 0.927935659885406

00:18:27.760 --> 00:18:30.024 but on average would be 3.5 days and

NOTE Confidence: 0.927935659885406

00:18:30.024 --> 00:18:32.468 at most Seven days after they occur.

NOTE Confidence: 0.927935659885406

00:18:32.470 --> 00:18:34.639 If you believe that there's a 14 day course

NOTE Confidence: 0.927935659885406

00:18:34.639 --> 00:18:36.868 of infectiousness into detecting people,

NOTE Confidence: 0.927935659885406

00:18:36.870 --> 00:18:38.440 on average after 3.5 days,

NOTE Confidence: 0.927935659885406

00:18:38.440 --> 00:18:40.354 that's one quarter of the way

NOTE Confidence: 0.927935659885406

00:18:40.354 --> 00:18:41.630 through the infectious period.

NOTE Confidence: 0.927935659885406

00:18:41.630 --> 00:18:43.996 Which means that you would be blocking

NOTE Confidence: 0.927935659885406

00:18:43.996 --> 00:18:46.258 3/4 of 75% of potential transmission days.

NOTE Confidence: 0.927935659885406

00:18:46.258 --> 00:18:48.564 If you isolate people who you are

NOTE Confidence: 0.927935659885406

00:18:48.564 --> 00:18:50.080 finding testing positive alright,

NOTE Confidence: 0.927935659885406

00:18:50.080 --> 00:18:52.108 but we noted the screening tests

NOTE Confidence: 0.927935659885406

00:18:52.108 --> 00:18:53.460 are not perfectly Saturday.

NOTE Confidence: 0.927935659885406

00:18:53.460 --> 00:18:55.150 Suppose it's only 70% sensitive.

NOTE Confidence: 0.927935659885406

00:18:55.150 --> 00:18:57.142 What's going to happen while in

NOTE Confidence: 0.927935659885406

00:18:57.142 --> 00:18:59.206 the first week you would catch

NOTE Confidence: 0.927935659885406

00:18:59.206 --> 00:19:01.230 70% of people who are infected?

NOTE Confidence: 0.927935659885406

00:19:01.230 --> 00:19:03.576 But there's also a 21% chance it

NOTE Confidence: 0.927935659885406

00:19:03.576 --> 00:19:05.544 would catch someone who was infected

NOTE Confidence: 0.927935659885406

00:19:05.544 --> 00:19:08.237 in the first week in the second week

NOTE Confidence: 0.927935659885406

00:19:08.237 --> 00:19:10.319 because they could test negative in

NOTE Confidence: 0.927935659885406

00:19:10.319 --> 00:19:12.776 the first week but still test positive.

NOTE Confidence: 0.927935659885406

00:19:12.780 --> 00:19:14.120 In the second week,

NOTE Confidence: 0.927935659885406

00:19:14.120 --> 00:19:15.795 this is assuming that sensitivity

NOTE Confidence: 0.927935659885406

00:19:15.795 --> 00:19:17.962 is not dependent on an individual's

NOTE Confidence: 0.927935659885406

00:19:17.962 --> 00:19:20.213 biologies and a person who would

NOTE Confidence: 0.927935659885406

00:19:20.213 --> 00:19:22.308 test negative falsely would always

NOTE Confidence: 0.927935659885406

00:19:22.308 --> 00:19:23.565 test negative falsely.

NOTE Confidence: 0.927935659885406

00:19:23.570 --> 00:19:25.682 Rather the assumption here is that

NOTE Confidence: 0.927935659885406

00:19:25.682 --> 00:19:27.981 the real reason for imperfect testing

NOTE Confidence: 0.927935659885406

00:19:27.981 --> 00:19:30.447 an for less than perfect sensitivity

NOTE Confidence: 0.927935659885406

00:19:30.447 --> 00:19:33.031 here has more to do a sample

NOTE Confidence: 0.927935659885406

00:19:33.031 --> 00:19:34.726 collection and issues like that.

NOTE Confidence: 0.927935659885406

00:19:34.730 --> 00:19:37.334 So now it turns out that instead

NOTE Confidence: 0.927935659885406

00:19:37.334 --> 00:19:39.194 of blocking 75% of transmission,

NOTE Confidence: 0.927935659885406

00:19:39.194 --> 00:19:41.070 you block 58% of transmission.

NOTE Confidence: 0.927935659885406

00:19:41.070 --> 00:19:42.970 But that's still pretty effective.

