

Curriculum Vitae

Alun L. Lloyd

Date of birth	4th August 1970	Nationality	US/British (dual citizen)
Current position	Director, Center for Quantitative Sciences in Biomedicine, Director, Biomathematics Graduate Program Professor, Department of Mathematics, North Carolina State University		
Work address	Center for Quantitative Sciences in Biomedicine Department of Mathematics North Carolina State University Raleigh NC 27695-8215	Home address	1001 Bayfield Drive Raleigh NC 27606-1701
Email	alun_lloyd@ncsu.edu		
Web	http://www.alunlloyd.com		
Phone	(919) 515-1910		
Fax	(919) 513-1172		

Educational and Employment History

January 2017 to present	Drexel Professor of Mathematics, North Carolina State University
July 2014 to present	Director, Center for Quantitative Sciences in Biomedicine, North Carolina State University
August 2009 to present	Professor, Department of Mathematics, North Carolina State University
July 2007 to present	Director, Biomathematics Graduate Program, North Carolina State University
August 2003 to present	Associate Professor, Biomathematics Graduate Program, Department of Mathematics, North Carolina State University
October 1999 to July 2003	Long-Term Member of the Program in Theoretical Biology, Institute for Advanced Study, Princeton
October 1997 to September 1999	Lecturer in Statistics and Computer Packages in the Biological Sciences, St Hilda's College, Oxford
October 1996 to September 1999	MRC Research Fellow, Department of Zoology, University of Oxford
October 1992 to September 1996	Studied for D.Phil. degree, Department of Zoology, University of Oxford Thesis title 'Mathematical Models for Spatial Heterogeneity in Population Dynamics and Epidemiology,' supervisor Lord May of Oxford, FRS (Robert M. May) Supported by a four-year Wellcome Trust Mathematical Biology Scholarship
October 1988 to June 1992	Read mathematics at Trinity College, Cambridge First Class in Parts IA, IB and II of Mathematical Tripos Awarded Certificate of Advanced Mathematical Study (Mathematical Tripos Part III)

Career Highlights

Research Areas

- Studies on spatial heterogeneity in ecology and epidemiology, with a particular focus on questions related to spatial synchrony (Lloyd, 1995; Lloyd & May 1996; Lloyd & May, 1999; Jansen & Lloyd, 2000; Lloyd & Jansen, 2004; Lloyd & Sattenspiel, 2009)
- Impact of non-exponential distributions of infectious and latent periods, particularly in terms of estimation of the basic reproductive number from epidemic data and impact on persistence of childhood infections (Nowak *et al.* 1997; Gravenor & Lloyd, 1998; Lloyd 2001*a,b,c*; Lloyd, 2004; Lloyd, 2009; Conlan *et al.*, 2010)
- Dynamics of epidemics on networks, particularly on scale-free networks (Lloyd & May, 2001; May & Lloyd, 2001; Lloyd *et al.*, 2006; Lloyd & Valeika, 2007; Durrett *et al.*, 2012)
- Impact of stochasticity on epidemiological models, with a particular interest in using moment equations to assess the magnitude of stochastic effects (Lloyd, 2004; Bai *et al.*, 2007; Lloyd *et al.*, 2007; Britton *et al.*, 2014)
- Genetic control of mosquito-borne infections, focusing on gene drive mechanisms (Huang *et al.*, 2007*a,b*; Gould *et al.*, 2008; Huang *et al.*, 2009; Ward *et al.*, 2011; Huang *et al.*, 2011; Walker *et al.*, 2011; Robert *et al.*, 2012; Legros *et al.*, 2012; Facchinelli *et al.*, 2013; Robert *et al.*, 2013; Okamoto *et al.*, 2013; Okamoto *et al.*, 2014; Robert *et al.*, 2014; Okamoto *et al.*, 2016)
- Transmission dynamics of mosquito-borne diseases: appropriate modeling frameworks and estimation of epidemiological parameters (Lloyd *et al.*, 2007; Reiner *et al.*, 2013; Smith *et al.*, 2014; Reiner *et al.*, 2014; Hollingsworth *et al.*, 2014; Okamoto *et al.*, 2016)
- Population dynamics of the *Aedes aegypti* mosquito: modeling and interpretation of empirical data (Magori *et al.*, 2009; Legros *et al.*, 2009; Xu *et al.*, 2010; Legros *et al.*, 2011; Walsh *et al.*, 2013; Guerra *et al.*, 2014)
- Parameter estimation and uncertainty quantification for epidemiological models, with a focus on questions of identifiability and subset selection (Cintron-Arias *et al.*, 2009*a,b*; Lloyd, 2009; Xu *et al.*, 2010; Capaldi *et al.*, 2012)
- Model-driven data collection and experimental design (Capaldi *et al.*, 2012; Robert *et al.*, 2012; Lessler *et al.*, 2014)

