everybody welcome
uh very much to to our lunch and learn
this month
i’m excited to be the person welcoming
you today um we have some exciting
one health announcements um the first is
that we have a complete seminar schedule
all ready for all of 2021
posted on our website and so if you go
to our website and homepage in the
seminar page you can
get advanced uh exciting warning and
invite your friends
to come to this wonderful lecture series
um we also have a twitter account active
so we are now
ut1 health on twitter all one word i
don’t know if capitalization matters on
twitter i suspect not
no excellent people who actually know
about twitter are shaking their heads
that’s fantastic
um okay we also have a fun
podcast series that’s been launched
already by comedian and science
enthusiast shane moss
um shane has been doing the here we are
uh podcast for a while and has now
started focusing and interviewing our
ut one health scholars and episodes are
available
under our media podcast
path on our one health website um
so yay for attention to ut one health
outreach and communication
and and all of our scholars for
participating in all of our wonderful
guest seminar
speakers uh including today’s seminar
speaker dr eric lofgren
um i am very pleased to
to be introducing dr lofgren and i’m
going to read his formal introduction
but also just
as a personal note eric is an awesome
scholar and a really interesting person
and i encourage all of you to reach out
to him after his talk
um all right dr lofgren is an infectious
disease epidemiologist his research
focuses on the uses of mathematical and
computational models of disease
transmission
particularly the transmission of
antimicrobial resistant infections
within and outside healthcare settings
as well as emerging infectious diseases
his work often focuses on producing
policy relevant results
working hand-in-hand with clinicians and policy makers to produce reproducible quantitative guidance for designing and evaluating public health initiatives. He is currently an assistant professor at Washington State University School for Global Animal Health. He holds a PhD in Epidemiology from UNC Chapel Hill and is a postdoc with the Network Dynamics and Simulation Science Lab at Virginia Tech. I'm very pleased to welcome him to talk to us today about dirty doctors and pestilent puppies. Eric. It's all yours. All right. Thank you very much, Nida. We'll go ahead and share my screen. Hopefully you can all see that so yeah. The title of this talk is dirty doctors and pestilent puppies, and that's really sort of an encapsulation of what I work on is kind of work on infection control problems mostly in humans sometimes in animals. Um, like many modelers, I just sort of wander around doing whatever interests us at the time. And I am at the Paul G Allen School for Global Animal Health, which is a mouthful. It's going to get a little smarter, uh, a little smaller where we're dropping the animal and we're just doing global health. Uh, here pretty soon. But I work in sort of both areas. And I actually like to start with an acknowledgement slide. Um, so a lot of this is done with my clinical collaborators, Dev Anderson and Rebecca Mooring at Duke University, and David Weber at UNC who is responsible for my interest in hospital fe at all. Um, much of this sort of came about um thinking-wise while I was a postdoc under Stephen Eubank at NDSSL. The Covet in Jail work um is a product of a large collaboration with Nina uh Christian Lum at the University of Pennsylvania. Aaron Horowitz and um Brooke I confess I don't know her last name at the ACLU and Kellen Myers who's a Tusculum um and then the hard-working graduate students.
of my lab
matt kaitlyn and stephanie who are the
folks pictured on the side of the screen
all looking very outdoorsy and so yeah
who am i um i have a phd in epidemiology
from unc chapel hill so i was sort of
trained as
a conventional like let's go estimated
relative risk from a cohort study
epidemiologist
um i did my postdoc at the network
dynamics and simulation science lab
which at the time was at virginia tech
which is a
a group focused on very large sort of
agent-based modeling of um
primarily human social systems and i now
work at wsu
i primarily will work on what i call
policy driven modeling problems so these
are problems where there is
some sort of clinical or policy
stakeholder that needs an answer to
something
um this is what pullman looks like if
you want to live in a place like this
where it is dry and beautiful for most
of the year please do come join us at
wsu
so this talk is sort of a play in three
acts and
um that will touch on sort of parameter
estimation for hospital epidemiology
using
chlorhexidine bathing is sort of a
motivating example uh copenhagen and
incarceration settings and infection
controls and antimicrobial resistance
and companion animals as kind of a
wandering through the work i do and sort
of some of my thoughts on the
global health and one health as an idea
so act one
so hospital fe has some data problems
um and the the sort of the core question
that that
engages me a lot is what if we know
something is going on but our data isn't
great
um this is a problem in hospital epi and
then you go
talk to the poor disease ecologists or
the wildlife disease ecologists in the
room and they go like
you have data and they get really
excited so so this is an
interesting thing where regardless of
who you talk to they're convinced that
they don't have enough data until you
get to like the people who are doing cardiology clinical trials or like we have 300,000 people in each arm we know everything um so a lot of examples for this from hospital fee for the work i do is a single sentence from a paper that is about something else so a lot of the like parameter estimates and the things i get really interested in papers are sort of that first sentence of the results section where people just sort of write down sort of the properties of the cohort they studied and then they get on to what they're actually interested in but it's that like first sentence that's that's really important for me um a summary statistic or a set of summary statistics but not the individual level data when you're working with human data it's often very hard to get that even when there's not hipaa problems there's you know yeah but we're going to mine this randomized trial for like four more papers before we give it to other people or information that is on one scale when you need it to be on another so we know things about hospital wards but we want to know about individual patients in that ward and i am what to do english medicine lovingly refers to as a data parasite which is i do research on other people's research um without necessarily paying them for it um primarily by trying to extract things from the existing literature so one of the ways we do this is with a method called approximate bayesian computation which um i primarily like because it works the same way my brain works but it's also a really cool tool and in its crudest form what you do is you special you specify a prior distribution for some parameter you're interested in so you say this probability is somewhere between you know 25 and 75 percent likely that's going to be my prior distribution you draw a