NOTE Confidence: 0.927935659885406

00:19:42.970 --> 00:19:45.370 If you have a root productive number in

NOTE Confidence: 0.927935659885406

00:19:45.370 --> 00:19:46.972 the neighborhood of two, for example,

NOTE Confidence: 0.927935659885406

00:19:46.972 --> 00:19:49.188 and you're blocking 58% of the transmission,

NOTE Confidence: 0.927935659885406

00:19:49.188 --> 00:19:51.680 that would already get you below 1.

NOTE Confidence: 0.927935659885406

00:19:51.680 --> 00:19:53.618 So that's The Level 100 course

NOTE Confidence: 0.927935659885406

00:19:53.618 --> 00:19:54.910 rationalization for repeat screening.

NOTE Confidence: 0.927935659885406

00:19:54.910 --> 00:19:57.326 Now what I'd like to do is give

NOTE Confidence: 0.927935659885406

00:19:57.326 --> 00:19:59.432 you the level two, of course,

NOTE Confidence: 0.927935659885406

00:19:59.432 --> 00:20:00.716 so remember this graph.

NOTE Confidence: 0.927935659885406

00:20:00.720 --> 00:20:02.988 It's our friend from the earlier study.

NOTE Confidence: 0.927935659885406

00:20:02.990 --> 00:20:04.278 This is the transmissibility

NOTE Confidence: 0.927935659885406

00:20:04.278 --> 00:20:05.566 by age of infection,

NOTE Confidence: 0.927935659885406

00:20:05.570 --> 00:20:08.020 and suppose I detect an infected person

NOTE Confidence: 0.927935659885406

00:20:08.020 --> 00:20:10.410 by screening right here at the red line,

NOTE Confidence: 0.927935659885406

00:20:10.410 --> 00:20:12.482 all right and where that red line

NOTE Confidence: 0.927935659885406

00:20:12.482 --> 00:20:15.022 is going to fall is going to depend

NOTE Confidence: 0.927935659885406

00:20:15.022 --> 00:20:17.356 on how frequently I test if I'm

NOTE Confidence: 0.927935659885406

00:20:17.356 --> 00:20:19.066 testing quite frequently is going

NOTE Confidence: 0.927935659885406

00:20:19.066 --> 00:20:21.730 to push the red line to the left.

NOTE Confidence: 0.927935659885406

00:20:21.730 --> 00:20:23.458 If I'm not testing so frequently,

NOTE Confidence: 0.927935659885406

00:20:23.460 --> 00:20:25.756 it pushes the red line to the right,

NOTE Confidence: 0.927935659885406

00:20:25.760 --> 00:20:27.488 but wherever the Red Line Falls,

NOTE Confidence: 0.927935659885406

00:20:27.490 --> 00:20:29.506 if you isolate the person found infectious,

NOTE Confidence: 0.927935659885406

00:20:29.510 --> 00:20:31.386 the blue area to the right of

NOTE Confidence: 0.927935659885406

00:20:31.386 --> 00:20:32.959 the red line is blocked,

NOTE Confidence: 0.927935659885406

00:20:32.960 --> 00:20:34.112 its transmission that would

NOTE Confidence: 0.927935659885406

00:20:34.112 --> 00:20:35.264 have happened but doesn't.

NOTE Confidence: 0.927935659885406

00:20:35.270 --> 00:20:37.139 The new reproductive number you have as

NOTE Confidence: 0.927935659885406

00:20:37.139 --> 00:20:39.177 a result of the repeat screening program

NOTE Confidence: 0.927935659885406

00:20:39.177 --> 00:20:41.310 is still the area under the curve,

NOTE Confidence: 0.927935659885406

00:20:41.310 --> 00:20:43.614 but it's only the area of this part,

NOTE Confidence: 0.927935659885406

00:20:43.620 --> 00:20:44.540 right here.

NOTE Confidence: 0.927935659885406

00:20:44.540 --> 00:20:45.920 Now of course,

NOTE Confidence: 0.927935659885406

00:20:45.920 --> 00:20:48.056 the timing which this is interrupted

NOTE Confidence: 0.927935659885406

00:20:48.056 --> 00:20:49.124 is itself random,

NOTE Confidence: 0.927935659885406

00:20:49.130 --> 00:20:50.915 because while you might be

NOTE Confidence: 0.927935659885406

00:20:50.915 --> 00:20:51.986 screening on schedule,

NOTE Confidence: 0.927935659885406

00:20:51.990 --> 00:20:53.414 the infection isn't infecting

NOTE Confidence: 0.927935659885406

00:20:53.414 --> 00:20:55.194 people on the same schedule,

NOTE Confidence: 0.927935659885406

00:20:55.200 --> 00:20:57.992 so you have to take into account the

NOTE Confidence: 0.927935659885406

00:20:57.992 --> 00:20:59.838 distribution of where this lies,

NOTE Confidence: 0.927935659885406

00:20:59.840 --> 00:21:00.554 but mathematically,

NOTE Confidence: 0.927935659885406

00:21:00.554 --> 00:21:02.696 that is not difficult to do.