Graduate Education

- Directed NC State Biomathematics Graduate Program (2007-present), securing the program's first training grant support (NSF Research Training Group grant, \$2.5 million for Fall 2013 through Spring 2018) and guiding work on the program's curriculum
- Graduated seven PhD students, four of whom have gone on to faculty positions (University of Georgia, University of Massachusetts, Boston, Worcester State University and Valparaiso University)
- Co-PI on interdisciplinary NSF IGERT training grant "Genetic Engineering and Society: The Case of Transgenic Pests" that considers both scientific and societal aspects of emerging genetic technologies
- Establishment of a graduate minor in Genetic Engineering and Society, co-developing one of its courses ("Systems Modeling of Emerging Biotechnologies") and spearheading the administrative process to establish the minor
- Chair of College Graduate Committee and Member of NC State Graduate School's Administrative Board

Prizes and Awards

2017	Appointed to Drexel Professorship, NC State University
1997	Elected to a Stipendary Lectureship, St. Hilda's College, Oxford
1996	Awarded Medical Research Council Non-Clinical Research Training Fellowship
1992	Awarded Wellcome Trust Mathematical Biology Scholarship
1991	Rouse Ball Essay prizewinner, Trinity College, Cambridge
1990	Elected to Senior Scholarship, Trinity College, Cambridge
1989	Elected to Junior Scholarship, Trinity College, Cambridge
1988	Royal Society of Chemistry Prize for best performance in WJEC chemistry A level Awarded Ministry of Defence Student Scientist Sponsorship
1986	Institute of Physics Prize for best performance in Nuffield physics O level

Teaching Activities

Course co-ordinator for MA 131 (Calculus for Life and Management Sciences A). Developed WebAssign-based homework problem set for the course, freeing up faculty from grading regular homework. Currently working on overhaul of course to provide a more engaging and relevant offering for biology undergraduates.

Co-developing (with Molly Fenn and Mette Olufsen) a hybrid online/lecture version of MA 231 (Calculus for Life and Management Sciences B). This course has a stronger emphasis on differential equations and modeling, particularly with life sciences applications, to increase its relevance for biological scientists and to encourage students to take further modeling-oriented mathematics courses. Funded by DELTA course redesign grant.

Developed undergraduate course "Differential Equations for Biologists" as part of NSF UBM (undergraduate biomathematics) program.

Developed graduate biomathematics course "Infectious Disease Modeling." As part of this effort, I produced an extensive set of printed notes from which I intend to develop a textbook. Several publishers (Springer, Princeton and Cambridge) have expressed interest in such a book.

Led the establishment of the graduate minor in Genetic Engineering and Society (GES), including the development of one graduate course (see below) and leading the administrative effort to establish two other courses and the minor itself.

Co-developed (with Jennifer Kuzma and Zack Brown) graduate course for Genetic Engineering and Society minor program: "Governance, Systems and Modeling". This course is aimed at a mixed audience of natural scientists and social science and humanities students.

Former chair of Mathematics Curriculum For Non-Majors committee, charged with ensuring that the mathematics department's service courses satisfy the requirements of other undergraduate programs.

Chair of Biomathematics Graduate Program Curriculum committee, charged with updating the graduate program's curriculum.

Courses taught at NC State University:

Spring 2017	BMA 815 (Infectious Disease Modeling), 12 students
Fall 2016	GES 591 (Bioeconomic Modeling), 4 students [co-taught]
Fall 2015	GES 591 (Systems Modeling of Emerging Biotechnologies), 8 students [co-taught]
Spring 2015	BMA 815 (Infectious Disease Modeling), 3 students [taught as overload]
Fall 2014	GES 591 (Governance, Systems and Modeling), 6 students [co-taught] MA/ST 810 (Stochastic Process Modeling of Ecological Systems), 15 students [co-taught]
Spring 2014	MA 231 H (Calculus for Life and Management Sciences B, honors section) 20 students GES 591 (Governance, Systems and Modeling), 6 students [co-taught]
Spring 2013	BMA 772 (Biomathematics II), 8 students
Fall 2012	MA 493 (Differential Equations for Biologists), 8 students
Spring 2012	MA 231 H (Calculus for Life and Management Sciences B, honors section), 24 students

Fall 2011	BMA 771 (Biomathematics I), 22 students
Spring 2011	BMA 815B (Infectious Disease Modeling), 14 students
Spring 2010	MA 231 H (Calculus for Life and Management Sciences B, honors section), 21 students
Fall 2009	MA 131 H (Calculus for Life and Management Sciences A, honors section), 24 students
Spring 2009	MA 231 H (Calculus for Life and Management Sciences B, honors section), 22 students
Fall 2008	BMA 771 (Biomathematics I), 9 students
Spring 2008	MA 432 (Modeling Biological Systems), 16 students
Fall 2007	BMA 771 (Biomathematics I), 8 students
Spring 2007	BMA 815B (Infectious Disease Modeling), 5 students MA 432 (Modeling Biological Systems), 15 students
Fall 2006	MA 131 (Calculus for Life and Management Sciences A), 100 students BMA 771 (Biomathematics I), 11 students
Spring 2006	BMA 815B (Infectious Disease Modeling), 8 students
Fall 2005	BMA 771 (Biomathematics I), 19 students MA 131 (Calculus for Life and Management Sciences A), 119 students
Spring 2005	BMA 815B (Infectious Disease Modeling), 28 students MA 432 (Modeling Biological Systems), 15 students
Fall 2004	BMA 771 (Biomathematics I), 17 students
Spring 2004	BMA 815B (Advanced Special Topics in Infectious Disease Modeling), 11 students
Fall 2003	MA 131 (Calculus for Life and Management Sciences A), 37 students

