EXHIBIT 2

DECLARATION OF DEREK CUMMINGS

I, Derek Cummings, hereby declare under the penalty of perjury pursuant to 28 U.S.C. § 1746:

1. I make this declaration based on my personal knowledge except where I have indicated otherwise. If called as a witness, I could and would testify competently and truthfully to these matters.

2. I am a Professor of Biology at the University of Florida and at the Emerging Pathogens Institute. I am a specialist in infectious disease epidemiology. I specialize in influenza, dengue and other mosquito-borne pathogens, and other respiratory illnesses. Before the pandemic of COVID-19, I had worked on multiple aspects of coronaviruses including an outbreak investigation of the first major outbreak of MERS (genetically related to SARS and SARS-CoV-2) in a hospital setting (in Saudi Arabia), efforts to estimate the extent of outbreaks of MERS and work to estimate the natural history of SARS. I have also conducted a large, multisite study of personal protective equipment to protect health care personnel from respiratory viruses including coronaviruses. My work on coronaviruses has been published in the New England Journal of Medicine, the Journal of American Medical Association and the Proceedings of the National Academy of Science.

Presently, I am providing guidance to the US CDC on personal protective equipment policy for the SARS-CoV-2 outbreak and providing input on models of the outbreak as part of a CDC working group.

3. COVID-19 is a disease caused by a novel zoonotic coronavirus, called SARS-CoV-2. It emerged in the Chinese province of Hubei in late 2019 and has since spread to 173 countries. The World Health Organization declared COVID-19 a pandemic on March 11, 2020. As of March 25, 2020, over 468,000 confirmed cases have been reported worldwide, causing over 21,000 deaths. The United States has had local transmission since January 2020, and since March has been experiencing an exponential rise in confirmed cases and widespread transmission across the country.

4. COVID-19 can cause severe symptoms, in particular pneumonia (inflammation of the lungs associated with infection), and can lead to death. Certain populations are at particularly high risk of severe outcomes. The CDC advises that individuals over 65 years old, individuals who are immunocompromised, and individuals with certain comorbidities including lung disease, heart disease, obesity, diabetes are at high risk for severe COVID-19 illness. Various studies have examined the time from symptom onset to hospitalization or severe symptoms, with estimates of the average

currently ranging from 7-9 days.

5. The case fatality rate among individuals presenting with symptoms has been estimated at 1.4% in Wuhan, the capital city of Hubei province, with higher rates in those over 65 and those with comorbidities. Case fatality rates are likely to vary from setting to setting, increasing as the healthcare system in an area becomes overburdened and sick patients are unable to be prioritized. Case fatality rates are also affected by surveillance practices in any setting which affect the number of cases included in the denominator of this rate.

6. Hospitalization with COVID-19 commonly is associated with need for intensive care and a ventilator to assist breathing. There are currently estimated to be ~45,000 ICU beds and ~160,000 ventilators in the USA, many of which are occupied by individuals sick with illnesses other than COVID-19. Uncontrolled spread of the virus would likely result in over 50% of the population becoming infected. Model projections, except under the most strict control measures, predict incidence of patients requiring hospitalization or ventilators rising well above the US capacity.

7. SARS-CoV-2 is a respiratory pathogen, meaning that it is spread through respiratory secretions, for example droplets expelled by an infected individual coughing or sneezing, in which the pathogen can remain viable

for at least 3 hours. Transmission can occur either by direct person-to-person contact, inhalation of these droplets, or by touching surfaces contaminated with these droplets.

8. There are multiple sources of evidence documenting pre-symptomatic transmission (i.e. the ability of an infected individual to infect others before their symptoms appear). A study in Singapore and Tianjin, China, estimated that 50% of transmission is due to pre-symptomatic individuals. Interventions targeting only transmission by sick individuals (such as isolation of those with symptoms) are therefore unlikely to contain transmission.

9. Timely and widespread testing of symptomatic individuals and their contacts is therefore essential to slowing transmission of the virus. The success of massive testing, active contact tracing, and isolation of individuals showing any COVID-19 symptoms has been demonstrated by the case of the Republic of Korea, which appears to have controlled local transmission. The scale and extent of transmission in the United States makes these tactics on their own infeasible, as contact tracing is very resource-intensive. However, without widespread availability of testing for individuals experiencing symptoms, it is impossible to know if local transmission is occurring in a

county or city and impossible to refine interventions in a specific location with the information that accurate surveillance provides.

10. There is no vaccine against SARS-CoV-2 infection, nor are there prophylactic pharmaceutical interventions or treatments that have been shown to reduce infection risk or symptom severity. Experimental treatments are, at a minimum, months from widespread availability due to the need to demonstrate effectiveness and obtain regulatory approval.

11. In the absence of pharmaceutical interventions, the only way to slow the rate of transmission is through a combination of preventive measures, chiefly social distancing, hygiene and isolation of cases. The lockdown in Wuhan, an extreme form of social distancing, was followed by a sustained decrease in transmission, and two months later the daily number of reported cases has dropped to zero, and lockdown restrictions will be lifted on April 8, 2020.

12. The goal of social distancing is to reduce the average number of contacts that individuals in the population have. All individuals should practice social distancing to the extent they can, not just to reduce their own risk of acquiring COVID-19, but to reduce their risk of infecting others. Reduced transmission reduces the growth rate of cases, easing pressure on hospitals and giving institutions more time to prepare.

13. Detained populations, including those in immigration detention facilities, are at high risk for infectious disease compared to the general population. Factors contributing to this excess risk include poor sanitation, lack of access to hygiene precautions, and high population density. In addition, transfer of detained immigrants between facilities complicates efforts to control infection and trace contacts. A recent outbreak of mumps in immigration detention facilities demonstrate the ability of an infectious agent to spread rapidly between centers, infecting at least 900 people from September 2018-August 2019.

14. The ability of SARS-CoV-2 to spread rapidly and widely in a closed population is demonstrated by the experience of cruise ships, including the Diamond Princess, on which around 700 (19%) of passengers and crew on board were infected over the course of three weeks despite the initiation of quarantine protocols. 11 of these individuals subsequently died.

15. Transmission of SARS-CoV-2 in detention facilities in the United States would lead to widespread and severe illness among the detained population, particularly among those considered at high risk.

16. Personal hygiene measures are effective at reducing infection risk, but for a virus as transmissible as SARS-CoV-2 they will be not be sufficient on their

own to curtail its spread. Furthermore, hygiene measures are only effective when there is sufficient access to them, and many individuals in incarcerated populations do not have adequate access to soap and water. Finally, other measures, such as regular disinfecting of surfaces, should supplement these efforts.

17. Due to the substantial amount of pre-symptomatic transmission observed in other settings, it is impossible to prevent intake of infectious individuals through screening for symptoms alone. Moreover, due to inadequate rates of COVID-19 testing in the United States, it is not possible to rule out local transmission because of lack of confirmed cases. Merely asking about travel history to areas with sustained community transmission, or contact with infected individuals, cannot rule out the possibility that an individual is infected with SARS-CoV-2 upon intake into a detention center.

18. Moreover, staff members who may be living in areas with sustained community transmission are able to transmit the disease to detained immigrants. This transmission too could occur while the staff members are asymptomatic, and thus cannot be controlled by screening for symptoms or contact history.

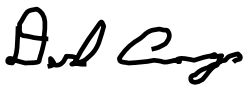
19. These concerns are not hypothetical: a detained immigrant in the Bergen

County Jail, NJ, tested positive for SARS-CoV-2 on March 24, 2020, and that staffers at Elizabeth Detention Center, NJ, and Aurora Detention Center, CO, have also tested positive for SARS-CoV-2

20. Isolation of symptomatic individuals within detention settings similarly will not stop transmission before symptom onset. As there are several modes of transmission other than direct person-to-person contact, it is not possible to identify all individuals who have had contact with a COVID-19 case. Quarantine of suspected contacts will therefore likely reduce the rate of spread of the virus in a facility but will not eliminate transmission.

Pursuant to 28 U.S.C. 1746, I declare under penalty of perjury that the foregoing is true and correct.

Executed this 29 day in March, 2020 in Gainesville, Florida.



Prof. Derek Cummings

EXHIBIT A

CURRICULUM VITAE

DEREK A.T. CUMMINGS

PERSONAL DATA

Business Address: Department of Biology
University of Florida
Bartram Hall
Gainesville, FL 32608

Mobile: (410)-916-1371
Fax: (352)-392-9925
Email: datc@ufl.edu

EDUCATION AND TRAINING

PhD, 2004	Johns Hopkins University, Whiting School of Engineering Geography and Environmental Engineering
MHS, 2004	Johns Hopkins University, Bloomberg School of Public Health International Health
MS, 2001	Johns Hopkins University, Whiting School of Engineering Geography and Environmental Engineering
ScB, 1996	Brown University Chemistry

PROFESSIONAL EXPERIENCE

UF Preeminence Professor	Department of Biology, University of Florida 2015-present
UF Preeminence Professor	Emerging Pathogens Institute 2015-present
Adjunct Professor	Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health 2015-present
Adjunct Professor	Department of International Health, Johns Hopkins Bloomberg School of Public Health 2015-present
Associate Professor	Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health 2013-2015

Adjunct Associate Professor	Department of International Health, Johns Hopkins Bloomberg School of Public Health 2013-2015
Adjunct Associate Professor	Department of Epidemiology, University of Pittsburgh Graduate School of Public Health 2013-2015
Nonresident Fellow	Brookings Institution 2007-present
Assistant Professor	Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health 2007-2013
Adjunct Assistant Professor	Department of International Health, Johns Hopkins Bloomberg School of Public Health 2007-2013
Adjunct Assistant Professor	Department of Epidemiology, University of Pittsburgh Graduate School of Public Health 2007-2013
Visiting Assistant Professor	Department of Epidemiology, University of Pittsburgh Graduate School of Public Health, University of Pittsburgh 2006 – 2007
Visiting Assistant Professor	Department of Biostatistics, Bloomberg School of Public Health, Johns Hopkins University 2006 – 2007
Research Associate	Department of International Health, Bloomberg School of Public Health, Johns Hopkins University 2004 – 2006
Program Coordinator	NIH Modeling Infectious Disease Agents Study (MIDAS) Center, University of Pittsburgh/Johns Hopkins University (pre-2006) 2003 - 2009
Research Assistant	Department of Geography and Environmental Engineering, GWC Whiting School of Engineering, Johns Hopkins University 1999-2004
Case Worker	Coalition for the Homeless, Crisis Intervention Program, NYC 1998

PROFESSIONAL ACTIVITIES

Society Membership

Society for Epidemiological Research
2004-present

American Academy for the Advancement of Science
2004-present

Asia Pacific Society of Medical Virology
2001-present

American Society of Tropical Medicine and Hygiene
2000-present

DIMACS Focus on Computation and Mathematical Epidemiology
2000-2008

Participation on Advisory Panels

WHO Working Group on Dengue Burden Estimation
2014-present

EcoHealthNet
Member of Steering Committee
2015-present

NIH P01 Flavivirus Infections: Pathogenesis and Prevention
Member of External Advisory Committee
2013-present

