

# Curriculum vitae – Leontine Alkema

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## CONTACT INFORMATION

Mailing address Department of Biostatistics and Epidemiology  
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University of Massachusetts, Amherst

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Website [leontinealkema.github.io/alkema\\_lab/](https://leontinealkema.github.io/alkema_lab/)

Google Scholar <https://scholar.google.com/citations?user=zN1unagAAAAJ&hl=en&oi=ao>

Github <https://github.com/leontinealkema>

Twitter <https://twitter.com/LeontineAlkema>

## RESEARCH INTERESTS

Methodological Bayesian inference; Statistical demography; Causal inference.

Substantive Family planning; Abortion and unintended pregnancies; Fertility; Reproductive health; Global health

## EDUCATION

2008 University of Washington, Seattle, USA  
Ph.D. Studies in Statistics, with Ph.D. track in Statistical Demography (2006)  
Dissertation: *Uncertainty assessments of demographic estimates and projections*  
Advisors: Prof. A. E. Raftery and Dr. S. J. Clark

2003 Delft University of Technology, the Netherlands  
M.S., Applied Mathematics  
Thesis: *Multivariate time series analysis of oil reservoir pressure*

2002 Delft University of Technology, the Netherlands  
B.S., Applied Mathematics

## EMPLOYMENT AND OTHER RESEARCH POSITIONS

2022 – Professor, Department of Biostatistics and Epidemiology  
University of Massachusetts, Amherst.

2018 – 2022 Associate Professor, Department of Biostatistics and Epidemiology  
University of Massachusetts, Amherst.

2015 – 2018 Assistant Professor, Department of Biostatistics and Epidemiology  
University of Massachusetts, Amherst.

2014 Visiting Assistant Professor, Department of Demography, UC Berkeley (Spring).

2012 – 2015 Honorary Assistant Professor, Saw Swee Hock School of Public Health  
National University of Singapore, Singapore.

2009 – 2015 Assistant Professor, Department of Statistics and Applied Probability,  
National University of Singapore, Singapore.

2013 – 2019	Lead technical advisor and consultant for maternal mortality estimation for the Maternal Mortality Estimation Inter-Agency Group (UN MMEIG, agencies involved: WHO, UNICEF, UNFPA, the World Bank and the UN Population Division).
2010 – 11	Consultant, United Nations Population Division, New York. Project: Method development to construct estimates and projections of family planning indicators.
2009	Lecturer, Department of Statistics, Columbia University, New York (Spring).
2008 – 09	Postdoctoral Research Fellow, Earth Institute, Columbia University, New York.
2006 – 08	Shanahan Fellow, Center for Studies in Ecology and Demography, University of Washington.
2005 – 08	Research assistant, Department of Statistics, University of Washington, Seattle.
2007	Visiting researcher, Centre for Actuarial Research, University of Cape Town, Cape Town, South Africa (2 months).
2007	Research intern, African Population and Health Research Center, Nairobi, Kenya. Topic: Poverty measurement in slum settlements (6 months).
2006	Consultant, Joint United Nations programme on HIV/AIDS (UNAIDS). Project: Development of a Bayesian melding approach for assessing uncertainty in the UNAIDS Estimation and Projection Package tool for estimating HIV prevalence in generalized epidemics.
2006	Research intern, United Nations Population Division, New York. Topic: Assessing uncertainty in fertility projections (3 months).
2003	Research assistant, Shell, the Netherlands.
2002	Research intern, WWF Denpasar, Indonesia. Topic: Analysis of fisheries data (3 months).

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#### FELLOWSHIPS AND AWARDS

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2020 – 2021	Faculty Success Fellow, University of Massachusetts Amherst.
2020	Public Engagement Project Fellowship, University of Massachusetts Amherst.
2013	Young Scientist Award; Faculty of Science, National University of Singapore.
2011 – 12	Excellent Young Teacher Award; Faculty of Science, National University of Singapore.
2009 – 10	Excellent Young Teacher Award; Faculty of Science, National University of Singapore.
2008 – 09	Earth Institute Postdoctoral Fellowship; Columbia University.
2006 – 08	Shanahan Fellowship, Center for Studies in Ecology and Demography; University of Washington.
2004	Hubert M. Blalock Fellowship, Center for Statistics and the Social Sciences; University of Washington.
2004	Post-graduate Study Award; VSB Bank, the Netherlands.
1997	Delft University of Technology Star Award; Delft University of Technology, the Netherlands.

## GRANTS

### Active

Years	Role	Organization, Title	Amount
2017-22/3	PI	The Bill & Melinda Gates Foundation; USA <i>Improved monitoring of family planning indicators: statistical approaches and tools to improve strategic information at national and subnational levels.</i>	\$1,406,258
2017 – 22	Subcontract PI	National Institutes of Health; USA <i>Improving the measurement of adolescent and adult mortality in low-income countries.</i>	Subcontract: \$347,021

### Completed

Years	Role	Organization, Title	Amount
2018 – 20	PI	UNICEF <i>Development of improved methods for estimating stillbirth rates.</i>	\$32,000
2018 – 19	PI	World Health Organization <i>Development of improved methods for estimating maternal mortality.</i>	\$67,499
2015 – 18	Subcontract PI	Funding from the Bill & Melinda Gates Foundation through Avenir Health; USA <i>Further development of the estimation and forecasting model for contraceptive prevalence and related family planning indicators for FP2020.</i>	Subcontract: \$400,000
2014 – 15	PI	Ministry of Education Singapore <i>Development of new estimation and projection methods for key global demographic and health indicators.</i>	S\$84,000
2013 – 15	PI	Humanities and Social Sciences Research Fund; National University of Singapore <i>Missing Girls: An Analysis of Trends in Pre- and Postnatal Gender Discrimination.</i>	S\$249,100
2013 – 15	PI	Global Asia Institute Research Grant; National University of Singapore <i>Human capital in Asia: modeling and analyzing sub-regional levels and trends.</i>	S\$138,800
2013	PI	UNICEF <i>Development of an improved estimation method for under-5 mortality.</i>	~\$20,000
2013	PI	UNICEF <i>Estimating sex differentials in child mortality (preliminary study).</i>	~\$20,000
2010 – 13	Co-PI	Global Asia Institute, National University of Singapore <i>Estimating and Projecting Urbanization and City Growth.</i>	S\$231,500

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## PEER-REVIEWED PUBLICATIONS

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Notes for co-author role at the time of majority of effort: \* = postdoc, graduate student, research associate, or undergraduate student.

