Laura Matrajt

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Research Interests

My research lies at the interface of mathematics, computer science, epidemiology, and public health policy. I use and develop quantitative tools including mathematical and computational models, statistics, optimization and machine learning to understand complex processes in epidemiology and public health with two primary goals in mind: to provide decision-makers with quantitative analyses of health outcomes and interventions and to further our understanding on how the infectious process at the individual level affects the infectious process at the population level and vice-versa.

Education

University of Washington, Seattle, Washington USA
- Ph.D. Applied Mathematics 2011
- M.S., Applied Mathematics 2009
- M.S., Mathematics 2007

Universidad Nacional Autónoma de México, Mexico city, MEXICO
- B.A., Mathematics 2005

University of Texas at Austin, Texas, USA
- One year exchange program during college 2002

PERSONAL NOTE: In early 2017, when I was 19 weeks pregnant, a significant health issue was discovered in my baby during a routine ultrasound. The rest of the pregnancy was extremely complicated, with medical appointments twice per week. My baby was born in July 2017, and during 2017-2019 he had two major surgeries and was hospitalized multiple times. Due to this I had to take frequent parental medical leaves, which resulted in a significant reduction of my research effort during this period. From mid-2019, I have returned full-time to the academic life, have published 10 articles and participated in 6 academic conferences.

Professional Experience

Secondary affiliation: Department of Applied Mathematics, University of Washington, Seattle, WA
Affiliate Associate Professor 2022-

Vaccine and Infectious Disease Institute, Fred Hutchinson Cancer Research Center, Seattle, WA
Staff Scientist 2021-
Dr. Janes group: research includes development of mathematical and statistical models of the impact of public health interventions, models of clinical studies, optimization tools for vaccine allocation and other interventions, equity-based optimization of public health interventions.

Vaccine and Infectious Disease Institute, Fred Hutchinson Cancer Research Center, Seattle, WA
Research Associate 2019-2021
Dr. Hilbert's group: research includes development of mathematical models of the impact of interventions for the COVID-19 pandemic, optimization tools for vaccine allocation against cholera and COVID-19, models of B-cell immunology to help vaccine design.

Vaccine and Infectious Disease Institute, Fred Hutchinson Cancer Research Center, Seattle, WA
Research Associate 2015 - 2019
Dr. Halloran's group: research included the development of mathematical models for dynamics and interventions for infectious diseases, in particular for influenza, typhoid, and dengue.

Vaccine and Infectious Disease Institute, Fred Hutchinson Cancer Research Center, Seattle, WA

Postdoctoral fellow 2013 - 2015
Dr. Halloran's group: research included the development of mathematical models for dynamics and interventions for infectious diseases, in particular for influenza, typhoid, and dengue.

Department of Medicine, University of Washington/Vaccine and Infectious Disease Institute, Fred Hutchinson Cancer Research Center, Seattle, WA
Postdoctoral fellow 2011 - 2013
Dr. Schiffer's group: Research included analysis of data and the development of mathematical models for interactions of the immune system and HIV, epidemiological analysis of herpes viruses, including HSV 1, HSV2, Epstein-Barr virus (EBV) and cytomegalovirus (CMV).

Vaccine and Infectious Disease Institute, Fred Hutchinson Cancer Research Center, Seattle, WA
Research Assistant June 2007 - 2011

PUBLICATIONS

1. Trejo I, Hung PY, and **Matrajt L**. Covid19Vaxplorer: a free, online, user-friendly COVID-19 Vaccine Allocation Comparison Tool, *accepted, PLoS Global Public Health, 2023.*https://doi.org/10.1101/2023.06.15.23291472

2. Stafford E, Dimitrov D, Ceballos R, Campelia G and **Matrajt L**. Retrospective Analysis of Equity-Based Optimization for COVID-19 Vaccine Allocation, *PNAS Nexus, 2023.* https://doi.org/10.1093/pnasnexus/pgad283