a value from that prior and you throw it at your model and you simulate your model a bunch of times
and you say what i want you to do is tell me whether or not it matches some summary statistic so an average number of cases or the time at which someone gets an infection you accept the parameter if the simulated results are close to your target by some tolerance epsilon and you can use a bunch of clever techniques like particle filtering or other algorithms to improve the computational efficiency of this but the smaller that epsilon gets you get closer and closer to a bayesian prior but if it's greater than zero this is an approximation of the prior um this is really cool because importantly it's like purely simulation you have to do absolutely no math or statistics you just sort of chuck computing power at this which is how all science should be done nina and why this is useful is theoretically you have likelihood free inference you don't have to specify the likelihood function of your model or your fit to the data um this is handy if the likelihood is very complicated or tends to not converge well so if you're using sort of exotic likelihood functions that don't converge nicely you can sort of skip them or if you simply don't know the likelihood function um that you it doesn't it's not well specified and acceptance the nice part of the about this is it can be made using summary statistics so you can work on an average or rate something like that instead of trying to fit to individual data you do lose some information when you do this or you can even do this with sort of qualitative patterns which admittedly you use you lose lots of information when you do that but you can say things like i want to make sure my model of bird migration has the birds leaving at the
right time
and coming back at the right time and
that's often very difficult to constrain
a model that way if you're thinking
about using likelihood-based methods
so that's really nice um graham and
railsbach refer to this as pattern
matching
um and it's a it's a really sort of
interesting approach to things
um this does involve giving up some
information compared to directly fitting
to data
but in many of the cases that i i think
about this has already been done for us
we've already lost the information the
information
cannot be gotten so doing something that
involves a lot of information isn't as
much of a sort of downside
as it as it initially feels like
practically um i find this relatively
straightforward to think about an
implement you can the sort of the basic
algorithm for this is relatively
straightforward to code
and you can sort of double dip when you
work on sort of improving the code for
your simulation engine
it also makes your fitting faster and so
that's that's sort of a nice
bonus as you you sit down to think about
whether or not it's worth trying to make
your simulations faster
is it will make fitting faster too
so my initial reaction to this is like
this can't actually work
this way um but as it turns out this has
actually been something that's been
proposed for a long time so reuben
proposed the idea of simulated priors
but computing power wasn't there yet and
computing power really is
the the main limiting factor beyond this
everything beyond a toy example
needs some form of a high performance
computing
preferably parallel coding and this is a
major drawback for you know
students in in global health or public
health or or veterinary medicine
i'm saying okay you're going to need a
cluster account as somewhat daunting as
a
as a first step but it is it is an
important one
so we're going to use um chlorhexidine
bathing as sort of a motivating example
of talking about
how we use this and why it's interesting
so chlorhexine if you if you don't know
is a disinfectant with a broad range of
effectiveness it's used
fairly widely in both human medicine and
veterinary medicine if you've ever had
oral surgery and then had a absolutely
disgusting tasting
green mouthwash that was probably
chlorhexidine
and this is commonly used in hospitals
as part of a daily bathing procedure
to reduce hospital-acquired infections
especially in intensive care units
and it's been shown to be effective
separately or as part of a bundle of
interventions in a number of randomized
clinical trials
but in some community studies like one i
was involved in um
with some folks at duke the results have
been somewhat more equivocal
so they found reductions in some
hospital infection
related conditions but not all and
there's a couple different sort of
explanations for this
phenomenon it's there's questions about
whether this was sort of already
improving
infection control standards that
obfuscate the effect of this
um i have some questions about the idea
of facility level
confounding by indication there's
there's definitely some different
constructs there that might work
um so but we're interested in sort of
why those
uh sort of discordant results exist
because whenever you have observational
studies and randomized trials that don't
agree with each other there's
there's interest there and figuring out
why and then the other reason that that
i'm
interested in sort of figuring out how
chlorhexidine works is that in many
sort of intervention studies there's
this end of the sentences like oh and
then also we introduce chlorhexidine
bathing
and they want to attribute all the
effect they see to whatever they
intended to be studying but i want to
know how much of it might be the
chlorhexidine so this is
very common um contact precautions or
sort of a controversial topic