53. M. Alexander, **L. Alkema** (forthcoming). A Bayesian cohort component projection model to estimate adult populations at the subnational level in data-sparse settings. *Demography*. See <https://arxiv.org/abs/2102.06121>.
52. Z. Wang\*, M. Fix, L. Hug, A. Mishra, D. You, H. Blencowe, J. Wakefield, **L. Alkema** (forthcoming). Estimating the stillbirth rate for 195 countries using a Bayesian sparse regression model with temporal smoothing. *Annals of Applied Statistics*. See [arxiv.org/2010.03551](https://arxiv.org/abs/2010.03551).
51. J. Bearak, A. Popinchalk, B. Ganatra, A. Moller, Ö. Tunçalp, C. Beavin, L. Kwok, **L. Alkema** (2022). Country-specific estimates of unintended pregnancy and abortion incidence: a global comparative analysis of levels in 2015–2019. *BMJ Global Health* 7:e007151. See <https://gh.bmj.com/content/7/3/e007151>.
50. H. Susmann\*, M. Alexander, **L. Alkema** (2022). Temporal models for demographic and global health outcomes in multiple populations: Introducing a new framework to review and standardize documentation of model assumptions and facilitate model comparison. *International Statistical Review*. Early view <https://onlinelibrary.wiley.com/doi/full/10.1111/insr.12491>.
49. E. Peterson\*, D. Chou, A.B. Moller, A. Gemmill, L. Say, **L. Alkema** (2022). Estimating misclassification errors in the reporting of maternal mortality in national civil registration vital statistics systems: A Bayesian hierarchical bivariate random walk model to estimate sensitivity and specificity for multiple countries and years with missing data. *Statistics in Medicine* 41:2483–2496. <https://onlinelibrary.wiley.com/doi/full/10.1002/sim.9335>.
48. D. Sharrow, L. Hug, D. You, **L. Alkema**, R. Black, S. Cousens, T. Croft, V. Gaigbe-Togbe, P. Gerland, M. Guillot, K. Hill, B. Masquelier, C. Mathers, J. Pedersen, K. Strong, E. Suzuki, J. Wakefield, N. Walker (2022). Global, regional and national trends in under-5 mortality 1990-2019 with scenario-based projections to 2030: a systematic analysis by the United Nations Inter-agency Group for Child Mortality Estimation. *The Lancet Global Health* 10(2): e195–206. [https://doi.org/10.1016/S2214-109X\(21\)00515-5](https://doi.org/10.1016/S2214-109X(21)00515-5).
47. F. Chao\*, A.R. Cook, P. Gerland, **L. Alkema** (2021). Global estimation and scenario-based projections of sex ratio at birth and missing female births using a Bayesian hierarchical time series mixture model. *Annals of Applied Statistics* 15(3): 1499-1528.
46. N. Cahill, E. Sonneveldt, P. Emmart, J. Williamson, R. Mbu, A. Barrière Fodjo Yetgang, I. Dambula, G. Azambuja, A. Mahumane Govo, B. Joshi, S. Felix, C. Makashaka, V. Ndaruhutse, J. Serucaca, B. Madzima, B. Muzavazi, **L. Alkema** (2021). Using Family Planning Service Statistics to inform model-based estimates of modern contraceptive prevalence. *Plos One* 16(10), e0258304.
45. L. Hug, D. You, H. Blencowe, A. Mishra, Z. Wang\*, M. Fix, J. Wakefield, A. Moran, V. Gaigbe-Togbe, E. Suzuki, D. Blau, S. Cousens, A. Creanga, T. Croft, K. Hill, K. Joseph, S. Maswime, E. McClure, R. Pattinson, J. Pedersen, L. Smith, J. Zeitlin, **L. Alkema** (2021). Global, regional, and national levels and trends in stillbirths from 2000 to 2019: a systematic assessment. *The Lancet* 398 (10302): 772–85.

