

NATHANIEL HENDRIX

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Center for Professionalism and Value
1016 16th St NW #8
Washington, DC 20036

[https://nathanielhendrix.com/
nhendrix@theabfm.org](https://nathanielhendrix.com/nhendrix@theabfm.org)

RESEARCH POSITIONS

American Board of Family Medicine, Center for Professionalism and Value in Health Care
Data Scientist, 2022 – Present

Stanford University, School of Medicine
Research Affiliate, 2022 – Present

Harvard University, T.H. Chan School of Public Health
Visiting Scientist, 2022

EDUCATION & TRAINING

Postdoctoral Fellowship, Harvard University, T.H. Chan School of Public Health, 2020 – 2022.

Ph.D., Health Economics and Outcomes Research, University of Washington, 2020.

Dissertation Title: “Using Health Economics Tools to Enhance the Clinical Utility of Artificial Intelligence-Based Diagnostics: A Case Study in Breast Cancer Screening”

Committee: David L. Veenstra (chair), Aasthaa Bansal, Brett Hauber, Christoph I. Lee

Pharm.D., University of Washington, 2015.

B.A. English Literature, Texas State University, 2004.

RESEARCH INTERESTS

Clinical Artificial Intelligence, Information Technology, Pharmacoepidemiology, Preference Assessment

PEER-REVIEWED PUBLICATIONS

* indicates co-first author

1. **N. Hendrix**, R.L. Phillips, and A.W. Bazemore (2023). “How Often Do Family Physicians Document Social Needs in Electronic Health Records?” *Journal of the American Board of Family Medicine*. doi: 10.3122/jabfm.2022.220296R1
2. **N. Hendrix**, A. Bazemore, A.J. Holmgren, L.R. Rotenstein, A.R. Eden, A.H. Krist, and R.L. Phillips (2023). “Variation in Family Physicians’ Experiences Across Different Electronic Health Record Platforms: A Descriptive Study.” *Journal of General Internal Medicine*. doi: 10.1007/s11606-023-08169-5
3. **N. Hendrix**, S. Warkaye, L. Tesfaye, M. Agachew, A. Arja, R. Sato, F. Getnet, and S. Verguet (2023). “Estimated Travel Time and Staffing Constraints to Accessing the Ethiopian Healthcare System: A Two-Step Floating Catchment Area Analysis.” *Journal of Global Health*. doi: 10.7189/jogh.13.04008
4. **N. Hendrix**, S. Bolongaita, S.T. Memirie, M.T. Tolla, D. Villano, and S. Verguet (2023). “Equitable prioritization of healthcare interventions by weighting outcomes on financial risk protection criteria.” *Value in Health*, online before print.
5. **N. Hendrix**, N. Oestreicher, D. Lalla, C.M. Dolan, K.A. Fisher, D.L. Veenstra and B. Moy (2022). “Residual disease burden after neoadjuvant therapy among U.S. patients with high-risk HER2+ early-stage breast cancer: A population effectiveness model.” *Clinical Breast Cancer*, 22(8). doi: 10.1016/j.clbc.2022.08.012