WHO Disease Reference Group on Dengue and other Emerging Viral Diseases
2010-2011

Member of the WHO Informal Network for Mathematical Modeling, Working Group on Influenza A (H1N1), 2009
2009

U.S. Department of Health and Human Services, Secretary's Advisory Council on Public Health Preparedness, Smallpox Modeling Working Group
2000-2002

Consultations
World Health Organization-Immunization and Vaccine-related Implementation Research (IVIR) Advisory Committee Meeting-Consultation on Dengue Risk Maps
2017

MSF/Epicentre
Design of vaccine trial to assess fractional dose of yellow fever vaccine. Trial to be conducted in Uganda and Kenya
2016-present

MSF/Epicentre
Analysis of vaccine trial data from Rotavirus vaccine trial
2016

World Health Organization
Consultation on Mathematical Modeling of Dengue Intervention Impact
2014

Ministry of Health of Liberia
Ebola Outbreak Epidemiological Investigation
2014-2015

Kingdom of Saudi Arabia MERS-CoV Outbreak Investigation Team
2013-2014

Medimmune
Estimation of Burden of Influenza B
2011-2012

World Health Organization.
Disease Reference Group on Dengue and other Emerging Viral Diseases of Public Health Importance. Scientific Committee.
2009

Epicentre and Medecins Sans Frontieres (MSF)
Outbreak investigation of measles in Maroua, Cameroon
2009

World Health Organization. Center for Vaccine Research.
Preparation of analysis of dengue models to assess future vaccine candidates.
2008

Data Safety and Management Boards (DSMB)
MSF-Epicentre
Randomized, double-blind non-inferiority trial of two antivenoms for the treatment of snakebite with envenoming, Central African Republican
2015-present

MSF-Epicentre
Effect of systematic utilization of antibiotic therapy in the ambulatory treatment of uncomplicated severe acute malnutrition
2013-2014

EDITORIAL ACTIVITIES

Study Sections
Member, NIH Clinical Research and Field Studies of Infectious Disease Study Section
2016-2019

NIH Special Emphasis Panel on International Collaborations in Environmental Health-ad hoc participation

2014, 2015

NIH Clinical Research and Field Studies of Infectious Disease Study Section-ad hoc participation
2013, 2014, 2016

NIH Director's Independence Award-ad hoc participation
2014, 2015, 2016

NIH Modeling and Analysis of Biological Systems-ad hoc participation
2013

NIH Infectious Disease, Reproductive Health, and Asthma/Pulmonary Conditions-ad hoc participation
2012, 2013

NSF/NIH Ecology and Evolution of Infectious Diseases-ad hoc participation
2012

Peer Review Activities

Associate Editor:
American Journal of Epidemiology, 2010-2014

Academic Editor:
PLoS Medicine, 2011, 2012, 2013, 2014, 2015
PLoS Computational Biology, 2009-2010, 2014

Referee:
Nature, New England Journal of Medicine, Science, PLoS Biology, PLoS Medicine, Epidemiologic Reviews, American Journal of Epidemiology, Biostatistics, Emerging Infectious Diseases, Mathematical and Computer Modeling, PLoS Neglected Tropical Diseases, PLoS One, Biosecurity and Bioterrorism, Journal of Theoretical Biology, American Journal of Tropical Medicine and Hygiene, Journal of the Royal Society Interface, Proceedings of the Royal Society B, Physics Review A, Lancet, Proceedings of the National Academy of Science, Science, eLife

HONORS AND AWARDS

Awards

KAVLI Frontiers in Science	2017
University of Florida Term Professorship	2017
International Society for Disease Surveillance Outstanding Research in Biosurveillance	2015
JHBSPH Teaching Excellence Award	2015
Advising, Mentoring, and Teaching Recognition Award (AMTRA)	2012
Burroughs Wellcome Career Award at the Scientific Interface	2007
UTRA Fellow, Brown University	1996
Meikeljohn Fellow, Brown University	1994
Rotary Scholarship	1992
National Merit Scholar	1992

PUBLICATIONS (*served as advisor/mentor)
127 peer-reviewed papers, cited 12334 times (Google Scholar), 21 papers have been cited more than 100 times, H-index of 44 (44 papers have been cited more than 44 times)

Journal Articles

1. **Cummings DA**, McMaster J, Rieger AL, Rieger PH. EPR spectroscopic and theoretical study chromium(I) carbonyl phosphine and phosphonite complexes. *Organometallics* 1997;16:4362-4368.

2. Epstein JM, **Cummings DAT**, Chakravarthy S, Singa RM, Burke DS. Toward a containment strategy for smallpox bioterror: An individual based computational approach. *Brookings Monographs* 2004.

3. **Cummings DAT**, Irizarry RA, Huang NE, Endy TP, Nisalak A, Ungchusak K, Burke DS. Travelling waves in the occurrence of dengue haemorrhagic fever in Thailand. *Nature* 2004;427:344-347.

4. Longini IM, Jr., Nizam A, Xu S, Ungchusak K, Hanshaoworakul W, **Cummings DAT**, Halloran ME. Containing pandemic influenza at the source. *Science* 2005;309:1083-7.

5. Ferguson NM, **Cummings DAT**, Cauchemez S, Fraser C, Riley S, Meeyai A, Iamsirithaworn S, Burke DS. Strategies for containing an emerging influenza pandemic in Southeast Asia. *Nature* 2005;437:209-214.

6. **Cummings DAT**, Schwartz IB, Billings L, Shaw LB, Burke DS. Dynamic effects of antibody-dependent enhancement on the fitness of viruses. *Proceedings of the National Academy of Sciences* 2005;102:15259-64.

7. Schwartz IB, Shaw LB, **Cummings DAT**, Billings L, McCrary M, and Burke DS. Chaotic desynchronization of multistrain diseases. *Physical Review E*. 2005;72:066201.

8. **Cummings DAT**, Moss WJ, Long K, Wiysonge CS, Muluh TJ, Kollo B, Nomo E, Wolfe ND and Burke DS. Improved measles surveillance in Cameroon reveals two major dynamic patterns of incidence. *International Journal of Infectious Diseases* 2006;10:148-155.

9. Ferguson NM, **Cummings DAT**, Fraser C, Cajka JC, Cooley PC, Burke DS. Strategies for mitigating an influenza pandemic. *Nature* 2006;442:448-452.

10. Burke DS, Epstein JM, **Cummings DAT**, Parker JI, Cline KC, Singa RM, Chakravarty S. Individual-based computational modeling of smallpox epidemic control strategies. *Academic Emergency Medicine* 2006;13:1142-1149.

11. Longini, IM, Halloran ME, Nizam A, Yang Y, Xu S, Burke DS, **Cummings DAT**, Epstein JM. Containing a Large Bioterrorist Smallpox Attack: A Computer Simulation. *International Journal of Infectious Diseases* 2007;11:98-108.

12. Billings L, Schwartz IB, Shaw LB, McCrary M, Burke DS, **Cummings DAT.** Instabilities in multiserotype disease models with antibody-dependent enhancement. *Journal of Theoretical Biology* 2007;246:18-27.

13. Lessler J, **Cummings DAT**, Fishman S, Vora A, Burke DS. Transmissibility of Swine Flu at Fort Dix, 1976. *Journal of the Royal Society Interfaces* 2007;4:755-762.

*14. Vora A, Burke DS, **Cummings DAT**. The impact of a physical geographic barrier on the dynamics of measles. *Epidemiology and Infection* 2008;136:713-720.

15. Halloran, M.E., Ferguson N.M., Eubank, S., Longini, I.M., **Cummings, D.A.T.**, Lewis, B., Xu, S., Fraser, C., Vullikanti, A., Germann, T.C., Wagener, D., Beckman, R., Kadau, K., Barrett, C., Macken, C., Burke, D.S., Cooley, P. Modeling targeted layered containment of an influenza pandemic in the United States. *Proceedings of the National Academy of Sciences* 2008;105:4639-4644.

16. Epstein, JM, Parker J, **Cummings DAT**, Hammond RA. Coupled Contagion Dynamics of Fear and Disease: Mathematical and Computational Explorations. *PLoS ONE* 2008;3:e3955.

*17. Lessler, J, Reich, NG, Brookmeyer R, Perl TM, Nelson KE, **Cummings DAT**. A systematic review of the incubation periods of acute respiratory viral infections. *Lancet Infectious Diseases* 2009;9:291-300.

18. Reich NG, Lessler J, **Cummings DAT**, Brookmeyer R. Estimating incubation period distributions with coarse data. *Statistics in Medicine* 2009;28:2769-84

19. **Cummings DAT**, Iamsirithaworn S, Lessler JT, McDermott A, Prasanthong R, Nisalak A, Jarman RG, Burke DS, Gibbons RV. The impact of the demographic transition on dengue in Thailand: insights from a statistical analysis and mathematical modeling. *PLoS Medicine* 2009;6:e1000139.

20. **Cummings DAT**. Temporal and Spatial Dynamics of Dengue Virus Transmission. *Frontiers in Dengue Virus Research.* 2009:173-181.

*21. Johansson M, **Cummings DAT**, Glass G. Multi-year climate variability and dengue: El Niño Southern Oscillation, Weather, and Dengue Incidence in Puerto Rico, Mexico, and Thailand. *PLoS Medicine* 2009;6:e1000168.

*22. Lessler J, Reich N, **Cummings DAT**, NYC DOHMH Swine Influenza Investigation Team. Outbreak of 2009 pandemic influenza A (H1N1) at a New York City High School. *New England Journal of Medicine.* 2009 Dec 31;361(27):2628-36.

23. Solomon BD, Lacbawan F, Mercier S, Clegg NJ, Delgado MR, Rosenbaum K, Dubourg C, David V, Olney AH, Wehner LE, Hehr U, Bale S, Paulussen A, Smeets HJ, Hardisty E, Tylki-Szymanska A, Pronicka E, Clemens M, McPherson E, Hennekam RCM, Hahn J, Stashinko E, Levey E, Wieczorek D, Roeder E, Schell-Apacik CC, Booth CW, Thomas RL, Kenwrick S, **Cummings DAT**, Bous SM, Keaton A, Balog JZ, Hadley D, Zhou N, Long R, Vélez JI, Pineda-Alvarez DE, Odent S, Roessler E, Muenke M. Mutations in ZIC2 in Human Holoprosencephaly: Description of a Novel ZIC2-Specific Phenotype and Comprehensive Analysis of 157 Individuals. *Journal of Medical Genetics* 2010;47:513-24.