44. F. Chao\*, A.R. Cook, P. Gerland, C. Guilmoto, **L. Alkema** (2021). Projecting sex imbalances at birth at global, regional and national levels from 2021 to 2100: scenario-based Bayesian probabilistic projections of the sex ratio at birth and missing female births based on 3.26 billion birth records. *BMJ Global Health* (6): e005516.
43. G. Guranich\*, N. Cahill, **L. Alkema** (2021). Fpemlocal: Estimating family planning indicators in R for a single population of interest. *Gates Open Research* 5 (24).
42. B. Masquelier, L. Hug, D. Sharrow, D. You, C. Mathers, P. Gerland, **L. Alkema** (2021). Global, regional, and national mortality trends in youth aged 15–24 years between 1990 and 2019: a systematic analysis. *The Lancet Global Health* 9 (4): e409–17.
41. N. Cahill, M. Weinberger, **L. Alkema** (2020). What increase in modern contraceptive use is needed in FP2020 countries to reach 75% demand satisfied by 2030? An assessment using the Accelerated Transition Method and Family Planning Estimation Model. *Gates Open Research* 4 (113).
40. J. Bearak, A. Popinchalk, B. Ganatra, A. Moller, Ö. Tunçalp, C. Beavin, L. Kwok, **L. Alkema** (2020). Unintended Pregnancy and Abortion by Income, Region, and the Legal Status of Abortion: Estimates from a Comprehensive Model for 1990–2019. *The Lancet Global Health* 8(9): e1152–61.
39. F. Chao\*, A.R. Cook, P. Gerland, **L. Alkema** (2019). A systematic assessment of the sex ratio at birth for all countries and estimation of national imbalances and regional reference levels. *Proceedings of the National Academy of Sciences* 116(19), 9303–9311.
38. J. Bearak, A. Popinchalk, G. Sedgh, B. Ganatra, A. Moller, Ö. Tunçalp, **L. Alkema** (2019). Pregnancies, abortions, and pregnancy intentions: a protocol for modeling and reporting global, regional and country estimates. *Reproductive Health* 16(1) 36.
37. L. Hug, M. Alexander\*, D. You, **L. Alkema** (2019). National, regional, and global levels and trends in neonatal mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the United Nations Inter-agency Group for Child Mortality Estimation. *The Lancet Global Health* 7(9), e710–e720.
36. B. Masquelier, L. Hug, D. Sharrow, D. You, D. Hogan, K. Hill, J. Liu, J. Pedersen, **L. Alkema** (2018). Global, regional, and national levels and trends in mortality among older children (5–9) and young adolescents (10–14) from 1990 to 2016. *The Lancet Global Health* 6(10): e1087–e1099.
35. F. Chao\*, D. You, J. Pedersen, L. Hug, **L. Alkema** (2018). National and regional under-5 mortality rate by economic status for low-income and middle-income countries: a systematic assessment. *The Lancet Global Health* 6(5): e535–e547.
34. J. Bearak, A Popinchalk, **L. Alkema**, G. Sedgh (2018). Global, regional, and subregional trends in unintended pregnancy and its outcomes from 1990 to 2014: estimates from a Bayesian hierarchical model. *The Lancet Global Health* 6(4): e380 - e389.
33. M. Alexander\*, **L. Alkema** (2018). Global estimation of neonatal mortality using a Bayesian hierarchical splines regression model. *Demographic Research* 38: 335 – 372.

32. N. Cahill\*, E. Sonneveldt, J. Stover, M. Weinberger, J. Williamson, C. Wei\*, W. Brown, **L. Alkema** (2018). Modern contraceptive use, unmet need, and demand satisfied among women of reproductive age who are married or in a union in the focus countries of the Family Planning 2020 initiative: a systematic analysis using the Family Planning Estimation Tool. *The Lancet* 391(10123): 870 – 882.
31. B. Ganatra, C. Gerdt, C. Rossier, R. Johnson, Ö. Tunçalp, A. Assifi, G. Sedgh, S. Singh, A. Bankole, A. Popinchalk, J. Bearak, Z. Kang\*, **L. Alkema** (2017). Global, regional and sub-regional classification of abortions by safety: Estimates for 2010-14. *The Lancet* 390(10110): 2372-2381.
30. **L. Alkema**, S. Zhang\*, D. Chou, A. Gemmill\*, A.B. Moller, D.M. Fat, L. Say, C.D. Mathers, D. Hogan. A Bayesian approach to the global estimation of maternal mortality (2017). *The Annals of Applied Statistics* 11(3): 1245 – 1274.
29. V. Kantorova, J.R. New\*, A. Biddlecom, **L. Alkema** (2017). Setting ambitious yet achievable targets using probabilistic projections: meeting demand for family planning. *Studies in Family Planning* 48(3): 223 – 233.
28. J.R. New\*, N. Cahill\*, J. Stover, Y.P. Gupta, **L. Alkema** (2017). Subnational Rates and Trends in Contraceptive Prevalence and Unmet Need for Family Planning from 1990 to 2020: An Analysis for All 29 States in India. *The Lancet Global Health* 5(3): e350-e358.
27. G. Sedgh, J. Bearak, S. Singh, A. Bankole, A. Popinchalk, B. Ganatra, C. Rossier, C. Gerdt, Ö. Tunçalp, R. Johnson, H.B. Johnston, **L. Alkema** (2016). Abortion incidence between 1990 and 2014: global, regional, and subregional levels and trends. *The Lancet* 388(10041): 258 – 267.
26. **L. Alkema**, D. Chou, D. Hogan, S. Zhang\*, A.B. Moller, A. Gemmill\*, D.M. Fat, T. Boerma, M. Temmerman, C.D. Mathers, L. Say (2016). Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Inter-agency Group for Maternal Mortality Estimation. *The Lancet* 387(10017): 462 – 474.
25. D. You, L. Hug, S. Ejdemo, P. Idele, D. Hogan, C. Mathers, P. Gerland, J.R. New\*, **L. Alkema** (2015). Global, regional, and national levels and trends in under-5 mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Inter-agency Group for Child Mortality Estimation. *The Lancet* 386(10010): 2275–2286.
24. **L. Alkema**, P. Gerland, A.E. Raftery, J. Wilmoth (2015). The United Nations Probabilistic Population Projections: An Introduction to Demographic Forecasting with Uncertainty. *Foresight: The International Journal of Applied Forecasting* 37: 19–24.
23. **L. Alkema**, J.R. New\* (2014). Global estimation of child mortality using a Bayesian B-spline bias-reduction method. *The Annals of Applied Statistics* 8(4): 2122–2149.
22. P. Gerland, A.E. Raftery, H. Ševčíková, N. Li, D. Gu, T. Spoorenberg, **L. Alkema**, B.K. Fosdick, J. Chunn, N. Lalic, G. Bay, T. Buettner, G.K. Heilig, J. Wilmoth (2014). World population stabilization unlikely this century. *Science* 346(6206): 234–237.