3. Dimitrov D, Adamson B and **Matrajt L**. Evaluating the use of dose-sparing vaccination strategies for Monkeypox, *PNAS Nexus, 2023.*
https://doi.org/10.1093/pnasnexus/pgad095

4. **Matrajt L,** Brown ER, Dimitrov D and Janes H. The role of antiviral treatment in curbing the COVID-19 pandemic: a modeling study Matrajt, L., Brown, E.R., Cohen, M.S. et al. Could widespread use of antiviral treatment curb the COVID-19 pandemic? A modeling study. BMC Infectious Diseases 22, 683 (2022). https://doi.org/10.1186/s12879-022-07639-1

5. Leung T, Eaton J, and **Matrajt L**. Optimizing one-dose and two-dose cholera vaccine allocation in outbreak settings: A modeling study. *PLoS Neglected Tropical Diseases, 2022 Apr 20;16(4):e0010358.*
https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0010358

6. Bracis C, Moore M, Swan DA, **Matrajt L,** et al. Improving vaccination coverage and offering vaccine to all school-age children will allow uninterrupted in-person schooling in King County, WA: Modeling analysis, *Mathematical Biosciences and Engineering, 2022, Volume 19, Issue 6: 5699-5716.*
http://www.aimspress.com/article/doi/10.3934/mbe.2022266

7. **Matrajt L,** Janes H, Schiffer JT and Dimitrov D. Quantifying the impact of lifting community non-pharmaceutical interventions for COVID-19 during vaccination rollout in the United States. *Open Forum Infectious Diseases, 2021, Vol. 8, Issue 7.*
https://doi.org/10.1093/ofid/ofab341

8. Leung T and **Matrajt L** Protection afforded by previous Vibrio cholerae infection against subsequent disease and infection: a review. *PLoS Neglected Tropical Diseases, 2021.*
https://doi.org/10.1371/journal.pntd.0009383

9. **Matrajt L**, Eaton J, Leung T, Dimitrov D, Schiffer JT, Swan DA and Janes H. Optimizing vaccine allocation for COVID-19 vaccines: potential role of single-dose vaccination. *Nature Communications* 12, 3449 (2021).
https://doi.org/10.1038/s41467-021-23761-1

10. Swan DA, Bracis C, Janes H, Moore M, **Matrajt L**, et al. COVID-19 vaccines that reduce symptoms but do not block infection need higher coverage and faster rollout to achieve population impact. *Scientific Reports, 2021*
https://doi.org/10.1038/s41598-021-94719-y

11. **Matrajt L**, Eaton J, Leung T and Brown ER. Vaccine optimization for COVID-19: who to vaccinate first? *Sciences Advances, 2020, Vol. 7, no. 6,* https://advances.sciencemag.org/content/7/6/eabf1374

12. **Matrajt L** and Leung T. Evaluating the Effectiveness of Social Distancing Interventions to Delay or Flatten the Epidemic Curve of Coronavirus Disease. *Emerging Infectious Diseases, 2020 Aug;26(8):1740-1748.* https://doi.org/10.3201/eid2608.201093

Podcast

13. Lee EC, Chao DL, Lemaitre J, **Matrajt L**, et al. Achieving coordinated national immunity and cholera elimination in Haiti through vaccination. *Lancet Public Health, 2020, Aug;8(8):e1081-e1089* https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30310-7/fulltext

14. **Matrajt L**, Halloran ME, Antia R. Successes and failures of the live-attenuated influenza vaccine, can we do better? *Clinical Infectious Diseases*, 2019. https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciz358/5485903

15. **Matrajt L**, Gantt S, Mayer BT, Krantz EM, Orem J, Wald A, Corey L, Schiffer JT, Casper C. Virus and host-specific differences in oral human herpesvirus shedding kinetics among Ugandan women and children. *Nature Scientific Reports*, 2017, Oct 12;7(1):13105. https://www.nature.com/articles/s41598-017-12994-0