in hospital epidemiology whether or not you know we should all be wearing gowns and gloves when we contact our patients and there are groups that have argued anything from sort of universal gowning and gloving so everyone is on contact precautions all the time to you can get rid of gowning and gloving for everyone but patients with active infections and when these people do these studies it's often what we you know we got rid of all the gowns and gloves and we added chlorhexidine bathing and then they want to talk about the effect of getting rid of the ganon gloves but what i want to do as a modeler is sort of disentangle those things to be able to look at the effect of both so this is an example of one of those sort of equivocal results where um you have the sort of chlorhexidine rate is going down already uh there's a little statistical artifact um because of sample size and then it keeps going down once we've introduced chlorhexidine but if i was you know the ceo of a hospital and i looked at this slope and then you told me oh it's going to cost you know a couple hundred thousand dollars to introduce chlorhexidine bathing i'd go i don't i don't know that we need to do that why don't we just keep doing whatever we were doing beforehand so the the question that comes up for for this study is can we estimate the per use effectiveness of fluorexin so basically when we you know take a chlorhexidine wipe um and then we wipe you down if you're colonized with mrsa what is the probability that you're no longer colonized and this is useful for trying to be able to understand those differences between things like a null effect versus an underpowered study untangling bundled interventions this is this is sort of an important number to know but it's really hard to estimate from empirical data if you think about how you do this in reality you'd have to find someone
who's colonized with mrsa
you would have to sort of pick a site on
their skin
bathe that skin with chlorhexidine sorry
sample that site
then pick another site nearby but not so
nearby that the sampling has already
influenced
your your skin flora pick that side
wipe it down with chlorhexidine then
sample that site and you'd have to do
this
while the person was in the intensive
care unit presumably because they're
sick
and so this is very hard to do even in
sort of
academic settings but in community
settings it's a very hard ask
and so it's hard to estimate purely from
empirical data and so the idea was let's
use a mathematical model and approximate
bayesian computation
to estimate this colonization parameter
instead
so this is a three-step process i like
things that come in threes because
it turns out human beings like things
that come in threes so step one
is sort of a pre-intervention fitting of
an icu to some data
so what we have is we have sort of a
meta population model of a hospital
where you have um i believe this one is
18 patients
who are seen by a single dedicated
intensivist and who are all supervised
by six nurses who are assigned primarily
to three specific patients so sort of a
conduit
care um level thing we have another
whole
a home preprint somewhere looking at
what happens when you start poking at
this structure but this is the structure
we use for this
and so what we're fitting the the icu
data to
is there's one free parameter in our
model that's how we sort of calibrate to
the experience of real hospitals
and this is the probability of
successful colonization of an
uncolonized patient
due to contact with a contaminated
healthcare worker so basically
this is if a nurse or doctor has mrsa on
their hands
and they touch you what's the likelihood
that you get colonized from that contact and what we fit this to is there was a study the benefits of universal gowning gloving or bug study that had a very very detailed um sort of rate calculation for their pre-intervention colonization rate in their hospitals and so we have that as sort of one of the best what is the infection rate in an icu before you do anything um infection rates so that’s what we we fit this to we also there is a very slow spontaneous decolonization rate that’s been observed in some other studies we put that in and yeah we use this stochastic meta population model of an icu i’ll prevent i’ll present a more simplified diagram of this later because essentially trying to show all the compartments for this model in a figure starts to break down very quickly and from here what we essentially do is we simulate a series of interrupted time series studies to try to get at this question so what we’re fitting in this model is this blue line and this is if anyone works in mosquito control and you’re like this looks a lot like a ross mcdonald model that’s because it is so what we have is we have s which is uncontaminated staff and we have h which is staff that have contamination on their hands their bodies something like that and contaminated healthcare workers can contaminate uncolonized patients so that’s those people in you those people and you then go from u to c and they’re colonized and then they can contaminate the hands of uncontaminated staff so that’s how you move from s to h so the important part of this model is that the patients aren’t giving each other infections we’re assuming everyone’s in a single room otherwise you’re otherwise you’ve got good infection control policies there’s no environmental contamination things like that and so really it’s just this contamination question is what’s driving infection and the
first thing we're fitting is this blue line
and that's what gives us the rate that a real ICU sees
the next step is to add chlorhexidine bathing so this is to estimate the probability that chlorhexidine bath results in full decolonization
and here um this is where I mentioned you know you can steal summary statistics
there's a very thorough meta-analysis um from the general political journal of critical care in 2016 that estimates an um incidence rate ratio of 0.75 basically so 25 reduction and the question we're asking is what value of the parameter we want to fit would result in that corresponding decrease of cases so this is a picture of those particular studies um the table isn't really important except you'll note we're leaving three studies out we'll get to those three studies in a moment and so we're fitting essentially this green line here now is is the line we're looking at which is the perimeter of you going back from colonized to uncolonized