21. **L. Alkema**, F. Chao\*, D. You, J. Pedersen, C.C. Sawyer (2014). National, regional, and global sex ratios of infant, child, and under-5 mortality and identification of countries with outlying ratios: a systematic assessment. *The Lancet Global Health* 2(9): e521–e530.
20. **L. Alkema**, J.R. New\*, J. Pedersen, D. You, on behalf of the members of the UN Inter-agency Group for Child Mortality Estimation and its Technical Advisory Group (2014). Child Mortality Estimation 2013: An overview of updates in estimation methods by the United Nations Inter-agency Group for Child Mortality Estimation. *PLOS ONE* 9(7): e101112.
19. L. Say, D. Chou, A. Gemmill\*, Ö. Tunçalp, A.B. Moller, J. Daniels, A.M. Gülmezoglu, M. Temmerman, **L. Alkema** (2014). Global causes of maternal deaths: A WHO systematic analysis. *The Lancet Global Health* 2(6): e323–e3332.
18. T.P. Phan, **L. Alkema**, E.S. Tai, K.H.X. Tan, Q. Yang, W.Y. Lim, Y.Y. Teo, C.Y. Cheng, X. Wang, T.Y. Wong, K.S. Chia, A.R. Cook (2014). Forecasting the burden of type 2 diabetes in Singapore using a demographic epidemiological model of Singapore. *BMJ Open Diabetes Research and Care* 2(1): e000012.
17. A.E. Raftery, **L. Alkema**, P. Gerland (2014). Bayesian population projections for the United Nations. *Statistical Science*, 29(1): 56–68.
16. F. Chao\*, **L. Alkema** (2014). How informative are vital registration data for estimating maternal mortality? A Bayesian analysis of WHO adjustment data and parameters. *Statistics and Public Policy*, 1(1): 6–14.
15. **L. Alkema**, G. Jones, C. Rue (2013). Levels of urbanization in the world's countries: testing consistency of estimates based on national definitions. *Journal of Population Research*, 30(4): 291–304.
14. M. Oestergaard, **L. Alkema**, J.E. Lawn (Editorial, 2013). Millennium Development Goals national targets are moving targets and the results will not be known until well after the 5 deadline of 2015. *International Journal of Epidemiology* 42(3): 645–647.
13. **L. Alkema**, V. Kantorova, C. Menozzi, A. Biddlecom (2013). National, regional and global rates and trends in contraceptive prevalence and unmet need for family planning between 1990 and 2015: a systematic and comprehensive analysis. *The Lancet* 381(9878): 1642–1652.
12. **L. Alkema**, J.R. New\* (2012). Progress toward global reduction in under-5 mortality: A bootstrap analysis of uncertainty in Millennium Development Goal 4 estimates. *PLOS Medicine* 9(12): e1001355.
11. **L. Alkema**, D. You (2012). Child Mortality Estimation: a comparison of UN-IGME and IHME estimates of levels and trends in under-5 mortality rates and deaths. *PLOS Medicine* 9(8): e1001288.
10. **L. Alkema**, M. Wong\*, P.R. Seah\* (2012). Monitoring progress towards Millennium Development Goal 4: A call for improved validation of under-5 mortality rate estimates. *Statistics, Politics, and Policy* 3(2): Art. 2.



9. **L. Alkema**, A. E. Raftery, P. Gerland, S. J. Clark, F. Pelletier (2012). Estimating trends in the total fertility rate with uncertainty using imperfect data: Examples from West Africa. *Demographic Research* 26(15): 331–362.
8. **L. Alkema**, W.L. Ann\* (2011). Estimating the under-5 mortality rate using a Bayesian hierarchical time series model. *PLOS ONE* 6(9): e23954.
7. **L. Alkema**, A. E. Raftery, P. Gerland, S.J. Clark, F. Pelletier, T. Buettner, G. K. Heilig (2011). Probabilistic projections of the total fertility rate for all countries. *Demography* 48(3): 815–839.
6. H. Ševčíková, **L. Alkema**, A.E. Raftery (2011). BayesTFR: An R package for probabilistic projections of the total fertility rate. *Journal of Statistical Software* 43: 1–29.
5. L. Winowiecki, S. Smukler, K. Shirley, R. Remans, G. Peltier, E. Lothes, E. King, L. Comita, S. Baptista, **L. Alkema** (2011). Tools for enhancing interdisciplinary communication. *Sustainability: Science, Practice & Policy* 7(1): 74–80.
4. L.F. Johnson, **L. Alkema**, R.E. Dorrington (2010). A Bayesian approach to uncertainty analysis of sexually transmitted infection models. *Sexually Transmitted Infections* 86: 169–174.
3. **L. Alkema**, A.E. Raftery, T. Brown (2008). Bayesian melding for estimating uncertainty in national HIV prevalence estimates. *Sexually Transmitted Infections* 84 (Suppl I): i11–i16.
2. T. Brown, J.A. Salomon, **L. Alkema**, A.E. Raftery, E. Gouws (2008). Progress and challenges in modelling country-level HIV/AIDS epidemics: the UNAIDS Estimation and Projection Package 2007. *Sexually Transmitted Infections* 84 (Suppl I): i5–i11.
1. **L. Alkema**, A.E. Raftery, S.J. Clark (2007). Probabilistic projections of HIV prevalence using Bayesian melding. *The Annals of Applied Statistics* 1(1): 229–248.

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#### OTHER PAPERS: WORKING, DISCUSSION, AND WHITE PAPERS

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C. Lee, H. Susmann\*, **L. Alkema** (2022). New measures for family planning and exposure to risk of pregnancy based on sexual activity and contraceptive use data.

J. Bearak, **L. Alkema**, V. Kantorova, J. Casterline (2022). Alignment between desires and outcomes among women wanting to avoid pregnancy: a global comparative study of ‘conditional’ unintended pregnancy rates.