NOTE Confidence: 0.927935659885406

00:21:02.700 --> 00:21:05.252 So now will go to the graduate course

NOTE Confidence: 0.927935659885406

00:21:05.252 --> 00:21:07.700 and just to make life interesting,

NOTE Confidence: 0.927935659885406

00:21:07.700 --> 00:21:09.480 let's imagine that we're considering

NOTE Confidence: 0.927935659885406

00:21:09.480 --> 00:21:10.548 a residential campus,

NOTE Confidence: 0.927935659885406

00:21:10.550 --> 00:21:12.758 and maybe that residential campus has

NOTE Confidence: 0.927935659885406

00:21:12.758 --> 00:21:15.200 10,000 students who are living on site.

NOTE Confidence: 0.915225088596344

00:21:15.200 --> 00:21:17.671 And here are the kinds of parameter

NOTE Confidence: 0.915225088596344

00:21:17.671 --> 00:21:19.896 variations that we consider here at

NOTE Confidence: 0.915225088596344

00:21:19.896 --> 00:21:22.080 the beginning of the school year,

NOTE Confidence: 0.915225088596344

00:21:22.080 --> 00:21:23.715 everyone is susceptible or perhaps

NOTE Confidence: 0.915225088596344

00:21:23.715 --> 00:21:26.060 looking at some of forest projections,

NOTE Confidence: 0.915225088596344

00:21:26.060 --> 00:21:28.232 maybe 15% or more have already

NOTE Confidence: 0.915225088596344

00:21:28.232 --> 00:21:30.408 become infected, and so maybe only

NOTE Confidence: 0.915225088596344

00:21:30.408 --> 00:21:32.580 80% of the students are susceptible.

NOTE Confidence: 0.915225088596344

00:21:32.580 --> 00:21:35.099 Suppose the tests are only 70% sensitive.

NOTE Confidence: 0.915225088596344

00:21:35.099 --> 00:21:36.844 These are all variables which

NOTE Confidence: 0.915225088596344

00:21:36.844 --> 00:21:39.090 can be changed in the analysis.

NOTE Confidence: 0.915225088596344

00:21:39.090 --> 00:21:40.494 Suppose we test weekly.

NOTE Confidence: 0.915225088596344

00:21:40.494 --> 00:21:43.044 Suppose we test bye week was suppose

NOTE Confidence: 0.915225088596344

00:21:43.044 --> 00:21:45.300 we don't bother testing at all.

NOTE Confidence: 0.915225088596344

00:21:45.300 --> 00:21:47.304 Suppose we account not only for

NOTE Confidence: 0.915225088596344

00:21:47.304 --> 00:21:48.306 internally generated outbreaks

NOTE Confidence: 0.915225088596344

00:21:48.306 --> 00:21:49.820 where you start with your RO,

NOTE Confidence: 0.915225088596344

00:21:49.820 --> 00:21:51.320 an initial person comes in,

NOTE Confidence: 0.915225088596344

00:21:51.320 --> 00:21:53.660 or a couple of people come in infected and

NOTE Confidence: 0.915225088596344

00:21:53.660 --> 00:21:56.139 the whole thing just generates from there,

NOTE Confidence: 0.915225088596344

00:21:56.140 --> 00:21:57.676 but you also include the possibility

NOTE Confidence: 0.915225088596344

00:21:57.676 --> 00:21:59.750 it we have a residential campus.

NOTE Confidence: 0.915225088596344

00:21:59.750 --> 00:22:01.857 People are going to go off campus,

NOTE Confidence: 0.915225088596344

00:22:01.860 --> 00:22:03.660 don't be infected in the community,

NOTE Confidence: 0.915225088596344

00:22:03.660 --> 00:22:05.514 and bring infections back that it

NOTE Confidence: 0.915225088596344

00:22:05.514 --> 00:22:07.667 campus or visitors from off campus could

NOTE Confidence: 0.915225088596344

00:22:07.667 --> 00:22:09.676 come in and infect students as well.

