What is CHICAS?

http://chicas.lancaster-university.uk

Barry Rowlingson

January 2016

Faculty of Health and Medicine,
Lancaster University

CHICAS
combining health information, computation and statistics

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"Combining Health Information, Computation, and Statistics"

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Health Data Science?

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What CHICAS isn't

- Statistical Consultancy Service
  - But we do like talking about statistics
  - Can probably find you jobbing statisticians
- Clinical Trials Research Unit
  - Maths and Stats has this!
- Service Teaching Group
  - Although some staff do some teaching
  - Do want to expand PG teaching...

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Who is CHICAS?

- Peter Diggle
- Frank Dondelinger
- Emanuele Giorgi
- James Hensman
- Chris Jewell
- Tom Keegan
- Jo Knight
- Jon Read
- Barry Rowlingson
- Luigi Sedda
- Ben Taylor

Plus three full-time PDRAs and 14 PhD Students.

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Peter Diggle

- Distinguished University Professor
- RSS President (2014-2016)
- Spatial and Longitudinal Analysis
- Biomedical, Health, Environmental Applications

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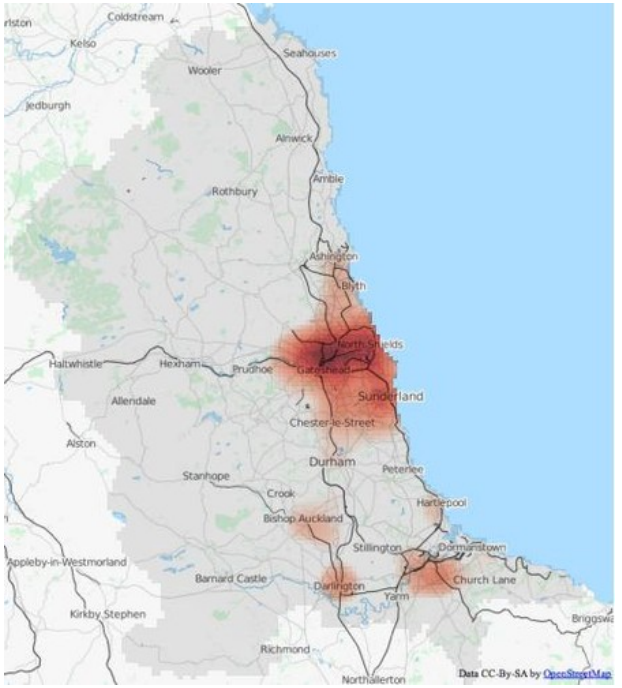
Campylobacter

enigma The Study of Campylobacter

- Most common cause of GI illness in England and Wales
- Integrating heterogeneous data collections
- Produce incidence maps
- Predict risk
- Target controls



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Frank Dondelinger

- Anniversary Lecturer in Biostatistics
- Statistical Genomics
- Disease Outcome Prediction
- Genetic Trait and Phenotype Prediction
- Networks and Pathway Inference
- Hierarchical Bayesian Modelling
- Analysis of Heterogeneous Datasets
- Systems Biology and Dynamical Modelling

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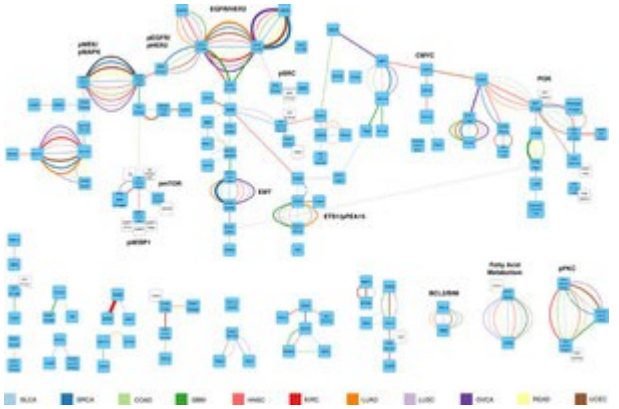
Signalling Pathway Reconstruction

- Using a Pan-Cancer Proteomics Dataset
- 181 proteins in 11 tumour types
- Graphical Gaussian models
- Reconstruction of known and novel pathways.
- Enabling new stratification and classification of cancer subtypes.



