RAFFAELE VARDAVAS, PH.D.

Mathematical Modeler | Expertise in Computational Modeling for Health Policy

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🎓 Google Scholar ✱ Secret Clearance (Active)

PROFESSIONAL EXPERIENCE

Senior Mathematician & Data Scientist
RAND Corporation

📅 2008 – 2025 📍 Santa Monica, CA

- Built COVID-19 decision support tool used by 30+ state/local governments; became RAND's most-viewed product in 2020 with 100K+ users
- Developed agent-based simulation models incorporating behavioral dynamics and network effects; validated against longitudinal survey data (n2,000; 17 waves over 8 years)
- Created deep generative models (VAEs, GANs) to generate synthetic health datasets preserving statistical properties and privacy
- Co-developer of COMPARE, a microsimulation model of 300M+ individuals, used to evaluate ACA reforms and benchmarked against CBO projections for coverage and cost impacts
- Conducted simulation-based cost-benefit analysis of U.S. military vision screening policies, quantifying expected net benefits and uncertainty across scenarios
- Developed predictive agent-based models for tax evasion behavior, informing IRS enforcement strategies
- Led healthcare workforce planning projects, optimizing nurse staffing across Virginia hospitals

Research Data Scientist
UCLA BioMath & Applied Math

📅 2002 – 2008 📍 Los Angeles, CA

- Built stochastic simulation models for HIV, influenza, and syphilis transmission using Monte Carlo and deterministic approaches
- Developed kinetic Monte Carlo algorithms for atomic diffusion, nucleation, and aggregation processes in materials science

RESEARCH INITIATIVES

$ Grant Leadership
Led or co-led 6 federal research grants totaling $8.7M over 17 years; managed multidisciplinary teams of 5-10 researchers

📈 COVID-19 State Policy Tool
Interactive web platform enabling policymakers to simulate pandemic scenarios; became RAND's most-viewed product in 2020 with 100K+ users

👥 Behavioral-Epidemiological Models
Agent-based models coupling cognitive decision-making with disease dynamics; validated against real-world data

🗄 Synthetic Data Generation
Deep learning pipeline creating privacy-preserving synthetic health datasets

CORE EXPERTISE

Mathematical & Computational modeling specialist with 17 years at the RAND Corporation, combining physics, applied mathematics, and computational methods to solve complex policy challenges in health, economics, and social systems.

TECHNICAL SKILLS

Programming:
R (Expert) C/C++ (Expert) Python (Intermediate)

R Ecosystem:
dplyr ggplot2 deSolve igraph Shiny R Markdown

Tools:
Git LaTeX NetLogo Tableau Plotly Mathematica

Methods:
Agent-Based Modeling • Monte Carlo Simulation • Stochastic Processes • Network Analysis • Optimization • Causal Inference • Time Series Analysis • Bayesian Methods • Machine Learning (incl. Deep Learning, Reinforcement Learning)

EDUCATION

Ph.D. in Physics
Imperial College London

📅 2002

M.Sci. in Physics (First Class Honours)
Imperial College London

📅 1998

AWARDS & HONORS

🏅 RAND Silver Medal Award (2021)
Mission & Impact for developing COVID-19 online tool for local policymakers,

MENTORING

Served on dissertation advisory committees for five RAND Ph.D. students (2010-2022) and two Sorbonne Université Ph.D. students (2021-2024)

SELECTED RESEARCH GRANTS

Modeling COVID-19 Transmission and Protective Behaviors

NIH/NIAID R01AI160240

📅 2021 – 2026 📍 PI; $2,758,368

RAND Alcohol Policy Platform

NIH/NIAAA 1R01AA022132-01A1

📅 2014 – 2021 📍 co-PI; $2,679,116

Agent-Based Model of Income Tax Evasion

NSF 1519116

📅 2015 – 2017 📍 PI; $605,844

SELECTED PUBLICATIONS

Vardavas, R., Armour, P., Katragadda, S.P., Pujol-Gentry, T., Nascimento de Lima, P., Fateh, B., Hernandez, H., Yi, S., Rojas Aguilera, J., & Gadwah-Meaden, C. (2024). Cost-Benefit Analysis of Comprehensive Military Eye Examination Policies. RAND Report RR-A2188-1.

Nowak, S.A., Nascimento de Lima, P., & **Vardavas, R.** (2023). Optimal non-pharmaceutical pandemic response strategies depend critically on time horizons and costs. *Scientific Reports*, *13*(1), 2416.

Vardavas, R., Nascimento de Lima, P., & Baker, L. (2021). Could periodic nonpharmaceutical intervention strategies produce better COVID-19 health and economic outcomes? *Journal on Policy and Complex Systems*, *7*(1).

Vardavas, R., Strong, A., Bouey, J., Welburn, J.W., Nascimento de Lima, P., Baker, L., Zhu, K., Priest, M., Hu, L., & Ringel, J.S. (2020). The Health and Economic Impacts of Nonpharmaceutical Interventions to Address COVID-19: A Decision Support Tool for State and Local Policymakers. RAND Report TLA173-1.

Isley, S., Lempert, R., Popper, S., & **Vardavas, R.** (2015). The effect of near-term policy choices on long-term greenhouse gas transformation pathways. *Global Environmental Change*, *34*, 147-158.

Vardavas, R., Breban, R., & Blower, S. (2007). Can influenza epidemics be prevented by voluntary vaccination? *PLoS Computational Biology*, *3*(5), e85.

Total: 40+ peer-reviewed publications, 30+ RAND reports

CONFERENCES

Selected Recent Invited Talks:
- University of Vermont TGIR (2024): Behavioral Feedback in Disease Models.
- MIDAS Webinar (2021): Modeling Infectious Behaviors.
- Virtual ISPOR Europe (2021): Mathematical Models of Disease Transmission.

Total: 20+ conference presentations at venues including SIAM, INFORMS, Santa Fe Institute, and international symposia.

REVIEW PANELS

WHO/OECD/World Bank Technical Working Group on Integrated Epidemiological-Economic Modelling for COVID-19 (2021-2022)

NIH/NIAID Review Panel: Emergency Awards for COVID-19 Research (2020)

NIH/NIAID Centers of Excellence for Influenza Research and Response (2020)

covering topics in health policy, tax evasion, social networks, and infectious disease prevention.

TEACHING

Full Course Instructor
Modeling Complex Systems for Policy , RAND Corporation, yearly 2020-2025

Tutorial Classes
Evolutionary Complex Socio-economic Systems, RAND Corporation, 2013

Teaching Assistant
Mathematical Finance, UCLA, 2003

EDITORIAL SERVICE

- **Topic Editor** for Frontiers in Public Health (2024–present): "Modelling the Impact of Human Behavior on Infectious Disease Epidemiology"
- **Peer Reviewer:** Chaos, Solitons & Fractals; Frontiers journals; BMC Infectious Diseases; and others

ADVISORY ROLES

Advisory Board Member

Create Cures Foundation

📅 2016 – Present 📍 Los Angeles, USA

Supporting research for inexpensive therapies for serious diseases and prevention strategies.

Board of Directors

L-Nutra

📅 2009 – 2015 📍 Los Angeles, USA

USC spin-off developing medical food for protection against age-related diseases.

Co-founder

Quantnotes.com

📅 2001 – 2009 📍 London, UK

Educational website on mathematical finance. Traffic: ~10,000 weekly sessions during operational period.