
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
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University of Texas at Austin, Texas, USA

One year exchange program during college	2002
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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 8 articles, have another 3 under review and participated in 5 academic conferences.

PROFESSIONAL EXPERIENCE

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

Staff Scientist 2021-

Dr. Janes group: research includes development of mathematical models of the impact of interventions for the COVID-19 pandemic, mathematical models of COVID-19 clinical trials, optimization tools for vaccine allocation against cholera and COVID-19, models of B-cell immunology.

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.

Dr. Schiffer's group: Research included analysis of data and the development of mathematical models for interactions of the immune system and HIV and herpes viruses, including HSV 1, HSV2, Epstein-Barr virus (EBV) and cytomegalovirus (CMV).

PUBLICATIONS

1. **Matrajt L**, Brown ER, Cohen M, Dimitrov D and Janes H. Could widespread use of antiviral treatment curb the COVID-19 pandemic? A modeling study. *Under review*, <https://www.medrxiv.org/content/10.1101/2021.11.10.21266139v2>
2. Leung T, Eaton J, and **Matrajt L**. Optimizing one-dose and two-dose cholera vaccine allocation in outbreak settings: A modeling study. *Accepted, PLoS Neglected Tropical Diseases, 2022* <https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0010358>
3. 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. *Accepted, Mathematical Biosciences and Engineering, 2022*. <https://www.medrxiv.org/content/10.1101/2021.10.01.21264426v1>
4. **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>
5. 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>
6. **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>
7. 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://www.nature.com/articles/s41598-021-94719-y>
8. **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>
9. **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://pubmed.ncbi.nlm.nih.gov/32343222/>
Podcast: <https://tools.cdc.gov/medialibrary/index.aspx#/media/id/407749>
10. 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](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30310-7/fulltext)
11. **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>
12. **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>
13. 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*
PMID: 27651417 PMCID: PMC5144733
<https://academic.oup.com/jid/article-lookup/doi/10.1093/infdis/jiw442>
14. 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*

PMID: 27268778 PMCID: PMC5168719

<http://www.sciencedirect.com/science/article/pii/S0264410X16303930?via%3Dihub>

15. **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, available online June 22, 2015.
<http://www.sciencedirect.com/science/article/pii/S175543651500064X>
16. **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.
PMID: 24390339. PMCID: PMC3957925.
<http://jvi.asm.org/content/88/6/3202.long>
17. **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. doi:10.1371/journal.pcbi.1002964
PMID: 23555207, PMCID: PMC3605056.
<http://www.ploscompbiol.org/article/info%3Adoi%2F10.1371%2Fjournal.pcbi.1002964>
18. **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, 10.1016/j.epidem.2011.11.0
PMID: 22325011, PMCID: PMC3703471.
<http://www.sciencedirect.com/science/article/pii/S1755436511000570>.
19. Kenah E, Chao DL, **Matrajt L**, Halloran ME, Longini IM Jr. The Global Transmission and Control of Influenza. *PLoS ONE*. 2011; 6(5): e19515. doi:10.1371/journal.pone.0019515.
PMID: 21573121, PMCID: PMC3089626.
<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0019515>.
20. Chao DL, **Matrajt L**, Basta NE, Sugimoto JD, Dean B, Bagwell DA, Ojulfstad 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.
PMID: 21427173, PMCID: PMC3121321.
<http://aje.oxfordjournals.org/content/173/10/1121.long>
21. **Matrajt L**, Longini IM Jr. Optimizing Vaccine Allocation at Different Points in Time during an Epidemic. *PLoS ONE*. 2010; 5(11): e13767. doi:10.1371/journal.pone.0013767
PMID: 21085686, PMCID: PMC2978681.
<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0013767>
22. 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.
PMID: 19745114, PMCID: PMC2880578.
<http://www.sciencemag.org/content/326/5953/729.long>
23. 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.
PMID: 19679750, PMCID: PMC2737588.
<http://aje.oxfordjournals.org/content/170/6/679.long>
24. 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
PMID: 18974084, PMCID: PMC2638553.
<http://aje.oxfordjournals.org/content/168/12/1343.long>

CURRENT FUNDING	NSF RAPID, "Comparative COVID- 19 vaccine allocation online tool."	\$199, 999
	Role: Principal investigator	
	CSFE, "Mathematical modeling of the impact of integrated prevention strategies against COVID-19 in Washington and Oregon"	\$390,000
	Role: Investigator	

COMPLETED
FUNDING

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

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: ¿Cuál 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.

LANGUAGE
FACILITIES

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

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

Imelda Trejo Lorenzo (Postdoc) April 2022-
Ugo Avila-Ponce de Leon (independent research) February 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, PLoS Medicine, PLoS Biology, PLoS Computational Biology, PLoS Neglected Tropical Diseases, PLoS One, Nature Communications, BMC Medicine, IEEE transactions on healthcare, Scientific Reports, 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:

<https://www.fastcompany.com/90577182/who-should-get-a-covid-19-vaccine-first-its>

<https://www.scientificamerican.com/article/doing-the-touchy-math-on-who-should-g>

<https://www.medscape.com/viewarticle/941274>

<https://singularityhub.com/2020/11/20/what-is-the-best-strategy-to-deploy-a-covi>

<https://www.technologyreview.com/2020/11/20/1012313/who-should-get-a-covid-19-va>

<https://www.smithsonianmag.com/science-nature/what-best-strategy-deploy-covid-19>

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%C3%B3n-del-covid-19/>

3/24/20: <https://open.spotify.com/episode/6jhodYuq00nmsUsAn3Pfbs?si=Vg57bjpbTbaIwN>

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

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

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 Association 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

COMPUTER SKILLS

Languages: Python, Matlab, R.
 Applications: L^AT_EX.
 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.)