6. **N. Hendrix***, K.P. Lowry*, J.G. Elmore, W. Lotter, A.G. Sorensen, W. Hsu, G.J. Liao, S. Parsian, S. Kolb, A. Naeim, and C.I. Lee (2022). "Radiologist preferences for the implementation of artificial intelligence-based decision support for detection and risk prediction during interpretation of screening mammography." *Journal of the American College of Radiology*, 19(10). doi: 10.1016/j.jacr.2022.06.019
7. S. Jiang, P. Mathias, **N. Hendrix**, D.L. Veenstra, and B. Devine (2022). "Customizing value-based methods to prioritize implementation of pharmacogenomic clinical decision support for learning health systems: A cost-utility analysis." *The Pharmacogenomics Journal*, 22. doi: 10.1038/s41397-022-00275-7
8. **N. Hendrix**, X. Jiang Kwete, S. Bolongaita, I. Megiddo, S.T. Memirie, A. Mirkuzie, J. Nonvignon, and S. Verguet (2022). "Economic evaluations of health system strengthening activities in low- and middle-income countries: A methodological systematic review." *BMJ Global Health*, 7(e007392). doi: 10.1136/bmjgh-2021-007392
9. L.F. Assebe, D. Dillu, K.A. Johansson, M.T. Tolla, G. Tiru, S. Bolongaita, A. Chakrabarti, and **N. Hendrix** (2021). "Financial risks of care-seeking for malaria by rural households in southwest Ethiopia." *BMJ Open*, 11(e056162). doi: 10.1136/bmjopen-2021-056162
10. **N. Hendrix**, D.L. Veenstra, M. Cheng, N.C. Anderson, and S. Verguet (2021). "Assessing the economic value of clinical artificial intelligence: Challenges and opportunities." *Value in Health*, 25(3). doi.org/10.1016/j.jval.2021.08.015
11. **N. Hendrix**, R. Gulati, B. Jiao, A.K. Kader, S.T. Ryan, and R. Etzioni (2021). "Clarifying the trade-offs of risk-stratified screening for prostate cancer: A cost-effectiveness study." *American Journal of Epidemiology*, 190(10). doi:10.1093/aje/kwab155
12. B. Jiao, R. Gulati, **N. Hendrix**, J.L. Gore, S. Rais-Bahrami, T.M. Morgan, and R. Etzioni (2021). "Modeling the cost-effectiveness of multi-parametric magnetic resonance imaging and urine-based reflex testing before prostate biopsy in men with intermediate prostate-specific antigen levels." *Value in Health*, 24(8). doi:10.1016/j.jval.2021.02.009
13. **N. Hendrix**, D.D. Kim, K.S. Patel, and B. Devine (2021). "Differences in the selection of health state utility values by sponsorship in published cost-effectiveness analyses." *Medical Decision Making*, 41(3). doi:10.1177/0272989X20985821
14. **N. Hendrix**, B. Hauber, C.I. Lee, A. Bansal, and D.L. Veenstra (2020). "Artificial intelligence in breast cancer screening: Primary care provider preferences." *Journal of the American Medical Informatics Association*, 28(6). doi:10.1093/jamia/ocaa292
15. **N. Hendrix**, Z. Marcum, and D.L. Veenstra (2020). "Medication persistence of targeted immunomodulators for plaque psoriasis: A retrospective analysis of a US claims database." *Pharmacoepidemiology & Drug Safety*, 29(6). doi:10.1002/pds.5021
16. **N. Hendrix**, D.A. Regier, A. Basu, D.L. Veenstra, J. Chatterjee, D.S. Dhanda, and J.J. Carlson (2020). "Provider preferences for resolving uncertainty and avoiding harms in precision medicine: Results from a discrete choice experiment." *Personalized Medicine*, 17(5). doi:10.2217/pme-2020-0018
17. R. Baral, J. Fleming, S. Khan, D. Higgins, **N. Hendrix**, and C. Pecenka (2020). "Inferring antenatal care visit timing in low- and middle-income countries: Methods to inform potential maternal vaccine coverage." *PLOS One*, 15(8). doi:10.1371/journal.pone.0237718
18. F. Debellut, **N. Hendrix**, V.E. Pitzer, K.M. Neuzil, D. Constenla, N. Bar-Zeev, A. Marfin, and C. Pecenka (2019). "Forecasting demand for the typhoid conjugate vaccine in low- and middle-income countries." *Clinical Infectious Diseases*, 68(S2). doi:10.1093/cid/ciy1076
19. **N. Hendrix**, D.A. Ollendorf, R.H. Chapman, A. Loos, S. Liu, V. Kumar, J.A. Linder, S.D. Pearson, and D.L. Veenstra (2018). "Cost-effectiveness of targeted pharmacotherapy for moderate to severe plaque psoriasis." *Journal of Managed Care & Specialty Pharmacy*, 24(12). doi:10.18553/jmcp.2018.24.12.1210
20. J.J. Carlson, D.D. Kim, G.F. Guzauskas, C.S. Bennette, D.L. Veenstra, A. Basu, **N. Hendrix**, D.L. Hershtman, L. Baker and S.D. Ramsey (2018). "Integrating value of research into NCI Clinical Trials Cooperative Group research review and prioritization: A pilot study." *Cancer Medicine*, 7(9). doi:10.1002/cam4.1657