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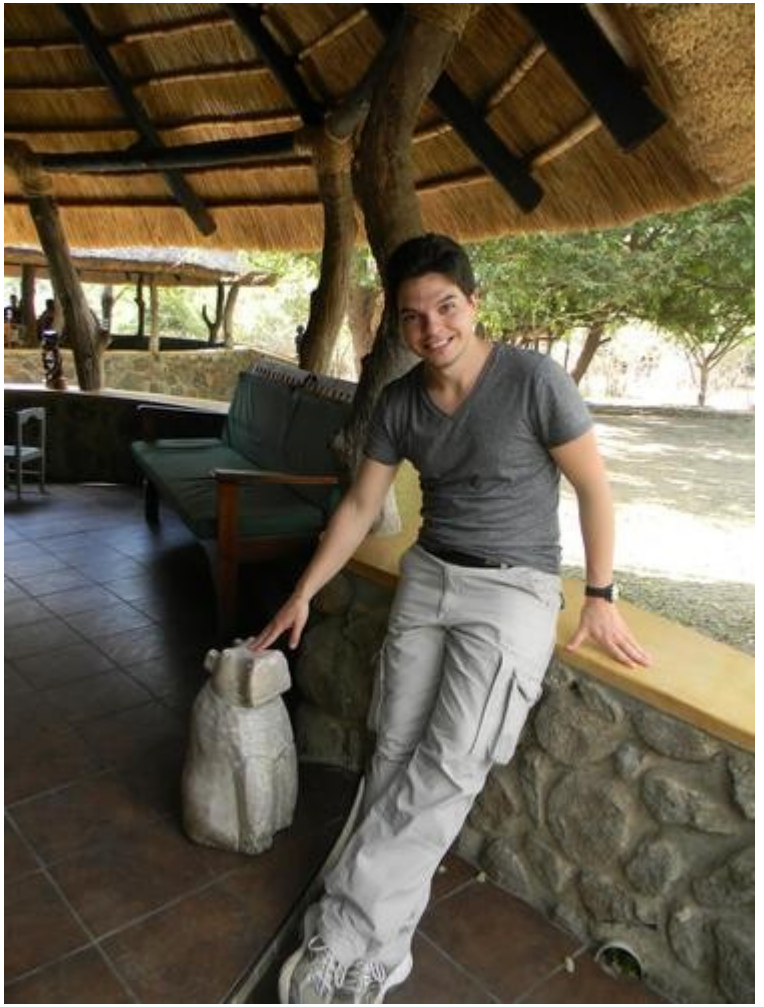
Emanuele Giorgi

- MRC Research Fellow
- Recent CHICAS PhD completion
- Spatio-temporal Statistics
- Prevalence Mapping



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Malaria Control in Malawi

- Intervention Effectiveness
- Monitoring and Evaluation Tool
- With Wageningen, Amsterdam, Malawi, Liverpool
- Aiming for 80% morbidity reduction

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James Hensman

- MRC Fellowship Lecturer in Biostatistics
- Statistical Machine Learning
- Gaussian Process Models
- Bioscience and Epidemiology Applications

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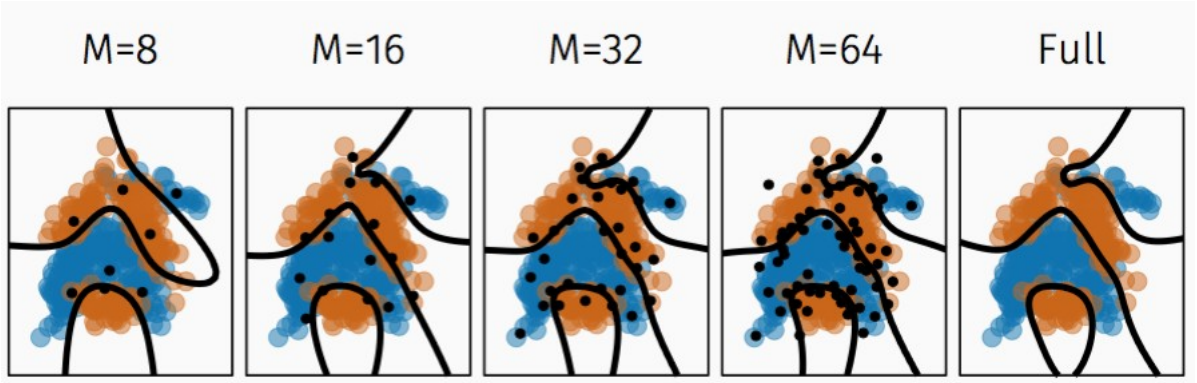
Scaling Gaussian Processes

- GPs are popular and useful statistical models
- Computation is $O(n^3)$
- Becomes slow with Big Data
- Developed algorithm for better than $O(n^3)$ performance with little accuracy sacrifice