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*25. Word DP, Young JK, **Cummings DAT**, Laird CD. Estimation of seasonal transmission parameters in childhood infectious disease using a stochastic continuous time model. *Proceedings of the 20th European Symposium on Computer Aided Process Engineering* 2010:229-234.

*26. Fried J, Gibbons RV, Kalayanarooj S, Thomas S, Srikiatkhachorn A, Yoon IK, Jarman RG, Greene S, **Cummings DAT**. Serotype specific differences in the risk of dengue hemorrhagic fever in hospitalized cases in Bangkok, Thailand, 1994-2006. *PLoS Neglected Tropical Diseases* 2010;4:e617.

27. Solomon, BD, Pineda-Alvarez DE, Raam MS, **Cummings DAT**. Evidence for inheritance in patients with VACTERL association. *Human Genetics* 2010;127:731-3.

*28. Lessler J, Brookmeyer R, Reich NG, Nelson KE, **Cummings DAT**, Perl TM. Identifying probable sources of infection for respiratory viruses. *Infection Control and Hospital Epidemiology* 2010;31:809-15.

*29. van Panhuis WG, Gibbons RV, Endy TP, Rothman AL, Nisalak A, Burke DS, **Cummings DAT**. Inferring the serotype of dengue virus infections based on pre- and post-infection neutralizing antibody titers. *Journal of Infectious Diseases.* 2010;202:1002-10.

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*31. Lessler J, dos Santos T, Aguilera X, Brookmeyer R. PAHO Influenza Technical Working Group, **Cummings, DAT**. H1N1pdm in the Americas. *Epidemics* 2010;2:132-138.

*32. Lessler J, Moss WJ, Lowther SA, **Cummings DAT**. Maintaining high rates of measles immunization in Africa. *Epidemiology and Infection* 2010;5:1-11.

33. Yang Y, Halloran ME, Daniel MJ, Longini IM, Jr., Burke DS, **Cummings DAT**. Modeling competing infectious pathogens from a Bayesian perspective: application to influenza studies with incomplete laboratory results. *Journal of the American Statistical Association* 2011;105:1310-1322.

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39. Lee BY, Connor D, Kitchen S, Bacon K, Shah M, Brown S, Bailey R, Laosiritaworn Y, Burke DS, **Cummings DAT**. Economic value of dengue vaccine in Thailand. *American Journal of Tropical Medicine and Hygiene* 2011;84:764-72.

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41. Lessler J, **Cummings DAT**, Read J, Wang S, Zhu H, Smith G, Guan Y, Jiang C, Riley S. Location-specific patterns of exposure to recent pre-pandemic strains of influenza A in southern China. *Nature Communications* 2011;2:423.

42. Johansson M, Hombach J, **Cummings DAT**. Models of the impact of dengue vaccines: a review of current research and potential approaches. *Vaccine* 2011;29:5860-8.

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46. Chaninan Sonthichai, Iamsirithaworn S, **Cummings DAT**, Shokekird P, Niramitsantipong A, Khumket S, Chittaganpitch M, Lessler J. Effectiveness of non-pharmaceutical interventions in controlling an Influenza A outbreak in a school, Thailand, November 2007. *Outbreak, Surveillance and Investigation Report* 2011;4:6-11.

*47. Word DP, **Cummings DAT**, Burke DS, Iamsirithaworn S, Laird CD. A nonlinear programming approach for estimation of transmission parameters in childhood infectious disease using a continuous time model. *Journal of the Royal Society Interface*. 2012 Feb 15. [Epub ahead of print].

*48. Reich NG, Lessler J, **Cummings DAT**, Brookmeyer R. Estimating absolute and relative case fatality ratios from infectious disease surveillance data. *Biometrics.* 2012. doi: 10.1111/j.1541-0420.2011.01709.x. [Epub ahead of print]

49. **Cummings DAT**, Boni M, WHO-VMI Dengue Vaccine Modeling Group. Assessing the potential of a candidate dengue vaccine with mathematical modeling. *PLoS Neglected Tropical Diseases.* 2012 Mar;6(3):e1450.

*50. Stark JH, Sharma R, Ostroff S, **Cummings DAT**, Stebbins S, Ermentrout B, Burke DS, Wisniewski S. Local Spatial and Temporal Processes of Influenza in Pennsylvania, USA: 2003-2009, *PLoS One*, 2012;7(3):e34245.

51. Burton J, **Cummings DAT**, Schwartz I, Billings L. Disease Persistence in Epidemiological Models: The Interplay between Vaccination and Migration. *Mathematical Biosciences*. 2012:239(1):91-6.

52. Read JM, Edmunds WJ, Riley S, Lessler JT, **Cummings DAT**. Close encounters of the infectious kind: a review of methods to measure social mixing behavior. *Epidemiology and Infection.* 2012 Jun 12:1-14..

*53. Salje H, Lessler J, Endy TP, Curriero F, Gibbons RV, Nisalak A, Nimmannitya S, Kalayanarooj S, Jarman RG, Thomas S, Burke DS, **Cummings DAT**. Revealing the micro-scale spatial signature of dengue transmission and immunity in an urban population. *Proceedings of the National Academy of Sciences.* 2012 Jun 12;109(24):9535-8.

54. Blackwood JC, **Cummings DAT**, Broutin H, Iamsirithaworn S, Rohani P. The population ecology of infectious diseases with pertussis as a case study. *Parasitology*. 2012 Apr 13:1-11.

55. Lessler J, Riley S, Read JM, Wang S, Zhu H, Smith GJD, Guan Y, Jiang CQ, **Cummings DAT**. Evidence for Antigenic Seniority in Influenza A (H3N2) Antibody Responses in Southern China. *PLoS Pathogens*. 2012 8(7): e1002802. doi:10.1371/journal.ppat.1002802

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*57. Rainwater-Lovett K, Rodriguez-Barraquer I, **Cummings DAT**, Lessler J. Variation in dengue virus plaque reduction neutralization testing: systematic review and pooled analysis. *BMC Infectious Diseases.* 2012 Sep 28;12(1):233. [Epub ahead of print]

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Chapters

1. **Cummings DAT**, Lessler J. Infectious Disease Dynamics. In Infectious Disease Dynamics: Theory and Practice. Third Edition. 2016.

2. Perkins TA, Reiner, Jr., RC, Rodriguez-Barraquer I, Smith DL, Scott TW, **Cummings DAT**. A review of transmission models of dengue: a quantitative and qualitative analysis of model features. In Dengue and Dengue Hemorrhagic Fever. Second Edition. 2014/8/29. CABI Publishing.

Meeting abstracts and presentations

*served as advisor/mentor; presenting author)

1. AL Roberts, **Cummings DA**, Totten LA, Leckta T. Computational methods for predicting heats of formation of halogenated methyl and ethyl radicals. National Meeting of the American Chemical Society, 2000, San Francisco, CA

2. **Cummings DAT**, Burke DS. Spatial Synchrony and Phase Coherency of Seasonal Variation in Temperature, Rainfall and Dengue in Thailand. *GEOMED, 2003, Baltimore, MD*

3. **Cummings DAT**, Huang NE, Nisalak A, Endy TP, Burke DS. Periodic traveling waves in dengue hemorrhagic fever incidence in Thailand. *American Society of Tropical Medicine and Hygiene, 2003, Philadelphia, PA*

4. **Cummings DAT**, Huang NE, Nisalak A, Endy TP, Burke DS. Traveling waves in dengue hemorrhagic fever incidence in Thailand.*6th Asia Pacific Congress of Medical Virology. 2003, Kuala Lumpur, Malaysia*

5. **Cummings DAT**, Huang NE, Nisalak A, Endy TP, Burke DS. Spatial coherence and association of temperature, rainfall and the incidence of dengue hemorrhagic fever in Thailand. *53rd Annual Meeting of the American Society of Tropical Medicine and Hygiene, 2004, Miami, FL*

6. **Cummings DAT**, Schwartz IB, Shaw L, Billings L, Burke DS. Simulation of the Population Effects of Dengue Vaccination. *First Asian Regional Dengue Research Network Meeting, 2004, Bangkok. Thailand*

7. **Cummings DAT**, Schwartz IB, Shaw L, Billings L, Burke DS. Dynamic effects of antibody-dependent enhancement on the fitness of dengue viruses. *National Institutes of Allergy and Infectious Disease Modeling Immunity for Biodefense Annual Meeting, 2006, Boston, MA*

*8. **Cummings DAT,** Rabaa MA. The relative timing of seasonal weather patterns and dengue incidence across the Southeast Asian region. 55th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Atlanda, G, 2006. [Am J Trop Med Hyg 2005;75:S137-138].

*9. Fichtenberg CM, **Cummings DAT**, Glass TA, Ellen JM. The impact of differential mixing by sexual activity on racial/ethnic STI disparities: A simulation study. 2nd North American Congress of Epidemiology, Seattle, WA, 2006.

10. **Cummings DAT**, Schwartz I, Burke DS, Gibbons RV. Spatial heterogeneity in the force of infection of dengue in Thailand and the spatial structure of phase relationships in multiannual oscillations. 57th Annual Meeting of the American Society of Tropical Medicine and Hygiene, New Orleans, LA, 2008.

11. **Cummings DAT**, Imsirithaworn S, Lessler J, Prasanthong R, Jarman RG, Burke DS, Gibbons RV. Dengue and the demographic transition. 57th Annual Meeting of the American Society of Tropical Medicine and Hygiene, New Orleans, LA, 2008.

*12. Rodriguez-Barraquer I, Marques E, **Cummings DAT**. Age shifts of DHF in Brazil: insight from a serological survey in Recife. 58th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Washington, DC, 2009.

*13. Benenson JD, Gibbons RV, Nisalak A, Kalayanarooj S, **Cummings DAT**. Susceptible reconstruction and serotype specific estimates of the transmissibility and seasonality of transmission of dengue viruses in Thailand. 58th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Washington, DC, 2009.

*14. Van Panhuis WG, Gibbons RV, Endy T, Burke DS, **Cummings DAT**. Assessing the accuracy of inferring the serotype of dengue virus infections based on pre- and post-infection neutralizing antibody titers. 58th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Washington, DC, 2009.

15. **Cummings DAT**, Iamsirithaworn S, Lessler JT, McDermott A, Prasanthong R, Nisalak A, Jarman RG, Burke DS, Gibbons RV. The impact of changes in human demography on cycles of dengue hemorrhagic fever incidence in Thailand. 42nd Annual Meeting of the Society for Epidemiologic Research, Anaheim, CA, 2009.

*16. Lessler J, Read JM, Riley SR, **Cummings DAT**. The use of satellite imagery in contact/travel questionnaires. 42nd Annual Meeting of the Society for Epidemiologic Research, Anaheim, CA, 2009.

