

WEBVTT

NOTE duration:"00:15:26.0590000"

NOTE language:en-us

NOTE Confidence: 0.892701679468155

00:00:00.000 --> 00:00:02.607 For the introduction.

NOTE Confidence: 0.892701679468155

00:00:02.607 --> 00:00:08.690 And hopefully this screen is sharing now.

NOTE Confidence: 0.892701679468155

00:00:08.690 --> 00:00:11.378 And thanks for the opportunity to talk.

NOTE Confidence: 0.892701679468155

00:00:11.380 --> 00:00:12.325 As Melissa said,

NOTE Confidence: 0.892701679468155

00:00:12.325 --> 00:00:15.041 I'm going to be talking about how we

NOTE Confidence: 0.892701679468155

00:00:15.041 --> 00:00:17.723 can use mathematical models to really

NOTE Confidence: 0.892701679468155

00:00:17.723 --> 00:00:19.623 better understand transmission of

NOTE Confidence: 0.892701679468155

00:00:19.623 --> 00:00:21.587 infection in vaccinated populations.

NOTE Confidence: 0.892701679468155

00:00:21.590 --> 00:00:23.960 And really, what I'm focusing on

NOTE Confidence: 0.892701679468155

00:00:23.960 --> 00:00:26.058 here is the distinction between

NOTE Confidence: 0.892701679468155

00:00:26.058 --> 00:00:28.278 the direct and indirect protection

NOTE Confidence: 0.892701679468155

00:00:28.278 --> 00:00:30.980 that is confirmed by vaccination.

NOTE Confidence: 0.892701679468155

00:00:30.980 --> 00:00:33.656 We've heard a lot so far,

NOTE Confidence: 0.892701679468155

00:00:33.660 --> 00:00:35.675 mostly about the direct protection

NOTE Confidence: 0.892701679468155

00:00:35.675 --> 00:00:38.580 that can be confirmed by vaccination.

NOTE Confidence: 0.892701679468155

00:00:38.580 --> 00:00:40.730 Two individuals receiving the vaccine

NOTE Confidence: 0.892701679468155

00:00:40.730 --> 00:00:42.880 and preventing them from having

NOTE Confidence: 0.892701679468155

00:00:42.950 --> 00:00:45.235 kind of severe consequences of

NOTE Confidence: 0.892701679468155

00:00:45.235 --> 00:00:47.063 infections such as hospitalization,

NOTE Confidence: 0.892701679468155

00:00:47.070 --> 00:00:49.746 and this is generally estimated from

NOTE Confidence: 0.892701679468155

00:00:49.746 --> 00:00:52.500 randomized control trials or estimates of.

NOTE Confidence: 0.892701679468155

00:00:52.500 --> 00:00:55.860 Effectiveness from case control studies.

NOTE Confidence: 0.892701679468155

00:00:55.860 --> 00:00:59.460 But vaccines can also confer

NOTE Confidence: 0.892701679468155

00:00:59.460 --> 00:01:02.340 indirect protections by preventing

NOTE Confidence: 0.892701679468155

00:01:02.340 --> 00:01:06.090 individuals who may be UN vaccinated

NOTE Confidence: 0.892701679468155

00:01:06.090 --> 00:01:09.020 from becoming infected and shedding.

NOTE Confidence: 0.892701679468155

00:01:09.020 --> 00:01:11.735 This pathogens and infecting other

NOTE Confidence: 0.892701679468155

00:01:11.735 --> 00:01:14.450 individuals in the population who,

NOTE Confidence: 0.892701679468155

00:01:14.450 --> 00:01:15.540 for example,

NOTE Confidence: 0.892701679468155

00:01:15.540 --> 00:01:18.810 maybe too young to receive vaccines.
NOTE Confidence: 0.892701679468155

00:01:18.810 --> 00:01:21.010 And thereby preventing those individuals
NOTE Confidence: 0.892701679468155

00:01:21.010 --> 00:01:23.780 who are exposed from developing severe
NOTE Confidence: 0.892701679468155

00:01:23.780 --> 00:01:26.280 disease and being hospitalised themselves.
NOTE Confidence: 0.892701679468155

00:01:26.280 --> 00:01:28.620 And so this indirect protection,
NOTE Confidence: 0.892701679468155

00:01:28.620 --> 00:01:31.422 which is also been also referred
NOTE Confidence: 0.892701679468155

00:01:31.422 --> 00:01:33.290 to us herd immunity,
NOTE Confidence: 0.892701679468155

00:01:33.290 --> 00:01:36.167 is something that really can only be
NOTE Confidence: 0.892701679468155

00:01:36.167 --> 00:01:38.429 estimated from very specific cluster
NOTE Confidence: 0.892701679468155

00:01:38.429 --> 00:01:40.814 randomized trial design or something
NOTE Confidence: 0.892701679468155

00:01:40.814 --> 00:01:44.145 that can be estimated and predicted
NOTE Confidence: 0.892701679468155

00:01:44.145 --> 00:01:46.577 using dynamic mathematical models.
NOTE Confidence: 0.892701679468155

00:01:46.580 --> 00:01:49.204 And the way that these models work is
NOTE Confidence: 0.892701679468155

00:01:49.204 --> 00:01:51.355 to follow generally what's considered
NOTE Confidence: 0.892701679468155

00:01:51.355 --> 00:01:54.193 the basic sirf type model design,
NOTE Confidence: 0.892701679468155