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Chris Jewell

- CHICAS Senior Lecturer
- Disease Outbreak Response
- Zoonotic Diseases
- Stochastic Dynamic Infection Models
- High Performance Computing, including GPU Programming

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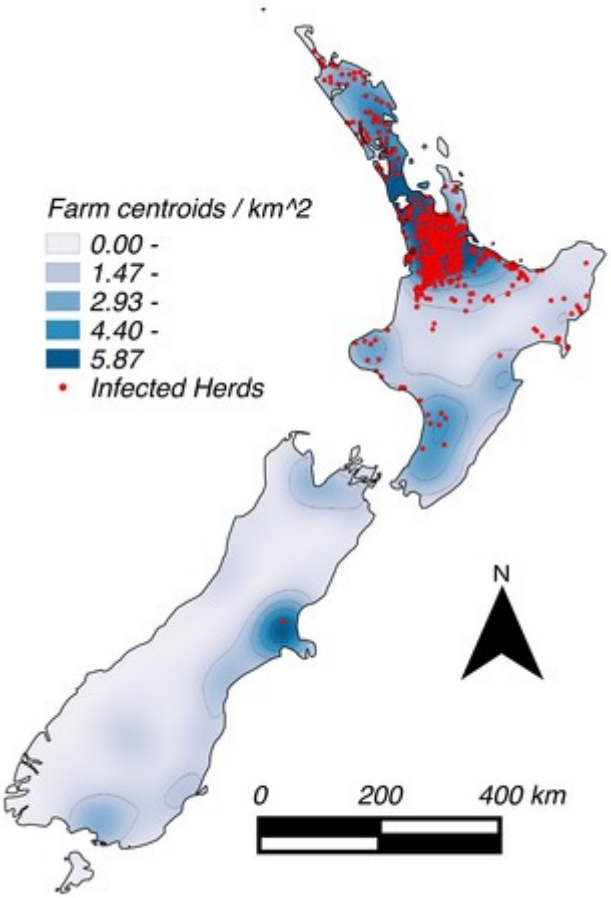
Vector-borne Disease Inference

- Methodology for forecasting
- Fitting algorithms from case data
- Predicting risk surfaces
- Data assimilation



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Tom Keegan

- Lecturer in Epidemiology
- Environmental and Occupational Epidemiology
- Exposure Measurement and Modelling

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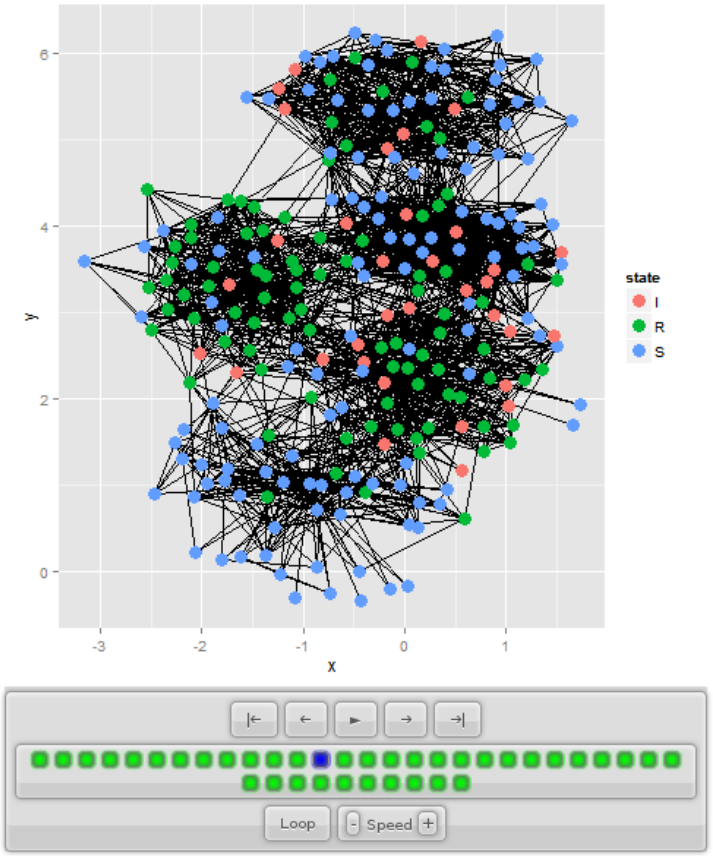
Infections and Networks

