

Eric Silverman

Education

2003–2007 **PhD**, *University of Leeds*, Leeds, UK.

1999–2002 **BA with Honors**, *Pennsylvania State University*, State College, PA, USA.

PhD thesis

Title *Methodological Issues in Computational Modelling for the Social Sciences*

Supervisor Professor David Hogg

Employment

2017–present **Research Fellow**, *MRC/CSO Social and Public Health Sciences Unit, University of Glasgow*, Glasgow, UK.

Leader of the Modelling Complex Systems workstream within the Complexity in Health programme, focusing on the development and implementation of agent-based models for population health applications.

2015–2017 **Research Lecturer**, *Teesside University*, Middlesbrough, UK.

Developed multidisciplinary research programmes in agent-based modelling for public health and migration. Performed teaching and supervision duties within the School of Computing.

2010–2015 **Postdoctoral Research Fellow**, *University of Southampton*, Southampton, UK.

Developed and analysed agent-based models of health and social care for the EPSRC-funded Care Life Cycle Project.

2007–2010 **JSPS Postdoctoral Research Fellow**, *University of Tokyo*, Tokyo, Japan.

Worked on multidisciplinary research in artificial life and complex systems science using computer simulation and robotics experiments. Funded by the Japan Society for the Promotion of Science.

Research Funding

2025–2030 **Population Health Career Scientist Award: Applying Agent-Based Modelling to the Development and Evaluation of Improved Policies for Health and Wellbeing in Scotland**, *National Institute for Health Research, UK*, Principal Investigator.

2023–2024 **Developing a platform for evaluating a ‘Minimum Income Guarantee’ policy and modelling major income supplementation reforms**, *National Institute for Health Research, UK*, Co-Investigator/Workstream Co-Leader.

2020–2021 **World Class Labs Capital Funding 2020/21**, *Medical Research Council, UK*, Co-Investigator.

2020–2025 **Quinquennial Funding for Social and Public Health Sciences Unit**, *Medical Research Council, UK*, Workstream Leader.

- 2019–2023 **PHASE: The Population HeAlth Simulation nEtwork**, *Medical Research Council, UK*, Co-Investigator/Workstream Leader.
- 2014–2019 **ESRC-IAA: Developing complex systems methods capacity in NHS Health Scotland**, *Economic and Social Research Council, UK*, Co-Investigator.
- 2005–2009 **Spatially Embedded Complex Systems Engineering (SECSE)**, *Engineering and Physical Sciences Research Council, UK*, Co-Investigator.

Editorial Boards

- 2023–Present **Royal Society Open Science**, *Royal Society*, Editorial Board Member for Health and Society Section.
- 2023–Present **International Journal of Microsimulation**, *International Microsimulation Association*, Editorial Board Member for Agent-Based Modelling Submissions.

Awards

- **Postgraduate Tuition Award** – University of Leeds, 2003–2006
- **Academic Excellence Scholarship** – Schreyer Honors College, Pennsylvania State University, 1999–2002
- **National Merit Scholarship**, 1999–2002
- **Liberal Arts Scholarship** – Pennsylvania State University, 1999–2000

Teaching

- Jan–May 2017 **Research Methods**, *Teesside University, Middlesbrough, UK*, Masters-level.
- Jan–May 2016 **Client-Side Scripting**, *Teesside University, Middlesbrough, UK*, Undergraduate.
- Apr 2013 **Agent-Based Modelling**, *Max Planck Institute for Demographic Research, Rostock, Germany*, PhD-level.
- Dec 2012 **Simulation**, *University of Southampton, Southampton, UK*, Masters-level.
- Apr 2013 **Beginning Computing**, *Temple University Japan, Tokyo, Japan*, Undergraduate.
- 2005–2006 **Bio-Inspired Computing**, *University of Leeds, Leeds, UK*, Undergraduate.
- 2003–2004 **Computational Modelling**, *University of Leeds, Leeds, UK*, Masters-level.