NOTE Confidence: 0.915225088596344

00:22:09.680 --> 00:22:11.936 We take a look at a number of

NOTE Confidence: 0.915225088596344

00:22:11.936 --> 00:22:12.990 different reproductive numbers,

NOTE Confidence: 0.915225088596344

00:22:12.990 --> 00:22:15.114 not just one which is the same thing as

NOTE Confidence: 0.915225088596344

00:22:15.114 --> 00:22:17.929 we can get a number of different age

NOTE Confidence: 0.915225088596344

00:22:17.929 --> 00:22:19.976 dependent transmission curves, land of A.

NOTE Confidence: 0.915225088596344

00:22:19.976 --> 00:22:21.586 And let's do a Sprint.

NOTE Confidence: 0.915225088596344

00:22:21.590 --> 00:22:23.590 Let's ask what happens if we try and

NOTE Confidence: 0.915225088596344

00:22:23.590 --> 00:22:25.626 pack the whole fall semester between

NOTE Confidence: 0.915225088596344

00:22:25.626 --> 00:22:27.476 September 1st and November 20th,

NOTE Confidence: 0.915225088596344

00:22:27.480 --> 00:22:30.434 which happens to be the Friday before

NOTE Confidence: 0.915225088596344

00:22:30.434 --> 00:22:31.934 Thanksgiving. What happens, OK?

NOTE Confidence: 0.915225088596344

00:22:31.934 --> 00:22:33.724 Let's find out what happens,

NOTE Confidence: 0.915225088596344

00:22:33.730 --> 00:22:35.991 so I'm going to show you graphs

NOTE Confidence: 0.915225088596344

00:22:35.991 --> 00:22:37.816 of the cumulative incidence of

NOTE Confidence: 0.915225088596344

00:22:37.816 --> 00:22:40.186 infection just for a few scenarios.

NOTE Confidence: 0.915225088596344

00:22:40.190 --> 00:22:43.430 So you get an idea of how this works.

NOTE Confidence: 0.915225088596344

00:22:43.430 --> 00:22:45.812 Let's start with a relatively low

NOTE Confidence: 0.915225088596344

00:22:45.812 --> 00:22:48.448 reproductive number of only one and a half.

NOTE Confidence: 0.915225088596344

00:22:48.450 --> 00:22:50.598 That would suggest that social distancing

NOTE Confidence: 0.915225088596344

00:22:50.598 --> 00:22:52.798 procedures taken on the campus actually

NOTE Confidence: 0.915225088596344

00:22:52.798 --> 00:22:54.910 are affective and its students are,

NOTE Confidence: 0.915225088596344

00:22:54.910 --> 00:22:55.990 by and large,

NOTE Confidence: 0.915225088596344

00:22:55.990 --> 00:22:57.430 going along with them,

NOTE Confidence: 0.915225088596344

00:22:57.430 --> 00:22:59.220 but on the other hand,

NOTE Confidence: 0.915225088596344

00:22:59.220 --> 00:23:01.410 we still will have imported infections

NOTE Confidence: 0.915225088596344

00:23:01.410 --> 00:23:02.870 coming from the outside.

NOTE Confidence: 0.915225088596344

00:23:02.870 --> 00:23:05.201 And suppose that are coming in at

NOTE Confidence: 0.915225088596344

00:23:05.201 --> 00:23:07.210 a rate of one per day,

NOTE Confidence: 0.915225088596344

00:23:07.210 --> 00:23:09.874 which means if we're looking at 80 days,

NOTE Confidence: 0.915225088596344

00:23:09.880 --> 00:23:11.550 there would be 80 infections

NOTE Confidence: 0.915225088596344

00:23:11.550 --> 00:23:13.220 imported just because of people

NOTE Confidence: 0.915225088596344

00:23:13.279 --> 00:23:15.079 going around town or visitors coming

NOTE Confidence: 0.915225088596344

00:23:15.079 --> 00:23:17.791 to school here on the left axis is

NOTE Confidence: 0.915225088596344

00:23:17.791 --> 00:23:19.239 the cumulative incidence infection.

NOTE Confidence: 0.915225088596344

00:23:19.240 --> 00:23:20.910 If you took this situation,

NOTE Confidence: 0.915225088596344

00:23:20.910 --> 00:23:22.674 it did no testing whatsoever and

NOTE Confidence: 0.915225088596344

00:23:22.674 --> 00:23:24.356 basically just let the outbreak

NOTE Confidence: 0.915225088596344

00:23:24.356 --> 00:23:25.248 run unmitigated.

NOTE Confidence: 0.915225088596344

00:23:25.250 --> 00:23:27.914 Here is what happens on the right axis,

NOTE Confidence: 0.915225088596344

00:23:27.920 --> 00:23:29.590 if indeed you do screening.