Students Advised

Doctoral Students

Completed

- Steve Valeika (Epidemiology, School of Public Health, UNC Chapel Hill), July 2008, co-advised with Annelies Van Rie, Epidemiology, UNC-CH
Supported on teaching assistantships and fellowships from UNC-CH
First job upon graduation: Assistant Professor, University of Georgia, School of Public Health
- Alex Capaldi (Applied Mathematics), Summer 2010
Supported on teaching assistantships and CQSB fellowship
Associate Professor, Department of Mathematics, Valparaiso University, IN
- Venita DePuy (BMA), May 2012
Self funded [part-time student]
Statistical Consultant
- Hamed Yarmand (Operations Research), May 2012, co-advised with Julie Ivy
Funded on teaching assistantship
Postdoc, Harvard Medical School, then Lecturer of Management Science and Information Systems, University of Massachusetts, Boston
- Michael Robert (BMA), Summer 2013, co-advised with Fred Gould, Entomology
Funded on teaching assistantships, CQSB fellowship, SAMSI fellowship and RA from NIH grant
Postdoc, Departments of Mathematics and Biology, University of New Mexico
- Miyuki Breen (BMA), Spring 2014, co-advised with Rory Conolly, Environmental Protection Agency
Miyuki won two "Best Poster" awards at NC Society of Toxicology annual meetings
Funded by teaching assistantship, VIGRE fellowship, EPA/NC State training grant
Miyuki is currently bringing up her child
- Timothy Antonelli (BMA), Summer 2015, co-advised with Fred Gould, Entomology
Tim won Outstanding Student Presentation awards two years running at the UNC Greensboro Regional Mathematics and Statistics (RMSC) conference
Funded on teaching assistantship, IGERT fellowship, RTG fellowship
Assistant Professor, Mathematics, Worcester State University
- Mandi Traud (BMA), Spring 2017, co-advised with Rob Dunn, Biology
Funded on teaching assistantships, SAMSI fellowships, RA support, also self-funded
Data Analyst, Washington, DC.

Current

Evan Bowles (BMA), expected Fall 2017

Funded on teaching assistantships, contract from RTI International, also self-funded

Natalie Clark (BMA), expected May 2018, co-advised with Ross Sozzani, Dept. of Plant and Microbial Biology

Natalie won an NSF Graduate Research Fellowship

Funded on teaching assistantship, RTG fellowship, NSF fellowship

Michael Vella (BMA), expected May 2019

Funded on RTG fellowship, Keck Foundation grant

Brandon Hollingsworth (BMA), expected May 2020

Funded on teaching assistantship, RTG fellowship

Hannah Blackmon (BMA), expected May 2020, co-advised with Cristina Lanzas, College of Veterinary Medicine

Funded on RTG fellowship, RA from Lanzas

Julian Sass (BMA), expected May 2021

Funded on IMSD fellowship

Masters Students

Hugh Cox (MBMA), Spring 2004

Jiayun Zhu (MBMA), Summer 2004

Haojun Ouyang (MBMA), Spring 2005

Ji Zhang (MBMA), Spring 2006

Lisa Soberano (MS, Biomathematics), Summer 2006

Miyuki Breen (MBMA, Biomathematics), Summer 2007

Jessica Wagner (BMA), Spring 2017, co-advised with Rory Conolly, Environmental Protection Agency

Undergraduate Students

Charles Rogers and Mark Darby (2004): NC State Minority Graduate Education (MGE) Summer REU

Ian Appel, Nancy Ho, BreAnne Pickelsimer and Thu Tran (2006): NC State Mathematics Summer REU

Sam Behrend, Ben Berman, Jason Smith and Justin Wright (2007): NC State Mathematics Summer REU

Jacob Frelinger (2007): Mathematics honors project

Leanne Morton (2007/8): Mathematics, independent research

Lilliane Costa, Eric Hall, Mark Hou and Lindsay Keegan (2009): NC State Mathematics Summer REU

Chassidy Bozeman, Jared Catenacci, Alyson Fox, Kathleen Rogers (2011): NC State Mathematics Summer REU

Group won "Outstanding Presentation" award at Joint Math Meetings, Boston 2012.

Bozeman won first place poster award at Emerging Researchers National Conference.

Marie Encarnacion, Breanne Hollie, Robert O'Brien, Sean Plummer (2012): NC State Undergraduate

Biomathematics (UBM)

Jorly Chatouphonexay, John Lombardi, Shane Wilson, Brett Yarchin (2012): NC State Mathematics Summer REU

Shane Wilson won SIGMAA Environmental Mathematics Award at MathFest. Madison, WI, 2012.

Bernadette Bucher, Robin Mabe, Lilyana Staight, Danielle Williams (2013): NC State Mathematics Summer REU

Group won "Outstanding Presentation" award at Joint Math Meetings, Baltimore 2014.