16. Mayer BT, **Matrajt L**, Casper C, Krantz EM, Corey L, Wald A, Gantt S, Schiffer JT. Dynamics of Persistent Oral Cytomegalovirus Shedding During Primary Infection in Ugandan Infants *Journal of Infectious Diseases*, 2016 Dec 1;214(11):1735-174 https://academic.oup.com/jid/article-lookup/doi/10.1093/infdis/jiw442

17. Feldstein LR, **Matrajt L**, Halloran ME, Keitel WA, Longini IM Jr., H5N1 Vaccine Working Group. Extrapolating theoretical efficacy of inactivated influenza A/H5N1 virus vaccine from human immunogenicity studies. *Vaccine*, 2016 Jul 19;34(33):3796-802 http://www.sciencedirect.com/science/article/pii/S0264410X16303930?via%3Dihub

18. **Matrajt L** Britton T, Halloran ME, and Longini IM Jr. One versus two doses: what is the best use of vaccine in an influenza pandemic? *Epidemics* Dec. 2015. http://www.sciencedirect.com/science/article/pii/S175543651500064X

19. **Matrajt L**, Younan PM, Kiem HP, Schiffer JT. The majority of CD4+ T-cell depletion during acute SHIV89.6P infection occurs in uninfected cells, *Journal of Virology*, 2014 Mar;88(6):3202-12. https://doi.org/10.1128/JVI.03428-13

20. **Matrajt L**, Halloran ME, and Longini IM Jr. Optimal vaccine allocation for the early mitigation of pandemic influenza, *PLoS Computational Biology*, 2013, 9(3): e1002964. https://doi.org/10.1371/journal.pcbi.1002964

21. **Matrajt L** and Longini IM Jr. Critical immune and vaccination thresholds for determining multiple influenza epidemic waves, *Epidemics*, Volume 4, Issue 1, March 2012, Pages 22-32, ISSN 1755-4365. http://www.sciencedirect.com/science/article/pii/S1755436511000570

22. Kenah E, Chao DL, **Matrajt L**, Halloran ME, Longini IM Jr. The Global Transmission and Control of Influenza. *PLoS ONE*. 2011; 6(5): e19515. https://doi.org/10.1371/journal.pone.0013767

23. Chao DL, **Matrajt L**, Basta NE, Sugimoto JD, Dean B, Bagwell DA, Oiulfstad B, Halloran ME, Longini IM Jr. Planning control of pandemic influenza H1N1 in Los Angeles County and the US, *American Journal of Epidemiology*. 2011; 173 (10): 1121-1130.
https://doi.org/10.1093/aje/kwq497

24. **Matrajt L**, Longini IM Jr. Optimizing Vaccine Allocation at Different Points in Time during an Epidemic. *PLoS ONE*. 2010; 5(11): e13767.
https://doi.org/10.1371/journal.pone.0013767

25. Yang Y, Sugimoto JD, Halloran ME, Basta NE, Chao DL, **Matrajt L**, Potter G, Kenah E, Longini Jr. IM. The Transmissibility and Control of Pandemic Influenza A (H1N1) Virus. *Science*. 2009: 729-733.
https://www.science.org/doi/10.1126/science.1177373

26. Basta NE, Chao DL, Halloran ME, **Matrajt L**, Longini IM Jr.Strategies for Influenza Vaccination of School Children in the US. *American Journal of Epidemiology*. 2009; 170: 679-686.
https://doi.org/10.1093/aje/kwp237

27. Basta NE, Halloran ME, **Matrajt L**, Longini IM Jr. Estimating Influenza Vaccine Efficacy From Challenge and Community-based Study Data. *American Journal of Epidemiology*. 2008; 168(12):1343-52
https://doi.org/10.1093/aje/kwn259

CURRENT FUNDING

IDCRC Early Career Investigator Pilot Awards Program, $99,838
"Mathematical simulations based on population models of SARS-CoV-2 dynamics to evaluate the impact of study design for vaccine effects on SARS-CoV-2 transmission".
12/2023-12/2024
Role: Principal investigator

NSF RAPID, "Comparative COVID- 19 vaccine allocation online tool." $199, 999
12/2021-01/2024
Role: Principal investigator