Selected Publications

- 2024 Hinsch, M., Robertson, D.L., and **Silverman, E.** *Evolutionary rescue effect can disappear under non-neutral mutations - a reply to Zhang et al. (2022)* *Nature Communications* 15:10676, <https://doi.org/10.1038/s41467-024-54828-4>.
- 2024 Shin, H., **Silverman, E.** *Navigating the Challenges of Spatially and Temporally Poor Data in Agent-based Models: Exploring Air Pollution Generation and Population Movement.* *Social and Economic Systems Modelling* 6, 18752. <https://doi.org/10.18174/sesmo.18752>.

- 2024 Shin, H., **Silverman, E.**, Li, Y., Tian, Y., and Zhao, Q. *Did the Implementation of Low Emission Zone in Glasgow Change the Traffic Flow and Air Quality?* Findings, September 2024.
- 2024 Gostoli, U., Hinsch, M., and **Silverman, E.** *Growing Populations from the 'Bottom-Up': An ABM Approach to the Generation of Synthetic Populations* In: Elsenbroich, C., Verhagen, H. (eds) *Advances in Social Simulation. ESSA 2023. Springer Proceedings in Complexity.* Springer, Cham.
- 2024 Hinsch, M., **Silverman, E.**, and Robertson, D.L. *Whole-System Pandemic Modelling Including Pathogen Evolution* In: Elsenbroich, C., Verhagen, H. (eds) *Advances in Social Simulation. ESSA 2023. Springer Proceedings in Complexity.* Springer, Cham.
- 2024 Bueck, J., and **Silverman, E.** and Hinsch, M. *Simulating Social Mechanisms of Depression.* In: *ALIFE 2024: Exploring New Frontiers*, Copenhagen, Denmark, 22-26 July 2024, http://abmhub.cs.ucl.ac.uk/2024/camera_ready/Bueck_etal.pdf.
- 2024 Brown, H., Albani V., Munford, L., Sutton, McHardy, F., **Silverman, E.**, Richiardi, M., Pearce, A., Heppenstall, A., Meier, P., Thomson, R., and Katikireddi, S. Association between individual level characteristics and take-up of a Minimum Income Guarantee for Pensioners: Panel Data Analysis using data from the British Household Panel survey 1999–2002. *Social Sciences and Humanities Open*, Vol 9, <https://doi.org/10.1016/j.ssaho.2024.100847>.
- 2023 Hinsch, M., **Silverman, E.** and Robertson, D. *Whole-System Pandemic Modelling Including Pathogen Evolution.* In: 18th Social Simulation Conference (SSC23), Glasgow, UK, 04-08 Sep 2023, (Accepted for Publication).
- 2023 Gostoli, U. , Hinsch, M. and **Silverman, E.** *Growing Populations From the 'Bottom-up': an ABM Approach to the Generation of Synthetic Populations.* In: 18th Social Simulation Conference (SSC23), Glasgow, UK, 04-08 Sep 2023, (Accepted for Publication).
- 2023 Shin, H. and **Silverman, E.** *Glasgow Low Emission Zone: Simulating the Change in Traffic Flow and the Following Health Outcomes.* In: 18th Social Simulation Conference (SSC23), Glasgow, UK, 04-08 Sep 2023, (Accepted for Publication).
- 2023 Hinsch, M., **Silverman, E.** and Robertson, D. L. *Simulating the Evolutionary Response of a Viral Pandemic to Behaviour Change.* In: *ALIFE 2023: Ghost in the machine*, Sapporo, Japan, 24-28 Jul 2023, https://doi.org/10.1162/isal_a_00691.
- 2023 Breeze, P. R. et al. *Guidance on the use of complex systems models for economic evaluations of public health interventions.* *Health Economics*, 32(7), pp. 1603-1625.
- 2023 Gostoli, U. and **Silverman, E.** *Self-isolation and testing behaviour during the COVID-19 pandemic: an agent-based model.* *Artificial Life*, 29(1), pp. 94-117.
- 2022 Gostoli, U. and **Silverman, E.** *An agent-based model of social care provision during the early stages of Covid-19.* *Scientific Reports*, 12, 16534.
- 2022 Bryden, J., **Silverman, E.** and Powers, S. T. *Modelling transitions between egalitarian, dynamic leader and absolutist power structures.* *PLoS ONE*, 17(2), e0263665.