00:01:54.200 --> 00:01:56.205 where we assume that when

NOTE Confidence: 0.892701679468155
00:01:56.205 --> 00:01:57.408 individuals are born,
NOTE Confidence: 0.892701679468155
00:01:57.410 --> 00:01:59.415 they might be susceptible to
NOTE Confidence: 0.892701679468155
00:01:59.415 --> 00:02:01.420 infection with a particular pathogen,
NOTE Confidence: 0.892701679468155
00:02:01.420 --> 00:02:03.826 an ask they are exposed to
NOTE Confidence: 0.892701679468155
00:02:03.826 --> 00:02:05.029 that pathogen overtime,
NOTE Confidence: 0.892701679468155
00:02:05.030 --> 00:02:06.815 they may become infected and
NOTE Confidence: 0.892701679468155
00:02:06.815 --> 00:02:08.600 in turn these individuals are
NOTE Confidence: 0.892701679468155
00:02:08.667 --> 00:02:10.639 infectious to other individuals,
NOTE Confidence: 0.892701679468155
00:02:10.640 --> 00:02:12.812 and So what we're most concerned
NOTE Confidence: 0.892701679468155
00:02:12.812 --> 00:02:15.240 about with these models is tracking
NOTE Confidence: 0.892701679468155
00:02:15.240 --> 00:02:17.505 infectious individuals as opposed to.
NOTE Confidence: 0.892701679468155
00:02:17.510 --> 00:02:20.905 The cases of disease within the population.
NOTE Confidence: 0.892701679468155
00:02:20.910 --> 00:02:23.094 And when once that infection resolves and
NOTE Confidence: 0.892701679468155
00:02:23.094 --> 00:02:25.029 individuals and no longer infectious,
NOTE Confidence: 0.892701679468155
00:02:25.030 --> 00:02:27.095 we can assume that they may have
NOTE Confidence: 0.892701679468155

00:02:27.095 --> 00:02:29.231 any bodies and be recovered and
NOTE Confidence: 0.892701679468155

00:02:29.231 --> 00:02:31.196 be immune from further infection,
NOTE Confidence: 0.892701679468155

00:02:31.200 --> 00:02:34.266 at least for some period of time.
NOTE Confidence: 0.892701679468155

00:02:34.270 --> 00:02:37.046 And there also is death that can occur
NOTE Confidence: 0.892701679468155

00:02:37.046 --> 00:02:39.416 from all of these compartments and
NOTE Confidence: 0.892701679468155

00:02:39.416 --> 00:02:42.455 then all of this really gets described
NOTE Confidence: 0.892701679468155

00:02:42.455 --> 00:02:45.290 by series of differential equations,
NOTE Confidence: 0.892701679468155

00:02:45.290 --> 00:02:47.302 which are mathematical expressions
NOTE Confidence: 0.892701679468155

00:02:47.302 --> 00:02:50.320 just showing how the rate of.
NOTE Confidence: 0.892701679468155

00:02:50.320 --> 00:02:53.056 Or the number of individuals in
NOTE Confidence: 0.892701679468155

00:02:53.056 --> 00:02:55.413 each state changes overtime in
NOTE Confidence: 0.892701679468155

00:02:55.413 --> 00:02:57.668 relation to these various rates.
NOTE Confidence: 0.892701679468155

00:02:57.670 --> 00:03:00.100 And when it comes to modeling
NOTE Confidence: 0.892701679468155

00:03:00.100 --> 00:03:01.315 vaccination kind of,
NOTE Confidence: 0.892701679468155

00:03:01.320 --> 00:03:03.679 the simplest way to do it within
NOTE Confidence: 0.892701679468155

00:03:03.679 --> 00:03:06.419 the sort of basic sirf type model

NOTE Confidence: 0.892701679468155

00:03:06.419 --> 00:03:08.897 framework is to assume that some

NOTE Confidence: 0.892701679468155

00:03:08.980 --> 00:03:11.240 fraction of individuals which is

NOTE Confidence: 0.892701679468155

00:03:11.240 --> 00:03:13.864 considered be here who are vaccinated

NOTE Confidence: 0.892701679468155

00:03:13.864 --> 00:03:15.684 and affectively protected by the

NOTE Confidence: 0.892701679468155

00:03:15.684 --> 00:03:18.000 vaccine might be moved from the

NOTE Confidence: 0.892701679468155

00:03:18.000 --> 00:03:19.608 suseptable compartment into the

NOTE Confidence: 0.892701679468155

00:03:19.608 --> 00:03:21.752 recovered and immune compartment while

NOTE Confidence: 0.892701679468155

00:03:21.752 --> 00:03:23.648 bypassing the infectious compartment,

NOTE Confidence: 0.892701679468155

00:03:23.650 --> 00:03:26.527 and so this reduces the number of

NOTE Confidence: 0.892701679468155

00:03:26.527 --> 00:03:27.760 currently infectious individuals.

NOTE Confidence: 0.892701679468155

00:03:27.760 --> 00:03:29.284 Within the population.

NOTE Confidence: 0.892701679468155

00:03:29.284 --> 00:03:32.332 And if you implement this in

NOTE Confidence: 0.892701679468155

00:03:32.332 --> 00:03:35.616 a very simple sirf type model,

NOTE Confidence: 0.892701679468155

00:03:35.620 --> 00:03:38.188 assuming and are not a 5 or the

NOTE Confidence: 0.892701679468155

00:03:38.188 --> 00:03:40.511 an average number of secondary

NOTE Confidence: 0.892701679468155

00:03:40.511 --> 00:03:43.186 infections produced by an infectious
NOTE Confidence: 0.892701679468155

00:03:43.186 --> 00:03:45.641 individual on a fully susceptible
NOTE Confidence: 0.892701679468155

00:03:45.641 --> 00:03:47.385 population and a 50%
NOTE Confidence: 0.831913828849792

00:03:47.390 --> 00:03:49.134 vaccine coverage with 100%
NOTE Confidence: 0.831913828849792

00:03:49.134 --> 00:03:51.318 effective vaccine, or vice versa,
NOTE Confidence: 0.831913828849792

00:03:51.318 --> 00:03:54.358 100% coverage with a 50% effective vaccine,
NOTE Confidence: 0.831913828849792

00:03:54.358 --> 00:03:57.790 then on left in blue here is plotted
NOTE Confidence: 0.831913828849792

00:03:57.868 --> 00:04:00.520 what the epidemic would look like.
NOTE Confidence: 0.831913828849792

