

CAROLYN GATES BSc VMD PhD MRCVS

Lecturer in Veterinary Epidemiology
Institute of Veterinary, Animal and Biomedical Sciences
Massey University
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RESEARCH INTERESTS

Production medicine, food animal epidemiology, animal health economics, infectious disease modelling, livestock trade, network analysis, decision support systems, knowledge transfer

QUALIFICATIONS

2010 – 2013	PhD in Epidemiology, University of Edinburgh Awarded November 2013
2010	MRCVS, Royal College of Veterinary Surgeons, United Kingdom
2006 – 2010	VMD, University of Pennsylvania GPA 3.93 / 4.0 (summa cum laude)
2004 – 2006	BSc in Animal Science, Rutgers University GPA 3.90 / 4.0 (with highest honors)

PROFESSIONAL EXPERIENCE

Lecturer in Veterinary Epidemiology

Feb 2015 – Present	Massey University, Palmerston North, NZ <ul style="list-style-type: none">- Responsible for teaching epidemiology and animal health economics into the undergraduate and postgraduate curricula.- Study design and data analysis support for IVABS.- Postgraduate supervision
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Research Scientist

Feb 2014 – Feb 2015	IIAD, Texas A&M University, College Station, TX <ul style="list-style-type: none">- Developing interfaces to collect syndromic surveillance data from veterinary practitioners through mobile devices, designing surveys and modelling studies to evaluate system performance
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Clinical Veterinarian

Oct 2013 – Feb 2015	Pennsylvania SPCA, Philadelphia, PA
May 2010- Feb 2015	Philadelphia Animal Welfare Society, Philadelphia, PA <ul style="list-style-type: none">- Performing high volume spay / neuter surgery, teaching surgical and clinical skills to veterinary students, managing shelter animal health protocols, providing outpatient veterinary care to underserved communities

RESEARCH TRAINING

Doctoral Thesis

2010 – 2013	Controlling endemic disease in cattle populations: current challenges and future opportunities (Advisor: Prof. Mark Woolhouse)
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CDC Epidemiology Elective

2010 Collecting and analyzing data on an animal importation through CDC Quarantine Stations (Advisor: Dr. Heather Bair-Brake)

Certificate in Veterinary Public Health

2009 – 2010 Developing the economic framework for integrating veterinary services into pro-poor livestock initiatives (Advisor: Dr. Alan Kelly)

Independent Research Study

2008 – 2009 Mathematical modelling of *Borrelia burgdorferi* transmission in wildlife reservoir hosts (Advisor: Dr. Dustin Brisson)

Research assistant in the Swine Research Unit responsible for animal care (Advisor: Dr. Thomas Parsons)

2008 Applications of risk analysis to mathematical modelling in veterinary epidemiology (Advisor: Dr. David Galligan)

2007 – 2008 Research assistant in the Medical Genetics Research Group responsible for animal care (Advisor: Dr. Mark Haskins)

Merck/NIH Summer Research Program

2008 Influence of prophylactic medications on endoparasite prevalence in companion animals: a time series analysis (Advisor: Dr. Thomas Nolan)

2007 Analyzing the spread of West Nile virus through national mosquito and avian surveillance data (Advisor: Dr. Raymond Boston)

George H. Cook Scholars Program

2004 – 2006 Evaluating the impact of ambient air pollution on thoroughbred race performance (Advisor: Dr. George Clark)

TEACHING EXPERIENCE

Classroom Teaching

2015/2016 Massey University

Team-taught Courses

227.114 – Veterinary Professional Studies

227.213 – Introductory Veterinary Clinical Science

227.216 – Veterinary Infectious and Parasitic Diseases

227.311 – Farm Animal Population Health

227.415 – SPINE Research Data Block

227.416 – Production Animal Medicine

227.408 – Veterinary Epidemiology and Economics

227.503 – Animal Health Roster

118.785 – Principles of Veterinary Epidemiology

118.816 – Advanced Analysis and Interpretation of Data

118.819 – Biosecurity and Risk Analysis

118.715 – Epidemiological Concepts 1

118.716 – Analysis and Interpretation of Data 1

118.772 – Calf Health, Medicine, and Management

193.301 – Veterinary Biostatistics and Epidemiology for BVetTech

Paper Coordinator

118.718 – Management of Biological Production Systems

118.815 – Epidemiological Methods 2

Training

- 2014 – Present IVABS Teaching and Learning Circle
- 2015 Foundations of Teaching and Learning at Massey
- 2014 Completed online teaching course (An introduction to evidence-based undergraduate STEM teaching by Vanderbilt University on Coursera)

Clinical Teaching

- 2010 – 2014 Clinical teaching veterinarian at Philadelphia Animal Welfare Society for high-volume spay/neuter and community practice for University of Pennsylvania veterinary students