- Influenza Transmission
- Social Network Graph Models
- Vaccination Scheme Design



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Jo Knight

- Anniversary Reader in Statistical Genetics
- Psychiatric Genetics
- Genetic Data Integration
- Epigenetics

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Jonathan Read

- Senior Lecturer in Epidemiology
  - Infectious diseases
  - Pathogen transmission and evolution
  - Human interaction patterns
  - Field-based and modelling studies
  - Worked on seasonal and pandemic influenza, Ebola, RSV, norovirus, rotavirus, pneumococci
  - Studies in China, Hong Kong, UK, USA, Malawi, Thailand, Indonesia, Vietnam

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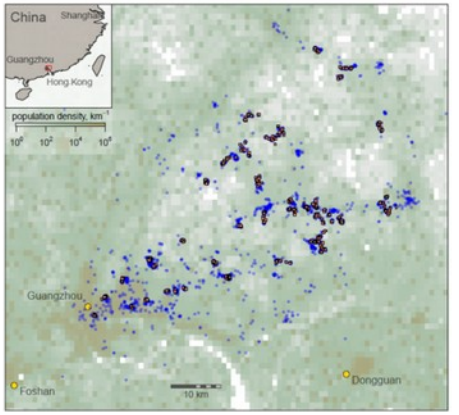
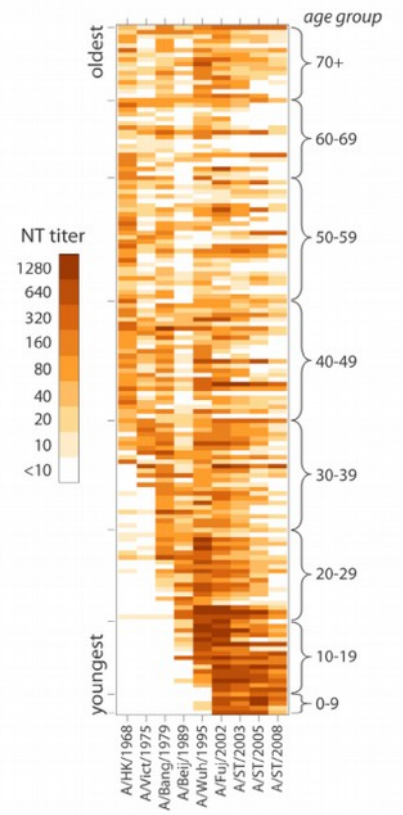
Fluscape

- Open cohort study
  - Guangdong province, China
  - Approx. 1,000 households
  - Approx. 2,000 individuals
  - 4 years field-work
  - Measure contact and travel patterns
  - Serological analysis of antibody titres to recent and historic influenza strains
  - Statistical analysis and modelling (simulation)





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Barry Rowlingson

- CHICAS Research Fellow
- Spatial Epidemiology
- Statistical Software Development
- Visualisation and Graphics
- Geographic Information Systems
- Web System Development