21. F. Debellut*, **N. Hendrix***, J.R. Ortiz, P. Lambach, K.M. Neuzil, N. Bhat, and C. Pecenka (2018). "Forecasting demand for maternal influenza immunization in low- and lower-middle-income countries." *PLOS One*, 13(6). doi:10.1371/journal.pone.0199470
22. W.J. Canestaro, **N. Hendrix**, A. Bansal, S.D. Sullivan, B. Devine, and J.J. Carlson (2017). "Favorable and publicly-funded studies are more likely to be published: A systematic review and meta-analysis." *Journal of Clinical Epidemiology*, 92. doi:10.1016/j.jclinepi.2017.08.004
23. **N. Hendrix**, N. Bar-Zeev, D. Atherly, J. Chikafa, H. Mvula, R. Wachepa, A. Crampin, T. Mhango, C. Mwansambo, R. Heyderman, N. French, N. Cunliffe, and C. Pecenka (2017). "The economic impact of childhood acute gastritis on Malawian families and the healthcare system: A prospective cohort study." *BMJ Open*, 7(9). doi:10.1136/bmjopen-2017-017347
24. P.C. Mathias, **N. Hendrix**, W.-J. Wang, K. Keyloun, M. Khelifi, P. Tarczy-Hornoch, and B. Devine (2017). "Characterizing pharmacogenomic-guided medication use with a clinical data repository." *Clinical Pharmacology & Therapeutics*, 102(2). doi:10.1002/cpt.611

Manuscripts Currently Undergoing Peer Review

1. **N. Hendrix**, H. Sidky, D. Sahner, and the N3C Consortium. "Influence of Prior SARS-CoV-2 Infection on COVID-19 Severity: Evidence from the National COVID Cohort Collaborative."
2. T. Wang, K. Stelter, J. Floyd, T. O'Neill, **N. Hendrix**, A. Bazemore, K. Rode, and W. Newton. "Blueprinting the Future: Automatic Item Categorization using Hierarchical Zero-Shot and Few-Shot Classifiers."
3. **N. Hendrix**, N. Maisel, J. Everson, V. Patel, A. Bazemore, L.S. Rotenstein, A.J. Holmgren, A.H. Krist, J. Adler-Milstein, and R.L. Phillips. "Comparative Analysis of Three Surveys on Primary Care Providers' Experiences with Interoperability and Electronic Health Records."
4. A.J. Holmgren, **N. Hendrix**, N. Maisel, J. Everson, A. Bazemore, L. Rotenstein, J. Adler-Milstein, and R.L. Phillips. "Assessing the relationship between EHR satisfaction, burnout, and burden reduction strategies for primary care physicians."
5. **N. Hendrix**, R.V. Parikh, M. Taskier, G. Walter, I. Rochlin, S. Saydah, E.H. Koumans, O. Rincón-Guevara, D.H. Rehkopf, and R.L. Phillips. "Heterogeneity of Diagnosis and Documentation of Post-COVID Conditions in Primary Care: A Machine Learning Analysis."
6. J. Everson, J. Adler-Milstein, A. Bazemore, R.L. Phillips, **N. Hendrix**, and V. Patel. "Primary care physicians' satisfaction with interoperability."
7. L.F. Assebe, O.F. Norheim, **N. Hendrix**, and S. Verguet. "Equity impact of a package of interventions addressing infectious diseases in Ethiopia."
8. L. Tesfaye, T. Forzy, F. Getnet, A. Misganew, M. Agachew, A. Arja, S. Warkaye, S. Kassahun, S. Memirie, T. Moshag, R. Sato, **N. Hendrix**, M. Zelalem, Y. Lakew, M. Hailu, and S. Verguet. "Estimating immunization coverage at the district level: A case study of measles and diphtheria-pertussis-tetanus vaccines in Ethiopia"

NON-PEER-REVIEWED PUBLICATIONS

Preprints

1. **N. Hendrix**, N. Maisel, J. Everson, V. Patel, A. Bazemore, L.S. Rotenstein, A.J. Holmgren, A.H. Krist, J. Adler-Milstein, and R.L. Phillips. "Comparative Analysis of Three Surveys on Primary Care Providers' Experiences with Interoperability and Electronic Health Records." *medRxiv*. doi: 10.1101/2024.01.02.24300713v1
2. T. Wang, K. Stelter, J. Floyd, T. O'Neill, **N. Hendrix**, A. Bazemore, K. Rode, and W. Newton. "Blueprinting the Future: Automatic Item Categorization using Hierarchical Zero-Shot and Few-Shot Classifiers." *arXiv*. doi: 10.48550/arXiv.2312.03561
3. **N. Hendrix**, H. Sidky, D. Sahner, and the N3C Consortium (2023). "Influence of Prior SARS-CoV-2 Infection on COVID-19 Severity: Evidence from the National COVID Cohort Collaborative." *medRxiv*. doi: 10.1101/2023.08.03.23293612v1