00:04:00.520 --> 00:04:02.860 Kind of each week through time.
NOTE Confidence: 0.831913828849792

00:04:02.860 --> 00:04:04.810 If there was no vaccination
NOTE Confidence: 0.831913828849792

00:04:04.810 --> 00:04:06.370 while on the right,
NOTE Confidence: 0.831913828849792

00:04:06.370 --> 00:04:08.866 the blue line represents the total
NOTE Confidence: 0.831913828849792

00:04:08.866 --> 00:04:10.530 number of cases cumulatively
NOTE Confidence: 0.831913828849792

00:04:10.599 --> 00:04:12.779 through time with no vaccination.
NOTE Confidence: 0.831913828849792

00:04:12.780 --> 00:04:15.030 And the dashed redline presents what
NOTE Confidence: 0.831913828849792

00:04:15.030 --> 00:04:17.870 you would expect if the vaccine were

NOTE Confidence: 0.831913828849792

00:04:17.870 --> 00:04:19.980 really just providing the direct

NOTE Confidence: 0.831913828849792

00:04:19.980 --> 00:04:21.920 protection to vaccinated individuals

NOTE Confidence: 0.831913828849792

00:04:21.920 --> 00:04:24.986 and preventing them from getting sick,

NOTE Confidence: 0.831913828849792

00:04:24.990 --> 00:04:28.035 which would just be a same epidemic

NOTE Confidence: 0.831913828849792

00:04:28.035 --> 00:04:30.290 but 50% smaller through time.

NOTE Confidence: 0.831913828849792

00:04:30.290 --> 00:04:34.050 The solid red line here represents what we

NOTE Confidence: 0.831913828849792

00:04:34.050 --> 00:04:36.828 actually see within the model framework.

NOTE Confidence: 0.831913828849792

00:04:36.830 --> 00:04:40.326 If you vaccinate 50% of the population before

NOTE Confidence: 0.831913828849792

00:04:40.326 --> 00:04:43.279 the vaccine or the epidemic takes off,

NOTE Confidence: 0.831913828849792

00:04:43.280 --> 00:04:45.000 which is an epidemic,

NOTE Confidence: 0.831913828849792

00:04:45.000 --> 00:04:47.150 which is considerably delayed and

NOTE Confidence: 0.831913828849792

00:04:47.150 --> 00:04:49.763 blunted compared to the epidemic that

NOTE Confidence: 0.831913828849792

00:04:49.763 --> 00:04:51.878 you see without any vaccination.

NOTE Confidence: 0.831913828849792

00:04:51.880 --> 00:04:54.645 And if you look at the cumulative

NOTE Confidence: 0.831913828849792

00:04:54.645 --> 00:04:56.837 number of cases occurring overtime

NOTE Confidence: 0.831913828849792

00:04:56.837 --> 00:04:59.615 by the end of the epidemic.
NOTE Confidence: 0.831913828849792

00:04:59.620 --> 00:05:01.112 With vaccination you see.
NOTE Confidence: 0.831913828849792

00:05:01.112 --> 00:05:02.977 Lower cumulative number of cases
NOTE Confidence: 0.831913828849792

00:05:02.977 --> 00:05:05.078 that occur within the population,
NOTE Confidence: 0.831913828849792

00:05:05.080 --> 00:05:07.288 then would be expected just based
NOTE Confidence: 0.831913828849792

00:05:07.288 --> 00:05:09.191 on this direct protection from
NOTE Confidence: 0.831913828849792

00:05:09.191 --> 00:05:10.268 the vaccine alone,
NOTE Confidence: 0.831913828849792

00:05:10.270 --> 00:05:12.025 and this difference between what
NOTE Confidence: 0.831913828849792

00:05:12.025 --> 00:05:13.780 you'd expect from the direct
NOTE Confidence: 0.831913828849792

00:05:13.845 --> 00:05:15.715 protection alone versus what you
NOTE Confidence: 0.831913828849792

00:05:15.715 --> 00:05:18.026 actually get from this reduction in
NOTE Confidence: 0.831913828849792

00:05:18.026 --> 00:05:19.896 transmission that occurs is generally
NOTE Confidence: 0.831913828849792

00:05:19.896 --> 00:05:21.820 measured as the indirect effect.
NOTE Confidence: 0.831913828849792

00:05:21.820 --> 00:05:24.340 But you'll note that if you
NOTE Confidence: 0.831913828849792

00:05:24.340 --> 00:05:26.190 measured the indirect effect,
NOTE Confidence: 0.831913828849792

00:05:26.190 --> 00:05:28.446 say back on week seven here,

NOTE Confidence: 0.831913828849792

00:05:28.450 --> 00:05:30.335 you would estimate a considerably

NOTE Confidence: 0.831913828849792

00:05:30.335 --> 00:05:31.466 stronger indirect effect,

NOTE Confidence: 0.831913828849792

00:05:31.470 --> 00:05:33.948 and so that's one aspect of this

NOTE Confidence: 0.831913828849792

00:05:33.948 --> 00:05:36.595 indirect effect is that it's inherently

NOTE Confidence: 0.831913828849792

00:05:36.595 --> 00:05:38.615 dynamic and changing overtime.

NOTE Confidence: 0.831913828849792

00:05:38.620 --> 00:05:40.370 And Furthermore it changes with

NOTE Confidence: 0.831913828849792

00:05:40.370 --> 00:05:41.770 coverage within the population.

NOTE Confidence: 0.831913828849792

00:05:41.770 --> 00:05:42.820 So for example,

NOTE Confidence: 0.831913828849792

00:05:42.820 --> 00:05:45.620 if you had 80% coverage in this scenario,

NOTE Confidence: 0.831913828849792

00:05:45.620 --> 00:05:47.370 according to the direct protection,

NOTE Confidence: 0.831913828849792

00:05:47.370 --> 00:05:49.820 you just expect to see an epidemic

NOTE Confidence: 0.831913828849792

00:05:49.820 --> 00:05:52.270 that's 20% the size of the epidemic.