Jaye Sudweeks (2016): RTG undergraduate student

Sergio Chavez and Beverly Setzer (2016): RTG undergraduate students (co-advised with Franz Hamilton)

Postdoctoral Mentoring

Krisztian Magori (January 2005-November 2006, co-advised with Fred Gould. Now faculty at Eastern Washington University) [NIH grant]

Yunxin Huang (December 2005-August 2008, co-advised with Fred Gould. Now faculty at Hubei University, China) [NIH grant]

Mathieu Legros (October 2006-June 2011, co-advised with Fred Gould. Now at ETH, Zurich) [NIH/Gates grant]

Ariel Cintron-Arias (September 2006-July 2009, co-advised with H. Thomas Banks. Now faculty member at East Tennessee State University) [SAMSI/CRSC]

Chonggang Xu (May 2009-May 2010, co-advised with Fred Gould. Now staff scientist at Los Alamos National Lab) [NIH grant]

Kenichi Okamoto (April 2011-December 2014, co-advised with Fred Gould. Now postdoc at Yale University) [NIH grant]

Emily Griffiths (May 2013-May 2015, co-advised with Fred Gould. Now at Public Health England) [NIH grant]

Andrea Arnold (July 2014-present. RTG postdoc)

Christian Gunning (October 2014-present, co-advised with Fred Gould) [NIH grant, Keck Foundation grant]
Franz Hamilton (August 2015-present. RTG postdoc)
Jungkoo Kang (September 2016-present, co-advised with Fred Gould) [two NIH grants]

Departmental and University Service

Biomathematics Program

Biomathematics (BMA) Graduate Program Review Committee (Member, 2004)
BMA Applications and Graduate Recruitment Committee (Member, 2004-2009; Chair 2010-present)
BMA Website (2004-present; site redesigned in 2004 and again in 2014)
BMA Curriculum Committee (Chair, 2004-present)
BMA First Year Student Award Committee (Member, 2005-2007; Chair 2008-present)
Biomath seminar organizer (Multiple semesters between 2008 and present)

Director, Biomathematics Graduate Program (2007-present)

Department of Mathematics

Mathematics Peer Teaching Committee (Member, 2005)
Mathematics Graduate Admissions Committee (Member, 2006)
Mathematics Undergraduate Non-Majors Committee (Member, 2006-2008, 2012-present; Chair 2008-2011)
Mathematics Computing Committee (Member, 2006-present)
Mathematics Graduate Program for Majors Committee (Member, 2006-present)
Mathematics Graduate Recruitment Committee (Member, 2008-present)
Mathematics Interdisciplinary Math Program Committee (Member 2009-2010)

Mathematics Personnel Evaluation Committee (Research) (Member 2012, 2014)
Mathematics Reappointment, Promotion and Tenure Committee (Member 2013, 2014; Chair 2015)
Mathematics Faculty Advisory Committee (Member, 2015-17)

Mathematics Faculty Search Committee: Stochastics (Member, 2005)
Mathematics Faculty Search Committee: General Search (Member, 2006/07; 2007/08; 2010/11; 2011/12; 2012/13; 2013/14)
Mathematics Faculty Search Committee: Analysis (Member, 2009/10)
Mathematics Faculty Search Committee: Applied Mathematics (Member 2014/15; 2015/16)

College and University

Graduate Academic Advisory Committee, College of Physical and Mathematical Sciences (Member 2007-2011; Chair 2011-present)
College Faculty Search Committee: Health Cluster (Member, 2007/08)

Genetic Pest Management Program, Executive Committee (Member 2007-2011)
Genetic Engineering and Society/IGERT co-PI committee (Member, 2011-present)
Genetic Engineering and Society Cluster Hire Committee (Member, 2011-2013)

Personalized Medicine Cluster Hire Committee (Member, 2014/15)

Administrative Board of the Graduate School (Member, Fall 2010; Fall 2011-present)

Presentations and Meetings

Recent Research Presentations (since 2004). Invited unless otherwise stated

June 2017. *After the Honeymoon, the Divorce: Unexpected Outcomes of Disease Control Strategies*. SIAM Dynamical Systems conference. Snowbird, UT. (*Contributed, to a session that I organized.*)
March 2017. Modeling gene drives, from concept, through trials and to the field: The importance of biological complexities. Lorentz Center Workshop on Regulating Gene Drive. University of Leiden, Netherlands.

February 2017. *Genetic Control Strategies for Vector-Borne Diseases*. Main Speaker, ANZIAM Mathematical Biology Special Interest Group workshop, University of Adelaide, Australia.

November 2016. *Model Guided Design of Experiments and Data Collection*. MBI Workshop on Population Models in the 21st Century, The Ohio State University, Columbus, OH.

October 2016. *Genetic Control Strategies for Vector-Borne Diseases*. Operations Research Program seminar, NC State.

September 2016. *Control of Dengue by Combined Strategies*. International Congress of Entomology, Orlando, FL.

July 2016. *Control of Dengue by Combined Strategies*. Society for Mathematical Biology Annual Meeting, University of Nottingham, UK. *Contributed talk*.

April 2016. *Genetic Control Strategies for Vector-Borne Diseases*. Workshop on Spatial Game Theory and Population Genetics, NIMBIOS, University of Tennessee, Knoxville.