**L. Alkema** (2020, R&R). The Global Burden of Disease fertility forecasts: Summary of the approach used and associated statistical concerns. See <https://osf.io/3m6va>.

B. Barakat, A. Dharamshi, **L. Alkema**, M. Antoninis (2021, R&R). Adjusted Bayesian Completion Rates (ABC) Estimation. See <https://osf.io/at368> for an earlier version.



**L. Alkema**, G. Yang\* and K. Gile (2022). Model-based estimates in demography and global health: quantifying the contribution of population-period-specific information.

C. Wei\* and **L. Alkema** (2021). How to estimate a population proportion if data are possibly subject to misclassification error? The case of estimating contraceptive prevalence based on self-reported usage. <https://submissions2.mirasmart.com/PAA2021/ViewSubmissionFile.aspx?sbmlD=2021&mode=html&valdate=false>

J. Bearak, A. Popinchalk, B. Ganatra, A. Moller, Ö. Tunçalp, C. Beavin, L. Kwok, **L. Alkema** (2020). Global estimation of unintended pregnancy and abortion using a Bayesian hierarchical random walk model. See <https://arxiv.org/abs/2007.09246>.

V. Adjiwanou, N. Alam, **L. Alkema**, et al. (2020). Measuring excess mortality during the COVID-19 pandemic in low- and lower-middle income countries: the need for mobile phone surveys. See <https://osf.io/preprints/socarxiv/4bu3q/>

V. Adjiwanou, **L. Alkema**, J. Long, T. McCormick (2018). Big data, big models, uncertainty, and bias: Data collection and modeling in low resource settings. White paper prepared for the NIH BD2K Behavioral and Social Sciences and Big Data Workshop.

G.A. Stevens, **L. Alkema**, R.E. Black, J.T. Boerma, G.S. Collins, M. Ezzati, J.T. Grove, D.R. Hogan, M.C. Hogan, R. Horton, J.E. Lawn, A. Marušić, C.D. Mathers, C.J.L. Murray, I. Rudan, J.A. Salomon, P.J. Simpson, T. Vos, V. Welch, GATHER Working Group (2016). Guidelines for accurate and transparent health estimates reporting: The GATHER statement. *The Lancet/PLOS Medicine*.

**L. Alkema**, A. Asafi, A. Bankole, B. Ganatra, C. Gerdtz, H. Johnston, A. Popinchalk, C. Rossier, S.D. Singh, O. Tunçalp, P. Van Look, G. Sedgh (2015). Estimating Global Abortion Incidence from 1990 until 2015 Using Bayesian Methods and a Framework of Abortion Determinants. Conference paper for Annual meeting of the Population Association of America, San Diego.

A.E. Raftery, **L. Alkema**, P. Gerland, S. J. Clark, F. Pelletier, T. Buettner, G. Heilig, N. Li, H. Sevcikova (2009). White Paper: Probabilistic Projections of the Total Fertility Rate for the 2010 World Population Prospects. <http://www.un.org/esa/population/meetings/EGM-Fertility2009/egm-fertility2009.html>

A.E. Raftery, **L. Alkema** (2008). Discussion on the paper "Estimates of human immunodeficiency virus prevalence and proportion diagnosed based on Bayesian multiparameter synthesis of surveillance data" by Goubar et al. *Journal of the Royal Statistical Society: Series A* 171(3): 541–580.

**L. Alkema**, O. Faye, M. Mutua, E. Zulu (2008). Identifying Poverty Groups in Nairobi's Slum Settlements: A Latent Class Analysis Approach. Conference paper for Annual meeting of the Population Association of America, New Orleans. <http://paa2008.princeton.edu/abstractViewer.aspx?submissionId=80116>

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## METHODOLOGICAL CONTRIBUTIONS TO GLOBAL MONITORING

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*Listed below are results from collaborative research projects with references to associated reports or organizations that utilized the methods developed.*

### Abortion and unintended pregnancies

- Main methods: Bayesian demographic accounting model for estimating abortions and unintended pregnancies.
- References: Guttmacher Institute and WHO reporting on abortions and unintended pregnancies globally since 2016. See <https://www.guttmacher.org/global/abortion>.

### Child mortality

- Main methods: Bayesian penalized B-spline regression model for estimating mortality; Bayesian hierarchical time series model for estimates mortality sex ratios.
- References: United Nations Inter-agency Group for Child Mortality Estimation (since 2012). Levels & Trends in Child Mortality.

### Family planning

- Method: Bayesian hierarchical time series model for estimation and projection for family planning indicators for married women.
- References:
  - United Nations Population Division (since 2013). Estimates and Projections of Family Planning Indicators;
  - Family Planning Estimation Tool (FPET), used for FP2020 and FP2030 monitoring. See <https://fp2030.org/data-hub/progress>.

### Fertility

- Method: Probabilistic projection method for the total fertility rate.
- References: United Nations Population Division (since 2011). World Population Prospects.

### HIV prevalence

- Method: Bayesian melding approach for estimating HIV prevalence in generalized epidemics.
- Reference: UNAIDS (2007). 2007 AIDS epidemic.

### Maternal mortality

- Main methods: Bayesian maternal mortality estimation model (BMat); Bayesian bivariate random walk model for sensitivity and specificity in reporting of maternal mortality in vital registration data (since 2019).
- References: UN Maternal Mortality Estimation Inter-Agency Group (2014, 2015, 2019). Trends in maternal mortality. Estimates by WHO, UNICEF, UNFPA, World Bank and the UN Population Division.

### Stillbirths

- Main method: Bayesian sparse regression model with temporal smoothing
- Reference: United Nations Inter-agency Group for Child Mortality Estimation (2020). Hidden in Plain Sight: The Global Burden of Stillbirths.

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## SOFTWARE

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**L. Alkema** (2019). Software for fitting the Bayesian maternal mortality estimation model (BMat). Available at [www.who.int/reproductivehealth/publications/maternal-mortality-2000-2017/en/](http://www.who.int/reproductivehealth/publications/maternal-mortality-2000-2017/en/).