4. S. Hegselman, Y. Zhou, ..., **N. Hendrix**, et al. (2023). "Recent Advances, Applications and Open Challenges in Machine Learning for Health: Reflections from Research Roundtables at ML4H 2022 Symposium." *Zenodo*. doi: 10.5281/zenodo.7951122
5. P.C. Mathias, S. Jiang, **N. Hendrix**, B.H. Shirts, P. Tarczy-Hornoch, D.L. Veenstra, D. Malone, and B. Devine (2022). "PRECISE Value: An interactive web application that estimates the value of implementing a clinical decision support system for a pharmacogenomic testing program." *Research Square*. doi: 10.21203/rs.3.rs-1777434/v1

MEDIA COVERAGE

1. B. Goodman (2023). "Covid-19 has changed and so has our immunity. Here's how to think about risk from the virus now." CNN.
<https://edition.cnn.com/2023/08/28/health/risk-from-catching-covid-wellness/index.html>

GRANTS AND SPONSORED PROJECTS

Active Funding

1. Bridging the Gap: Evaluating Vaccination Trends, Equity, & Hesitancy in Primary Care to Inform Policy & Practice
 Role on Project: Lead Quantitative Scientist
 Funder: Sanofi
 Project Period: January 2024 - January 2025
 Amount: \$250,000
2. Assessing the racial, ethnic, and geographic equitability of COVID-19 treatments in a primary care population
 Role on Project: Data Scientist (PI: D. Rehkopf)
 Funder: Food and Drug Administration
 Project Period: May 2023 - April 2025
 Project Identifier: U01 FD007879-01
 Amount: \$999,998
3. Novel algorithmic fairness tools for reducing health disparities in primary care
 Role on Project: Sub-PI (PI: S. Rose)
 Funder: National Institutes of Health (National Library of Medicine)
 Project Period: April 2022 - March 2026
 Project Identifier: R01 LM013989-01
 Amount: \$1,531,866
4. Physician use and burdens of health IT (cooperative agreement)
 Role on Project: Data Scientist (PI: R.L. Phillips)
 Funder: US Department of Health & Human Services (Office of National Coordinator for Health IT)
 Project Period: March 2021 - March 2024

Under Review

1. A Foundation Model for Primary Care
 Role on Project: Co-PI
 Funder: Stanford Human-Centered AI
 Project Identifier: Hoffman-Yee Research Award, 2024
2. Biosurveillance Through Analysis of Cultural Transmission in Clinical Language

Role on Project: Co-PI

Funder: ARPA-H

3. Modeling Diagnostic Heterogeneity to Improve Applications of Real World Data

Role on Project: PI

Funder: NIH Common Fund

Project Identifier: RFA-RM-23-005 (DP2 mechanism)

4. Predictors of Changing Practice Patterns after Guideline Updates: Evidence from a Nationwide Primary Care Registry (Under Revision)

Role on Project: PI

Funder: Agency for Healthcare Research and Quality

Project Identifier: PA-23-115 (R03 mechanism)

Completed Funding

1. SARS-CoV-2 Reinfection Severity (PHASTR contract)

Role on Project: PI

Funder: National Institutes of Health (National Center for Advancing Translational Sciences)

Project Period: February 2023 - April 2023

Amount: \$50,000

2. Developing Data-Driven Cancer Researchers

Role on Project: Pre-Doctoral Trainee (PIs: R. Etzioni and S. Schwartz)

Funder: National Institutes of Health (National Cancer Institute)

Project Period: September 2018 - July 2020

Project Identifier: T32 CA009168-42

3. Pre-Doctoral Fellowship in Outcomes Research

Role on Project: Pre-Doctoral Trainee

Funder: PhRMA Foundation

Project Period: July 2018 - December 2019

Total: \$37,500

Description: Funds provided for cost-of-living support during my Ph.D. dissertation.

4. Health Services Research Training

Role on Project: Pre-Doctoral Trainee (PI: D. Grembowski)

Funder: Agency for Healthcare Research and Quality

Project Period: September 2015 - August 2017

Project Identifier: T32 HS013853-17

INVITED PRESENTATIONS

1. "Assessing the Economic Value of Clinical Artificial Intelligence." National Academies of Sciences, Engineering, and Medicine, Global Forum on Innovation in Health Professional Education, Washington, DC, 2023.
2. "Family Physicians' Experiences with Electronic Health Records." Georgetown University, Family Medicine Grand Rounds, Washington, DC, 2023.
3. "Radiologist Preferences for AI-Based Decision Support during Breast Cancer Screening." University of Washington, Program in Health Economics and Outcomes Research (PHEnOM), Seattle, 2021.