now there's a step three which is new pearson so mu pearson is a nasal um decontamination process that often takes place alongside fluorescein for full decolonization staff lives very happily in your nose and so even if we decolonize your skin it's possible you will then touch your nose and recolonize yourself so we need to essentially get up in there and kill everything in there too and several large studies have included both that same meta-analysis essentially said for those studies you have an incident rate ratio of 0.578 so basically 0.58 and so there's an additional reduction in the studies scene that use mu purisin and so we need to now estimate both of these effects note that this does assume the effect of these two treatments is additive so you know you can you could do one you could do other you could do both the both is just the effect of one plus the other we've started to look at what happens if you sort of relax that additive assumption but that
the answer is the math gets much much harder and so that’s these um three studies that we left out and the important one is this study by susan huang which is why we wanted to include this is because there’s about a hundred thousand individuals in each arm of the study this is most of the data we have about chlorhexidine is contained in this single massive randomized trial so throwing that out because they also included mupirasan is kind of a problem so that that’s why we included that study and and sort of added this comparison component so now we have basically a new purple arrow along with the gray narrow again getting you back from colonized to uncolonized so the caveats and assumptions to this are because all models have caveats and assumptions is we assume random mixing within the patients that the nurse sees so you they sort of bounce between their three patients and then random mixing between patients and the intensivists we're only examining chlorhexidine’s effect on decolonization so the idea here is that chlorhexidine reduces colonization pressure by decolonizing potential infection sources but it’s not self-protective if we give you a chlorhexidine bath you're not equipped with like immersive deflector shield uh we've looked at the effect in another study of that sort of deflector shield idea and the answer is that it’s okay um we also assume there’s an instant detection of acquisition so you know we we find and know perfectly whether or not you have mrsa and we’re sort of counting things appropriately we relax this assumption in some of the results i’ll show and add a latent period of between one and four days where you’re colonized but we don’t know it yet and that sort of changes the answers but not much colonization is an all or nothing process in this you are either colonized or you’re not
there's no like uh it's growing but it's
t's not quite there yet
everyone is treated so for simplicity
everyone gets a chlorhexidine bath every
day
and the other one and this is sort of
for the observational epidemiologist in
the room
there's an assumption that the mix of
interrupted time series and randomized
clinical trial study designs
that are included in this meta-analysis
are both capable of estimating an
unbiased effect
so essentially neither group is is
somehow systematically wrong
and we can just take their data as is
and use it
so the results we get from this are the
the figures on the left are
uh chlorhexidine and pearson the figures
on the right or when we add that latent
period
um and the answer is the per sort of
application efficacy which is this
median line
is about 18 for both if you assume we
know perfect
um sort of detection and about 15
if we don't so this actually came as a
surprise to me because this means this
isn't actually very good at what it's
supposed to do
you know we bathe you once and there's a
less than 20 percent chance that you're
now
clean um that's a little bit worrisome
given we
do this to people in the icu all the
time but what it turns out is is that if
you just do this
a lot it works really well
because one of the things that we had
also been asked on by clinician
is can i space out the timing of bathing
for chlorhexidine
chlorhexidine is associated with skinny
irritation in adults
and it's associated with neurotoxicity
in infants
so there's definitely an interest in
like could we only do this occasionally
and still get something out of it and so
we varied this from sort of
this baseline which is we never do this
to 24 or 48 and all the way up to sort
of five days
you know you get a a bath once every
business week
and the answer is you still get benefits from this so essentially if you apply an okay intervention a lot even if that a lot is is less frequent than you otherwise would you still get benefits from this which i think is sort of an important um message and the takeaways that you that we we got from this study are that the per use effectiveness of and comparison is surprisingly low but there is a sort of caveat to that which is these estimates are they're not lab estimates they're effectiveness not efficacy so they're both based on the actual chemical action and importantly the application and i think the application is where we as a field sort of have some weaknesses that we can improve on for example chlorhexidine um there are many sort of apocryphal stories about nurses adding a um soap to chlorhexidine because chlorhexidine isn't a surfactant when you wash someone with it it doesn't produce suds and people want to see sort of suds when they're where they're going through bathing the problem with that is soap deactivates chlorhexidine so if you add soap to chlorexidine to bake studs what you've done is you've made bubbles but not chlorhexidine anymore and so that's sort of a problem and then similarly for um mu pearson i i went to a talk with susan huang she described the process of decolonizing someone with me pearson in her study and it's essentially a nurse sticks a swab with me pearson up your nose sort of rubs it around in a circular motion for two or three minutes and then does your other nostril um this sounds like possibly the most awkward thing i have ever heard and so my question is is that actually happening in these studies or is everybody doing what probably happens which is you just sort of get both nostrils you sort of go around for a bit and then you're done and is that enough application time for me pearson things like that