*17. Lessler J, **Cummings DAT**, Read JM, Wang S, Zhu H, Smith GJD, Guan Y, Jiang CQ, Riley S. Location-specific patterns of exposure to recent pre-pandemic strains of Influenza A in Southern China. 3rd North American Congress of Epidemiology, Montreal, Canada, 2010.

18. Lessler J, Reich NG, Iamsirithaworn S, **Cummings DAT**. Predicition and imputation of spatio-temporal data: dengue surveillance in Thailand. 3rd North American Congress of Epidemiology, Montreal, Canada, 2010.

*19. Althouse B, Sall A, Hanley K, Diallo M, Watts D, Weaver S, **Cummings DAT**. A multi-host, multi-vector SIR model of Dengue-2 virus in Senegal. 59th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Atlanta, GA, 2010.

*20. Van Panhuis WG, Luxemburger C, Pengsaa K, Limkittkil K, Sabchareon A, **Cummings DAT**, Lang J, Durbin AP. A longitudinal analysis of maternal dengue antibody kinetics among infants in Bangkok. 59th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Atlanta, GA, 2010.

*21. Reich NG, Shrestha S, King AA, Rohani P Gibbons RV, **Cummings DAT**. Using a discrete-time state-space model to estimate the degree of cross-protection between serotypes of dengue virus due to infection. 3rd International Conference on Infectious Disease Dynamics, Boston, MA, 2011.

*22. Lessler J, Metcalf CM, **Cummings DA**, Grenfell BT. The coverage of measles vaccinations activities in Africa. 3rd International Conference on Infectious Disease Dynamics, Boston, MA, 2011.

*23. Chadsuthi S, Althouse B, Iamsirithaworn S, Wannapong T, **Cummings DAT.** Climate, land use and travel times predict the spatial advance of cases of chikungunya during an outbreak in Southern Thailand. 60th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA 2011.

*24. Rainwater-Lovett K, Rodriguez-Barraquer I, **Cummings DAT**, Lessler J. Variation in dengue virus plaque reduction neutralization testing: systematic review and pooled analysis. 60th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA 2011.

*25. Althouse BM, Ng YY, **Cummings DAT**. Prediction of dengue incidence using search query surveillance. 60th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA 2011.

26. **Cummings DAT**, Reich NG, Burke DS, Nisalak A, Jarman R, Gibbons RV. Estimates of the degree of length of cross-protection between dengue serotypes from time series models. 60th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA 2011.

*27. Rodriguez-Barraquer I, Buathong R, Iasirithaworn S, Lessler JT, Jarman RG, **Cummings DAT**. The changing epidemiology of dengue in Thailand: insights from serological studies conducted in the same location, 30 years apart. 60th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA 2011.

*28. Buathong R, Rodriguez-Barraquer I, Iasirithaworn S, Lessler JT, Jarman RG, Gibbons RV, **Cummings DAT.** Serological survey of dengue infections among individuals in Rayong, Thailand. 60th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA 2011.

*29. Azman A, Salje J, Rodriguez-Barraquer I, Althouse BM, Endy TP, Nisalak A, Jarman R, Gibbons RV, **Cummings DAT**. Longitudinal characterization of antibody response to dengue virus in Bangkok, Thailand. 60th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA 2011.

*30. Salje H, Lessler J, Endy T, Curriero F, Gibbons RV, Nisalak A, Nimmannitya S, Jarman R, Burke DS, **Cummings DAT**. Evidence for spatially and temporally clustered transmission and immunity of dengue virus from hostpial-based surveillance. 60th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Philadelphia, PA 2011.

31. Building models of school-based interventions to control influenza and other respiratory pathogens: the role of proximity detectors and contact surveys to describe the social mixing of school aged children. **Cummings DAT**, Cousins JH, Creppage K, Galloway D, Guclu H, Li K, Noble E, Brown S, Rainey J, Read J, Gao H, Uzicanin A, Vukotich CJ Sr., Zimmer SM. Dynamics of Preparedness. University of Pittsburgh.

32. Seroprevalence of dengue immunity among multiple species of non-human primates in Senegal. American Society of Tropical Medicine and Hygiene. **Cummings DAT**, Althouse BA, Cummings DAT, Guerbois M, Althouse BM, Sall AA, Diallo M, Diallo D, Diop O, Benefit B, Simons E, Watts DM, Weaver SC, Hanley KA. *American Society of Tropical Medicine and Hygiene. 2013.*

*33. Potential opportunities and perils of imperfect dengue vaccines: Direct vs. indirect vaccine effects Rodriguez-Barraquer I, Mier-y-Terán-Romero L, Schwartz IB, Burke DS, **Cummings DAT**. *Epidemics. Amsterdam, 2013.*

34. Recreating Historic Patterns of Influenza Incidence from Cross-Sectional Serologic Data. Lessler J, Riley S, Read JM, Zhu H, Jiang CQ, Guan Y, **Derek AT Cummings.** *Epidemics. Amsterdam, 2013.*

35. Social behavior and influenza infection. Kucharski AJ, Kwok KO, Wei VWI, Cowling BJ, Read JM, Lessler JT, Cummings DAT, Riley S, *Epidemics. Amsterdam, 2013.*

36. Social connectivity along a population density gradient in southern China. Read JM, Lessler J, Riley S, Wang S, Tan LJ, Kwok KO, Guan Y, Jiang CQ, **Cummings DAT**. *Epidemics. Amsterdam, 2013.*

37. Nonlinear Programming Techniques for Efficient Estimation of Large Spatio-Temporal Infectious Disease Models. **Cummings DAT**, Laird CD, Word D, Burke DS. *MIDAS Annual meeting*. 2014

38. Adjusting underreported real time case data for prediction of Dengue in Thailand. Sakrejda K, Reich NG, **Cummings DAT**, Suangtho P, Hinjoy S, Iamsirithaworn S, Clapham HE, Salje H. *American Society of Tropical Medicine and Hygiene.* 2014

*39. Characterizing global and local trends in dengue transmission: insight from age-specific surveillance data. Rodriguez Barraquer I, **Cummings DAT.** *American Society of Tropical Medicine and Hygiene.* 2014

*40. Estimating cross-enhancement and cross-protection of dengue viruses using time series data from Thailand. Clapham HE, Reich NG, Yoon IK, Jarman RG, Sakrejda K, Fernandez S, Nisalak A, Kalayanarooj S, **Cummings DAT.** *American Society of Tropical Medicine and Hygiene.* 2014

*41. Evidence for the recent emergence of dengue in Bangladesh: results from a seroprevalence study. Salje H, Naser AM, Rahman M, Rahman MZ, Lessler J, **Cummings DAT**, Luby SP, Gurley E. *American Society of Tropical Medicine and Hygiene.* 2014

*42. Mechanisms of traveling waves and periodic spatial synchronization of dengue hemorrhagic fever incidence in Thailand. Mier-y-Teran Luis, Grabowski K, Lessler J, Salje H, Rodriguez-Barraquer I, Burke D, Anantapreecha S, A-Nuegoonpipat A, Jarman R, Iamsirithaworn S, Bianco Si, Shaw LB, Schwartz IB, **Cummings DAT**. *American Society of Tropical Medicine and Hygiene.* 2014

43. Real-time forecasting of the 2014 dengue fever season in Thailand. Reich NG, Sakrejda K, **Cummings DAT**, Suarngtho P, Hinjoy S, Iamsiithaworn S, Clapham HE, Salje H, Lessler J. *American Society of Tropical Medicine and Hygiene.* 2014

*44. Variability in dengue titer estimates from plaque reduction neutralization tests poses a challenge to epidemiological studies and vaccine development. Salje H, Rodriguez-Barraquer I, Rainwater-Lovett K, Nisalak A, Thaisomboonsuk B, Thomas SJ, Fernandez S, Jarman RG, Yoon IK, **Cummings DAT.** *American Society of Tropical Medicine and Hygiene.* 2014

*45. What proportion of dengue virus infections result in no apparent disease? Clapham HE, **Cummings DAT**, Johansson MA. *American Society of Tropical Medicine and Hygiene.* 2014

46. Reconstructing transmission chains of influenza among school children using deep sequencing and multiple sources of contact information. *US NIH MIDAS Annual meeting.* Washington, DC. May. 2016.

47. Dengue cohort comparison project. American Society of Tropical Medicine and Hygiene. Atlanta, GA.Nov. 2016.

48. Correlation of Corrective Eyewear to Acute Respiratory Infection (ARI) Among Outpatient Healthcare Personnel (HCP). ID Week. New Orleans, LA. Oct. 2016.

49. Predicting county-level influenza activity using school absenteeism data in Allegheny County, PA from 2010-2015. ID Week. New Orleans, LA. Oct. 2016.

50. Influenza and Other Respiratory Viral Infections Among School Children in Pittsburgh, Pennsylvania. ID Week. New Orleans, LA. Oct. 2016.

51. Ventilator-Associated Staphylococcus aureus and Pseudomonas aeruginosa Infections Among Intensive Care Unit (ICU) Patients in Six Healthcare Systems: Temporal Trends and Risk Factors. ID Week. New Orleans, LA. Oct. 2016.

52. Acute Respiratory Infections (ARIs) Among Outpatient Healthcare Personnel (HCP). ID Week. New Orleans, LA. Oct. 2016.

53. Predicting county-level influenza activity using school absenteeism data in Allegheny County, PA from 2010-2015. International Society for Disease Surveillance. Annual Meeting. Atlanta, Dec. 2016.

54. Utility of Nontraditional Data Sources for Early Detection of Influenza. International Society for Disease Surveillance. Annual Meeting. Atlanta, Dec. 2016.