NOTE Confidence: 0.831913828849792

00:05:52.270 --> 00:05:53.670 But in this case,

NOTE Confidence: 0.831913828849792

00:05:53.670 --> 00:05:56.172 if you have an 80% effective vaccine,

NOTE Confidence: 0.831913828849792

00:05:56.172 --> 00:05:58.804 you would be able to eliminate the

NOTE Confidence: 0.831913828849792

00:05:58.804 --> 00:06:00.771 pathogen altogether and prevent the
NOTE Confidence: 0.831913828849792

00:06:00.771 --> 00:06:03.490 epidemic from occurring in the first place.
NOTE Confidence: 0.831913828849792

00:06:03.490 --> 00:06:04.286 More generally,
NOTE Confidence: 0.831913828849792

00:06:04.286 --> 00:06:06.674 these models can be adapted to
NOTE Confidence: 0.831913828849792

00:06:06.674 --> 00:06:08.849 account for the waning vaccine,
NOTE Confidence: 0.831913828849792

00:06:08.850 --> 00:06:10.910 induced immunity and leaky protection,
NOTE Confidence: 0.831913828849792

00:06:10.910 --> 00:06:11.734 for example,
NOTE Confidence: 0.831913828849792

00:06:11.734 --> 00:06:13.794 by including a separate compartment
NOTE Confidence: 0.831913828849792

00:06:13.794 --> 00:06:15.030 for vaccinated individuals,
NOTE Confidence: 0.831913828849792

00:06:15.030 --> 00:06:17.837 which can then kind of Wayne back
NOTE Confidence: 0.831913828849792

00:06:17.837 --> 00:06:20.477 into this acceptable state or have
NOTE Confidence: 0.831913828849792

00:06:20.477 --> 00:06:22.742 a differential rate of infection
NOTE Confidence: 0.831913828849792

00:06:22.742 --> 00:06:24.990 occurring from this compartment.
NOTE Confidence: 0.831913828849792

00:06:24.990 --> 00:06:28.270 Or can be modified to allow for infected
NOTE Confidence: 0.831913828849792

00:06:28.270 --> 00:06:30.875 individuals to be somehow different
NOTE Confidence: 0.831913828849792

00:06:30.875 --> 00:06:33.720 from UN vaccinated infected individuals.

NOTE Confidence: 0.831913828849792

00:06:33.720 --> 00:06:35.175 So, for example,

NOTE Confidence: 0.831913828849792

00:06:35.175 --> 00:06:37.115 less infectious than unvaccinated

NOTE Confidence: 0.831913828849792

00:06:37.115 --> 00:06:38.085 infected individuals.

NOTE Confidence: 0.831913828849792

00:06:38.090 --> 00:06:39.524 And in reality,

NOTE Confidence: 0.831913828849792

00:06:39.524 --> 00:06:42.392 these vaccines models get much more

NOTE Confidence: 0.831913828849792

00:06:42.392 --> 00:06:44.778 complicated when you take into

NOTE Confidence: 0.831913828849792

00:06:44.778 --> 00:06:47.058 account the specifics of natural

NOTE Confidence: 0.831913828849792

00:06:47.058 --> 00:06:50.120 immunity and the Natural History of

NOTE Confidence: 0.831913828849792

00:06:50.120 --> 00:06:52.144 infection of different pathogens.

NOTE Confidence: 0.831913828849792

00:06:52.150 --> 00:06:54.580 These are just two different

NOTE Confidence: 0.831913828849792

00:06:54.580 --> 00:06:56.038 models for rotavirus.

NOTE Confidence: 0.831913828849792

00:06:56.040 --> 00:06:58.665 One in which we don't account for

NOTE Confidence: 0.831913828849792

00:06:58.665 --> 00:07:00.477 the different strains of rotavirus

NOTE Confidence: 0.831913828849792

00:07:00.477 --> 00:07:02.319 and one in which we do,

NOTE Confidence: 0.831913828849792

00:07:02.320 --> 00:07:04.455 which get considerably kind of

NOTE Confidence: 0.831913828849792

00:07:04.455 --> 00:07:06.163 more increasingly complicated and
NOTE Confidence: 0.831913828849792

00:07:06.163 --> 00:07:08.341 in reality what I spend my time
NOTE Confidence: 0.831913828849792

00:07:08.341 --> 00:07:10.834 looking at is a whole bunch of code
NOTE Confidence: 0.831913828849792

00:07:10.834 --> 00:07:12.784 that is used to implement these
NOTE Confidence: 0.831913828849792

00:07:12.790 --> 00:07:15.140 models in a computer program.
NOTE Confidence: 0.847669661045074

00:07:15.140 --> 00:07:18.626 And so the ways in which these
NOTE Confidence: 0.847669661045074

00:07:18.626 --> 00:07:20.999 different models can be used,
NOTE Confidence: 0.847669661045074

00:07:21.000 --> 00:07:22.458 including explaining observed
NOTE Confidence: 0.847669661045074

00:07:22.458 --> 00:07:25.162 patterns in data. So, for example,
NOTE Confidence: 0.847669661045074

00:07:25.162 --> 00:07:28.734 models have helped us to understand how the
NOTE Confidence: 0.847669661045074

00:07:28.734 --> 00:07:31.694 seasonality of rotavirus epidemics changed
NOTE Confidence: 0.847669661045074

00:07:31.694 --> 00:07:34.660 following vaccine introduction in the US,
NOTE Confidence: 0.847669661045074

00:07:34.660 --> 00:07:37.588 Anan why this change of curd.
NOTE Confidence: 0.847669661045074

00:07:37.590 --> 00:07:40.025 Furthermore, we've also used models
NOTE Confidence: 0.847669661045074

00:07:40.025 --> 00:07:41.973 to evaluate cost effectiveness.
NOTE Confidence: 0.847669661045074