- 2022 Angione, C., **Silverman, E.** and Yaneske, E. *Using machine learning as a surrogate model for agent-based simulations*. PLoS ONE, 17(2), e0263150.
- 2021 **Silverman, E.** and Gostoli, U. *PHASE: Facilitating Agent-Based Modelling in Population Health*. In: Winter Simulation Conference 2020, Orlando, FL, USA, 13-16 Dec 2020, pp. 135-146. ISBN 9781728194998.
- 2021 **Silverman, E.**, Gostoli, U., Picascia, S., Almagor, J., McCann, M., Shaw, R. and Angione, C. *Situating agent-based modelling in population health research*. Emerging Themes in Epidemiology, 18, 10.
- 2020 Gostoli, U. and **Silverman, E.** *Social and child care provision in kinship networks: an agent-based model*. PLoS ONE, 15(12), e0242779.
- 2020 Gostoli, U. and **Silverman, E.** *Sound behavioural theories, not data, is what makes computational models useful*. Review of Artificial Societies and Social Simulation, 22 Apr.
- 2019 **Silverman, E.** *Convolutional Neural Networks for Cellular Automata Classification*. In: 2019 Conference on Artificial Life (ALIFE 2019), Newcastle, UK, 29 July - 02 Aug 2019, pp. 280-281.
- 2019 Gostoli, U. and **Silverman, E.** *Modelling social care provision in an agent-based framework with kinship networks*. Royal Society Open Science, 6(7), 190029.
- 2019 Gostoli, U. and **Silverman, E.** *Social and Child Care Provision and Kinship Networks: An Agent-Based Model*. In: 15th Annual Social Simulation Conference (SSC 2019), Mainz, Germany, 23-27 Sept 2019.
- 2019 Bryden, J. and **Silverman, E.** *Underlying socio-political processes behind the 2016 US election*. PLoS ONE, 14(4), e0214854.
- 2018 **Silverman, E.** *Bringing ALife and complex systems science to population health research*. Artificial Life, 24(3), pp. 220-223.
- 2018 **Silverman, E.** *Methodological Investigations in Agent-Based Modelling – With Applications for the Social Sciences*. Methodos Series Volume 13. Berlin: Springer.
- 2017 **Silverman, E.**, Charles, F., Porteous, J., Wood, I., and Ells, L. *Agent-Based Virtual Urban Environments for Population Health Applications*. In ABMUS 2017 : The 2nd International Workshop on Agent-based Modelling of Urban Systems (ABMUS2017), May 8, 2017 – May 9, 2017, Sao Paulo, Brazil. Berlin: Springer.
- 2017 Courgeau, D., Bijak, J., Franck, R., and **Silverman, E.** *Model-Based Demography: Towards a Research Agenda*. In Agent-Based Modelling and Population Studies, Springer Series on Demographic Methods and Population Analysis. Berlin: Springer.
- 2016 **Silverman, E.**, Geard, N. and Wood, I. *Job Insecurity in Academic Research Employment: An Agent-Based Model*. Proceedings of the Fifteenth International Conference on the Simulation and Synthesis of Living Systems. Cambridge, MA: MIT Press.
- 2015 **Silverman, E.**, Hilton, J., Noble, J., Bijak, J. *Semi-Artificial Models of Populations: Connecting Demography with Agent-Based Modelling*. In Chen, S., Terano, T., Yamamoto, R., and Chung-Ching, T. (editors), Advances in Computational Science: The Fourth World Congress. Springer Japan, Tokyo.