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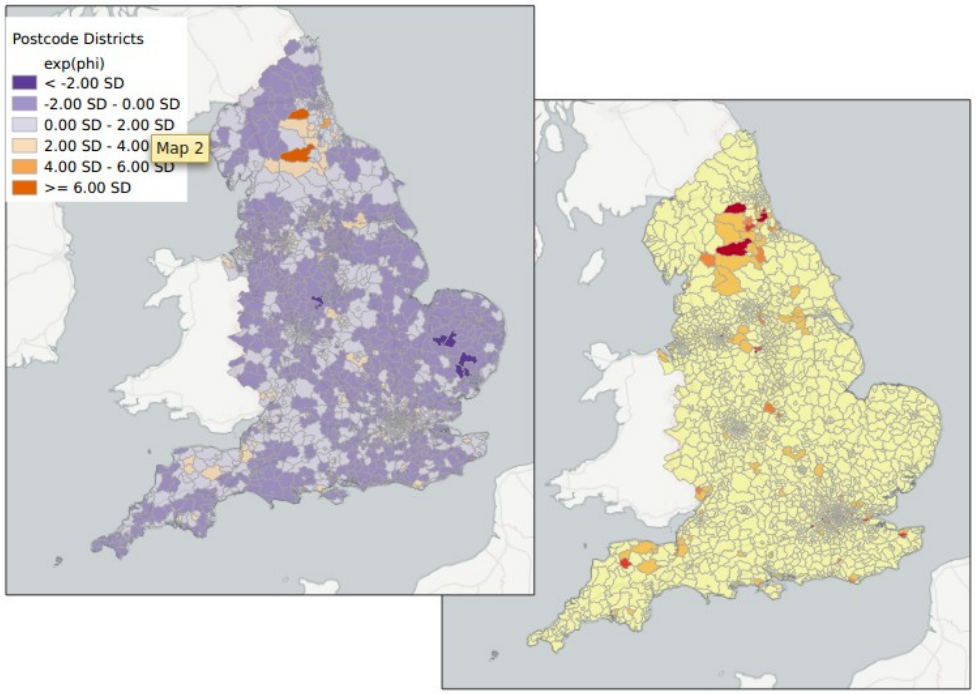
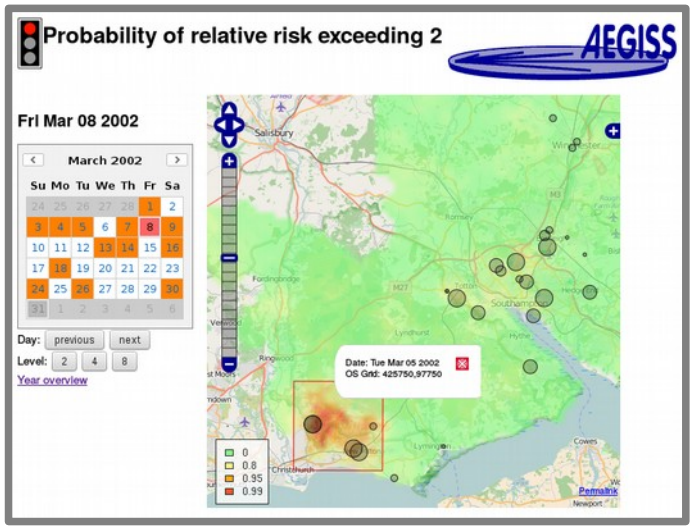
AEGISS2

- Integration of Human and Veterinary Case Data
- Vet Data via SAVSNET
- Human Data via NHS111
- Rapid Detection of Disease Outbreaks





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Luigi Sedda

- Anniversary Lecturer in Spatial Epidemiology
- Vector-borne disease mapping
- Emergence and spread
- Species Distribution
- Disease Control

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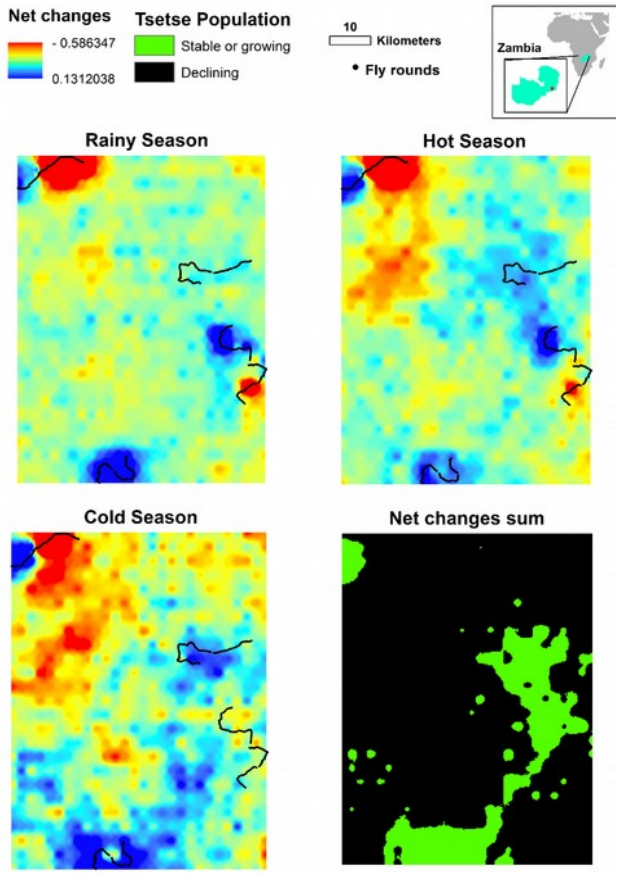
Mapping Vector Hot-Spots

- Determine vector and host population dynamics
- Tsetse fly distribution analysis
- Map stable/growing tsetse fly zones
- With Lancaster, Liverpool STM, Southampton University



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Ben Taylor

- Lecturer in Statistics
  - Methodological and computational aspects of log-Gaussian Cox Processes.
  - Combining data recorded at multiple spatial scales.
  - Filtering methodology and applications.
  - Forecasting meningitis incidence in sub-Saharan Africa in collaboration with the World Health Organisation.
  - Spatial prediction of campylobacter in the UK.
  - Spatial modelling of survival outcomes