Scientific Presentations (without abstracts)

1. Time-series decomposition methods for infectious disease epidemiology. *North American Congress of Epidemiology, 2006, Seattle, WA.*

2. Spatial coherence and association of temperature, rainfall and the incidence of dengue hemorrhagic fever in Thailand. *DIMACS Workshop on Facing the Challenge of Infectious Diseases in Africa: The Role of Mathematical Modeling, 2006, Johannesburg, South Africa*

3. Modeling new vaccines for measles. *DIMACS Workshop on Facing the Challenge of Infectious Diseases in Africa: The Role of Mathematical Modeling, 2006, Johannesburg, South Africa*

4. Strategies for looking for pattern in spatio-temporal data. *DIMACS Workshop on Spatio-temporal and network models of disease spread, 2007, Edinburgh, Scotland*

5. Dengue and the demographic transition. *2nd International Conference on Dengue and Dengue Hemorrhagic Fever, 2008, Phuket, Thailand*

6. Influenza transmission in households in 1918. *Epidemics Conference on Infectious Disease Dynamics, 2008, Asilomar, CA*

7. Immune landscapes of human influenza in southern China. *Ecology and Evolution of Infectious Diseases, National Institutes of Health and National Science Foundation, 2010, Snowbird, UT*

8. Location-specific patterns of exposure to recent pre-pandemic strains of influenza A in southern China: the Fluscape project. *Ecology and Evolution of Infectious Diseases, National Institutes of Health and National Science Foundation, 2011, Madison, WI*

9. The role of modeling epidemics. What do we learn? *Infectious Disease Society of America, 2011, Washington, DC*

10. Location-specific patterns of exposure to recent pre-pandemic strains of influenza A in southern China: the Fluscape project. *Ecohealth, 2011, Baltimore, MD*

11. Dengue Work of the VMI. *Vaccine Modeling Initiative, 2011, Princeton, NJ.*

12. Estimates of the degree and length of cross-protection between dengue serotypes from time series models. *American Society of Tropical Medicine and Hygiene, 2011, Philadelphia, PA*

13. Immunological landscapes of influenza in southern China: the Fluscape project. *NIH MIDAS annual meeting, 2012, Boston, MA.*

14. Estimates of the degree and length of cross-protection between dengue serotypes from time series models. *NIMBioS Dengue Workshop, 2012, Knoxville, TN.*

15. Interactions between serotypes of dengue highlight epidemiological impact of cross-immunity. *Dynamical Systems Applied to Biology and Natural Sciences, 2013, Lisbon, Portugal.*

16. Models of the impact of partially effective dengue vaccines. *Gates Foundation Mathematical Modeling Summit. 2013. Seattle, WA.*

17. Integrated dengue control strategies. *Gates Foundation Mathematical Modeling Summit. 2013. Seattle, WA.*

18. Mechanistic models of transmission utilizing contact data. *Society for Epidemiologic Research. 2013*, *Boston, MA*.

19. Natural History and Transmissibility of the MERS-CoV. American Society of Microbiology. Annual Meeting. 2014. *Washington, DC.*

20. Spatiotemporal patterns of Dengue and Chikungunya virus. NIH RAPIDD Annual Meeting. 2014. *Bethesda, MD.*

21. Dengue modeling consortium: Analysis of CYD23 data. Sanofi. 2014. *Lyon, France.*

22. Spatiotemporal patterns of Dengue and Chikungunya virus. MIDAS Annual meeting. 2014. *Atlanta, GA*.

23. Middle Eastern Respiratory Syndrome (MERS): Investigating a Novel Coronavirus. MIDAS Annual meeting. 2014. *Atlanta, GA*.

24. Spatial dynamics of dengue at multiple scales. Gates Grand Challenges Meeting. 2014. *Seattle, WA.*

25. Transmission dynamics of dengue at multiple scales. WHO Consultation on Dengue Burden. 2014. *Atlanta, GA.*

26. Reporting requirements. Specific requirements for dengue intervention models. WHO Consultation on the impact of dengue vaccines. 2014. *Geneva, Switzerland.*

27. Transmission dynamics of dengue and immunization impact at multiple scales. WHO Consultation on the impact of dengue vaccines. 2014. *Geneva, Switzerland.*

28. Characterizing Ebola Transmission and Surveillance in West Africa. Society for Epidemiologic Research. June, 2015. *Denver, CO*.

29. Immunological landscapes of influenza in China. NIH RAPIDD Meeting on Landscape theory in infectious disease dynamics. September, 2015. *Bethesda, MD.*

30. Trends in cases of dengue in infants: insights into serotype differences in disease in naive and non-naive individuals and population transmission dynamics. Clapham HE, Nisalak A, Kalayanarooj S, Thaisomboonsuk B, Klungthong C, Fernandez S, Srikiatkhachorn A, Macareo LR, Lessler J, Cummings DAT, Yoon IK. American Society of Tropical Medicine and Hygiene. 2016. *New Orleans, LA.*

31. Treatment as prevention strategies for HCV will require massive scale up to see benefits in prevention. Luis Mier-y-Teran-Romero, Derek Cummings, David Thomas, Carl Latkin, John Wong, Greg Kirk, David Thomas, Shruti Mehta. CROI, February, 2016. *Boston, MA*.

32. Age Sharing Patterns in People who Inject Drugs in Baltimore: Implications for HCV Treatment as Prevention Strategies. M. Kumi Smith, Matt Graham, Shruti Mehta, Luis Mier-y-Teran-Romero, Carl Latkin, Derek A.T. Cummings. Epidemics. 2016. *Clearwater, FL.*

Invited Seminars

1. Recurring spatial temporal traveling waves in dengue hemorrhagic fever incidence in Thailand.
Capitol Area Dengue Research Meeting, 2004, Silver Spring, MD

2. Modeling outbreaks for public health response.
Emerging Respiratory Infections Conference, Delaware Health and Social Services, 2004, Dover, DE

3. Spatial patterns of dengue hemorrhagic fever in Thailand.
Department of Geography, University of Maryland, 2004, College Park, MD

4. Periodic Traveling Waves in Dengue Hemorrhagic Fever Incidence in Thailand.
Virginia Bioinformatics Institute, 2004, Blacksburg, VA

5. Processes impacting the incidence of dengue hemorrhagic fever on multiple temporal and spatial scales.
53rd Annual Meeting of the American Society of Tropical Medicine and Hygiene, 2004, Miami, FL

6. Dynamic effects of antibody dependent enhancement on the fitness of dengue viruses.
Fogarty International Center, 2005, Washington, DC

7. Spatial synchrony of the waves of incidence of influenza in 1918.
Influenza Modeling Workshop, Global Health Security Action Group, G8, 2005, London, UK.

8. Can pandemic influenza be contained with antivirals?
Global Emerging Infections Surveillance and Response System, U.S. Department of Defense, 2005, Linthicum, MD

9. Dynamic effects of antibody dependent enhancement on the fitness of dengue viruses.
Center for Infectious Disease Dynamics, Penn State University, 2005, State College, PA

10. Strategies for containing an emerging influenza pandemic in Southeast Asia.
Modeling Working Group. Johns Hopkins Department of Biostatistics, 2005, Baltimore, MD

11. Simulating Pandemic Influenza.
Global Pandemic Initiative. IBM Industry Solutions Laboratory, 2005, Hawthorne, NY

12. Containing Pandemic Influenza.
Pandemic Influenza Preparedness Training, Johns Hopkins Center for Preparedness, 2006, Cumberland, MD

13. Dengue dynamics in Thailand over the last 20 years.
Thailand Centers for Disease Control, 2006, Bangkok, Thailand

14. Containing Pandemic Influenza.
Infectious Disease Informatics. Surveillance, Modeling and Response. National Center for Supercomputing Applications, 2006, Urbana-Champaign, IL

15. Dengue viruses: periodic traveling waves and serotype cycling in Thailand.
Five decades of discovery: A symposium to honor the contributions of Monto Ho, 2006, Pittsburgh, PA

16. Shifts in the epidemiology of dengue in Thailand.
University of Pittsburgh. Department of Epidemiology, 2007, Pittsburgh, PA

17. Dengue and the demographic transition.
NIH Fogarty Center, 2008, Bethesda, MD

18. Open questions in dengue research.
Penn State University: Research and Policy for Infectious Diseases Dynamics, 2008, University Park, PA

19. Shifts in the age of dengue hemorrhagic fever cases in Thailand.
CDC Branch, 2008, Puerto Rico

20. Models of the impact of dengue vaccines: a review of current research and potential approaches.
WHO Scientific Consultation of Dengue Vaccines, 2008, Belem, Brazil

21. Swine H1N1 influenza A: transmissibility, natural history and the potential impact of non-pharmaceutical interventions.
Johns Hopkins University, 2009, Baltimore, MD

22. Recent findings of transmission dynamics of dengue.
WHO Dengue Reference Group, 2009, Havana, Cuba

23. Dynamics and natural history of H1N1 influenza.
Grand Rounds, Welch Center, Johns Hopkins University, 2010, Baltimore, MD

24. The impact of spatial heterogeneity in the transmission of dengue on the synchrony of incidence.
University of Michigan MAC-EPID Annual Seminar, Ann Arbor, MI 2010.

25. Spatial variation in the transmission of dengue in Thailand: the role of demography and density.
Harvard School of Public Health, 2010, Boston, MA

26. Dengue Virus: Global trends, cycles and waves.
University of Michigan, 2010, Ann Arbor, MI

27. Spatial heterogeneity in the transmission of dengue at multiple spatial scales.
National Center for Medical Intelligence, 2011, Frederick, MD

28. Modeling approaches in long-term safety assessment of live attenuated dengue vaccines. Technical consultation on long term safety assessment of live attenuated dengue vaccines.
WHO, 2011, Geneva

29. Immune landscapes of human influenza in southern China: The Fluscape Project.
Harbin School of Public Health, 2011, Harbin, China

30. Modeling approaches in long-term safety assessment of live attenuated dengue vaccines. Technical Consultation on a Framework for Dengue Vaccine Safety Assessment.
WHO, 2011, Geneva

31. Dengue modeling work at Johns Hopkins and the Vaccine Modeling Initiative.
Secretaría de Salud (Ministry of Health), 2011, México

32. Spatial heterogeneity of influenza immunity and infection: the effect of population density and effective neighborhood size. *University of Massachusetts Amherst, 2012, Amherst, MA*

33. Models of the impact of partially effective dengue vaccines. *2013. Sanofi Pasteur. Lyon, France.*

34. Spatial heterogeneity of influenza immunity and infection: the Fluscape study. *Ecology and Evolution of Infectious Disease Meeting. 2013. State College, PA.*

35. Techniques and Opportunities in Infectious Disease Modeling. *Center for AIDS Research Seminar. Johns Hopkins Bloomberg School of Public Health. 2013. Baltimore, MD.*

36. The Fluscape study. Guangzhou Centers for Disease Control. *2013. Guangzhou, China.*

37. Social Mixing and Respiratory Transmission in Schools Study. *US Centers for Disease Control. 2013. Atlanta, GA.*

38. Middle Eastern Respiratory Syndrome (MERS): Investigating a Novel Coronavirus. Johns Hopkins Health Advisory Board. 2013. *Baltimore, MD.*

39. Social Mixing and Respiratory Transmission in Schools. US Centers for Disease Control. 2013. *Atlanta, GA.*

40. Opportunities and challenges to treatment as prevention approaches for Hepatitis C virus control. Johns Hopkins University Center for AIDS Research. 2014. *Baltimore, MD.*

41. Review of Dengue Models. White House Office of Science and Technology Policy meeting on Integrating Prediction and Forecasting Models for Decision-making: Dengue Epidemic Prediction. 2014. *Washington, DC.*

42. Potential opportunities and peril of imperfect dengue vaccines. Johns Hopkins Medical School. 2014. *Baltimore, MD.*

43. Ventilator Associated Pneumonia among ICU patients: S. aureus and Pseudomonas spp. Medimmune. 2014. *Gaithersburg, MD.*

44. Assessing local transmission of Ebola virus in Liberia. Imperial College. 2014. *London, UK.*

45. Spatial dynamics of dengue and vaccine models. Royal Society. 2014. *London, UK.*

46. Spatial scales of influenza immunity: Results from the Fluscape project. RAPIDD Group. 2015. *Washington, DC.*

47. Prediction of dengue incidence in Thailand. Disease Forecasting Group. White House. 2015. *Washington, DC.*

48. Temporal variation in dengue case numbers and relation to climate and using age to map hazards of infection. WHO Dengue Global Burden Meeting. 2015. *Geneva, Switzerland.*

49. Immunological landscapes of influenza in China. NIH RAPIDD Meeting on Landscape theory in infectious disease dynamics. September, 2015. *Bethesda, MD.*

50. Hospital acquired infections among ICU and individuals undergoing Surgery in 6 Hospital systems: S. aureus and Pseudomonas spp. Derek Cummings, Rebecca Pierce, Eili Klein, and Trish Perl. Medimmune. October, 2015. *Rockville, MD*.