um so that’s that’s the real question we have is is how much of this is application
but there’s room to move the needle there this is not sort of these 25 percent
or sort of 40 decreases in infections that we’re seeing in hospital units this isn’t the cap of how well
decolonization can do there’s there’s room for more there and the good news is that some flexibility
application frequency still has a positive effect
um if you’re really interested in going into detail on this this did finally get published in gemma network open
um the url is down below it’s trivially easy to find by typing in jama network open lofgren there’s only two papers there
so act two we’re going to shift gears entirely and we’re going to talk about covet a little bit because i’m sure
everyone is not yet tired of hearing about cobit work and so we wanted to look at covet 19 in jails
covet 19 has been a huge problem in jails prisons and detention centers for reasons that i don’t think requires sort of particularly brilliant epidemiology you have lots of people in close quarters with not particularly good access to hygiene no real infection control no real social distancing and highly shared environments so we were particularly concerned that essentially we’re preserving this one setting with potential for super spreading because it’s sort of socially and politically uncomfortable to talk about you know we have closed movie theaters we’ve closed schools um wsu sent all our our students home for for the semester and then like but jails do we still need to deal with those and it turns out the answer is yes and so this modeling work that we were looking at here was looking at intervention interventions to try to reduce covet 19 in jails um doing work with both university and ngo collaborators in this case on the aclu who were really helpful in sort of
informing what was feasible interventions and helping with immensely with parameters i'm not an expert in incarceration um i hadn't ever sort of worked in jail settings before so they were useful both for you know putting us in contact with experts who could say things like yes this is how a jail works no this is not how a jail works you know you just saw that on tv and also feasible interventions on sort of both sides of things things that you can't do that because that's sort of a violation of someone's constitutional rights or also we shouldn't spend a lot of time talking about this intervention because that's not politically feasible it's never going to happen so what we did is we modeled a largely idealized system a city at the start of its coven-19 outbreak doing everything otherwise well so they have a social distancing and sort of work from home order and people are complying with it and most of the parameters here are drawn from allegheny county pennsylvania due to a particularly detailed amount of public data about their jail um expressly this means it will not predict a single city or jail despite an immense desire from people to have it do that we can't sort of plug in knoxville's numbers or los angeles numbers and like turn the crank and tell you how many gel cases you're going to have it's not meant for that it's an idealized system and so what we do here is we model the jail and community sort of interface and the fact that jails are highly connected to their communities jails are essentially short-term um facilities most people are intended to return to their um community they often do so very very quickly and so we essentially have is another meta population model where in the community we have children adults for three categories low risk high risk and elderly and then the jail staff and they cycle between these categories the children in
our model can’t be arrested
so the jail staff um move to the jail
and stay there for eight hours and then
go home
and the low-risk um high-risk and
elderly adults can be arrested
they go to a um a different sort of
population which is processing in court
this is you know your court dates um
being processed to get put in jail
being processed to get taken out of jail
things like that and then put in jail
itself and then
they can cycle back to the community
what we see when we do this is a
phenomenon we call carceral
amplification
which is this idea that because we have
this highly connected
very sort of powerful source of
infection in the community
uh sorry in the jail both you see a very
large
spike in cases in the jail that happens
before the community
but then this will also feed cases into
the community
and so essentially you have this engine
that’s driving infection transmission
and you get a very scary epidemic curve
for the jail itself
which unfortunately we did see some very
scary epidemic curves for jails in this
particular outbreak
um and we looked at a lot of different
potential questions the first
one i’m presenting here is sort of this
question of well could we just do social
distancing can we you know
we can we space prisoners out can we
give them soap and will that you know
work and the answer is that even when
you get to
the equivalent of a population
sheltering in place
well that would certainly help you still
get a very large spike
and in the community it mostly just
delays the epidemic
and in the jail it slightly reduces the
magnitude of the epidemic and delays it
but you still have a very large sort of
epidemic so it’s not enough
to just spread people out which is what
i think um
some facilities we’re hoping for is we
can just do social distancing and we’ll
be fine
so then we looked at some other