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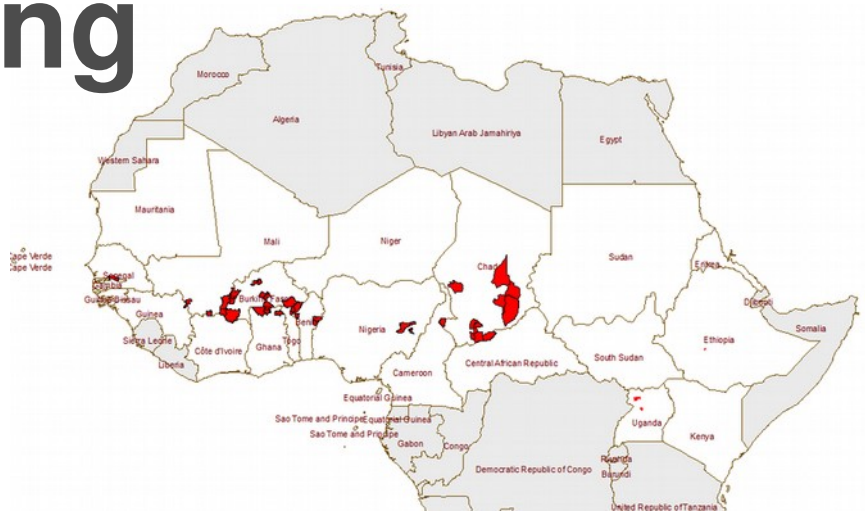
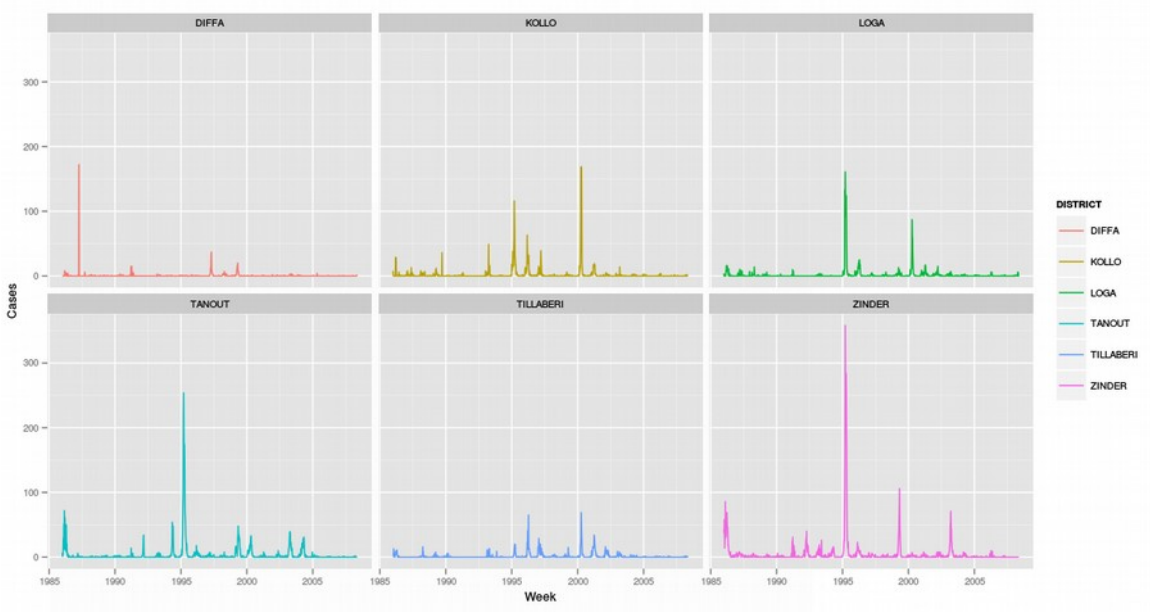
Meningitis Forecasting

- Weekly District Case Counts
- Dynamic Linear Model
- Epidemic Alert and Forecast
- Weekly Reports Delivered to WHO