51. Temporal variation in dengue case numbers and relation to climate and using age to map hazards of infection. World Health Organization. Dec. 2015. *Geneva, Switzerland*.

52. Potential opportunities and perils of dengue vaccines. EpiCentre. June 2016. *Paris, France.*

53. Estimation of transmission processes using data augmentation. Institut Pasteur. Seminar. June 2016. *Paris, France.*

54. Interactions of dengue viruses at multiple spatial and temporal scales. Harvard School of Public Health. February, 2016. *Cambridge, MA.*

55. An engineer's experience in epidemiology. Plenary Speaker. Johns Hopkins Bloomberg School of Public Health Department of Environmental Health and Engineering Inaugural Research Retreat. Jan. 2017. *Baltimore, MD.*

56. Comparative modelling of dengue vaccine impact and Global estimates of the dengue transmissibility and seropositivity. WHO Immunization and vaccines related implementation research-Advisory Committee meeting. 2017. *Annecy, France.*

57. Spatial dynamics of dengue transmission. University of Florida Emerging Pathogens Institute External Advisory Committee Meeting. 2017. *Gainesville, FL.*

58. Characterizing the genetic and antigenic diversity of dengue at multiple spatial and temporal scales. University of Florida Veterinary Medicine Seminar. 2017. *Gainesville, FL.*

CURRICULUM VITAE

DEREK A. T. CUMMINGS

PART II

TEACHING

Advisees

Current Advisees

Post-doctoral

Leah Katzelnick	Biology/joint with UC Berkeley	2016-present
Rebecca Borchering	Biology	2017-present
Bingyi Yang	Biology	2017-present
Alex Kirpich	Biology	2017-present
Bernardo Garcia-Carreras	Biology	2017-present
Diana Rojas-Alvarez	Biology/joint with UF Biostats	2017-present

PhD

Angkana Huang	Biology	2017-present
Diana Rojas-Araya	Entomology	2017-present

Undergraduate (undergraduates doing research with me)

Carlos Moreno	Applied Physiology and Kinesiology	2015-present
Silvio Martinez-Daniel	Biomedical Engineering	2017-present
Francesca Maurici	Biology	2016-2017
Chastity Perry	Biology	2017

Past Advisees

Post-doctoral

Hannah Clapham 2013-2016
Current Position: Mathematical Epidemiologist
Oxford University Clinical Research Unit

Henrik Salje 2014-2016
Current Position: Faculty, Institut Pasteur

Luis Mier-y-Teran-Romero 2010-2014
Current Position: US CDC Staff Scientist

Isabel Rodriguez-Barraquer 2012-2014
Current Position: Assistant Professor, University of California San Francisco

Kaitlin Rainwater-Lovett 2012-2013
Current Position: Research Associate, Johns Hopkins School of Medicine

Nicholas Reich 2010-2011
Current Position: Associate Professor, University of Massachusetts, Biostatistics

Justin Lessler 2008-2011
Current position: Associate Professor, Johns Hopkins Bloomberg School of Public Health

Carl Laird 2007-2008
Current Position: Associate Professor, Texas A&M University, Department of Chemical Engineering

PhD

Stephanie Cinkovich Biology 2015-2018
Thesis title:
The role of host composition and asymptomatic infection on the transmission dynamics of zoonotic diseases

Jacob Ball Epidemiology 2015-2018
(co with Xinguang Chen)
Thesis title:
Epidemiological models of infectious diseases for clinical and public health decision support

Talia Quandelacy Epidemiology 2013-2017
Thesis title:
Characterizing micro-scale transmission dynamics of influenza

Henrik Salje Epidemiology 2009-2014
Thesis title:
Insights into the microscale spatial dynamics of dengue and chikungunya in Southeast Asia

Andrew Azman Epidemiology 2009-2014
(co with Justin Lessler)
Thesis title: Heterogeneities in Cholera Transmission

Ben Althouse Epidemiology 2009-2013
Thesis title: Mechanistic Modeling of Sylvatic Arboviruses in Senegal

Su-Hsun Liu Epidemiology 2008-2012
Thesis title: Detectable Human Papillomavirus DNA: Prevalent vs. Incident Infection

Isabel Rodriguez-Barraquer Epidemiology 2007-2012
Thesis title: The Shifting Epidemiology Of Dengue: Insight From Serological Surveys

Justin Lessler Epidemiology 2004-2008
Thesis title: Detection and characterization of respiratory pathogens in institutions

Masters

Jordan Johnson MS in Epidemiology 2013-2015
Thesis title: Co-infections with multiple respiratory viruses in children in 9 Pittsburgh area schools in the

winter of 2012-2013

Jacob Carey MS in Epidemiology 2014-2016
Quantifying proximal contacts between school children during school, outside of school and during school closures

Yanjie Huang MS in Epidemiology 2013-2014
Thesis title: Quantifying Human Mobility Using The Longest Disease Traveled

Rome Buathong MS in Tropical Medicine 2010-2014
Royal Tropical Institute, Amsterdam, Netherlands
Thesis title: Risk and protective factors for primary and secondary dengue infections among school-aged children in Meuang district, Rayong province, Thailand

Madhura Rane MS in Epidemiology 2012-2013
Socioeconomic determinants of mortality and disease transmission at census tract level during the 1918 H1N1 Influenza pandemic in Chicago

Katrina Mott MS in Epidemiology 2010-2012
The Effect Of Age And Syndrome On Serotype Prevalence In Invasive Pneumococcal Disease: A Sub-Analysis Of The Pneumococcal Global Serotype Project

Paul Maurizio MS in Molecular Microbiology and Immunology 2009-2011
Thesis Title: Detection And Vertical Transmission Of Culex Flavivirus In Culex Quinquefasciatus (Diptera: Culicidae) Mosquitoes From Zambia, Africa

Ben Althouse MS in Biostatistics 2009-2010
Thesis Title: A Multi-Host Multi-Vector SIR Model of Dengue Fever in Senegal

Ripa Chakravorty MS in Epidemiology 2009-2010
Thesis Title: Modeling the incubation period of Escherichia coli

Jon Benenson MS in Biostatistics 2008-2010
Thesis Title: Susceptible reconstruction and serotype specific estimates of seasonality of transmission of dengue viruses in Thailand using a Time-Series-Susceptible-Infected-Recovered model

Jodi Udd MPH 2009-2010

Eileen Obe MPH 2009-2010

Yih Yng Ng MPH 2008-2009
Thesis title: Prediction of Influenza-Like Illness trends in Singapore using Internet search data

Hannah Lee MPH 2008-2009

Katherine Lin MHS in Epidemiology 2007-2008
Thesis Title: A Method to Geocode Rural Addresses and Post Office Boxes: Application to a Study of Drinking Water Nitrate Exposure and Cancer Incidence

Duza Baba, MHS in International Health 2006

Heidi Hallman	MHS in International Health	2006
Kristin Kelling	MHS in International Health	2005
Alex Ruan	Undergraduate in Public Health	2012

*Preliminary Oral Participation (*alternate)*
Departmental

Name		Date
Talia Quandelacy	PhD	2015
Rebecca Pierce*	PhD	2014
Andrew Azman	PhD	2012
Henrik Salje	PhD	2011
Isabel Rodriguez-Barraquer	PhD	2011
Benjamin Althouse	PhD	2010
Su-Hsun Liu	PhD	2009
Amanda Latimore	PhD	2007
Bridget Ambrose	PhD	2006

Schoolwide

Sheldon Waugh	PhD	Epidemiology	2017
Punam Amratia	PhD	Forest Resources and Conservation	2017
Stephanie Cinkovich	PhD	Biology	2017
Jacob Ball	PhD	Epidemiology	2016
Talia Quandelacy	PhD	Epidemiology	2015
Mariam Fofana	PhD	Epidemiology	2014
Holly Schuh	PhD	International Health	2014
Kristen Little	PhD	Epidemiology	2014
Huitong Qui	PhD	Biostatistics	2014
Mufaro Kanyangarara	PhD	International Health	2014
Ian Craig	PhD	International Health	2013
Jessica Atwell	PhD	International Health	2013
Ricardo Castillo	PhD	Epidemiology	2012
Andrew Azman	PhD	Epidemiology	2012
Benjamin Althouse	PhD	Epidemiology	2012
Genevieve Wojcik	PhD	Epidemiology	2011
Michelle Mergier*	PhD	International Health	2011
Alison Turnbull*	PhD	Epidemiology	2011
Emily Gurley	PhD	Epidemiology	2011
Henrik Salje	PhD	Epidemiology	2011
Su-Hsun Liu	PhD	Epidemiology	2011
Amanda Latimore	PhD	Epidemiology	2010
James Stark	PhD	Epidemiology, University of Pittsburgh	2010
Isabel Rodriguez-Barraquer	PhD	Epidemiology	2010
Nikolas Wada*	PhD	Epidemiology	2010
Adrienne Shapiro	PhD	Epidemiology	2009
Bridget Ambrose	PhD	Epidemiology	2008
Willem van Panhuis	PhD	International Health	2008

Nicholas Reich	PhD	Biostatistics	2008
Kathryn Anderson	PhD	Epidemiology, Emory University	2008
Tassanee Silawan	PhD	Epidemiology, Mahidol University	2007

Final Oral Participation

Henrik Salje	PhD	Epidemiology	2014
Andrew Azman	PhD	Epidemiology	2014
Kara Randolph*	PhD	Epidemiology	2014
Ben Althouse	PhD	Epidemiology	2013
Hannah Clapham	PhD	Infectious Disease Epidemiology Imperial College	2013
Melinda Munos*	PhD	International Health	2012
Alison Liu	PhD	Epidemiology	2012
Isabel Rodriguez-Barraquer	PhD	Epidemiology	2012
Kaitlin Rainwater Lovett	PhD	Epidemiology	2012
Johns Ayers*	PhD	Health, Behavior and Society	2011
Kathryn Anderson	PhD	Epidemiology, Emory University	2010
James Stark	PhD	Epidemiology, University of Pittsburgh	2010
Nicholas Reich	PhD	Biostatistics	2010
Emily Henkle*	PhD	Epidemiology	2010
Willem van Panhuis	PhD	International Health	2009
Justin Lessler	PhD	Epidemiology	2008
Michael Johansson	PhD	Molecular Microbiology & Immunology	2008
Christina Schumaker	PhD	Epidemiology	2008
David Dowdy	PhD	Epidemiology	2008
Tassanee Silawan	PhD	Epidemiology, Mahidol University	2008