March 2016. *Evaluation of Combined Control Strategies for Vector-Borne Diseases*. Ecology and Evolutionary Biology Seminar, Emory University.

March 2016. Uncertainty Quantification for Epidemiological Models. UNISA/UP Workshop on Mathematical and Theoretical Epidemiology. Pretoria, South Africa.

February 2016. Parameter Estimation for Epidemiological Models. UNISA/UP Workshop on Mathematical and Theoretical Epidemiology. Pretoria, South Africa.

February 2016. Stochastic Models in Epidemiology. UNISA/UP Workshop on Mathematical and Theoretical Epidemiology. Pretoria, South Africa.

July 2015. *Evaluation of Combined Control Strategies for Vector-Borne Diseases*. Biomath-2015 Satellite Conference, University of Pretoria, South Africa.

May 2015. *Evaluation of Combined Control Strategies for Vector-Borne Diseases*. SIAM Dynamical Systems conference, Snowbird, UT.

October 2014. *Modeling Novel Strategies for Controlling Mosquito-Borne Diseases*. Plenary Talk, AISC Conference, Game Theory and Mathematical Biology Workshop. UNC-Greensboro.

July 2014. *Integro-Differential Equations in Epidemiology: Impacts of Waiting Time Distributions*. University of Pretoria, South Africa.

July 2014. *Modeling Novel Strategies for Controlling Mosquito-Borne Diseases*. University of Pretoria, South Africa.

April 2014. *Integro-Differential Equations in Epidemiology: Impacts of Waiting Time Distributions*. Workshop on “Structured Integro-Differential Models in Mathematical Biology”, Wolfgang Pauli Institute, Vienna, Austria.

November 2013. *Modeling Novel Strategies for Controlling Mosquito-Borne Diseases*. East Tennessee State University, Johnson City, TN.

September 2013. *Genetic Control Strategies for Mosquito Borne Diseases*, Institute Pasteur, Paris, France.

August 2013. *Uncertainty Quantification for Epidemic Models*. RAPIDD Infectious Disease Dynamics meeting, Isaac Newton Institute, Cambridge, UK. (Part of a month-long funded visit to the Isaac Newton Institute.)

May 2013. *Wolbachia-based Control of Dengue Infection*. SIAM Dynamical Systems Conference, Snowbird, Utah.

September 2012. *Mark Release Recapture Experiments*. RAPIDD Meeting on Modeling Mosquito Movement.

November 2011. *Wolbachia-Based Control of Dengue*. Department of Mathematics, University of North Carolina, Greensboro.

November 2011. *Simple and Complex Dengue Models that Incorporate Human Movement*. RAPIDD Meeting on Human Movement in Mosquito Borne Diseases. Emory University.

September 2011. *Genetic Control of Mosquito-Borne Diseases*. Genetic Engineering and Society Colloquium, NC State.

June 2011. *Wolbachia-Based Control of Dengue*. Mini-symposium talk, European Society for Mathematical and Theoretical Biology/Society for Mathematical Biology, Krakow, Poland.

April 2011. *Wolbachia Modeling*. Annual Meeting of Gates *Wolbachia* Project, Thala Beach, Queensland, Australia.

December 2010. *Fighting Fire With Fire: Can we use mosquitoes to combat mosquito-borne disease?* Biomathematics seminar, NC State University.

October 2010. *Demographic Stochasticity: Quantifying Variability Using Moment Equations*. Plenary talk, Southeast Atlantic Regional Conference on Differential Equations (SEARCDE), Virginia Tech, Blacksburg, VA.

June 2010. *Mosquito-Borne Diseases: Modeling and Control: From Simple to Complex Models*. Modelling Complex Systems conference, Dept. of Physics, Manchester, UK.

April 2010. *Genetic Strategies for Controlling Mosquito-Borne Diseases: Old Ideas Revived, and New Challenges for Modelers*. Healthcare Engineering seminar, NC State University.

April 2010. *Estimation of Mosquito Dispersal Kernels*. RAPIDD Mosquito Group meeting on Model Gaps, University of Oxford, UK.

October 2009. *Transgenic Approaches for the Control of Dengue*. Plenary Talk, Second International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems. University of Alabama at Huntsville, Huntsville, AL.

June 2009. *Transgenic Approaches for the Control of Dengue*. Plenary talk, CAIMS (Canadian Applied and Industrial Mathematics Society) Annual Meeting, University of Western Ontario, London ON, Canada.

May 2009. *Models for Gene Drive and Dengue Transmission*. Annual network meeting for Scott O'Neill's Gates Foundation Group. Cairns, Queensland, Australia.

April 2009. *Transgenic Approaches for the Control of Dengue*, AMS Sectional Meeting, NC State University, Raleigh, NC

October 2008. *Transgenic Approaches for the Control of Dengue*, DIMACS/ECDC Workshop on Spatiotemporal and Network Modeling of Diseases, Tubingen, Germany.

October 2008. *Transgenic Approaches for the Control of Dengue*. Duke University Seminar on Global Health.