00:07:41.980 --> 00:07:44.452 Specifically, my group has looked at

NOTE Confidence: 0.847669661045074
00:07:44.452 --> 00:07:46.780 the cost effectiveness of different
NOTE Confidence: 0.847669661045074
00:07:46.780 --> 00:07:49.825 vaccination strategies against typhoid fever.
NOTE Confidence: 0.847669661045074
00:07:49.830 --> 00:07:53.274 Asking is it cost effective to introduce
NOTE Confidence: 0.847669661045074
00:07:53.274 --> 00:07:56.381 typhoid vaccines in various low income
NOTE Confidence: 0.847669661045074
00:07:56.381 --> 00:07:59.993 countries and kind of under what conditions?
NOTE Confidence: 0.847669661045074
00:08:00.000 --> 00:08:01.053 And then finally,
NOTE Confidence: 0.847669661045074
00:08:01.053 --> 00:08:03.510 these models can be used to address
NOTE Confidence: 0.847669661045074
00:08:03.576 --> 00:08:05.428 issues around future trends,
NOTE Confidence: 0.847669661045074
00:08:05.430 --> 00:08:06.768 like for example,
NOTE Confidence: 0.847669661045074
00:08:06.768 --> 00:08:08.998 can we possibly eliminate COVID-19
NOTE Confidence: 0.847669661045074
00:08:08.998 --> 00:08:09.890 through vaccination?
NOTE Confidence: 0.847669661045074
00:08:09.890 --> 00:08:12.906 And so I just want to briefly into
NOTE Confidence: 0.847669661045074
00:08:12.906 --> 00:08:16.029 a couple examples from my own work.
NOTE Confidence: 0.847669661045074
00:08:16.030 --> 00:08:18.775 So back in 2009 I was involved in a
NOTE Confidence: 0.847669661045074
00:08:18.775 --> 00:08:21.438 study looking at trying to understand
NOTE Confidence: 0.847669661045074

00:08:21.438 --> 00:08:23.713 the early impact of rotavirus
NOTE Confidence: 0.847669661045074

00:08:23.788 --> 00:08:26.248 vaccine introduction in the West,
NOTE Confidence: 0.847669661045074

00:08:26.250 --> 00:08:28.806 where what was observed following the
NOTE Confidence: 0.847669661045074

00:08:28.806 --> 00:08:30.510 introduction of rotavirus vaccines
NOTE Confidence: 0.847669661045074

00:08:30.577 --> 00:08:33.272 in 2006 isn't at the first season
NOTE Confidence: 0.847669661045074

00:08:33.272 --> 00:08:34.427 following vaccine introduction,
NOTE Confidence: 0.847669661045074

00:08:34.430 --> 00:08:36.884 which occurs kind of only among
NOTE Confidence: 0.847669661045074

00:08:36.884 --> 00:08:38.520 infants in the US.
NOTE Confidence: 0.847669661045074

00:08:38.520 --> 00:08:41.285 The rotavirus epidemic in the US was
NOTE Confidence: 0.847669661045074

00:08:41.285 --> 00:08:44.720 really kind of similar in size to previous.
NOTE Confidence: 0.847669661045074

00:08:44.720 --> 00:08:46.148 Pre vaccination epidemics,
NOTE Confidence: 0.847669661045074

00:08:46.148 --> 00:08:50.153 so in blue is the 2006 2007 rotavirus
NOTE Confidence: 0.847669661045074

00:08:50.153 --> 00:08:53.645 season and number of rotavirus positive
NOTE Confidence: 0.847669661045074

00:08:53.645 --> 00:08:57.509 specimens in the US surveillance system,
NOTE Confidence: 0.847669661045074

00:08:57.510 --> 00:09:00.974 whereas the grey in the black is the
NOTE Confidence: 0.847669661045074

00:09:00.974 --> 00:09:04.740 mean pre vaccination rotavirus season.

NOTE Confidence: 0.847669661045074
00:09:04.740 --> 00:09:08.238 Whereas in the second season following
NOTE Confidence: 0.847669661045074
00:09:08.238 --> 00:09:11.410 vaccine introduction plotted in red here,
NOTE Confidence: 0.847669661045074
00:09:11.410 --> 00:09:14.758 the epidemic was considerably smaller than.
NOTE Confidence: 0.847669661045074
00:09:14.760 --> 00:09:16.230 Free vaccinate vaccination,
NOTE Confidence: 0.847669661045074
00:09:16.230 --> 00:09:19.660 epidemics and pizza around 10 weeks after
NOTE Confidence: 0.847669661045074
00:09:19.737 --> 00:09:22.509 the usual peak in the rotavirus season.
NOTE Confidence: 0.847669661045074
00:09:22.510 --> 00:09:25.548 So current kind of quite a bit
NOTE Confidence: 0.847669661045074
00:09:25.548 --> 00:09:28.440 later in kind of late winter.
NOTE Confidence: 0.847669661045074
00:09:28.440 --> 00:09:29.700 Early spring time.
NOTE Confidence: 0.847669661045074
00:09:29.700 --> 00:09:30.120 Um?
NOTE Confidence: 0.847669661045074
00:09:30.120 --> 00:09:33.271 And initially this was not really well
NOTE Confidence: 0.847669661045074
00:09:33.271 --> 00:09:36.011 understood because it wasn't really
NOTE Confidence: 0.847669661045074
00:09:36.011 --> 00:09:38.756 known that introducing rotavirus vaccine
NOTE Confidence: 0.847669661045074
00:09:38.756 --> 00:09:41.588 would prevent a lot of transmission,
NOTE Confidence: 0.847669661045074
00:09:41.590 --> 00:09:44.686 since only infants were getting vaccinated.
NOTE Confidence: 0.847669661045074