NOTE Confidence: 0.915225088596344

00:23:29.590 --> 00:23:31.588 And if you disquieting biweekly every

NOTE Confidence: 0.915225088596344

00:23:31.588 --> 00:23:34.010 other week, or if you do screening.

NOTE Confidence: 0.915225088596344

00:23:34.010 --> 00:23:35.390 Weekly and what happens?

NOTE Confidence: 0.915225088596344

00:23:35.390 --> 00:23:36.770 What would happen here?

NOTE Confidence: 0.915225088596344

00:23:36.770 --> 00:23:39.562 Is that over this run of 80 days

NOTE Confidence: 0.915225088596344

00:23:39.562 --> 00:23:41.945 you would end up with 20% of

NOTE Confidence: 0.915225088596344

00:23:41.945 --> 00:23:43.670 the students or the residents.

NOTE Confidence: 0.915225088596344

00:23:43.670 --> 00:23:45.740 I should say on campus students

NOTE Confidence: 0.915225088596344

00:23:45.740 --> 00:23:47.120 and graduates to interpret.

NOTE Confidence: 0.915225088596344

00:23:47.120 --> 00:23:49.208 Perhaps also some workers who are

NOTE Confidence: 0.915225088596344

00:23:49.208 --> 00:23:51.653 resident and in any event you would

NOTE Confidence: 0.915225088596344

00:23:51.653 --> 00:23:53.330 have about 20% being infected.

NOTE Confidence: 0.915225088596344

00:23:53.330 --> 00:23:56.090 But if you screen everybody biweekly in this,

NOTE Confidence: 0.915225088596344

00:23:56.090 --> 00:23:57.735 see which situation following the

NOTE Confidence: 0.915225088596344

00:23:57.735 --> 00:23:59.890 theory that I showed you earlier,

NOTE Confidence: 0.915225088596344

00:23:59.890 --> 00:24:02.298 you're going to have about 3 1/2%

NOTE Confidence: 0.915225088596344

00:24:02.300 --> 00:24:04.385 look at the difference 20% for

NOTE Confidence: 0.915225088596344

00:24:04.385 --> 00:24:06.160 3 1/2% from biweekly screening.

NOTE Confidence: 0.927866160869598

00:24:06.160 --> 00:24:07.912 Only one and 1/2% of the

NOTE Confidence: 0.927866160869598

00:24:07.912 --> 00:24:09.560 screen on a weekly basis.

NOTE Confidence: 0.927866160869598

00:24:09.560 --> 00:24:11.600 This is an example of a scenario that

NOTE Confidence: 0.927866160869598

00:24:11.600 --> 00:24:13.889 could be controlled by weekly screening.

NOTE Confidence: 0.927866160869598

00:24:13.890 --> 00:24:15.738 Let's make the scenario more challenging.

NOTE Confidence: 0.927866160869598

00:24:15.740 --> 00:24:17.966 Suppose it turns out that the behavior

NOTE Confidence: 0.927866160869598

00:24:17.966 --> 00:24:20.627 on campus is more or less like what was

NOTE Confidence: 0.927866160869598

00:24:20.627 --> 00:24:22.849 going on in Mujan at the beginning.

NOTE Confidence: 0.927866160869598

00:24:22.850 --> 00:24:24.410 So we gotta reproductive number

NOTE Confidence: 0.927866160869598

00:24:24.410 --> 00:24:26.558 more like 2.3 instead of 1.5. Well,

NOTE Confidence: 0.927866160869598

00:24:26.558 --> 00:24:29.022 now what happens if you don't do anything?

NOTE Confidence: 0.927866160869598

00:24:29.030 --> 00:24:31.494 And if you basically let this go unmitigated,

NOTE Confidence: 0.927866160869598

00:24:31.500 --> 00:24:32.732 you're in real trouble,

NOTE Confidence: 0.927866160869598

00:24:32.732 --> 00:24:34.900 because 80% or so will become infected.

NOTE Confidence: 0.927866160869598

00:24:34.900 --> 00:24:37.056 And, of course, that would never happen.

NOTE Confidence: 0.927866160869598

00:24:37.060 --> 00:24:38.914 I'm just showing you what the

NOTE Confidence: 0.927866160869598

00:24:38.914 --> 00:24:40.150 power of screening is.

NOTE Confidence: 0.927866160869598

00:24:40.150 --> 00:24:42.106 Suppose you screw. In this situation,

NOTE Confidence: 0.927866160869598

00:24:42.110 --> 00:24:43.988 once every other week biweekly screening,

NOTE Confidence: 0.927866160869598

00:24:43.990 --> 00:24:46.182 you still end up with 12.5% of

NOTE Confidence: 0.927866160869598

00:24:46.182 --> 00:24:47.430 the students being infected.