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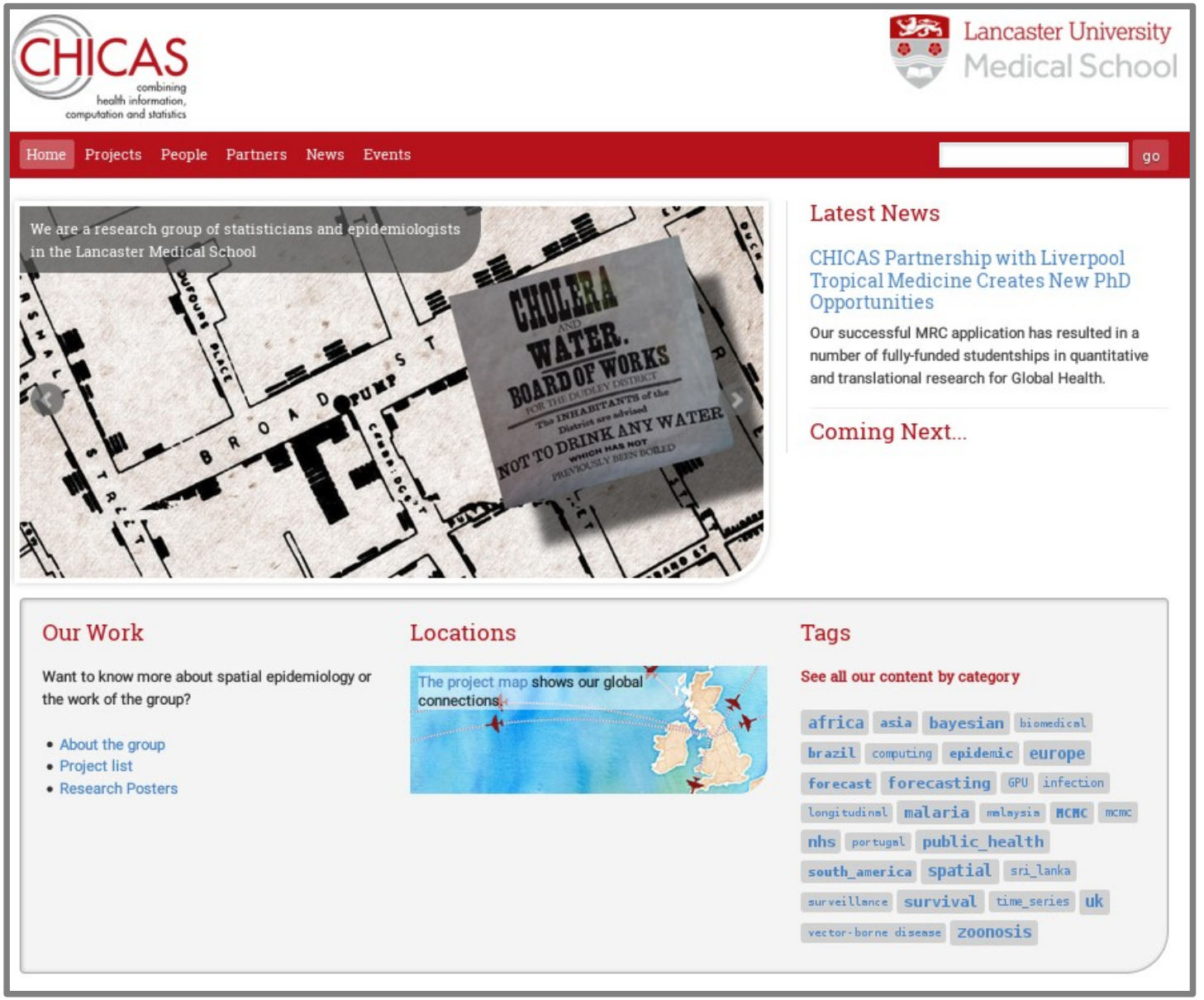
Web Site



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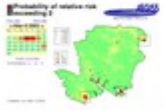
AEGISS 2

Real-time Surveillance Modelling

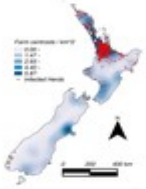


Brazilian Leptospirosis Study

Ecoepidemiology of Leptospirosis in the Urban Slums of Brazil

Inference for Vector-borne Diseases

Statistical Inference and Data Assimilation for Dynamical Models of Vector-borne Diseases.



Predicting Stroke

Population Predictors for Stroke Risk in Kelantan, Malaysia.