Teaching Assistant

- 2011 – 2012 University of Edinburgh
 - Animal Biology III (Demonstrator)
 - Behavioural Ecology (Demonstrator)
 - Parasite Biology III (Demonstrator)

SUPERVISION

PhD Students

- Arata Hidano (co-supervisor) Massey University - Development of a cost-effective approach to the elimination of bovine tuberculosis among livestock in New Zealand
- Mary van Anandel (co-supervisor) Massey University - Novel applications of new animal demographic and animal movement data sources for enhancing investigation and management of exotic disease outbreaks
- Jun Hee Han (main supervisor) Massey University - Designing a national eradication programme for bovine viral diarrhoea virus (BVD) in New Zealand
- Aaron Yang (co-supervisor) Massey University - Epidemiology of bovine digital dermatitis in New Zealand
- Rudolfo Bueno (co-supervisor) Massey University - Field deployable diagnostic tests for foot-and-mouth disease
- Sabrina Greening (co-supervisor) Massey University - Epidemiology and evolution of pathogens on livestock transport networks

Masters Students

- Shekhar Pohkrel (main supervisor) Massey University - Modelling the transmission dynamics of *Campylobacter* in the New Zealand poultry industry
- Isobel Topham (co-supervisor) Massey University - Epidemiology of dropped-hock syndrome in New Zealand dairy cattle
- Claire Luckman (co-supervisor) Massey University - Epidemiology of feline leukaemia virus in domestic cats in New Zealand

Undergraduate Students

- 2014 Victoria Novak (co-supervisor) Texas A&M University

SOFTWARE SKILLS

Statistical	R, STATA, SPSS, Minitab
Programming	C, Python, R, Visual Basic
Spatial	ArcGIS, QGIS, GoogleEarth

AWARDS AND HONORS

University of Edinburgh

2010 – 2013	Principal's Career Development Scholarship Scottish Overseas Research Student Award Scheme
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University of Pennsylvania

2006 – 2010	Dean's List Opportunity Scholarship Award
2010	William B. Chalupa Excellence in Dairy Nutrition Award Swine Proficiency Award Peter J. Francis Anatomy Award Class of 2010
2009	Hill's Innovations in Public Health Award (1 st Place) SAVMA Emerging Issues Essay Contest (1 st Place) Phi Zeta Veterinary Honor Society Induction
2008	Lois Fairchild Veterinary Public Service Scholarship Hill's Innovations in Public Health Award (2 nd Place) SAVMA Emerging Issues Essay Contest (2 nd Place) Association for Women Veterinarians Foundation Scholarship
2007	American Veterinary Medical Foundation Scholarship

Rutgers University

2006	George H. Cook Scholar Award American Society of Animal Science Scholastic Achievement Award Edward J. Bloustein Distinguished Scholar Award Rutgers Outstanding Scholar Award Dr. John W. Bartlett Scholarship Herbert Estate / Kelly Scholarship President's Volunteer Service Award
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CONFERENCES AND PRESENTATIONS

1. Muellner P, Muellner U, **Gates MC**, Pearce P, Cave N. Equine disease monitoring: a New Zealand Equine Health initiative. Oral Presentation. Massey Equine Patrons Day, Palmerston North, New Zealand, Aug 23 2016.
2. **Gates MC**, French NP. "Transmission and evolution of pathogens on livestock networks." Oral Presentation. National Science Challenge – Biosecurity Networks Workshop, Wellington, New Zealand, Jun 15 2016.
3. **Gates MC** "Controlling endemic disease in cattle populations through the targeted manipulation of contact network topology." Oral Presentation. One Health Aotearoa Symposium Wellington, New Zealand Mar 22 – Mar 23 2016.
4. **Gates MC**. "Modelling infectious disease transmission on livestock networks." Oral Presentation. MPI-Massey Day, Upper Hutt, Wellington, Feb 25 2016.