NOTE Confidence: 0.927866160869598

00:24:47.430 --> 00:24:49.308 By the way, as I say,

NOTE Confidence: 0.927866160869598

00:24:49.310 --> 00:24:51.774 These things just think what this implies

NOTE Confidence: 0.927866160869598

00:24:51.774 --> 00:24:53.690 about isolation capacity that you would

NOTE Confidence: 0.927866160869598

00:24:53.690 --> 00:24:55.880 need in order to put people getting sick.

NOTE Confidence: 0.927866160869598

00:24:55.880 --> 00:24:57.580 But weekly screening in this

NOTE Confidence: 0.927866160869598

00:24:57.580 --> 00:24:59.280 scenario still is infecting less

NOTE Confidence: 0.927866160869598

00:24:59.337 --> 00:25:01.202 than 2 1/2% of the students overall.

NOTE Confidence: 0.927866160869598

00:25:01.202 --> 00:25:01.828 And finally,

NOTE Confidence: 0.927866160869598

00:25:01.830 --> 00:25:03.395 let's really try and challenge

NOTE Confidence: 0.927866160869598

00:25:03.395 --> 00:25:04.960 us a little bit more.

NOTE Confidence: 0.927866160869598

00:25:04.960 --> 00:25:06.520 Here's what reproductive number of

NOTE Confidence: 0.927866160869598

00:25:06.520 --> 00:25:09.055 3.3 this is closer to what we saw

NOTE Confidence: 0.927866160869598

00:25:09.055 --> 00:25:10.585 in Connecticut at the beginning,

NOTE Confidence: 0.927866160869598

00:25:10.590 --> 00:25:12.540 based on the initial rising hospitalization.

NOTE Confidence: 0.927866160869598

00:25:12.540 --> 00:25:13.970 Or smiles have similarly rapid

NOTE Confidence: 0.927866160869598

00:25:13.970 --> 00:25:15.400 increase at the very beginning.

NOTE Confidence: 0.927866160869598

00:25:15.400 --> 00:25:17.110 We're still keeping up by one

NOTE Confidence: 0.927866160869598

00:25:17.110 --> 00:25:17.965 imported infection everyday.

NOTE Confidence: 0.927866160869598

00:25:17.970 --> 00:25:19.979 Now, of course, if you didn't screen,

NOTE Confidence: 0.927866160869598

00:25:19.980 --> 00:25:21.732 you would have a complete disaster

NOTE Confidence: 0.927866160869598

00:25:21.732 --> 00:25:22.900 because almost everyone would

NOTE Confidence: 0.927866160869598

00:25:22.946 --> 00:25:24.266 be infected in this scenario.

NOTE Confidence: 0.927866160869598

00:25:24.270 --> 00:25:26.550 But again, we would not let that happen.

NOTE Confidence: 0.927866160869598

00:25:26.550 --> 00:25:27.910 On the other hand,

NOTE Confidence: 0.927866160869598

00:25:27.910 --> 00:25:29.950 look what happens if we scream.

NOTE Confidence: 0.927866160869598

00:25:29.950 --> 00:25:31.600 BI weekly screening doesn't really

NOTE Confidence: 0.927866160869598

00:25:31.600 --> 00:25:32.590 get you enough.

NOTE Confidence: 0.927866160869598

00:25:32.590 --> 00:25:35.230 It would tell you that you go from

NOTE Confidence: 0.927866160869598

00:25:35.230 --> 00:25:37.210 like 100% to 46% or something,

NOTE Confidence: 0.927866160869598

00:25:37.210 --> 00:25:39.190 so you cut it in half.

NOTE Confidence: 0.927866160869598

00:25:39.190 --> 00:25:41.353 But who would accept half of the

NOTE Confidence: 0.927866160869598

00:25:41.353 --> 00:25:42.676 students almost getting infected

NOTE Confidence: 0.927866160869598

00:25:42.676 --> 00:25:44.668 and yet weekly screening in this

NOTE Confidence: 0.927866160869598

00:25:44.668 --> 00:25:46.733 very same scenario gives you a

NOTE Confidence: 0.927866160869598

00:25:46.733 --> 00:25:48.423 cumulative incidence of four percent.