scenarios looking at things like um arrest reduction so this is essentially um sheriff's departments and things like that using some discretion to say look we're not going to arrest you we're not going to send you to jail here's your court date you better show up on that court date um and we looked at a number of different scenarios for this so the dark blue line is what happens if the community as a whole is just sheltering in place but we don't do that and then we sort of step through progressively more extreme versions of bail reduction uh sorry arrest rejection the first one is bail eligible if we think we're eligible if you're eligible for bail we're just not going to charge you for bail and send you home this one is a pretty easy one to justify it's essentially like we're just not gonna make you write a check but we otherwise think that yes you can be in the community you're eligible for bail um the salmon line is what if we send vulnerable people home so we look at you and we say you know you meet some of the criteria for people who are vulnerable to copenhagen so you're elderly you have lots of sort of comorbidities surrounding your your cardiac system things like that what if we don't arrest you um the sort of pale blue line is low level offenses so this is offenses against property not people what if we send those folks home we say okay don't do that again but like we're not really worried about you being a threat to other people and the final one is just what if we just arrested fewer people we just say like across the board arrest fewer people and what we see is that in each one of these essentially the more people you choose not to arrest and send to jail the better your health outcomes are so you have huge reductions in the incarcerated population but you also see fairly substantial reductions in in both infections hospitalizations and
death in the community
and even in staff which admittedly is
sort of the hardest
needle to move in this is is infections
among among staff
so the takeaway we we have from this is
that copper 19 in jail
is a threat to both the jail itself and
the surrounding community and these two
systems
are very tightly linked and because
jails are inherently very permeable
settings
most people are there for short stays a
lot of those people are only there for a
day or two
which is just enough time to get coveted
and then return to your community and
get everyone you live with sick
um some control efforts may be
detrimental if they discourage case
finding
so i didn’t show that in in this one but
essentially
if you punish reporting that you're sick
which
some jails did sort of implicitly do by
turning their
um isolation war isolation cells into
quarantine wards
which is not a very pleasant place to be
quarantined
that discourages case finding and that
encourages people to wait until they're
obviously ill
which is extremely detrimental to sort
of all
infection control processes increasing
distancing helps
but it doesn't fully resolve the problem
and importantly that's impossible in
crowded scales
so if if your jail is already at
capacity social distancing isn't really
something you can do
and so decarcerization efforts are
important both for
being more effective themselves and to
enable that increased social distancing
for those who must remain in jail if
there are individuals who we say
look this person does just have to be in
jail
the less people who don't have to be in
jail the easier it is to keep them
um socially distanced and um from
getting sick
so acts 3 the final act of this is the
role of companion animals in infection
control
and antimicrobial resistance so
infection control and antimicrobial
resistance and veterinary populations
and settings is very similar to in human
settings
but you have less money and your
patients can't talk
and it turns out both of those things
are actually really really big
challenges to infection control
in for example veterinary teaching
hospitals which wsu's is this
this lovely building um on the the
right-hand side of the screen which is
about
10 feet away from where i work and one
goal of my group is to examine infection
control in these settings
and this is largely in higher uh
inspired by klebsiella pneumonia
outbreak
at the wsu veterinary teaching hospital
where this is a pulse fuel gel of
essentially there was an outbreak of
klebsiella
in 2009 all the way to 2011
that was pernicious and very hard to
deal with and but then we we dealt with
it was 2011 we were finished
and then in 2016 a dog shows up
with a strain of kleps yellow that is
smack dab in the middle of the outbreak
strain
um and it's five years later and this is
a little bit confusing
and so the question is sort of but where
does the klebsiella come from
um somewhere in pullman there is a chain
of klebsiella and ammonia transmission
that gave this dog
essentially an outbreak strain five
years later is this in humans
like is this just like there are some
elderly people and their dogs
who are just passing klebsiella between
each other um
is this only in animals is there some
sort of disgusting little puddle in the
vegetarian teaching hospital that just
has klebsiella living in it and we we
haven't found it yet or is it in you
know both
does the hospital know so does pullman
regionals see cases of klebsiella and
ammonia
um we still don't know the answer to
that i do need to get around to finding
that out
and then the question that sort of comes around with that is what if you could combine infection control for human and veterinary populations. What if these two groups of people talked to each other used their surveillance data accordingly and sort of looked at this question and so since I'm a modeler the answer to this is what if we just build a utopia where this happens um so what we decided to do was build what's called the synthetic population of pet ownership so this is a virtual population of people who own pets and their pets go to hospitals and they go to hospitals and we we watch what happens.

Lots of synthetic populations which have been used in epidemiology there's been a lot of them used for 19 are constructed for fleeting transients and largely indirect contact so in fairness this is because they were designed mostly to model influenza where this makes perfect sense you know you can sneeze on someone and get them sick for looking at something like MRSA or a antimicrobial resistant E.coli we need something that's built on more direct sustained contact um we need something where you know touch in a shared environment is a much more important thing and ideally um from sort of a project perspective this would be suited for modeling as a standalone network or a sort of a synthetic catchment population for looking at um community transmission for both veterinary or human hospitals and would also be nice not to reinvent the wheel so we did is we stole a model from some colleagues of mine uh Christian Lum um Samar Swarup Stephen Euranik and James Howden um who were looking at um incarceration and using an agent based model of racial disparities in incarceration rates and importantly what they do is they create a synthetic population that builds affinities based on proximity so essentially they scatter people on a one by one grid and they say you you know make friends you meet your future life.