July 2008. *A Novel Control Method for Dengue Virus*. DIMACS/BIRS Workshop on Modeling the Impact of Policy Options during Public Health Crises, Banff, Canada.

April 2008. *Modeling Genetic Strategies for Controlling Mosquito-Borne Diseases*. Plenary lecture, Atlantic Coast Symposium on Mathematics and Biology, North Carolina State University.

December 2007. *Mathematical Modeling of Dengue*. Invited talk for a session during workshop on genetic control mechanisms National Evolutionary Synthesis Center, Durham NC.

May 2007. *Modeling Genetic Strategies for Controlling Mosquito-Borne Diseases*. Atlantic Coast Conference on Mathematics and Biology, Virginia Tech.

April 2007. *Drug Resistance in Acute Viral Infections*. University of Pittsburgh, Department of Epidemiology.

February 2007. *Drug Resistance in Acute Viral Infections*. Yale University, School of Public Health, Department of Epidemiology.

January 2007. *Mathematical Modeling: Issues and Innovative Approaches*. Keynote Lecture, EU-US SafeFood workshop, National Conservation Training Center, Shepherdstown, WV.

October 2006. *Drug Resistance in Acute Viral Infections*. Ecology and Evolution seminar, Duke University, Biology Department.

October 2006. *Mathematical Modeling of Vector-Borne Diseases*. Workshop of Genetic Strategies for Mosquito Control, North Carolina State University.

September 2006. *Drug Resistance in Acute Viral Infections*. Applied Mathematics seminar, Duke University, Mathematics Department.

March 2006. *Drug Resistance in Multi-Strain Infections*. University of North Carolina, Chapel Hill, Department of Biology.

July 2005. *Epidemic Dynamics on Networks*. AMS-IMS-SIAM Conference on Modeling the Dynamics of Human Diseases: Emerging Paradigms and Challenges, Snowbird, Utah.

June 2005. *Network Models in Epidemiology: An Overview of Recent Developments*. Research Triangle Institute International, Durham NC.

September 2004. *Network Models in Epidemiology*. Population Biology seminar, North Carolina State University, College of Veterinary Medicine.

June 2004. *Drug Resistance in Multi-Strain Infections*. Canadian Mathematical Society/Canadian Applied and Industrial Mathematics Society joint summer meeting, Dalhousie University, Halifax, Canada.

May 2004. *Network Models in Epidemiology*. DIMACS Working Group on Methodologies for Comparing Vaccination Strategies. Rutgers, NJ.

Recent Teaching Presentations (since 2004)

April 2013. *Transgenic Approaches for the Control of Dengue*. Duke University, Biology Department.

November 2011. *Transgenic Approaches for the Control of Dengue*. Duke University, Biology Department.

May 2011. *Introduction to Epidemiological Modeling*. SAMSI Undergraduate Workshop, RTP NC.

February 2011. *Emerging Infectious Diseases*. Biomathematics, NC State.

January 2011. *Network Models in Epidemiology*. Plant Pathology, NC State.
April 2009. *Network Models in Epidemiology*. UNC-Chapel Hill, Epidemiology Department.
March 2009. *Transgenic Approaches for the Control of Dengue*. Duke University, Biology Department.
September 2008. *Network Models for HIV*. UNC-Chapel Hill, Epidemiology Department.
May 2008. *Network Models in Epidemiology*. John's Hopkins University, Epidemiology/Biostatistics.
April 2008. *Network Models in Epidemiology*. UNC-Chapel Hill, Epidemiology Department.
September 2007. *Network Models for HIV*. UNC-Chapel Hill, Epidemiology Department.
April 2007. *Network Models in Epidemiology*. UNC-Chapel Hill, Epidemiology Department.
November 2006. *Modeling Emerging Infectious Diseases*. UNC-Chapel Hill, Department of Biology.
October 2006. *Network Models for HIV*. UNC-Chapel Hill, Epidemiology Department.
April 2006. *Network Models in Epidemiology*. John's Hopkins University, Epidemiology/Biostatistics.
July 2005. *Network Epidemiology: An Introduction*. Mathematical and Theoretical Biology Institute Summer School, Los Alamos, NM.
May 2005. *Network Models in Epidemiology*. John's Hopkins University, Epidemiology/Biostatistics.
April 2005. *Introduction to Modeling Approaches in Epidemiology*. UNC-Chapel Hill, Epidemiology Department.
September 2004. Tutorial on Infectious Disease Modeling. SAMSI Computational Biology of Infectious Disease opening workshop, Durham NC.
April 2004. *Introduction to Modeling Approaches in Epidemiology*. UNC-Chapel Hill, Epidemiology Department.