NOTE Confidence: 0.927866160869598

00:25:48.430 --> 00:25:50.740 4% of 10,000 is still a sizable

NOTE Confidence: 0.927866160869598

00:25:50.740 --> 00:25:51.730 number of students,

NOTE Confidence: 0.927866160869598

00:25:51.730 --> 00:25:53.710 but it's not an uncontrollable number.

NOTE Confidence: 0.927866160869598

00:25:53.710 --> 00:25:54.294 So this,

NOTE Confidence: 0.927866160869598

00:25:54.294 --> 00:25:56.338 this again is an example of what

NOTE Confidence: 0.927866160869598

00:25:56.338 --> 00:25:58.000 happens with weekly screening.

NOTE Confidence: 0.927866160869598

00:25:58.000 --> 00:25:58.337 Now.

NOTE Confidence: 0.927866160869598

00:25:58.337 --> 00:26:00.359 It's possible that even weekly screening.

NOTE Confidence: 0.927866160869598

00:26:00.360 --> 00:26:02.290 Could be overrun and here, for example,

NOTE Confidence: 0.927866160869598

00:26:02.290 --> 00:26:04.450 just again to give you a sense of

NOTE Confidence: 0.927866160869598

00:26:04.511 --> 00:26:06.450 the kinds of analysis one can do.

NOTE Confidence: 0.927866160869598

00:26:06.450 --> 00:26:07.840 We have no imported infections,

NOTE Confidence: 0.927866160869598

00:26:07.840 --> 00:26:09.496 one per week, one per day.

NOTE Confidence: 0.927866160869598

00:26:09.500 --> 00:26:11.162 5 today we have our different

NOTE Confidence: 0.927866160869598

00:26:11.162 --> 00:26:11.716 reproductive numbers.

NOTE Confidence: 0.927866160869598

00:26:11.720 --> 00:26:12.952 We have weekly screening.

NOTE Confidence: 0.927866160869598

00:26:12.952 --> 00:26:14.800 We have biweekly screening and here

NOTE Confidence: 0.927866160869598

00:26:14.852 --> 00:26:16.756 we see the numbers of infections that

NOTE Confidence: 0.927866160869598

00:26:16.756 --> 00:26:18.640 would occur over the same 80 day run.

NOTE Confidence: 0.927866160869598

00:26:18.640 --> 00:26:20.355 The first thing to do if you

NOTE Confidence: 0.927866160869598

00:26:20.355 --> 00:26:22.247 want to compare by we've got the

NOTE Confidence: 0.927866160869598

00:26:22.247 --> 00:26:23.612 weekly screening is just look

NOTE Confidence: 0.927866160869598

00:26:23.612 --> 00:26:25.569 at the difference in this scale.

NOTE Confidence: 0.927866160869598

00:26:25.570 --> 00:26:26.443 We're talking thousands.

NOTE Confidence: 0.927866160869598

00:26:26.443 --> 00:26:28.480 Here were up at that level only

NOTE Confidence: 0.927866160869598

00:26:28.541 --> 00:26:29.999 in the very very worst case.

NOTE Confidence: 0.927866160869598

00:26:30.000 --> 00:26:30.656 But this.

NOTE Confidence: 0.927866160869598

00:26:30.656 --> 00:26:33.280 This has a pretty important lesson to it,

NOTE Confidence: 0.927866160869598

00:26:33.280 --> 00:26:35.982 which is if you're into the weekly

NOTE Confidence: 0.927866160869598

00:26:35.982 --> 00:26:38.328 screening world I hope I've convinced

NOTE Confidence: 0.927866160869598

00:26:38.328 --> 00:26:40.925 you that we should be there if

NOTE Confidence: 0.915978312492371

00:26:41.001 --> 00:26:43.593 for it down in this region were OK.

NOTE Confidence: 0.915978312492371

00:26:43.600 --> 00:26:46.504 Up here we have one imported infection for

NOTE Confidence: 0.915978312492371

00:26:46.504 --> 00:26:49.526 day an we have a reproductive number of

NOTE Confidence: 0.915978312492371

00:26:49.526 --> 00:26:52.789 say 2.26 which is doing well number well,

NOTE Confidence: 0.915978312492371

00:26:52.790 --> 00:26:56.302 you know we're still going to have 200

NOTE Confidence: 0.915978312492371

00:26:56.302 --> 00:26:59.298 infected students at the end of the 80 days.

NOTE Confidence: 0.915978312492371

00:26:59.300 --> 00:27:01.215 Anything out here of course

NOTE Confidence: 0.915978312492371

00:27:01.215 --> 00:27:02.747 these are disastrous scenarios.

NOTE Confidence: 0.915978312492371

00:27:02.750 --> 00:27:05.048 So weekly screening isn't the panacea.