Acute Kidney Injury

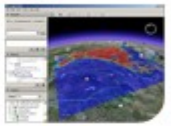
Investigating the Influence of Acute Kidney Injury on Long-term Kidney Function

Campylobacter Transmission

A Better Understanding of Campylobacter in Humans

Loa-loa Modelling

Identifying High-risk Areas for LF Treatment

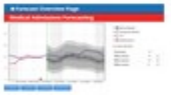


Partial Likelihood for Space-Time Models

Developing Methods for Space-time Point Process Models

Alder Hey Hospital Prediction

Predicting Emergency Admissions in a Children's Hospital



GPU Accelerated Epidemic Forecasting

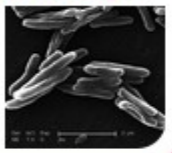
Within-chain Acceleration of MCMC Using GPUs as Likelihood Co-processors

National Snakebite Study in Sri Lanka

Developing a Risk Map for Snakebites

Tuberculosis in Portugal

Spatial Survival Analysis of TB Outcomes



Amazonian Food Insecurity

Environmental Change and its Effect On Food Supplies

Health e-Research Centre

MRC-funded Research into New Techniques in Health Research

Malaria Control in Malawi

Community-based Malaria Control in Majete Wildlife Reserve, Malawi

Predicting Renal Failure

Real-time Monitoring of Progression Towards Renal Failure in Primary Care Patients

Bluetongue Mapping

BBSRC-funded Study Into Bluetongue Disease Vectors in the UK

Coronary Heart Disease

Socio-economic Factors in Coronary Heart Disease

Infections and Networks

Using network connectivity to explore the spread of infections.

Noisy Knees

A Non-invasive Osteoarthritis Test

Projects

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African Institute for Mathematical Sciences (Tanzania)

College of Public Health, University of Arizona (Tucson)

Hong Kong University School of Public Health (Hong Kong)

Lancaster Data Science Institute (Lancaster)

MD Anderson Cancer Center (Houston, Texas)

Oswaldo Cruz Foundation (Brazil)

Stichting Dioraphte (Netherlands)

University of Liverpool Institute of Infection and Global Health (Liverpool)

AstraZeneca Innovative Medicine Oncology (Cambridge, UK)

Department of Zoology, University of Oxford (Oxford)

Imperial College School of Public Health (London)

KEMRI-Wellcome Trust - University of Oxford Collaborative Programme (Kenya)

MRC Epidemiology Unit (Cambridge, UK)

Public Health England

The Colt Foundation

University of Glasgow School of Mathematics and Statistics (Glasgow, UK)

Bioeconomy Africa (Addis Ababa)

Centres for Disease Control and Prevention (USA)

Flowminder Foundation (Stockholm)

Johns Hopkins Bloomberg School of Public Health (Baltimore)

Malawi-Liverpool-Wellcome Trust Clinical Research Programme (Blantyre, Malawi)

Salford Royal NHS Foundation Trust (Salford)

United Nations Food and Agriculture Organisation (Rome)

World Health Organisation (Geneva)

Centre de Recerca en Sanitat Animal (CReSA) (Barcelona)

Farr Institute at HeRC (Manchester)

German Centre for Neurodegenerative Diseases (DZNE) (Bonn, Germany)

Lancaster Environment Centre (Lancaster)

MRC Biostatistics Unit (Cambridge, UK)

Otago University (New Zealand)

The Water Research Institute (Bari, Italy)

University of Pittsburgh School of Medicine (Pittsburgh)

Centre for Ecology and Hydrology (Wallingford)

Coalition for Operational Research on Neglected Tropical Diseases (Decatur, Georgia, USA)

International Research Institute for Climate and Society (New York)

Liverpool School of Tropical Medicine (Liverpool)

NIHR Health Protection Research Unit in Gastrointestinal Infections

Scienze della Natura e del Territorio (Sassari, Italy)

University of Liverpool Faculty of Health and Life Sciences (Liverpool)

Yale University School of Public Health (New Haven, USA)

Connections

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World Connections

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Euro Connections

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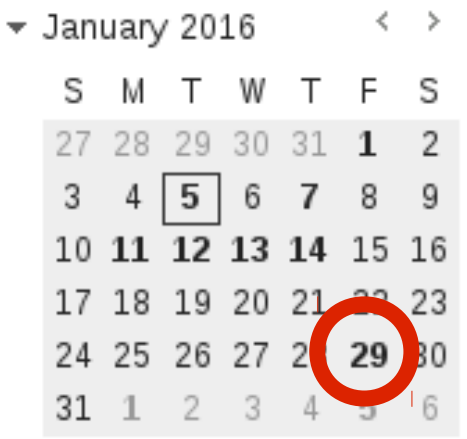
CHICAS and BLS KE workshop

Fri, 29 January
12:00 – 16:30



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