G. Guranich, M. Wheldon, N. Cahill, **L. Alkema** (2020). *fpemlocal*: The local implementation of the Family Planning Estimation Model. Available at <https://github.com/AlkemaLab/fpemlocal>  
*Note: This package forms the basis of the Family planning estimation tool used for FP2030 reporting, available at [fpet.track20.org](http://fpet.track20.org).*

G. Guranich, E. Peterson, **L. Alkema** (in preparation for public release for UN MMEIG 2022 release of maternal mortality estimates). *Bmat/Bmis*: An R Package for estimating misclassification of maternal deaths in CRVS systems and fitting the Bayesian maternal mortality estimation model.

H. Ševčíková, **L. Alkema**, A. Raftery (2011). *bayesTFR*: An R Package for Probabilistic Projections of the Total Fertility Rate. Available at [cran.r-project.org/web/packages/bayesTFR](http://cran.r-project.org/web/packages/bayesTFR).

M. Wheldon, J.R. New, N. Cahill, G. Guranich, C. Wei, A. Tait, K. Bietsch, **L. Alkema** (2019). *FPemGlobal*: An R Package for producing global estimates and projections of contraceptive use, unmet need for family planning, met need for family planning, and other family planning indicators for all (married/partnered and unmarried) women. Available at [github.com/FPcounts/FPemGlobal](https://github.com/FPcounts/FPemGlobal).

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## SELECTED PRESENTATIONS

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### International and national invited presentations and oral conference presentations

#### *2021 onwards*

- European Population Conference, The Netherlands (6/2022)
- MAP5 Colloquium, Université de Paris, France (6/2022)
- International Conference on Multilevel Analysis, The Netherlands (4/2022)
- Complex Data Modeling Research Network (<https://midas.mat.uc.cl/network/>) MiDaS Seminar series, Chile (7/2021)
- 41<sup>st</sup> Conference on Applied Statistics, Ireland (5/2021)
- University of Washington, Department of Statistics Working group in Applied, Bayesian and Computational Statistics (5/2021)
- Pennsylvania State University, Department of Statistics Colloquium (3/2021)

#### *2015-2020*

- Measuring Average Sexual Exposure (4/2020). Population Association of America Annual meeting (virtual).
- Bayesian modelling in action: monitoring family planning indicators (6/2020). Berkeley 2020 workshop on formal demography.
- Got data? Quantifying the contribution of population-period-specific information to model-based estimates (4/2020). MRP Conference, Columbia University.

- Estimating time trends for the World Population Prospects 2021: Lessons learned from model development for under-5 mortality and other demographic indicators (4/2020). Expert Group Meeting on "Methods for the World Population Prospects 2021 and beyond".
- Monitoring maternal mortality by the United Nations: improved estimates of levels, trends and reporting errors through Bayesian multilevel temporal regression modeling (08/2019). Joint Statistical Meetings, Denver.
- Sensible Statistics for the Social Sciences: How to estimate a population proportion if data are subject to unknown misclassification error? CSSS 20th Anniversary Conference (5/2019). Center for Statistics in the Social Sciences, University of Washington, Seattle.
- Small area estimation of family planning indicators using the Family Planning Estimation Tool (4/2019). Population Association of America Annual meeting, Austin.
- Model-Based Estimates in Demography and Global Health: Quantifying the Contribution of Population-Period-Specific Information (04/2019). Population Association of America Annual meeting, Austin.
- Discussion of Demographic Estimation for Monitoring and Decision making in Sparse-Data Settings (04/2019). Population Association of America Annual meeting, Austin.
- Model-Based Estimates in Demography and Global Health: Quantifying the Contribution of Population-Period-Specific Information (2019). New England Statistics Symposium.
- Model-based estimates in demography and global health: quantifying the contribution of population-period-specific information (08/2018). Joint Statistical Meetings, Vancouver, Canada (topic-contributed session).
- Statistics Department colloquium (10/2017). Harvard University.
- To space or to limit? An Assessment of Levels and Trends in Unmet Need for Limiting and Spacing From 1990 to 2030 in the World's Poorest Countries Using a Bayesian Hierarchical Time Series Model (04/2018) Population Association of America Annual meeting, Denver.
- A Bayesian approach to the global estimation of maternal mortality (6/2016). International Society for Bayesian Analysis 2016 world meeting, Sardinia, Italy (topic-contributed session).
- Subnational Rates and Trends in Contraceptive Prevalence and Unmet Need for Family Planning from 1990 to 2020: An Analysis for All 29 States in India (4/2016). Annual Meeting of the Population Association of America, Washington D.C.
- Trends in maternal mortality 1990-2015: Estimates developed by WHO, UNICEF, UNFPA, the World Bank and UNPD (3/2016). WHO Reference Group on Global Health Statistics (RGHS), Geneva, Switzerland.
- Bongaarts goes Bayesian (11/2015). Sussmilch lecture at the Max Planck Institute for Demographic Research, Rostock, Germany.
- Statistical Modeling in Global Health: A Selection of Recent Developments and Future Opportunities in Child, Maternal and Reproductive Health (10/2015). Computational Social Science Institute seminar, University of Massachusetts Amherst.