Other Workshops and Meetings Attended, but no presentation given

February 2016. Center for Genetic Engineering and Society Gene Drive workshop. NC State University.
January 2016. Joint Mathematics Meetings, Seattle, WA.
November 2015. NIMBIOS Undergraduate Research Conference, Knoxville, TN.
November 2015. Triangle Center for Evolutionary Medicine, RTP, NC.
August 2015. MBI Undergraduate Capstone Conference, Ohio State University, OH.
May 2015. P01 Dengue Project Meeting, Iquitos, Peru.
April 2015. P01 Dengue Project Meeting, Emory University.
January 2015. Joint Mathematics Meeting, San Antonio, TX.
October 2014. Center for Programmable Plants conference, NC State.
September 2014. White House Dengue Modeling Meeting, Office of Science and Technology Policy, Washington DC.
August 2014. P01 Dengue Project Meeting, Iquitos, Peru.
May 2014. Infectious Disease Dynamics follow-up meeting, Isaac Newton Institute, Cambridge, UK.
April 2014. RAPPIDD Mosquito Maps Workshop, UC Davis.
January 2014. Joint Mathematics Meeting, Baltimore, MD.
August 2012. RAPPIDD Human Movement Working Group, Emory University.
March 2012. MBI workshop on Evolution and Spread of Disease, Ohio State University.
February 2012. RAPPIDD Annual Meeting, Fogarty International Center, NIH, Bethesda, MD.
October 2011. *Wolbachia* Modeling Workshop, Monash University, Melbourne, Australia.
June 2011, SAMSI Complex Networks Transition Workshop, SAMSI, RTP.
April 2011. RAPPIDD Leptospirosis Working Group, UCLA.
January 2011. RAPPIDD Annual Meeting, Fogarty International Center, NIH, Bethesda, MD.
October 2010. SAMSI Complex Networks Inference workshop, SAMSI, RTP.
August 2010. SAMSI Complex Networks Opening Meeting, SAMSI, RTP.
June 2010. RAPPIDD meeting on Mosquito and Human Movement, Penn State University, PA.
June 2010. RAPPIDD Mosquito Group Annual Meeting and Model Inventory Meeting, Bethesda, MD.
June 2009. Gates Foundation Network Meeting on Genetic Control of Dengue, UC Irvine.
April 2009. RAPPIDD Vector Borne Diseases Modeling Group. Fogarty Center/NIH, Bethesda, MD.
November 2008. RAPPIDD Spatial Dynamics of Epidemics workshop. Penn. State University, State College, PA.
July 2008. Quantitative Biology: Curriculum and Institutional Transformation at the Math/Biology Interface. Howard Hughes Medical Institute, Chevy Chase, MD.
June 2008. Gates Foundation Network Meeting on Genetic Control of Dengue, UC Irvine.
June 2007. Gates Foundation Network Meeting on Genetic Control of Dengue, UC Irvine.
May 2007. DIMACS Workshop on Spatiotemporal and Network Modeling of Diseases, Edinburgh, UK.
July 2006. Joint SMB/SIAM Life Sciences Conference, Raleigh, NC. (Organizing Committee member).
March 2006. Theoretical Ecology conference, University of Oxford, Department of Zoology.
August 2005. Mathematical Epidemiology conference, Banff International Research Station, Alberta, Canada. (Session rapporteur).

Research Funding

Current

RTG: Parameter Estimation for Mechanistic Biological Models. (Lloyd, PI. 4 co-PIs). NSF. \$2,500,000. August 2013-July 2018.

IGERT: Genetic Engineering and Society: The Case of Transgenic Pests. (Lloyd, co-PI. Gould, NC State entomology, PI, 3 other co-PI) NSF \$3,200,000. August 2011-July 2017.

UBM: Integrated Undergraduate Training in Mathematics and Life Science (Lloyd, co-PI; Tran, NC State mathematics, PI. 2 other co-PI). NSF \$240,000. August 2011-July 2016.

NIH P01: Drivers of Heterogeneities in Dengue Epidemiology, Transmission Dynamics and Control (Lloyd, PI of NC State subcontract; PI: Scott, UC Davis). NIH, \$350,000 to NC State. April 2014-March 2019.

NIH R01: Improving robustness of a tactical model of *Aedes*/dengue dynamics. Gould, PI. Co-investigators: Lloyd, T.W. Scott and A.C Morrison (UC Davis). NIH, \$1,350,000. October 2011-July 2017.

Completed

The Emergence and Spread of Drug Resistant Rhinovirus. A. Lloyd (Co-PI) and D. Wodarz (Co-PI). Viropharma, Inc. \$40,000. March 2001-May 2002.

Geographic Epidemic Modeling (GEM) study. Sattenspiel, L. (Anthropology, U Missouri, PI), Lloyd (Co-PI). Defense Threat Reduction Agency. \$30,000. May 2002-May 2003.

Mathematical Models for HIV Transmission. Lloyd (PI), Valeika (Co-PI), Adimora (Co-PI). Center for AIDS Research, UNC-Chapel Hill. \$16,570. May 2004-May 2006.

Population genetics of transgenes in insect vectors. Fred Gould (Entomology, NCSU, PI), Scott (UC Davis, Co-Investigator), O'Brochta (UMD, Co-Investigator), Lloyd (Co-Investigator). NIH. \$ 1,272,596. June 2004-May 2010

Genetic strategies for control of dengue virus transmission. Lloyd, co-Investigator. (NC State PI: Gould; main PI: James, UC Irvine). Gates Foundation/FNIH (subcontract from UC Irvine). September 2005-June 2013. \$453,132 total to NC State.