5. Hidano A, **Gates MC**, Stevenson MA, Bosson MA, Carpenter TE. “Influence of disease control zones on dairy cattle movement patterns”. Oral Presentation. MPI-Massey Day, Upper Hutt, Wellington, Feb 25 2016.
6. **Gates MC**. “Investigating atypical mortality patterns associated with skin lesions in New Zealand King Salmon.” Ministry for Primary Industries, Upper Hutt, New Zealand Feb 12 2016.
7. **Gates MC**, Woolhouse MEJ. “Controlling endemic disease in cattle populations through the targeted manipulation of contact network topology.” Oral Presentation. ISVEE 14, Merida, Mexico, Nov 3 – Nov 7, 2015
8. Epidemics 4, Amsterdam, Netherlands, Nov 19 – Nov 22, 2013.
 - **Gates MC**, Woolhouse MEJ. “Controlling endemic disease in cattle populations through improved herd reproductive management.” Oral Presentation.
 - **Gates MC**, Woolhouse MEJ. “Controlling endemic disease in cattle populations through the targeted manipulation of contact network topology.” Poster.
9. **Gates MC**, Volkova VV, Woolhouse MEJ. "Impact of changes in cattle movement regulations on the risks of bovine tuberculosis for Scottish farms." Poster *EPIC Annual Meeting* Edinburgh, Scotland, Sep 25 – Sep 26, 2012.
10. **Gates MC**, Woolhouse MEJ. “Implications of constrained network topology for modelling and controlling infectious disease on cattle movement networks” Poster *Epidemics 3* Boston, Massachusetts, Nov 29 – Dec 2, 2011.
11. *NIMBioS Working Group - Bovine Tb/Cattle movement modeling*. Presentation on network analysis modelling techniques. Knoxville, Tennessee, Jan 31 – Feb 1, 2011.
12. **Gates MC**, Nolan TJ. “The influence of chemoprophylactics on endoparasites prevalence in companion animals: a time series analysis of case from a veterinary teaching hospital between 1984 and 2007” Poster *Merck-Merial-NIH National Veterinary Scholars Symposium*. East Lansing, Michigan, Jul 31-Aug 3, 2008.
13. **Gates MC**, Boston RC. “Analyzing the spread of West Nile virus through mosquito and avian surveillance data” Poster. *Merck-Merial-NIH National Veterinary Scholars Symposium*. Bethesda, Maryland, Aug 1-4, 2007.

PEER REVIEW

1. BMC Research Notes
2. Journal of Veterinary Medicine and Animal Health
3. Trends in Microbiology
4. Veterinary Research
5. PLoS Computational Biology
6. Proceedings Royal Society B
7. Veterinary Parasitology: Regional Reports and Reviews
8. Preventive Veterinary Medicine

9. New Zealand Veterinary Journal
10. Journal of Medical Education

THESIS EXAMINATIONS

Masters

1. Jun Hee Han (2016) “Time and space analysis of abattoir monitoring data of Johne’s disease in New Zealand” Master of Veterinary Studies (Epidemiology), Massey University
2. Shen-Yan Hee (2015) “A Bayesian approach to the estimation of the sensitivity and specificity of diagnostic tests for leptospirosis, and the estimation of infection prevalence in sheep and cattle” Master of Veterinary Studies (Epidemiology), Massey University
3. Simon Clark (2015) “Survey of complementary or alternative medicine use in humans and pets in New Zealand” Master of Veterinary Medicine, Massey University
4. Ruth Pirie (2015) “Improving data collection for STI surveillance in New Zealand and examining patterns for sexually transmitted chlamydia infections and testing in the Bay of Plenty, 2003—2007” Master of Veterinary Studies (Epidemiology), Massey University

RESEARCH FUNDING

2017

Massey University Research Fund (MURF) – Validating molecular contact tracing methods using *Staphylococcus aureus* in dairy cattle as a model system (NZD \$9,000)

AGMARDT – Epidemiology and economics of bovine viral diarrhoea virus in New Zealand beef herds (NZD \$95,000)

2016

Massey University Research Fund (MURF) - Modelling the management decisions of New Zealand beef and dairy farmers (NZD \$6,720)

IVABS Postgraduate Fund 2016 - Modelling the spread of foodborne pathogens through New Zealand poultry supply networks (NZD \$1,000) + co-funding from MPI (NZD \$500)

IVABS PhD Scholarship 2016 - Designing a national eradication programme for bovine viral diarrhoea virus (BVD) in New Zealand (NZD \$84,000)

EXTERNAL CONSULTING

May 2016 – Jun 2016 Johnes Disease Research Consortium (JDRC) Developing a web-based interface for an ovine Johne’s disease simulation model

May 2016 Ministry for Primary Industries (MPI) Spatial epidemiology of New Zealand Psa-v outbreak in kiwi fruit

Aug 2015 – Sep 2015 Ministry for Primary Industries (MPI) Investigation of atypical mortality patterns in farmed New Zealand king salmon

- July 2015 – Aug 2015 Operational Solutions for Primary Industries (OSPRI) Modelling farmer compliance rates for reporting animal demographics and contacts during an exotic disease response
- Sep 2014 – Feb 2015 Scottish Government’s Centre of Expertise on Animal Disease Outbreaks (EPIC) Evaluating the impact of altering movement standstill on the epidemiology of foot-and-mouth disease outbreaks