CDC/ Council of State and Territorial Epidemiologists (CSTE), "Using mathematical modeling to understand community vulnerabilities and guide pandemic preparedness based on COVID-19 experience" $274,468
08/2023-08/2024
Role: Co-Investigator

COMPLETED FUNDING

CDC/ Council of State and Territorial Epidemiologists (CSTE), "Mathematical modeling of the impact of integrated prevention strategies against COVID-19 in Washington and Oregon" $390,000
08/2023-08/2024
Role: Co-Investigator

Wellcome Trust Epidemic Preparedness: Preventing and Controlling Cholera grant "Optimizing vaccine allocation for cholera epidemics", Grant Reference: 215685/Z/19/Z 07/19-07/21 $428, 882
Role: Principal Investigator

CONSULTING ROLES

Consultant with the Sabin Vaccine Institute: Jan 2014- March 2015
Under this role, I reviewed typhoid transmission and vaccination models and provided a report that included a presentation to the WHO Immunization and Vaccines-related Implementation Research Advisory Committee.

Conference, Presentations, Workshops

Retrospective Analysis of Equity-Based Optimization for COVID-19 Vaccine Allocation. Contributed talk, Epidemics Conference, December 2023.

Retrospective Analysis of Equity-Based Optimization for COVID-19 Vaccine Allocation. Contributed talk, IDM Symposium, May 2023.

¿Cómo optimizar la distribución de las vacunas contra el COVID-19? Invited plenary talk at the 55th Congress of the Mathematical Mexican Society, October 2022.

Could widespread use of antiviral treatment curb the COVID-19 pandemic? A modeling study. Contributed talk at the MIDAS Meeting (online), September 2022.

The role of antiviral treatment in curbing the COVID-19 pandemic: a modeling study. Contributed poster at the Ecology and Evolution of Infectious Diseases conference (online) , June 2022.

Optimising Vaccine Allocation for COVID-19 Shows the potential role of Single Dose Vaccination. Invited talk at the Optimal Vaccination Strategies meeting, Juniper Consortium, Newton Gateway to Mathematics, Cambridge, December 2021.

Optimizing vaccine allocation for COVID-19 vaccines shows the potential role of single-dose vaccination. Contributed talk, Epidemics conference, December 2021.

¿Cómo optimizar la distribución de las vacunas contra el COVID-19? Invited talk, 5th Meeting of Mexican Mathematicians in the World, Online conference, December 2021.

Antiviral use against the COVID-19 pandemic, a modeling study. Poster presented at Epidemics conference, December 2021.

Optimizing COVID-19 vaccine allocation. Michigan Institute for Computational Discovery and Engineering, and the department of Epidemiology at the School of Public Health joint seminar, November 2021.

Optimizing COVID-19 vaccine allocation: Who to vaccinate first? Invited talk at the 15th Vaccine Congress, Online, October 2021.

Optimizing vaccine allocation for COVID-19 vaccines: critical role of single-dose vaccination Talk at the IAS COVID-19 virtual conference, February 2nd, 2021.

Evaluating the Effectiveness of Social Distancing Interventions: delaying the epidemic or flattening the curve? Poster presented at the IAS COVID-19 virtual conference, 10-11 July 2020.

Successes and failures of the live-attenuated influenza vaccine, can we do better? Presented at Epidemics, Charleston US, December 2019.

Optimizing vaccine allocation in network models. Invited talk presented at the Canadian Applied Mathematics and Industrial Mathematics Society, Whistler, Canada, June 2019.

Using a mathematical model to optimally select a live attenuated influenza vaccine oral presentation (not given due to family health reasons) selected to be presented at the Epidemics 6 Conference, Stiges, Spain, December 2017.

Una o dos dosis de vacuna:¿Cúal es el mejor uso de las vacunas en una pandemia de influenza? Invited talk presented at the "Primer simposio sobre el proceso salud-enfermedad desde la perspectiva de los sistemas complejos", Mexico city, Mexico, February 2015.