Strategic Positioning of Biofuels and Biobased Products in the Economic Context of Agricultural and Crude Oil Markets. Chih Tsai (IES Solar Programs, NCSU, PI), and others. Lloyd (consultant). U.S. Dept. of Agriculture. \$436,000. January 2007-June 2009.

Modeling population replacement strategies using *Wolbachia*-infected *Aedes aegypti* and their impact on dengue transmission. Lloyd PI, Subcontract from University of Queensland, Prime Sponsor: Gates Foundation/FNIH. \$110,000. September 2009-September 2011.

National Science Foundation, Ecology of Infectious Diseases. Eco-epidemiology of Leptospirosis in Latin America: Understanding the dynamics of transmission in a community. Oct 2009-Sep 2013. PI: C. Munoz-Zanzi (U. Minnesota) \$ 1,391,552.
Role: Consultant (although I wrote the modeling component of the grant application, which was about 20% of the entire proposal).

Mathematics of Sterile Insect Technique. NC State/University of Pretoria collaborative grant. co-PI with Roumen Anguelov (Univ. Pretoria, South Africa). NC State award: \$4000. 2012-2014.

Graduate Industrial Traineeship: A Multi-Organ Computational Model of Energy Homeostasis and its Disruption by the Environmental Contaminant 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD). (Lloyd, NC State lead. Subcontract from Hamner Institute, RTP; \$40k total, 1/1/14-8/15/15.)

Consultancy Work

Several of my research projects have been initiated as part of consultancy work for external companies. As an example, I have worked with Viropharma Inc. (Exton, PA), a pharmaceutical company that has developed a drug that targets the common cold virus. As part of the drug's submission to the Food and Drug Administration (FDA), concerns surrounding the emergence of drug-resistant virus strains had to be addressed. Together with Dominik Wodarz, I developed models to assess the impact of the use of anti-viral drugs for the emergence and spread of drug resistance, examining scenarios under which resistance would, or would not, be a problem.

A project with RTI (RTP, NC) investigated the sampling properties of epidemiological networks. This work has implications for the practical use of network approaches in epidemiology and their application to modeling the spread of pandemic influenza. This work was funded by RTI's MIDAS (Models of Infectious Disease Agents Study) grant from the NIH.

Other Professional Activities

I was an editorial board member for *Biology Letters* (published by the Royal Society of London) January 2006-December 2011.

Organizing committee member, SMB/SIAM Life Sciences Meeting (Raleigh, 2006). Co-organizer, DIMACS Workshop on Spatiotemporal and Network Modeling of Diseases (Rutgers, NJ, 2003; Edinburgh, UK, 2007; Tubingen, Germany, 2008), SIAM-SEAS meeting (Raleigh, 2010), RAPIDD meeting on Model Complexity and Dimension Reduction in Models for Mosquito-Borne Disease (Washington DC, 2010). Co-organizer, SAMSI program on Computational Biology of Infectious Diseases (2004/2005). Faculty fellow, SAMSI program on Complex Networks (2010/2011). Co-organizer, SAMSI Dynamics ON Complex Networks workshop (2011). Co-organizer and faculty fellow, SAMSI program on Mathematical and Statistical Ecology (2014/15). Co-organizer of opening and transition workshops for SAMSI ecology program. Co-organizer of RTG Tutorial Workshop on Parameter Estimation for Mechanistic Biological Models (NC State University; 2014 and 2016).

I referee papers for a wide range of journals, including Nature, Science, Proceedings of the National Academy of Sciences, Physical Review Letters, Proceedings of the Royal Society B, Journal of the Royal Society Interface, Ecology Letters, PLoS Neglected Tropical Diseases, PLoS ONE, Epidemics, Emerging Infectious Diseases, Journal of Infectious Diseases, Journal of Theoretical Biology, Journal of Mathematical Biology, Mathematical Biosciences, Bulletin of Mathematical Biology, Theoretical Population Biology, BioSystems, Physical Review E, Applied Mathematical Modeling, and the Journal of Difference Equations and Applications.

Reviewed tenure/promotion cases for a number of US and non-US institutions.

Reviewed research proposals for NIH, NSF, Natural Sciences and Engineering Research Council of Canada, Medical Research Council (UK), Research Grant Council of Hong Kong, Greek Science Foundation and National Science Foundation of Chile.

Reviewed research monograph proposals and textbooks for several publishers (Academic Press, Cambridge University Press, Springer).

Publication List

(88 total accepted; 6761 citations according to *Google Scholar* as of 6/23/2016; h-index 35)

Refereed Journal Articles

Submitted (Under Revision):

Zhang, Y. & LLOYD, A.L. (2017) Weak convergence of a seasonally forced epidemic model. *Journal of Mathematical Biology*. Original submission available: arXiv:1412.0964 , <http://arxiv.org/abs/1412.0964>

Published and In Press

Yakob, L., LLOYD, A.L., Kao, R., Ferguson, H.M., Brock, P., Drakeley, C. & Bonsall, M. (2017) *Plasmodium knowlesi* invasion following spread by infected mosquitoes, macaques and humans. *Parasitology*. *In press*.

Usaini, S., LLOYD, A.L., Anguelov, R. & Garba, S.M. (2017) Dynamical behavior of an epidemiological model with

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