Thesis Committee Participation

Mark Kartzinel (UF)	The impact of the larval environment on post-emergence fitness of aedes aegypti
Punam Amratia (UF)	Fine-scale mapping of malaria in Ghana: use of Bayesian models
Jacob Ball (UF)	The ecology and epidemiology of respiratory diseases in high-risk populations
Stephanie Cinkovich (UF)	The Role of Host Composition and Asymptomatic Infection on the Transmission Dynamics of Zoonotic Diseases
Andrew Azman (JHU)	Heterogeneities in Cholera Transmission
Mary Grabowski (JHU)	Patterns and predictors of the epidemiological and evolutionary dynamics of HIV-1 infection in Rakai, Uganda
Ben Althouse (JHU)	Studies of Sylvatic Dengue in Senegal
Henrik Salje (JHU)	Combining surveillance data with genetic analysis in the characterization of spatiotemporal clustering of dengue cases in Bangkok
Isabel Rodriguez-Barraquer	Towards a better estimation of the force of infection and basic reproductive number of dengue virus
Su-Hsun Liu (JHU)	Mathematical modeling to inform likelihood of second peak HPV prevalence in older women
Kaitlin Lovett (JHU)	The Impact of Immune Reconstitution and Revaccination on Measles Immunity in HIV-infected Zambian Children initiating Antiretroviral Therapy

Genevieve Wojcik (JHU)	A Genome-Wide Association Study of Oral Polio Vaccine Failure in Infants from Bangladesh (MAL-ED Study):Gene-, and Pathway-Level Analyses
Emily Gurley (JHU)	Exposure to Indoor Air Pollution and Pneumonia in Dhaka, Bangladesh
Justin Lessler (JHU)	The Detection and Characterization of Respiratory Virus Transmission in Institutions
Willem van Panhuis (JHU)	Dynamics of Dengue Antibodies : Transplacental Transfer, Decline after Birth and the Serotype Specific Response to Infection among Infants and Children in Thailand
Christina Schumacher (JHU)	Identifying, Chracterizing and Predicting the Role of Core Groups in Syphilis Epidemics
Nicholas Reich (JHU)	Statistical Methods for Incomplete Data from Infectious Disease Outbreaks
Michael Johansson (JHU)	The Influence of Climate on Dengue Transmission in Puerto Rico
David Dowdy (JHU)	Impact and Cost-Effectiveness of Improved Diagnostics for Tuberculosis in Developing Countries

Classroom Instruction

2017
Principal Instructor (and course developer)
Department of Biology
University of Florida
Outbreaks
Enrollment: 25
I developed a course called “Outbreaks” ZOO4926 which is an undergraduate course that teaches quantitative concepts in characterizing epidemics and dynamics of emerging infectious diseases in multiple hosts including humans, animals and plants. Development included creation of lectures, 5 labs (in class quantitative assignments), final projects and final exam.

2009-2015
Principal Instructor (and course developer) (with Dr. William Moss and Dr. Justin Lessler)
Department of Epidemiology
Bloomberg School of Public Health
Johns Hopkins University
Concepts and Methods in Infectious Disease Epidemiology
Enrollment: 10, 35, 35, 35, 32, 27

2007-2008, 2009-2015
Principal Instructor (and course developer)
Department of Epidemiology
Bloomberg School of Public Health
Johns Hopkins University
Infectious Disease Dynamics: Theoretical and Computational Approaches
Enrollment: 18, 25, 20, 30, 20, 22, 24, 20

2014
Principal Instructor (with Dr. Kenrad Nelson, Dr. Shruti Mehta, and Dr. Isabel Rodriguez-Barraquer)
Department of Epidemiology
Bloomberg School of Public Health

Johns Hopkins University
Epidemiology of Infectious Diseases
Enrollment: 42

2011
Guest Lecturer “Modeling and prediction of DHF”, “Models of dengue transmission and dengue vaccines”
PAHO/Instituto Pedro Kouri Dengue Institute
Havana, Cuba
Enrollment: 210

2010
Principal Instructor (and course developer)
Infectious Disease Dynamics: Theoretical and Computational Approaches
Johns Hopkins Bloomberg School of Public Health Fall Institute
Barcelona, Spain
Enrollment: 20

2007-2013
Instructor
Department of Epidemiology
Bloomberg School of Public Health
Johns Hopkins University
Epidemiologic Methods 3
Enrollment: 220 on average in class total each year, 60 in lab section each year.

2007-2013
Faculty Advisor
Department of Epidemiology
Bloomberg School of Public Health
Johns Hopkins University
Modeling of Spatial and Temporal Disease Epidemiology Forum-Student Group

2005-2006
Principal Instructor (and course developer)
Department of International Health
Bloomberg School of Public Health
Johns Hopkins University
Infectious Disease Dynamics: Theoretical and Computational Approaches
Enrollment: 19, 15

2005-2013 (12 separate lectures)
Guest Lecturer “Introduction to mathematical modeling of infectious diseases”, “Influenza"
Department of Epidemiology
Bloomberg School of Public Health
Johns Hopkins University
Infectious Disease Epidemiology

2012-2014 (5 separate lectures)
Guest Lecturer “MERS Coronavirus”, “Dengue", “SARS Coronavirus”

Department of Epidemiology
Bloomberg School of Public Health
Johns Hopkins University
Emerging Infectious Disease

2008-2010
Guest Lecturer "Host demographics and infectious disease dynamics"
Department of Molecular Microbiology and Immunology
Bloomberg School of Public Health
Johns Hopkins University
Ecology of Infectious Disease

2007-2008
Co-organizer
Departments of Epidemiology and Biostatistics
Bloomberg School of Public Health
Johns Hopkins University
Epi/Biostats Working Group on Infectious Disease

2014, 2015
Guest Lecturer "Infectious Disease Epidemiology"
Global Institute of Public Health
New York University

2006-2008
Guest Lecturer
University of Pittsburgh Graduate School of Public Health
Department of Epidemiology
Infectious Disease Epidemiology

2012
Guest Lecturer "A Practical Short Course in Infectious Disease Modeling"
Harvard University/Mahidol University
Bangkok

2006-2014
Guest Lecturer "Models of infectious disease dynamics"
United States Uniformed Services University
Bethesda, MD
Infectious Disease Epidemiology

2006-2011
Instructor
Field Epidemiology Training Program
Thailand Ministry of Public Health
Bangkok, Thailand
Infectious Disease Dynamics

2003-2004
Guest Lecturer

Department of Earth and Planetary Sciences
Zanvyl Krieger School of Arts and Sciences
Johns Hopkins University
Climate Change and Global Health

2001
Tutorial Instructor
GEOMED 2001
Université Pierre et Marie Curie, Paris
Time-Series Analysis, Pre-conference Tutorial

1996
Teaching Assistant
Inorganic Chemistry, Brown University

RESEARCH GRANT PARTICIPATION

Active Support
Linking antigenic and genetic variation of dengue to individual and population risk
02/01/15-1/31/2020, NIH R01 Total award: $3,800,000
Principal Investigator: Derek Cummings
Primary Goal: Characterize the genetic and antigenic variability of dengue viruses circulating over the last twenty years using a large repository of viral samples and build population models of ecological interactions between dengue viruses and its impact on human health.

Southeast Regional Center of Excellence in Vector-Borne Diseases: the Gateway Program.
12/31/2016-12/30/2021, US Centers for Disease Control Total award: $9,999,628.
Principal Investigator: co-PI's Derek Cummings, Greg Glass, John Beier (University of Miami), Tom Unnasch (University of South Florida), Rhoel Dinglasan, Program Director.
Primary Goal: Conduct research to enhance our understanding of the transmission dynamics of arthropod-borne disease transmission in order to effectively respond to detect and control outbreaks.

Monitoring cause-specific school absences to estimate influenza transmission in Western PA
09/01/13-08/31/16, CDC U01 Total award: $1,500,000
Principal Investigator: Derek Cummings
Primary Goal: To refine surveillance in communities for influenza and other respiratory disease incidence using cause-specific absenteeism in school-children in western Pennsylvania.
Role: Principal Investigator

Methods for Reducing Spatial Uncertainty and Bias in Disease Surveillance
02/01/2013-01/31/2018, NIH R01 NIAID Total award to UF subcontract: $226,469
Principal Investigator: Justin Lessler
The goal of this research is to develop methods that can improve forecasting and current estimates of the incidence of dengue and other infectious diseases. The project uses multiple approaches including mechanistic models and models that traverse multiple temporal and spatial scales to produce estimates of incidence.
Role: Investigator

Influenza Immunity and Survival in Aging Populations
09/01/15-08/31/2017, US NIH R56 Total award to UF subcontract: $26,395
Principal Investigator: Justin Lessler, Derek Cummings (local PI)
Primary Goal: This study aims to understand how and why this increase in antibody titers occurs, and what role survival effects, patterns of infection and the biology of the immune response over multiple infections play in its development.
Role: Investigator

University of Pittsburgh MIDAS Center of Excellence: Data and Statistical Inference Project
07/01/14-08/31/19, NIH U01 Total award to UF subcontract: $217,409
Principal Investigators: Derek Cummings (local PI), Donald Burke (overall PI)
Primary Goal: Computational modeling for science and policy is driven by availability of data to estimate model parameters. Insights for disease transmission dynamics are derived from statistical inference using these models. This project will capitalize on new opportunities provided by large scale genetic and epidemiological data created during MIDAS-II to study infectious disease transmission dynamics at the micro- and macro level using innovative statistical approaches and parameter estimation methods.
Role: Investigator

Modeling interactions between HIV interventions in key populations in India
7/1/2015-6/30/2017, US NIH R21 Total award: $448,573
Principal Investigators: Derek Cummings
Primary Goal: The proposed study will use a novel modeling approach to help to disentangle multiple dynamic effects of combination interventions in order to inform future large-scale implementation of such combination interventions.