partner etc based largely on the people who are near you and there's lots of ways to conceptualize this space you can think about this as geography you're more likely to sort of meet and be friends with someone who lives near you then far away this can be affinity so this can be you know you agree on two different axes of some belief etc and there's a pairing process agents have children based on population distributions etc and at the end of this you get a synthetic population with parent sibling spouse and close friend relationships which we said are the kinds of relationships where you can foresee sort of immersive transmission occurring where there's that level of durate um direct sustained contact so this is what this ends up looking like you get a legitimate sort of family tree and this is that one by one sort of affinity space once you run a clustering algorithm on it and you can see that there's you know distinct groups of people you have communities and so this is sort of what we're going for and so our extension of this model is to add pets um the first version will likely just have dogs and we're working on that now built primarily on national level statistics where we can and then sort of collapsing down to pullman level statistics we're not primarily as a zero-inflated poisson model where we say you know you have probability of either owning dogs or not owning dogs and then for those who own dogs we draw how many dogs you own from distribution in my case that answer is three one of them is felix here and at the moment we're not modeling animal animal contact so we're not modeling for example doggy daycare although we are interested in this and one of the questions we are interested in is modeling the type of ownership so for example felix here is sleeping on a chair this is the same chair i
normally eat dinner in
so there’s definitely a potential
microbiome interaction there
whereas someone who has an outdoor
hunting dog
that relationship is probably much less
sort of intensive
this work is ongoing but one of the
questions is like okay but but why
add this besides that you know i can put
cute dogs on slides
and one of the answers to that is we’ve
actually seen coveting companion animals
so in a study we did sampling 67 dogs in
46 cove 19 positive households
um we had clinical signs in about a
quarter of those dogs
and 43 of them were antibody positive
but all of them were um pcr negative
when we did nasopharyngeal swabs
so they sort of got covered but they
didn’t they weren’t good at shedding it
so it’s pop
it’s likely that sort of the people gave
the pets coveted
um and there was a weak association with
some sort of behaviors that would make
sense
um so if you share a bed with your dog
or the number of humans with covenant in
the household
those were both sort of things that were
associated with a higher risk in the
dogs
there’s also a novel coronavirus
currently emerging among domestic dogs
in malaysia right now
suggesting that we should also be
focusing on domestic animals in addition
to one health’s
often very wildlife and
livestock-centric approach
essentially because companion animals
have very high contact rates
there’s similar antibiotic usage
patterns for example a lot of dogs when
they’re treated for antimicrobial
sorry antibiotic sort of susceptible
infections get
people drugs and um so there’s there’s
sort of a
question there with drug usage patterns
and so there’s there’s
there’s room for looking at companion
animals as a potential source
for either transmitting disease or just
carrying it along with them as fomites
so you know
if you have mrsa you pet your dog’s ears
your dog is not very likely to get mrsa
it is however likely to carry that mrsa
on their ears for a while
you know you get treated and then you
come back and you pet your dog’s ears
again and you’ve just recolonized
yourself
so we have some other work in that area
um
working with a vet student here
distinguishing human human animal
and animal animal transmission in
hospital settings
so essentially trying to look at a
veterinary school and say okay
who’s giving who what um direct
observation of staff using contact
patterns in veterinary teaching
hospitals so
going to some of the same parameters we
have for hospitals for veterinary
teaching hospitals
obviously this is on hold for covid
because as it turns out i’m going to
have a bunch of undergrads follow a
bunch of clinicians around
it’s a terrible idea in the middle of a
pandemic um we’re also working on some
social contact surveys of pacific
islander populations
in both washington state and arkansas
and currently working on a contact diary
survey
of wsu staff and faculty to try to
figure out if there are particular
groups who who did or did not
sort of successfully reduce their
contact rate um
while working sort of with our our
particular version of work from home
so thank you all very much for your
attention uh my contact information if
you’re interested in talking to me
is eric.lofgren.wsu.edu i am on twitter
at
germs and numbers and i’m hiring at
least one postdoc
so um feel free to reach out and a lot
of this work has been funded by the
modeling infectious diseases and
healthcare program or
um we have a contract with the cdc
looking at this in healthcare
or we have a national science foundation
rapid grant to look at covet 19 as well
um and yeah thank you all very much for
your time and attention
thank you so much um uh
internet clapping um i so i think we
have time for some questions i don't
know do you want people to unmute do you
want that to be a curated
question experience how would you like
to handle questions
um i am happy with any of those
approaches
um dealer's choice
all right so let's let's try it and
unmute and go for it and if it becomes
madness i will start arbitrating
anyone have questions feel free to add me
here i'll i'll start with the last last
one point i made in the chat very
interesting thank you
um you said the estimated efficacy of of
of bathing
the the the individuals uh was
surprisingly low but isn't that what
clinical
trials have shown so the clinical trials show
that the the sort of reduction in
overall sort of ward level infections
were somewhere between about 25 and 40
percent
and so i think everyone everyone is
imagining
when we do things that we do believe are
very effective we also get those sort of
same numbers
um basically a lot of sort of
the aspirational sort of infection
control um reduction is about 25
and so i think what it is is that we