00:09:44.690 --> 00:09:47.746 But based on models that we have fitted

NOTE Confidence: 0.847669661045074

00:09:47.746 --> 00:09:50.836 to pre vaccination data in the US,

NOTE Confidence: 0.847669661045074

00:09:50.840 --> 00:09:52.960 in particularly the spatio temporal

NOTE Confidence: 0.847669661045074

00:09:52.960 --> 00:09:55.350 pattern of epidemics in the US,

NOTE Confidence: 0.847669661045074

00:09:55.350 --> 00:09:57.205 We were able to retrospectively

NOTE Confidence: 0.847669661045074

00:09:57.205 --> 00:09:59.622 predict this delay in the timing

NOTE Confidence: 0.847669661045074

00:09:59.622 --> 00:10:01.089 of rotavirus epidemics,

NOTE Confidence: 0.847669661045074

00:10:01.090 --> 00:10:03.430 particularly in the second season

NOTE Confidence: 0.847669661045074

00:10:03.430 --> 00:10:05.770 following the introduction of the

NOTE Confidence: 0.847669661045074

00:10:05.842 --> 00:10:08.432 vaccine based solely on the idea that

NOTE Confidence: 0.847669661045074

00:10:08.432 --> 00:10:11.878 infants seem to be the ones who are most

NOTE Confidence: 0.847669661045074

00:10:11.878 --> 00:10:13.830 infectious when infected with rotavirus.

NOTE Confidence: 0.847669661045074

00:10:13.830 --> 00:10:16.030 And this provided an important

NOTE Confidence: 0.847669661045074

00:10:16.030 --> 00:10:17.790 form of that model.

NOTE Confidence: 0.847669661045074

00:10:17.790 --> 00:10:19.836 Validation for kind of future prediction,

NOTE Confidence: 0.847669661045074

00:10:19.840 --> 00:10:21.705 although of course models aren't

NOTE Confidence: 0.847669661045074

00:10:21.705 --> 00:10:24.325 perfect and we didn't do a great

NOTE Confidence: 0.847669661045074

00:10:24.325 --> 00:10:26.371 job of reproducing kind of the

NOTE Confidence: 0.847669661045074

00:10:26.371 --> 00:10:28.004 relative size of the epidemics

NOTE Confidence: 0.847669661045074

00:10:28.004 --> 00:10:30.069 that a curd in in 2008 2009,

NOTE Confidence: 0.847669661045074

00:10:30.070 --> 00:10:31.770 compared to 2000 seven 2008.

NOTE Confidence: 0.847669661045074

00:10:31.770 --> 00:10:33.816 Although we did again get the

NOTE Confidence: 0.847669661045074

00:10:33.816 --> 00:10:34.839 timing quite similar,

NOTE Confidence: 0.847669661045074

00:10:34.840 --> 00:10:36.898 but one of the things that we

NOTE Confidence: 0.847669661045074

00:10:36.898 --> 00:10:38.794 predicted with this model was that

NOTE Confidence: 0.847669661045074

00:10:38.794 --> 00:10:41.020 ask the coverage within the under five

NOTE Confidence: 0.847669661045074

00:10:41.080 --> 00:10:43.360 children population kind of increased.

NOTE Confidence: 0.847669661045074

00:10:43.360 --> 00:10:45.080 You would start to see.

NOTE Confidence: 0.847669661045074

00:10:45.080 --> 00:10:47.747 Lower our sort of later and later,

NOTE Confidence: 0.847669661045074

00:10:47.750 --> 00:10:50.010 at epidemics of rotavirus occurring

NOTE Confidence: 0.847669661045074

00:10:50.010 --> 00:10:53.000 each year until you reach this region

NOTE Confidence: 0.847669661045074

00:10:53.000 --> 00:10:55.608 in which you will see kind of 80
NOTE Confidence: 0.82375967502594

00:10:55.685 --> 00:10:57.790 to 90% coverage among the eligible
NOTE Confidence: 0.82375967502594

00:10:57.790 --> 00:11:00.280 infant population and what was happening
NOTE Confidence: 0.82375967502594

00:11:00.347 --> 00:11:03.035 here was that you actually the model is
NOTE Confidence: 0.82375967502594

00:11:03.035 --> 00:11:05.286 predicting that you actually start to
NOTE Confidence: 0.82375967502594

00:11:05.286 --> 00:11:07.560 get epidemics occurring every two years,
NOTE Confidence: 0.82375967502594

00:11:07.560 --> 00:11:09.084 or these biennial epidemics
NOTE Confidence: 0.82375967502594

00:11:09.084 --> 00:11:10.227 of rotavirus happening.
NOTE Confidence: 0.82375967502594

00:11:10.230 --> 00:11:12.135 And this was something that
NOTE Confidence: 0.82375967502594

00:11:12.135 --> 00:11:14.040 we predicted back in 2009,
NOTE Confidence: 0.82375967502594

00:11:14.040 --> 00:11:17.120 just after the vaccines have been rolled out.
NOTE Confidence: 0.82375967502594

00:11:17.120 --> 00:11:18.401 And sure enough,
NOTE Confidence: 0.82375967502594

00:11:18.401 --> 00:11:21.390 if you look at more recent data,
NOTE Confidence: 0.82375967502594

00:11:21.390 --> 00:11:24.379 this for example from New York City,
NOTE Confidence: 0.82375967502594

00:11:24.380 --> 00:11:27.014 in which we have rotavirus hospitalizations
NOTE Confidence: 0.82375967502594

00:11:27.014 --> 00:11:30.059 encoded in blue here and lab confirmed

NOTE Confidence: 0.82375967502594

00:11:30.059 --> 00:11:32.483 rotavirus cases within NYC in gold.

NOTE Confidence: 0.82375967502594

00:11:32.490 --> 00:11:35.479 Here you can see that sure enough,

NOTE Confidence: 0.82375967502594

00:11:35.480 --> 00:11:37.136 beginning around 2011, 2013,

NOTE Confidence: 0.82375967502594

00:11:37.136 --> 00:11:40.610 you really are starting to see this pattern,

NOTE Confidence: 0.82375967502594

00:11:40.610 --> 00:11:42.730 in which you're getting rotavirus

NOTE Confidence: 0.82375967502594

00:11:42.730 --> 00:11:44.426 epidemics happening primarily in

NOTE Confidence: 0.82375967502594

00:11:44.426 --> 00:11:47.032 the odd numbered years and much

NOTE Confidence: 0.82375967502594

00:11:47.032 --> 00:11:48.728 lower rotavirus activity happening.