Optimal vaccine allocation through a network of cities for pandemic influenza. Invited talk presented at the Mathematical conference of the Americas, Guanajuato, Mexico, August, 2013.

Modeling the indirect effects of HIV/SHIV infection. Poster presented at the Disease Dynamics 2013: Immunization, a true multi-scale problem Workshop, Vancouver, Canada, January 2013.

Optimal vaccine allocation through a network of cities for pandemic influenza. Poster presented at the Disease Dynamics 2013: Immunization, a true multi-scale problem Workshop, Vancouver, BC, Canada, January 2013.

Optimal vaccine allocation through a network of cities for pandemic influenza. Contributed talk presented at ECCS'12 Satellite Meeting "Data-driven modeling of contagion processes", Brussels, Belgium, September 2012.

Optimizing vaccine allocation at different points in time during an epidemic. INFORMS Meeting 2010, Austin, US November 2010.

Critical vaccine and immune thresholds to predict multiple epidemic waves. SMB 2010, Annual Meeting of the Society for Mathematical Biology, Rio de Janeiro, Brazil July 2010.

One vs. two doses: optimal vaccination strategies for pandemic influenza. EPIDEMICS conference, Athens, Greece, December 2009.

One vs. two doses: optimal vaccination strategies for pandemic influenza. Infectious Disease Agent Study (MIDAS) meeting, Monterey, CA, 2008.

TEACHING EXPERIENCE

North Seattle College, Seattle, Washington, USA
Instructor — Summer 2016
University of Washington, Seattle, Washington USA
Instructor — Summer 2010
Teaching Assistant — 2005-2007
Universidad Nacional Autonoma de Mexico (UNAM), Mexico city, Mexico
Teaching Assistant — 2004-2005

ADVISING

Erin Stafford (Graduate student, University of Washington)	March 2022 -
Imelda Trejo Lorenzo (Postdoc)	April 2022- August 2022
Tiffany Leung (Postdoc)	October 2019-Dec 2021
Tim Davies (Undergraduate student from North Seattle College)	Spring 2016
Steven Monda (Undergraduate Research Program, coadvisor with Josh Schiffer)	Summer 2013

REFEREE WORK

Reviewer for the following journals: Science, Science Translational Medicine, PNAS, Lancet Infectious Diseases, Science Advances, PLoS Medicine, PLoS Biology, PLoS Computational Biology, PLoS Neglected Tropical Diseases, PLoS One, Nature Communications, BMC Medicine, BMJ Open, IEEE transactions on healthcare, Scientific Reports, Preventive Medicine, American Journal of Preventive Medicine.

MEDIA COVERAGE

Globe and Mail, 03/22/2021, in reference to the the manuscript *Vaccine optimization for COVID-19: who to vaccinate first?* https://www.theglobeandmail.com/opinion/editorials/article-the-covid-19-vaccine

Seattle Met, 03/11/2021, in reference to the manuscript *Optimizing vaccine allocation for COVID-19 vaccines: potential role of single-dose vaccination*: https://www.seattlemet.com/health-and-wellness/2021/03/did-washington-state-get-its-vaccine-distribution-order-right

Recherche Française, 03/05/21, in reference to the the manuscript *Vaccine optimization for COVID-19: who to vaccinate first?* https://www.larecherche.fr/covid-19-vaccins/lutte-contre-l%C3%A9pid%C3%A9mie-de-covid-19-qui-vacciner-en-premier

NPR 01/10/21, in reference to the manuscript *Optimizing vaccine allocation for COVID-19 vaccines: critical role of single-dose vaccination* https://www.npr.org/2021/01/10/955384322/vaccine-strategies

Mashable article on 01/11/2021, in reference to the manuscript *Optimizing vaccine allocation for COVID-19 vaccines: potential role of single-dose vaccination*: https://mashable.com/article/covid-vaccines-one-dose/

CBC article 12/14/20, in reference to the manuscript *Vaccine optimization for COVID-19: who to vaccinate first?* https://www.cbc.ca/news/health/vaccine-rollout-spread-death-covid-19-1.5836027