sort of perceive chlorhexidine is this
very powerful
tool and i think that carries along with
sort of an intuition that it should work
really well
but you're right it doesn't it doesn't
have to it doesn't imply that it does
that especially when you think about
how often it's applied that you can you
know if you just do this a lot and it's
just okay
you get a reduction that is just okay
um but i think a lot of people
clinically and and from from talking to
clinicians
this seems to be surprising to people i
think a lot of people are expecting
chlorhexidine
to be much more effective on sort of a
per-use basis
okay well but i mean again it seems like
the procedure is still 25
so why would you expect it is more
efficient but okay yeah
um i think it's that people imagine that
there's a lot of other sort of pathways
that you can you can get infections
through
sure um but yeah i think it's i think
it's fair it's just sort of
reflecting on people's reaction to this
this work because
i've ended up sort of presenting
versions of this over the past four or
five years one person who is not
surprised
so now you can correct it well that's
excellent
all right so i i can i can uh take
inviter's privilege and ask so i don't
actually know that much about veterinary
teaching hospitals
um from putting on my one health
curious hat
how much interplay do you is there
between wildlife
that is just ambient and contact with
animals that are then brought into
i assume not a lot of wildlife is
brought into the teaching hospital but i
but that could be a false assumption but
i do assume sort of partner animals
domestic animals and agricultural
animals are brought in how much
interaction is there in an average
veterinary hospital
among different sort of categories of
animals that might have contact with
that's a that's a good question
essentially is the veterinary teaching
hospital itself sort of a mixing bowl
um so so for our veterinary teaching
hospital at least
um the livestock animals and the sort of
companion animals
us effectively have different wings of
the hospital um and indeed
sort of even in sort of the large animal
setting
most of the things we think of as
livestock animals so sheep cows llamas
etc
and horses are actually also separate uh
the equine icu is very swanky
um for the companion animals um
they're mixed together somewhat so you
can foresee sort of a
and they're they're kenneled so you can
for example see for ca
there was a contact between some unknown
wildlife
and a dog that dog comes to the
veterinary teaching hospital and now there's a lot of dog to dog contact um and one of the things that has made sort of looking at veterinary teaching hospitals challenging is when we think about human hospitals there's a there's this idea of terminal disinfection so when you leave your room we really clean your room you know we there's clorox and there's robots that shoot uv lasers and there's all kinds of great stuff um first of all veterinary teaching hospitals can't afford the robots but also the the kennel is never empty so there's never a this is just empty we're gonna hose it down with bleach so you don't necessarily get that same sort of you have this sort of continuous fomite exposure thing um that's one of the reasons i'm really interested in it is because i'm like oh that's that's weird contact i want to study that um so yeah it's definitely possible there's not a huge amount of different species mixing um mainly and also the wildlife we do get at least at our veterinary teaching hospital tends to be big wildlife so that ends up in the large animal side when you know or we get a grizzly or something like that which does happen on occasion thank you um all right are there any other other questions on any of the three acts of the the talk or things generally all right um i'm gonna say let's please thank eric again for a really nice lunch and learn seminar um and if you have any follow-up questions for him either on the thing on these things that he's described or in general if you're interested in in statistical simulation things in epidemiology um especially about data okay um but thank you so much for coming thank you all thank you eric that was great [Music] excellent talk yeah so um so alan is a pathologist at the vet school so you might
run into him some he does a lot of amphibian work
oh interesting yeah i'm on uh one of the pathologists
we have a phd residency program for pathology here at wsu and
i'm on someone's committee who's working on
elk hoof disease which i keep calling elf huff disease and that's not right
um but yeah she's working on that the pathologists are fun
yeah nice of course we're always fun excellent
all right are there specific grizzly diseases that get
treated in large animal hospitals like dude no
so i mean some some of it is is grizzly necropsy
um and then uh some of it is we are the closest veterinary teaching hospital
so occasionally if you hit a grizzly with your car
um people will show up with essentially a grizzly and a pickup truck
um which is awkward because once you once a grizzly has come in contact with humans
they can't be rewilded so you've sort of just given us a grizzly for life um
but but we have a group but we good news is we have a grizzly research center
um where we study things mostly about how the cardiovascular system of grizzlies work because
i eat an enormous meal and then take a nap is a really bad idea if you're a person
and apparently a swell idea if you're a grizzly bear so they're they're trying to figure out
why that is but yes we do on very rare occasion get very strange animals um but yeah for the most part it's still dogs and cats and then occasionally horses but it is one of the perks of working by the vet school is you can just walk by and be like is that a llama and yes it is today we're working on llamas
i really love the idea of of the involuntary gift of a lifelong grizzly that's yeah that's way worse than an easter puppy a grizzly is for life not just christmas yeah we actually see quite we see a lot of wildlife here and
ours are not grizzlies but black bear
and um i think the ones that maybe get a
little bit more
um hard to deal with are the ones
if you're trying to prove or disprove
that
a grizzly fed off of a human yeah
or a black bear in this case um
and i'm sure that that's some of the
cases that you all see too yeah
yeah but
[Music]
interesting covid thank you
all right all right thank you all very
much
thanks again thanks so much