- 2014 Courgeau, D., Bijak, J., Franck, R., and **Silverman, E.** *Are the Four Baconian Idols still alive in demography?* *Revue Quetelet*, 2(2): 31-59.
- 2014 Bijak, J., Courgeau, D., **Silverman, E.**, and Franck, R. *Quantifying Paradigm Change in Demography*. *Demographic Research*, 30(32): 911-924.
- 2014 **Silverman, E.**, Bijak, J., Courgeau, D., and Franck, R. *Advancing Social Simulation: Lessons from Demography*. In Sayama, H., Rieffel, J., Risi, S., Doursat, R., and Lipson, H. (eds.), *Artificial Life 14: Proceedings of the Fourteenth International Conference on the Synthesis and Simulation of Living Systems*. Cambridge, MA: MIT Press.
- 2013 Bijak, J., Hilton, J., **Silverman, E.**, Cao, V. *Reforging the Wedding Ring: Exploring a Semi-Artificial Population Model for the United Kingdom with Gaussian Process Emulators*. *Demographic Research*, 29(27), p. 729-766.
- 2013 **Silverman, E.**, Bijak, J., Hilton, J., Cao, V.D. and Noble, J. (2013) *When Demography Met Social Simulation: A Tale of Two Modelling Approaches*. *Journal of Artificial Societies and Social Simulation*, 16 (4) 9.
- 2013 **Silverman, E.**, Hilton, J., Noble, J., Bijak, J. *Simulating the cost of social care in an ageing population*. In Rekdalsbakken, W., Bye, R.T., Zhang, H. (editors), *Proceedings of the 27th European Conference on Modelling and Simulation*, p. 689-695. Digitaldruck Pirrot, Dudweiler, Germany.
- 2013 Bijak, J., **Silverman, E.** *Probability and Social Science: Methodological Relationships between the Two Approaches*. *Population Studies*, 67(1), 127-129.
- 2012 Noble, J., **Silverman, E.**, Bijak, J., Rossiter, S., Evandrou, M., Bullock, S., Vlachantoni, A., Falkingham, J. *Linked lives: the utility of an agent-based approach to modelling partnership and household formation in the context of social care*. In Laroque, C., Himmelsbach, J., Pasupathy, R., Rose, O., and Uhrmacher, J.M. (Eds.), *Proceedings of the 2012 Winter Simulation Conference*.
- 2011 Brailsford, S., **Silverman, E.**, Rossiter, S. *Complex systems modelling for supply and demand in health and social care*. In Jain, S., Creasey, R.R., Himmelsbach, J., White, K.P., and Fu, M. (Eds.), *Proceedings of the 2011 Winter Simulation Conference*.
- 2011 **Silverman, E.**, and Ikegami, T. *Defining Robustness in Artificial Life*. *International Journal of Bio-Inspired Computation*, 3, pp. 179-186.
- 2011 Noble, J., **Silverman, E.**, de Pinedo Garcia, M. *The explanatory value of some post-connectionist models*. Presented at Systematicity and the Post-Connectionist Era: Taking stock of the architecture of cognition, San Jose, Andalucia, Spain.
- 2011 Efstathiou, S., **Silverman, E.** *Conceptual frameworks and interdisciplinarity: modelling ageing populations*. Presented at Third Conference of the European Philosophy of Science Association, Athens, Greece.
- 2011 **Silverman, E.**, Bijak, J., Noble, J. *Feeding the Beast: Can Computational Demographic Models Free Us from the Tyranny of Data?* In Lenaerts, T., Giacobini, M., Bersini, H., Bourguine, P., Dorigo, M., and Doursat, R. (Eds.), *Advances in Artificial Life, ECAL 2011 Proceedings*.

- 2011 Arranz, J., Noble, J., **Silverman, E.** *The origins of communication revisited*. In Lenaerts, T., Giacobini, M., Bersini, H., Bourguine, P., Dorigo, M., and Doursat, R. (Eds.), *Advances in Artificial Life, ECAL 2011: Proceedings of the Eleventh European Conference on the Synthesis and Simulation of Living Systems*.
- 2009 **Silverman, E.**, Ikegami, T. *Robustness and Artificial Life*. Proceedings of the Complex 09 conference, Tokyo, Japan.
- 2009 Hubert, J., Matsuda, E., **Silverman, E.** and Ikegami, T. *Robotic Approaches to the Study of Robustness*. Proceedings of the Mobiligence 2009 Conference, Awaji, Japan.
- 2008 Bullock, S., **Silverman, E.** *Levins and the Legitimacy of Artificial Worlds*. Presented at Epistemological Perspectives on Simulation, Lisbon, Portugal.
- 2008 **Silverman, E.**, Ikegami, T. *Redefining Robustness (Abstract)*. In S. Bullock, J. Noble, R. A. Watson, and M. A. Bedau (Eds.) Proceedings of the Eleventh International Conference on Artificial Life, MIT Press, Cambridge, MA, p. 62.
- 2008 **Silverman, E.**, Ikegami, T. *Dancing Robots: Form, Environment, and Context in Human-Robot Interaction (Abstract)*. In S. Bullock, J. Noble, R. A. Watson, and M. A. Bedau (Eds.) Proceedings of the Eleventh International Conference on Artificial Life, MIT Press, Cambridge, MA, p. 63.
- 2007 **Silverman, E.**, Bryden, J. *From artificial societies to new social science theory*. Almeida e Costa, F., Rocha, L.M., Costa, E., Harvey, I., and Coutinho, A. (editors) *Advances in Artificial Life, 9th European Conference, ECAL 2007, Proceedings*, 645-654.
- 2004 **Silverman, E.**, Bullock, S. *Empiricism in artificial life*. in: Pollack, J, Bedau, M, Husbands, P, Ikegami, T and Watson, R A (editors), *Artificial Life IX: Proceedings of the Ninth International Conference on the Simulation and Synthesis of Living Systems*, MIT Press: Cambridge, MA, pp. 534-539.