Undark Magazine (reprinted in Smithsonian Magazine, Scientific American, Medscape, Fast company and Technology Review), 11/18/20, in reference to the manuscript *Vaccine optimization for COVID-19: who to vaccinate first?*: https://undark.org/2020/11/18/best-strategy-to-deploy-covid-19-vaccine/. This article has been reposted in the following media outlets:

Fastcompany, Scientific American, Medscape, Singularity Hub, Technology Review, Smithsonian

New York Times article 11/05/2020, in reference to the manuscript *Vaccine optimization for COVID-19: who to vaccinate first?*: https://www.nytimes.com/2020/11/05/magazine/who-gets-covid-vaccine.html?referringSource=articleShare

US CDC podcast referring to the article *Evaluating the Effectiveness of Social Distancing Interventions to Delay or Flatten the Epidemic Curve of Coronavirus Disease* Podcast:https://overcast.fm/+HST4bVSU?fbclid=IwAR2V0VotuH67rw5OUklqX411pg9kuRmBXecB-kV3BvNEhe2w2eg_letfAKE

Featured in Der Tagesspiegel (Germany), 11/19/20, https://www.tagesspiegel.de/wissen/jung-anstecken
26633142.html

Featured in Respekt magazine (Czech Republic), 05/26/2020: https://www.respekt.cz/tydenik/2020/22/jen-chripecka?issueId=100457

Interviews with "Sopitas" radio show, Mexico city, March-April 2020

3/16/20: https://www.mixcloud.com/Sopitas/16-marzo-2020-investigaci%C3%B3n-sobre-l
C3%B3n-del-covid-19/

3/24/20: https://open.spotify.com/episode/6jhodYuqOOnmsUsAn3Pfbs?si=Vg57bjpbTbaIwN

4/3/20: https://www.mixcloud.com/Sopitas/03-abril-2020-que-tan-efectivas-son-las-

4/27/20: https://www.mixcloud.com/Sopitas/ensayos-cl%C3%ADnicos-de-las-vacunas-par

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Invited talks for undergraduates and outreach activities

Invited talk at the Lewis & Clark Mathematical Sciences Colloquium, Lewis and Clark College	Fall 2021
Invited talk at the UW Tacoma math seminar, UW Tacoma,	Spring 2021
GEM (Girls Empowered by Math), Stem for Her, virtual presentation,	Fall 2020
MESA workshop, Fred Hutchinson Cancer Research Center,	Fall 2019
Presenter, Expanding your Horizons Workshop, Bellevue College	Spring 2016
Contributed talk at the PNW Section of the Mathematical Asociation of America Meeting, UW Tacoma	Spring 2015
Invited talk at the Mathematics Undergraduate Colloquium, Seattle University	Fall 2013
Invited talk at the Western Washington Community College Student Math Conference	Winter 2013
Invited talk at the Ready Set Transfer (RST) program at North Seattle College (NSC)	Fall 2012

Guest lecture at an Ordinary Differential Equations class, Everett Community College — Summer 2012

Invited talk at the Undergraduate Mathematical Sciences Seminar, UW Seattle — Spring 2012

Presenter, Expanding your Horizons Workshop, Bellevue College — Spring 2009

Language facilities

Spanish (native)
English (fluent)
French (fluent).

Computer Skills

Languages: Python, Matlab, R.
Applications: LaTeX.
Maple, Mathematica (proficient).

Honors and Awards

Graduate School Top Scholar Award, University of Washington — 2005-2006

Beca para estudios de posgrado en el extranjero — 2005-2010
(Funding for Graduate studies abroad from CONACYT, Mexico.)

Reconocimiento por desempeño académico — 2003
(Award for outstanding academic performance, UNAM, Mexico.)

Beca de movilidad estudiantil — 2002
(Scholarship for studying abroad from UNAM, Mexico. Funding for a one year exchange program at the University of Texas, at Austin.)