4. “Cost-Effectiveness Analysis to Support the Equitable Implementation of Clinical Artificial Intelligence.” Harvard University Center for Research for Computation and Society Health Equity Panel, online (due to COVID-19), 2021.
5. “Cost-Effectiveness of Risk-Stratified Screening for Prostate Cancer.” Cancer Intervention and Surveillance Modeling Network (CISNET) Annual Meeting, online (due to COVID-19), 2020.

SELECTED PRESENTATIONS

1. **N. Hendrix**, A. Bazemore, L. Rotenstein, A.J. Holmgren, A. Krist, and R.L. Phillips (2023). “Variation in Family Physicians’ Experiences Across Different Electronic Health Record Platforms.” AMIA Informatics Summit, Seattle.
2. **N. Hendrix**, B. Hauber, C.I. Lee, A. Bansal, and D.L. Veenstra (2020). “Provider preferences for attributes of artificial intelligence in breast cancer screening: A discrete choice experiment.” ASCO Annual Meeting, online (due to COVID-19).
3. **N. Hendrix**, Z. Marcum, and D.L. Veenstra (2019). “Drug survival of targeted therapies for plaque psoriasis: Evidence from a large U.S. claims database.” International Conference on Pharmacoepidemiology & Therapeutic Risk Management (ICPE), Philadelphia, Pennsylvania.
4. **N. Hendrix**, B. Adamson, A. Basu, and B. Devine (2018). “Increasing trend toward reporting significant digits in utility weights: Behavior implications of ‘flat of the curve’ medicine?” ISPOR Annual Meeting, Baltimore, Maryland.
5. **N. Hendrix**, D.A. Ollendorf, R. Chapman, A. Loos, S. Liu, V. Kumar, J. Linder, S. Pearson, and D.L. Veenstra (2017). “Cost-effectiveness of targeted therapy for moderate-to-severe plaque psoriasis: an analysis based on Institute for Clinical and Economic Review (ICER) report.” ISPOR Annual Meeting, Boston, Massachusetts.
6. **N. Hendrix**, and B. Devine (2016). “Deriving utility weights from patient-reported outcomes in epilepsy.” ISPOR Annual Meeting, Washington, DC.

TEACHING

University of Michigan

Guest lecture: “Natural language processing with clinical notes.” University of Michigan School of Public Health, HMP 601 (Population Health Informatics: graduate level course with approximately 30 students), 2023.

Harvard University

Guest lecture: “Visualizing results of cost-effectiveness analyses using R and ggplot2.” Harvard T.H. Chan School of Public Health, GHP 501 (Modeling for Health System Analysis & Priority Setting: graduate level course with approximately 25 enrolled students), 2021.

University of Washington

Curriculum developer and instructor of MarketScan Summer Bootcamp (an introduction to claims data for 10 entering graduate students), 2019.

Approximately 18 hours of lecture and office hours covering basic SAS, SQL and R programming; data subsetting and cleaning; patient identification; and descriptive statistics

Teaching assistant for PHARM 541 (Pharmacy, Healthcare, and Society), 2018.

Developed and graded exercises on reimbursement in the healthcare system and basic ideas in the economic evaluation of medicines for a class of approximately 90 PharmD students

HONORS & AWARDS

Rubenstein Scholarship Fund (\$5,000), University of Washington School of Pharmacy, 2020.

Rubenstein Scholarship Fund (\$4,000), University of Washington School of Pharmacy, 2019.

Graduate Student Leadership Award, University of Washington School of Pharmacy, 2019.

SERVICE TO PROFESSION, UNIVERSITY & DEPARTMENT

Editorial Service

Referee for *Applied Health Economics*, *BMC Health Services Research*, *BMJ Global Health*, *BMJ Open*, *European Journal of Health Economics*, *Journal of Biomedical Informatics*, *Journal of Clinical Epidemiology*, *Journal of General Internal Medicine*, *Journal of Managed Care and Specialty Pharmacy*, *Journal of Urology*, *npj Digital Medicine*, *Pharmacoepidemiology & Drug Safety*, and *Value in Health*

University of Washington, The Comparative Health Economics, Outcomes & Policy (CHOICE) Institute

Member, Strategic Planning Committee, 2019.

Founder and lead student editor, *Incremental Thoughts: The CHOICE Institute's Student Blog*, 2018-2019.

Member, Ph.D. Admissions Committee, 2018.

PROGRAMMING LANGUAGES

R, Python, VBA, SQL