NOTE Confidence: 0.915978312492371

00:27:05.050 --> 00:27:06.386 It doesn't always work.

NOTE Confidence: 0.915978312492371

00:27:06.386 --> 00:27:08.390 It really depends on what the

NOTE Confidence: 0.915978312492371

00:27:08.455 --> 00:27:10.407 underlying parameters are here,

NOTE Confidence: 0.915978312492371

00:27:10.410 --> 00:27:13.857 which suggests to me that if you're going to.

NOTE Confidence: 0.915978312492371

00:27:13.860 --> 00:27:15.995 Rely on a screening program to get

NOTE Confidence: 0.915978312492371

00:27:15.995 --> 00:27:18.250 you through a residential program.

NOTE Confidence: 0.915978312492371

00:27:18.250 --> 00:27:20.871 You have got to be very, very,

NOTE Confidence: 0.915978312492371

00:27:20.871 --> 00:27:22.976 very confident that your epidemiological

NOTE Confidence: 0.915978312492371

00:27:22.976 --> 00:27:25.321 scenario really is gonna land you

NOTE Confidence: 0.915978312492371

00:27:25.321 --> 00:27:27.400 in this part of the parameter space.

NOTE Confidence: 0.915978312492371

00:27:27.400 --> 00:27:29.596 'cause if you move over here,

NOTE Confidence: 0.915978312492371

00:27:29.600 --> 00:27:31.790 it becomes lights out pretty fast.

NOTE Confidence: 0.915978312492371

00:27:31.790 --> 00:27:33.005 So to summarize,

NOTE Confidence: 0.915978312492371

00:27:33.005 --> 00:27:35.030 modeling can help understand transmission

NOTE Confidence: 0.915978312492371

00:27:35.030 --> 00:27:37.420 dynamics that has a lot of applicability

NOTE Confidence: 0.915978312492371

00:27:37.420 --> 00:27:39.751 and I hope I've illustrated that with

NOTE Confidence: 0.915978312492371

00:27:39.751 --> 00:27:42.013 the sludge data modeling can help

NOTE Confidence: 0.915978312492371

00:27:42.013 --> 00:27:43.145 understand intervention proposals.

NOTE Confidence: 0.915978312492371

00:27:43.145 --> 00:27:45.770 I've gone into detail on repeat screening.

NOTE Confidence: 0.915978312492371

00:27:45.770 --> 00:27:47.834 But of course there are many

NOTE Confidence: 0.915978312492371

00:27:47.834 --> 00:27:49.210 other interventions that one

NOTE Confidence: 0.915978312492371

00:27:49.271 --> 00:27:50.837 can study in the same way.

NOTE Confidence: 0.915978312492371

00:27:50.840 --> 00:27:52.108 Epidemic modeling in general

NOTE Confidence: 0.915978312492371

00:27:52.108 --> 00:27:53.693 is not about curve fitting.

NOTE Confidence: 0.915978312492371

00:27:53.700 --> 00:27:55.596 It is not like election polling.

NOTE Confidence: 0.915978312492371

00:27:55.600 --> 00:27:58.471 It's not like trying to make a guess and

NOTE Confidence: 0.915978312492371

00:27:58.471 --> 00:28:01.618 see if you kind of hit the hit the target.

NOTE Confidence: 0.915978312492371

00:28:01.620 --> 00:28:01.946 Rather,

NOTE Confidence: 0.915978312492371

00:28:01.946 --> 00:28:03.902 it's more like trying to navigate

NOTE Confidence: 0.915978312492371

00:28:03.902 --> 00:28:05.419 a car through the fog.

NOTE Confidence: 0.915978312492371

00:28:05.420 --> 00:28:07.010 Want to understand transmission dynamics?

NOTE Confidence: 0.915978312492371

00:28:07.010 --> 00:28:08.858 And you want to use that understanding

NOTE Confidence: 0.915978312492371

00:28:08.858 --> 00:28:10.491 to assess alternative decisions or

NOTE Confidence: 0.915978312492371

00:28:10.491 --> 00:28:12.075 interventions to support decision-making?

NOTE Confidence: 0.915978312492371

00:28:12.080 --> 00:28:13.344 And that's my story,

NOTE Confidence: 0.915978312492371

00:28:13.344 --> 00:28:14.924 and I'm sticking with it.

NOTE Confidence: 0.915978312492371

00:28:14.930 --> 00:28:16.198 Thank you very much.

NOTE Confidence: 0.980173289775848

00:28:18.770 --> 00:28:20.126 Thank you very much.