NOTE Confidence: 0.82375967502594

00:11:48.730 --> 00:11:50.640 In even numbered winter seasons,

NOTE Confidence: 0.82375967502594

00:11:50.640 --> 00:11:53.478 and this was very consistent with

NOTE Confidence: 0.82375967502594

00:11:53.478 --> 00:11:56.090 the predictions that we had for

NOTE Confidence: 0.82375967502594

00:11:56.090 --> 00:11:58.610 our model in a shift in the in

NOTE Confidence: 0.82375967502594

00:11:58.701 --> 00:12:01.231 the disease to potentially kind

NOTE Confidence: 0.82375967502594

00:12:01.231 --> 00:12:03.761 of slightly older age groups.

NOTE Confidence: 0.82375967502594

00:12:03.770 --> 00:12:06.470 So another policy question that we've

NOTE Confidence: 0.82375967502594

00:12:06.470 --> 00:12:08.270 addressed using these mathematical
NOTE Confidence: 0.82375967502594

00:12:08.342 --> 00:12:10.742 models is the question around in
NOTE Confidence: 0.82375967502594

00:12:10.742 --> 00:12:12.342 which Gabby eligible countries.
NOTE Confidence: 0.82375967502594

00:12:12.350 --> 00:12:14.460 Would it be potentially cost
NOTE Confidence: 0.82375967502594

00:12:14.460 --> 00:12:16.570 effective to introduce these novel
NOTE Confidence: 0.82375967502594

00:12:16.640 --> 00:12:18.985 typhoid conjugate vaccines which have
NOTE Confidence: 0.82375967502594

00:12:18.985 --> 00:12:21.330 just been developed and licensed
NOTE Confidence: 0.82375967502594

00:12:21.399 --> 00:12:23.309 and approved recommended by WHL
NOTE Confidence: 0.82375967502594

00:12:23.309 --> 00:12:25.648 within the past couple of years,
NOTE Confidence: 0.82375967502594

00:12:25.648 --> 00:12:27.788 and in particular when introducing
NOTE Confidence: 0.82375967502594

00:12:27.788 --> 00:12:28.644 these vaccines,
NOTE Confidence: 0.82375967502594

00:12:28.650 --> 00:12:31.380 which would be the best strategy
NOTE Confidence: 0.82375967502594

00:12:31.380 --> 00:12:33.200 just to routinely vaccinate
NOTE Confidence: 0.82375967502594

00:12:33.282 --> 00:12:35.556 infants at nine months of age?
NOTE Confidence: 0.82375967502594

00:12:35.560 --> 00:12:37.894 Or to potentially also include a
NOTE Confidence: 0.82375967502594

00:12:37.894 --> 00:12:39.827 catch up campaign among children

NOTE Confidence: 0.82375967502594
00:12:39.827 --> 00:12:42.235 up to five or 15 years of age.
NOTE Confidence: 0.82375967502594
00:12:42.240 --> 00:12:44.688 And so we evaluated these three
NOTE Confidence: 0.82375967502594
00:12:44.688 --> 00:12:46.831 different strategies using a dynamic
NOTE Confidence: 0.82375967502594
00:12:46.831 --> 00:12:49.041 model of typhoid transmission in
NOTE Confidence: 0.82375967502594
00:12:49.041 --> 00:12:51.206 order to predict vaccine impact
NOTE Confidence: 0.82375967502594
00:12:51.206 --> 00:12:52.846 over a 10 year period,
NOTE Confidence: 0.82375967502594
00:12:52.850 --> 00:12:54.820 and generally found reductions that
NOTE Confidence: 0.82375967502594
00:12:54.820 --> 00:12:57.340 vary slightly from country to country,
NOTE Confidence: 0.82375967502594
00:12:57.340 --> 00:12:59.782 based primarily on the age structure
NOTE Confidence: 0.82375967502594
00:12:59.782 --> 00:13:01.003 of the country,
NOTE Confidence: 0.82375967502594
00:13:01.010 --> 00:13:03.030 but that overall routine vaccination
NOTE Confidence: 0.82375967502594
00:13:03.030 --> 00:13:06.732 plus a catch up campaign to 15 years of
NOTE Confidence: 0.82375967502594
00:13:06.732 --> 00:13:08.752 age was predicted potentially decrease
NOTE Confidence: 0.82375967502594
00:13:08.752 --> 00:13:11.208 typhoid fever incidents by around 58%.
NOTE Confidence: 0.82375967502594
00:13:11.210 --> 00:13:12.886 Overall Gabby eligible countries.
NOTE Confidence: 0.82375967502594

00:13:12.886 --> 00:13:15.400 And when we consider the costs
NOTE Confidence: 0.82375967502594

00:13:15.467 --> 00:13:17.627 associated with vaccine introduction as
NOTE Confidence: 0.82375967502594

00:13:17.627 --> 00:13:20.510 well as the illness itself generally,
NOTE Confidence: 0.82375967502594

00:13:20.510 --> 00:13:23.380 what we found was that routine vaccination.
NOTE Confidence: 0.82375967502594

00:13:23.380 --> 00:13:25.648 Plus this catch up campaign to 15
NOTE Confidence: 0.82375967502594

00:13:25.648 --> 00:13:28.775 years of age was always the preferred
NOTE Confidence: 0.82375967502594

00:13:28.775 --> 00:13:30.859 strategy whenever introducing typhoid
NOTE Confidence: 0.82375967502594

00:13:30.859 --> 00:13:33.841 vaccines in the 1st place was cost
NOTE Confidence: 0.82375967502594