Selected Events

- Sept 2024 **Social Simulation Conference 2024**, *Krakow, Poland*, Programme Committee member.
- Jul 2024 **Artificial Life 2024: Exploring New Frontiers**, *Copenhagen, Denmark*, Author.
- Sept 2023 **Social Simulation Conference 2023**, *Glasgow, UK*, Author (3 papers), Programme Committee member.
- July 2023 **Artificial Life 2023: Ghost in the Machine**, *Hokkaido, JP*, Author.
- July 2021 **Artificial Life, ABMHuB Workshop**, *Prague, CZ*, Author, Programme Committee member.
- Dec 2020 **Winter Simulation Conference 2020**, *Orlando, FL, USA*, Invited Speaker.
- July 2020 **Artificial Life, ABMHuB Workshop**, *Montreal, CA*, Author, Programme Committee member.
- Sept 2019 **Social Simulation Conference 2019**, *Mainz, Germany*, Author.
- July 2019 **Artificial Life 2019**, *Newcastle, UK*, Author, Programme Committee member.

- July–Aug 2018 **ORAHs 2018**, *Oslo, Norway*, Author.
- March 2017 **What Works Scotland: Prevention and Prediction**, *Glasgow, UK*, Invited Speaker.
- July 2016 **Artificial Life XV**, *Cancún, Mexico*, Author, Programme Committee member.
- Nov 2015 **Validation and Models in Computational Biomedical Science**, *Sheffield, UK*, Invited speaker.
- July 2015 **European Conference on Artificial Life**, *York, UK*, Programme Committee member.
- July 2014 **Artificial Life XIV**, *New York City, USA*, Author, Programme Committee member.
- Nov 2013 **Chaire Quetelet**, *Louvain-la-Neuve, Belgium*, Author (2 papers).
- Aug 2013 **Joint Statistical Meetings**, *Montréal, Canada*, Author.
- May 2013 **European Conference on Modelling and Simulation**, *Ålesund, Norway*, Author.
- Sept 2012 **4th World Congress on Social Simulation**, *Taipei, Taiwan*, Author.
- Aug 2011 **European Conference on Artificial Life**, *Paris, France*, Author.
- Nov 2009 **Complex '09**, *Tokyo, Japan*, Author.
- Aug 2008 **Alife XI**, *Winchester, UK*, Author (1 paper, 2 abstracts), Programme Committee member.

Reviewing

- Articles Adaptive Behaviour, Artificial Life, International Journal of Bio-Inspired Computing, Demographic Research, Journal of Artificial Societies and Social Simulation, Nature Communications, International Journal of Microsimulation, PLoS One, Royal Society Open Science
- Books Springer
- Proposals Austrian Research Promotion Agency, Biotechnology and Biological Sciences Research Council, Templeton Foundation

Leadership

- **Vice President** – Glasgow University and College Union, 2024–2025
- **Workstream Lead** – Modelling Complex Systems, MRC/CSO Social and Public Health Sciences Unit, University of Glasgow, 2017–Present
- **President** – Southampton University and College Union, 2011–2015
- **Chief Scientist** – BSES Expeditions, Svalbard March–June 2006