Completed Support
Staphylococcus aureus and Pseudomonas Hospital Acquired Infections
01/01/13-12/31/16, MedImmune
Principal Investigator: Derek Cummings (co) with Trish Perl
Funding Level: 0.6 months
Primary Goal: Identify risk factors for hospital acquired infections of staphylococcus aureus and pseudomonas in 7 hospital centers and assist in trial design for new intervention products.
Role: Principal Investigator

From Ebola Response to Sustainable Public Health Systems in Liberia
7/1/2015-6/30/2016, US CDC
Principal Investigator: David Peters, Derek Cummings (co-PI's)
Funding Level: 2.4 calendar months
Primary Goal: The goal of this project is to support the Ministry of Health of Liberia in building an integrated disease surveillance system to conduct surveillance for a number of infectious diseases as well as build general capacity to analyze infectious disease surveillance data.
Role: co-Principal Investigator

Inference for interacting pathogens with mechanistic and phenomenological models

09/01/14-08/31/16, NIH
Principal Investigators: Derek Cummings (local PI), Nick Reich (overall PI)
Funding Level: 1.56 calendar months
Primary Goal: Develop inference framework to estimate interactions of multiple pathogens that co-circulate and induce immune responses that might create competitive and/or enhancing relationships.
Role: Investigator

Modeling of infectious disease; A study of repeat influenza vaccination, and how population based immunity impacts the genetic makeup of dengue viruses.
04/01/14-9/30/2016, WRAIR
Principal Investigator: Derek Cummings
Funding Level: 0.12 calendar months
Primary Goal: Two part project to determine the impact of successive influenza vaccine on immunity and risk and 2) dengue population immunity and how this shapes the dengue viral evolution.
Role: Principal Investigator

09/01/10-08/31/15, CDC/VA
Principal Investigators: Trish Perl, Lew Radonovich (co-PI's)
Funding Level: 1.2 calendar months
Primary Goal: The goal of this research is to compare the efficacy of surgical masks to N95 respirators in protecting health care workers from respiratory viruses including influenza.
Role: Investigator

Analytic Support for the Ebola Outbreaks and Strengthening Primary Health Care in West Africa and Democratic Republic of Congo
10/15/14-01/31/15, Unicef
Principal Investigators: David Peters (PI)
Funding Level: 0.12 calendar months
Primary Goal: The goal of this project is to conduct analyses and simulations to support UNICEF's response to the Ebola virus outbreak in West Africa.
Role: Investigator

VMI II: Application of Computational Models to Guide and Evaluate Global
07/01/13-06/30/15, University of Pittsburgh, Bill and Melinda Gates Foundation
Principal Investigator: Derek Cummings
Funding Level: 0.60 calendar months
Primary Goal: To use theoretical models to evaluate multiple vaccination strategies and vaccine candidates to control dengue and other vector-borne diseases
Role: Principal Investigator

Quantifying Contact Rates and Mixing Patterns in School Aged Children
08/31/11 - 08/30/14, CDC
Principal Investigator: Derek Cummings (co) with Shanta Zimmer
Funding Level: 1.2 calendar months
Primary Goal: The goal of this work is to use multiple methods to quantify the contacts that school children make that could potentially transmit influenza including survey,

	proximity detectors and GPS devices in order to evaluate each of these methods. We will also link measures of social contact to the risk of acquisition of influenza.
Role:	co-Principal Investigator

Immune Landscapes of Human Influenza in Households, Towns and Cities in Southern China
10/01/08-8/31/14, NIH

Principal Investigator:	Derek Cummings
Funding Level:	1.8 calendar months
Primary Goal:	The goal of this work is to characterize immunological profiles to human influenza in space and time among individuals living in Guangzhou province, China, and to build computational models that capture the transmission dynamics that could create the specific distributions observed.
Role:	Principal Investigator

Career Award at the Scientific Interface
07/01/07 - 07/31/15, Burroughs Wellcome

Principal Investigator:	Derek Cummings
Funding Level:	0.12 calendar months
Primary Goal:	To study natural and vaccine-induced immunity and spatial-temporal dynamics of epidemic dengue
Role:	Principal Investigator

Using Viral Sequences to Characterize the Micro-scale Dispersal Dynamics of Dengue in Bangkok
2/1/2012-12/31/2014, Johns Hopkins Center for Global Health

Principal Investigator:	Derek Cummings
Funding level:	$50,000 research funds (0 months)
Primary Goal:	Describe the micro-scale transmission of dengue in an urban environment using genetic and geographic information on the occurrence of cases.
Role:	Principal Investigator

Computational Models of Infectious Disease Threats Center for Excellence
04/01/09 – 04/01/14, NIH-NIGMS

Principal Investigator:	Don Burke
Funding Level:	3.0 calendar months
Primary Goal:	Integrate the most advanced and powerful techniques of epidemiological data analysis with those of computer simulation to produce a unified computational epidemiology.
Role:	Investigator

Vaccine Modeling Initiative
04/1/08-04/31/13, Bill and Melinda Gates Foundation

Principal Investigator:	Don Burke
Funding Level:	1.0 calendar months
Primary Goal:	Evaluation of candidate vaccine technologies using computational models.
Role:	Investigator

Temporal and Spatial Dynamics of Sylvatic Arbovirus Transmission and Emergence

10/1/08-09/31/13, NIH
Principal Investigator: Scott Weaver
Funding Level: 1.8 calendar months
Primary Goal: The goal of this project is to study the dynamics of transmission of dengue and chikungunya virus among non-human primate species in Senegal and determine which species support transmission of these viruses endemically and which ones appear to be only spillover species.
Role: Investigator

Multi-Scale Modeling of Infectious Diseases in Fluctuating Environments
09/01/09 – 08/31/13, NIH
Principal Investigator: Derek Cummings, Lora Billings (co)
Funding Level: 0.6 calendar months
Primary Goal: The objective of this proposal is to develop new mathematical models of infectious disease transmission that effectively, capture the impact of stochasticity on dynamics and lead to more effective control. The group will study the dynamics of disease spread in fluctuating environments modeled at various population scales.
Role: Co-Principal Investigator

Preparedness and Catastrophic Event Response (PACER)
06/01/09 – 05/31/12, US department of Homeland Security
Principal Investigator: Gabe Kelen
Funding Level: 0.12 calendar months
Primary Goal: PACER is a consortium of research institutions studying how the nation can best prepare for and respond to potential large-scale incidents and disasters. My work on this project is on model development for pandemic influenza models particularly, methods for parameter estimation for individual based simulations.
Role: Investigator

Immune Reconstitution of HIV-1 Infected Zambian Children Initiating Antiretroviral Therapy 03/01/07 – 02/28/12, NIH
Principal Investigator: William Moss
Funding Level: 0.6 calendar months
Primary Goal: This project will study measles and measles vaccination in HIV-1-infected children in Lusaka, Zambia to characterize measles virus-specific immune reconstitution and immunologic memory in Zambian children initiating ART.
Role: Investigator

Planning for Avian Influenza Outbreaks and Potential Pandemics
9/14/05 – 3/31/10, NIH-Fogarty International Center
Principal Investigator: Don Burke
Funding Level: 0.6 calendar months
Primary Goal: Develop capacity among epidemiologists at the Thai Ministry of Public Health to utilize new theoretical and computational tools in concert with traditional epidemiologic approaches to address issues surrounding avian influenza and potential influenza pandemics.
Role: Investigator

Computational Models of Infectious Disease Threats

04/01/04 – 04/01/09, NIH-NIGMS
Principal Investigator: Don Burke
Funding Level: 4.2 calendar months
Primary Goal: Integrate the most advanced and powerful techniques of epidemiological data analysis with those of computer simulation to produce a unified computational epidemiology.
Role: Program Coordinator and Investigator

Pittsburgh Influenza Prevention Program
10/01/06 - 09/31/08, CDC
Principal Investigator: Don Burke
Funding Level: 0.6 calendar months
Primary Goal: Study the transmission dynamics of influenza in Pittsburgh elementary schools and conduct trials of non-pharmaceutical interventions targeting influenza transmission.
Role: Investigator

Harmonic Decomposition and Compartmental Models in the Analysis of Epidemiologic and Climatic Data: An Analysis of Dengue in Southeast Asia
07/01/04 - 06/31/07, NOAA
Principal Investigator: Don Burke
Funding Level: 2.4 calendar months
Primary Goal: Apply methods developed under previous funding cycle to data from Southeast Asia on dengue hemorrhagic fever.
Role: Investigator

Ethical Issues in Influenza Pandemic Preparedness and Response
04/01/06 - 10/01/06, Rockefeller Foundation
Principal Investigators: Ruth Faden and Ruth Karron (co-PI's)
Funding Level: 0.12 calendar months
Primary Goal: Identify current and potential responses to the threat of pandemic influenza that profoundly affect the world's disadvantaged and to undertake concrete action to prevent or at least to mitigate those responses that are the most unjust. Simulate the impact of pandemic mitigation responses in resource poor settings.
Role: Investigator

Computational Modeling of Vaccination Strategies against Smallpox
08/01/02 - 07/31/04, Alfred P. Sloan Foundation
Principal Investigator: Joshua Epstein
Funding Level: 2.4 calendar months
Primary Goal: Develop computer simulations of the introduction and spread of a bio-terrorist agent such as smallpox in human populations, and evaluate possible response strategies.
Role: Investigator

Research to Guide Allocation of Public Resources in the Event of an Intentional Introduction of Smallpox
12/01/02 – 05/31/04, FIC / NIH / DHHS
Principal Investigator: Don Burke
Funding Level: 2.4 calendar months
Primary Goal: Develop, evaluate, and utilize computational models of smallpox

	introduction into the USA, and of public health strategies to contain smallpox epidemics.
Role:	Investigator

Harmonic Deconstruction in the Analysis of Epidemiologic and Climatic Data.
08/01/02 – 07/31/03, NOAA

Principal Investigator:	Don Burke
Funding Level:	2.4 calendar months
Primary Goal:	Develop and evaluate new computational methods for correlating dengue epidemiologic data and weather data, such as wavelet transforms and Empiric Mode Decomposition.
Role:	Investigator

ACADEMIC SERVICE

Department of Biology

Advisory Committee	2015-present
Strategic Planning Committee	2016-present

Department of Epidemiology

Lead, Department of Epidemiology Self-study	2013-present
Chair of Faculty Executive Committee	2013-present
Faculty Executive Committee	2012-present
Infectious Disease Journal Club, Faculty Coordinator	2009-2012
Admissions and Credentialing Committee, Member	2009-2012

Department of International Health

Steering Committee, Member	2005-2006

School-wide

Technology Transfer Committee, Member	2010-2015

ADDITIONAL INFORMATION

Personal statement of research and research objectives

I am interested in developing effective strategies for the control infectious diseases. My approach in doing this is to develop temporally or spatially targeted administration of vaccines or other interventions to produce the largest reduction in morbidity and mortality. I utilize a mix of field study and theoretical models of infectious disease in order to understand the transmission dynamics of dengue, influenza, measles, hepatitis C and chikungunya and to estimate the impact of specific interventions.

Keywords

Infectious disease, dynamics, influenza, dengue, measles, hepatitis C, ebola, social dynamics, vaccine-preventable, mathematical models, ecology