00:13:33.841 --> 00:13:35.706 effective and the strategy was
NOTE Confidence: 0.82375967502594

00:13:35.710 --> 00:13:38.038 likely to be cost effective based
NOTE Confidence: 0.82375967502594

00:13:38.038 --> 00:13:40.094 on willingness to pay thresholds
NOTE Confidence: 0.82375967502594

00:13:40.094 --> 00:13:42.674 or willingness to kind of adopt
NOTE Confidence: 0.82375967502594

00:13:42.674 --> 00:13:43.964 A health strategy.
NOTE Confidence: 0.82375967502594

00:13:43.970 --> 00:13:46.094 That's somewhat reasonable in in 38
NOTE Confidence: 0.82375967502594

00:13:46.094 --> 00:13:48.910 out of 54 Gabby eligible countries.
NOTE Confidence: 0.82375967502594

00:13:48.910 --> 00:13:49.734 For example,

NOTE Confidence: 0.82375967502594

00:13:49.734 --> 00:13:53.034 when the threshold set to 25% of the

NOTE Confidence: 0.82375967502594

00:13:53.034 --> 00:13:58.174 GDP per capita, which is relatively low.

NOTE Confidence: 0.82375967502594

00:13:58.174 --> 00:13:59.150 Threshold.

NOTE Confidence: 0.82375967502594

00:13:59.150 --> 00:13:59.469 Um?

NOTE Confidence: 0.82375967502594

00:13:59.469 --> 00:14:01.702 And one of the things that we've

NOTE Confidence: 0.82375967502594

00:14:01.702 --> 00:14:04.375 done is to then take some of these

NOTE Confidence: 0.82375967502594

00:14:04.375 --> 00:14:07.213 results and to put it on a website

NOTE Confidence: 0.82375967502594

00:14:07.213 --> 00:14:09.028 that take on Typhoid website,

NOTE Confidence: 0.82375967502594

00:14:09.030 --> 00:14:11.151 which is one of the main advocacy

NOTE Confidence: 0.82375967502594

00:14:11.151 --> 00:14:12.434 websites around typhoid vaccine

NOTE Confidence: 0.82375967502594

00:14:12.434 --> 00:14:14.667 information that can be then used to

NOTE Confidence: 0.82375967502594

00:14:14.667 --> 00:14:16.268 allow potential decision makers to

NOTE Confidence: 0.82375967502594

00:14:16.268 --> 00:14:18.780 explore some of these results on their own.

NOTE Confidence: 0.82375967502594

00:14:18.780 --> 00:14:19.950 And then finally,

NOTE Confidence: 0.82375967502594

00:14:19.950 --> 00:14:22.290 when it comes to this question

NOTE Confidence: 0.844244605965085

00:14:22.373 --> 00:14:25.264 of what's going to happen with COVID-19
NOTE Confidence: 0.844244605965085

00:14:25.264 --> 00:14:28.976 and the question of herd immunity around
NOTE Confidence: 0.844244605965085

00:14:28.976 --> 00:14:30.776 introducing COVID-19 vaccination.
NOTE Confidence: 0.844244605965085

00:14:30.780 --> 00:14:32.980 And will we eventually be
NOTE Confidence: 0.844244605965085

00:14:32.980 --> 00:14:34.740 able to eliminate COVID-19?
NOTE Confidence: 0.844244605965085

00:14:34.740 --> 00:14:37.008 My take on this is that the
NOTE Confidence: 0.844244605965085

00:14:37.008 --> 00:14:39.190 answer is maybe that is really,
NOTE Confidence: 0.844244605965085

00:14:39.190 --> 00:14:41.242 but that's really going to require
NOTE Confidence: 0.844244605965085

00:14:41.242 --> 00:14:42.994 massive undertaking in the way
NOTE Confidence: 0.844244605965085

00:14:42.994 --> 00:14:45.269 models help us is to consider this
NOTE Confidence: 0.844244605965085

00:14:45.269 --> 00:14:46.710 critical proportion to vaccinate,
NOTE Confidence: 0.844244605965085

00:14:46.710 --> 00:14:50.095 which is going to be equal to 1 -- 1
NOTE Confidence: 0.844244605965085

00:14:50.095 --> 00:14:52.840 over are not an for for COVID-19 if you
NOTE Confidence: 0.844244605965085

00:14:52.918 --> 00:14:55.599 consider and are not of around 3:00,
NOTE Confidence: 0.844244605965085

00:14:55.600 --> 00:14:58.176 this is where you get some of
NOTE Confidence: 0.844244605965085

00:14:58.176 --> 00:15:00.391 these estimates of 60 to 70% of

NOTE Confidence: 0.844244605965085
00:15:00.391 --> 00:15:02.096 people needing to be vaccinated.
NOTE Confidence: 0.844244605965085
00:15:02.100 --> 00:15:04.494 But this is not just the coverage
NOTE Confidence: 0.844244605965085
00:15:04.494 --> 00:15:05.968 that's needed, it's really.
NOTE Confidence: 0.844244605965085
00:15:05.968 --> 00:15:07.938 The coverage plus the efficacy
NOTE Confidence: 0.844244605965085
00:15:07.938 --> 00:15:08.726 against transmission,
NOTE Confidence: 0.844244605965085
00:15:08.730 --> 00:15:11.650 which we don't really know and so For
NOTE Confidence: 0.844244605965085
00:15:11.650 --> 00:15:13.798 these reasons I think it's really
NOTE Confidence: 0.844244605965085
00:15:13.798 --> 00:15:16.579 going to be be difficult to eliminate
NOTE Confidence: 0.844244605965085
00:15:16.579 --> 00:15:19.327 infection altogether with vaccination.
NOTE Confidence: 0.844244605965085
00:15:19.330 --> 00:15:22.850 And so with that I'm going to end and thank
NOTE Confidence: 0.844244605965085
00:15:22.941 --> 00:15:26.056 you again for the invitation to speak.