PUBLICATIONS

1. Muellner P, Muellner U, **Gates MC**, Pearce P, Ahlstrom C, O’Neill D, Brodbelt D, Cave N. (2016) Evidence in practice – leveraging companion animal and equine health data from primary care veterinary clinics in New Zealand. *Frontiers in Veterinary Science* 3.
2. Hidano A, Carpenter TE, Stevenson MA, **Gates MC** (2016) Evaluating the efficacy of regionalisation in limiting high-risk livestock trade movements. *Preventive Veterinary Medicine* 133: 31- 41.
3. **Gates MC**, Muellner P, Muellner U, Pearce P and Cave N. (2016) Starting a practice-based revolution. *VetScript* 29(7): 10.
4. **Gates MC**, Woolhouse MEJ. (2015) Controlling infectious disease through the targeted manipulation of contact network structure. *Epidemics* 12: 11-19.
5. **Gates MC**, Holmstrom LK, Biggers K, Beckham TR (2015) Integrating novel data streams to support infectious disease surveillance in commercial livestock production systems: challenges and opportunities. *Frontiers in Public Health* 3:74.
6. **Gates MC**, Humphry RW, Gunn GJ, Woolhouse MEJ. (2014) Not all cows are epidemiologically equal: quantifying the risk of bovine viral diarrhoea virus (BVDV) transmission through cattle movements. *Veterinary Research* 45: 110.
7. **Gates MC**, Nolan TJ. (2014) Declines in canine endoparasite prevalence associated with the introduction of commercial heartworm, flea, and tick preventatives. *Veterinary Parasitology* 204 (3-4): 265 - 268.
8. **Gates MC**. (2014) Characteristics of replacement breeding cattle trade in Great Britain. *Veterinary Record* 175(3): 67.
9. **Gates MC**, Woolhouse MEJ. (2014) Suboptimal herd performance amplifies the spread of infectious disease in the cattle industry. *PLoS ONE* 9(3): e93410.
10. **Gates MC**, Volkova VV, Woolhouse MEJ. (2013) Risk factors for bovine tuberculosis in low incidence regions related to the movements of cattle. *BMC Veterinary Research* 9:25.
11. **Gates MC**, Humphry RW, Gunn GJ (2013) Associations between bovine viral diarrhoea virus (BVDV) seropositivity and performance indicators in beef suckler and dairy herds. *Veterinary Journal* 198(3): 631 – 637.
12. **Gates MC**, Woolhouse MEJ, Gunn GJ, Humphry RW. (2013) Relative associations of cattle movements, local spread, and biosecurity with bovine viral diarrhoea virus (BVDV) seropositivity in beef and dairy herds. *Preventive Veterinary Medicine* 112(3-4): 285-295.

13. **Gates MC.** (2013) Evaluating the reproductive performance of British beef and dairy herds using national cattle movement records. *Veterinary Record* 173: 499.
14. **Gates MC, Volkova VV, Woolhouse MEJ.** (2013) Impact of changes in cattle movement regulations on the risks of bovine tuberculosis for Scottish farms. *Preventive Veterinary Medicine* 108(2-3): 125–136.
15. **Gates MC.** (2011) Recipe websites: a novel medium for disseminating food safety and origin information. *Food Protection Trends*. 105-109.
16. **Gates MC, Nolan, TJ.** (2010) Efficacy of heartworm preventatives against ascarids and hookworms in client-owned dogs: a retrospective case control study. *Journal of Veterinary Pharmacology and Therapeutics* 34(2): 116-119.
17. **Gates MC, Nolan TJ.** (2009) Factors influencing heartworm, flea, and tick preventative use in patients presenting to a veterinary teaching hospital. *Preventive Veterinary Medicine* 93 (2-3): 193-200.
18. **Gates MC, Nolan TJ.** (2009) Estimating endoparasite prevalence and recurrence across different age groups of well cared for companion animals. *Veterinary Parasitology* 166: 153-158.
19. **Gates MC, Nolan TJ.** (2009) Risk factors for endoparasitism in well cared for dogs: a retrospective case-control study of 6,553 veterinary teaching hospital cases. *Journal of Small Animal Practice* 50(12): 636 – 640.
20. **Gates MC.** (2009) One Health continuing medical education: an avenue for advancing interdisciplinary communication on One Health issues. *Journal of the American Veterinary Medical Association* 234(11): 1384 –1386.
21. **Gates MC, Nolan TJ.** (2009) Comparison of passive fecal flotation run by veterinary students to zinc-sulfate centrifugation flotation run in a clinical parasitology laboratory. *Journal of Parasitology* 95(5): 1213 – 1214.
22. **Gates MC, Boston RC.** (2009) Irrigation linked to a greater risk of human and veterinary West Nile virus cases in the United States from 2004 – 2006. *Preventive Veterinary Medicine* 89: 134 – 137.
23. **Gates MC.** (2007) The influence of air pollution on thoroughbred race performance. *Equine and Comparative Exercise Physiology* 4: 79-88.