#### Selected presentations before 2015

*Summarized by topic, all presentations are talks unless noted otherwise.*

#### Estimating Gender Differences in Child Mortality

- Annual Meeting of the Population Association of America, Boston (4/2014)
- IUSSP International Population Conference, Busan, South Korea (9/2013)
- Annual Meeting of the Population Association of America, New Orleans (4/2013, poster)

#### Estimating Child Mortality

- Annual Meeting of the Population Association of America, Boston (4/2014, poster award)
- UC Berkeley, Department of Statistics seminar (4/2014)
- UC Berkeley, Department of Demography seminar (3/2014)
- IUSSP International Population Conference, Busan, South Korea (9/2013)
- Joint Statistical Meetings, Montreal (8/2013)
- Annual Meeting of the Population Association of America, Washington D.C. (4/2011)

#### Estimates and Short-term Projections of Unmet Need for Contraceptives

- Annual Meeting of the Population Association of America, Washington D.C. (4/2011, poster)
- Second Singapore Conference on Statistical Science, Singapore (4/2011)

#### Urbanization (Probabilistic Projections/Alternative Estimates/City Projections)

- Annual Meeting of the Population Association of America, Washington D.C. (4/2011, poster)
- Asian Population Association Conference, Bangkok, Thailand (8/2012, poster)
- Annual Meeting of the Population Association of America, San Francisco (4/2012, poster)

#### Probabilistic Projections of Fertility

- IUSSP International Population Conference, Busan, South Korea (9/2013)
- Annual Meeting of the Population Association of America, New Orleans (4/2013, poster)
- Expert Group Meeting on Recent and Future Trends in Fertility, United Nations Population Division, New York (12/2009)
- IUSSP International Population Conference, Marrakech, Morocco (9/2009)
- Joint Statistical Meetings, Denver (8/2008)
- Earth Institute Fellows Symposium, Columbia University, New York (11/2008)
- Annual meeting of the Pacific Institute for the Mathematical Sciences collaborative research group on Bayesian modeling and computation for networks, Washington State (5/2008)
- Annual Meeting of the Population Association of America, New Orleans (4/2008)
- Center for Demography and Ecology Seminar Series, University of Washington, Seattle (11/2007)
- Centre for Actuarial Research (CARE), University of Cape Town, South Africa (8/2007)
- United Nations Population Division, New York (4/2007)

#### Assessing Uncertainty in Fertility Estimates in Western Africa

- IUSSP International Population Conference, Marrakech, Morocco (9/2009)
- Annual meeting of the Population Association of America, Detroit (4/2009)
- Human Mortality Database Symposium, Max Planck, Rostock, Germany (6/2008)

#### Identifying Poverty Groups in Nairobi's Slum Settlements: A Latent Class Analysis Approach

- Annual Meeting of the Population Association of America, New Orleans (4/2008)
- INDEPTH annual conference and scientific meeting, Nairobi, Kenya (9/2007)
- African Population and Health Research Center, Nairobi, Kenya (6/2007)

#### Probabilistic Projections of HIV Prevalence using Bayesian Melding

- Workshop on Epidemiology of Infectious Diseases, IMS, Singapore (1/2010)
- Annual Meeting of the Actuarial Society South Africa, Cape Town (8/2007)
- Medical Council South Africa, Cape Town (7/2007)

- Annual Meeting of the Population Association of America, New York (4/2007)
- African Population and Health Research Center, Nairobi, Kenya (1/2007)
- International Workshop on Data, Algorithms and Decision Making, Trest, Czech Rep. (12/2006)
- UNAIDS reference group technical meeting, London, UK (10/2006)
- Statistical Center for HIV/AIDS Research and Prevention, Fred Hutchinson, Seattle (2/2006)

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## TEACHING EXPERIENCE AND ADVISING

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### Courses taught

University of Massachusetts Amherst, Department of Biostatistics and Epidemiology, USA

- Topics in Biostatistics and Data Science in Public Health (BIOSTATS 690P), Spring 2021
  - Responsible for course development, coordination, and co-teaching.
- Various courses related to Statistical Computing with R:
  - Introduction to Statistical Computing with R (PUBLIC HEALTH 490R), Fall 2019, Fall 2020.
  - Introduction to Statistical Computing with R (BIOSTATS 597D), Fall 2018, Fall 2019, Fall 2020.
  - Intermediate Statistical Computing with R (BIOSTATS 597E), Fall 2019, Fall 2020.
  - Advanced Statistical Computing with R (BIOSTATS 597A), Fall 2019, Fall 2020.
  - Advanced R for Data Science (BIOSTATS 690R), Fall 2018.
- Applied Bayesian Statistical Modeling:
  - Applied Bayesian Statistical Modeling (BIOSTATS 730), Spring 2017, Spring 2018, Fall 2022.
  - Bayesian computation in biostatistics (BIOSTATS 697G), Spring 2016.

National University of Singapore, Department of Statistics and Applied Probability, Singapore

- Applied regression analysis (ST5202), Spring 2010 and Spring 2011.
- Applied time series analysis (ST3233), Fall 2013 and Fall 2014.
- Demographic methods (ST3244), Fall 2010, Fall 2011 and Spring 2013.
- Regression analysis (ST3131), Spring 2010 and Spring 2012.
- Survival analysis (ST5212), Spring 2015.

UC Berkeley, Department of Demography, USA

- Advanced demographic analysis (Demography 211), Spring 2014.

Columbia University, Department of Statistics, New York, USA

- Linear regression models (W4315), Spring 2009.

Other classroom instruction:

- Fall 2019: Guest lecture on estimating maternal mortality for Public Health 492E, an undergraduate research seminar course to provide students with an understanding of current public health research. University of Massachusetts Amherst.
- Spring 2018: Guest lectures on Bayes rule and estimating child mortality for Public Health 200 Introduction to Public Health. University of Massachusetts Amherst.
- Applied linear regression analysis (Short course), May 2012. Soochow University, School of Mathematical Science, Suzhou, China

## Mentorship

Graduate and postdoctoral advising (Chair of committee) at UMass Amherst, unless noted otherwise:

Period	Name	Degree	Notes
2022 –	Lucas Godoy Garraza	PhD	<i>Topic: Causal inference with applications to impact assessment related to family planning</i>
2021 –	Jadey Wu	PhD	<i>Topic: Bayesian hierarchical and spatial modeling; Bayesian workflow in sparse data settings</i>
2018 – 22	Herb Susmann	PhD	<i>Title: Bayesian Hierarchical Temporal Modeling and Targeted Learning with Application to Reproductive Health</i>
2016 – 22 (expected)	Chuchu Wei	PhD	<i>Title: Improved use of compositional data subject to self-reporting errors in Bayesian models</i>
2018 – 21	Zhengfan Wang	PhD	<i>Title: Development of Bayesian hierarchical temporal sparse regression models for prediction in data-limited settings Current position: Postdoc, UMass Amherst</i>
2015 – 19	Emily Peterson	PhD	<i>Title: Bayesian methods for the assessment of reporting errors for data-sparse population-periods with applications to estimating mortality. Current position: Postdoc, Emory University.</i>
2013 – 17	Fengqing Chao	PhD NUS	<i>Title: Methods for estimating global health indicators. Current position: Research scientist, KAUST, Saudi Arabia.</i>
2016 – 17	Niamh Cahill	Postdoc advisor	<i>Current position: Assistant Professor, Maynooth University, Ireland.</i>
2020 – 21	Barbara Mottley	MS	<i>Title: Subnational analysis of birth weight in Ghana using Bayesian spatial regression models Current: PhD student, Environmental Health Sciences</i>
2017 – 19	Greg Guranich	MS	<i>Title: Estimating age-specific contraceptive use for spacing of childbirth for all countries in Sub-Saharan Africa from 1985 to 2030 using a Bayesian hierarchical time series model. Current position: Consultant, World Health Organization</i>
2016 – 18	Zhenning Kang	MS	<i>Title: Categorizing abortions by safety category: A Bayesian hierarchical modeling approach. Current position: Data scientist, Holyoke Medical Group.</i>

Chair of Honor's theses at the National University of Singapore:

2014 – 15	Michael Linardi Tanny, Tan Yu Wen Joanne and Chen Yunjin (Estimating inequality in child mortality).
2012 – 13	Wu Jinxian (Estimating age patterns of child mortality), Neo Soo Khee and Goh Wei Xian (Estimating fertility rates).
2011 – 12	Jin Rou New (Estimating child mortality; NJR received the NUS Outstanding Undergraduate Researcher Prize), Fengqing Chao (Estimating and validating measures of maternal mortality), Stella Ting (Estimating gender biases in child mortality).
2010 – 11	Maria Wong, Pei Rong Seah, Zhuang Dingxuan (Validating child mortality estimates).
2009 – 10	Wei Ling Ann (Estimating child mortality), Choo Shao Ying (Poverty in Kenya).



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## PROFESSIONAL ACTIVITIES AND SERVICE

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### Departmental/University service at UMass Amherst

- 2022 – Chair, Biostatistics Curriculum Committee
- 2022 – Chair Biostatistics Graduate Advisory Committee
- 2018 – 2021 Biostatistics Program Head (co-head in 2018/19)
- 2020 – 2021 Member, Biostatistics Curriculum Committee
- 2019 – 2020 Member (Fall) and Chair (Spring), Departmental Personnel Committee
- 2018 – 2020 Chair (18/19) and Member (19/20), Biostatistics Graduate Advisory Committee
- 2018 – 2019 Member, Biostatistics Master's degree Development Committee
- 2017 – 2019 Chair, Biostatistics Curriculum Committee
- 2017 – 2018 Member, Biostatistics Faculty Search Committee
- 2016 Member, organizing committee for Computational Social Science Institute mixer
- 2015 – 2017 Member, Biostatistics Admissions Committee
- 2015 – 2016 Member, Biostatistics Faculty Search Committee

### Departmental/University service at the National University of Singapore

- 2014 – 2015 Member, undergraduate Statistics curriculum committee
- 2012 – 2013 Member, organizing committee for the Third Singapore Conference on Statistical Science
- 2009 – 2012 Member, consulting center committee, Department of Statistics and Applied Probability

### International service

- 2021 – Member, Subject Matter Expert Group for Institute for Health Metrics and Evaluation (IHME) Maternal Mortality Drivers research project
- 2021 – Member, World Health Organization Reference Group on Health Statistics Task Force on reporting guidelines for global health estimation (GATHER)
- 2021 – Member, Technical Advisory Group of the United Nations Maternal Mortality Estimation Inter-agency Group (UN MMEIG)
- 2019 – Member, World Health Organization Reference Group on Health Statistics.
- 2019 – Technical advisor to the FP2020/2030 Performance Monitoring & Evidence Working group.
- 2011 – Member, technical advisory group of the United Nations Inter-agency Group on Child Mortality Estimation (UN IGME, agencies involved: UNICEF, WHO, UN Population Division and the World Bank).
- 2014 – 2016 Member, World Health Organization working group on reporting of global health indicators.

### Other professional activities

- 2022 – Deputy Editor for *Demography*.
- 2014 – 2022 Associate Editor for *The Annals of Applied Statistics*.
- 2019 Organizer for invited session “Demographic Estimation for Monitoring and Decision making in Sparse-Data Settings” at the annual meeting of the Population Association of America in Denver, 2019.
- 2013 – 2014 Organizer of two sessions on statistical demography at the annual meeting of the Population Association of America in Boston, 2014.

Ad hoc reviewer

Statistics journals: *The Annals of Applied Statistics; Statistics, Politics and Policy; Statistica Sinica.*

Demography journals: *Demography; Demographic Research; Population Studies; Asia Population Studies.*

Global health: *New England Journal of Medicine; The Lancet; The Lancet Global Health; BMJ Global Health; BMJ Open; WHO Bulletin; Contraception; Health and Nutrition; PLOS Medicine; Sexually Transmitted Infections.*

Other: *Proceedings of the National Academy of Sciences; PLOS ONE.*