

MHRN 2023 Annual Report



2023 ANNUAL REPORT



Mental Health Research Network

About MHRN

Who we are

- A consortium of 14 research centers, embedded in large and diverse health care systems.
- Dedicated to improving patient mental health through research, practice, and policy.
- Expertise in epidemiology, health services, economics, disparities, outcomes, and quality assessment, and pragmatic clinical trials.
- Partner health systems serve a combined population of over 20 million people in 16 states.
- Supported by a cooperative agreement with the National Institute of Mental Health.



Our Mission

As a national model for learning mental health care systems, MHRN will:

- Identify research questions that matter to patients, healthcare providers, and health care system.
- Efficiently answer those questions with real-world research involving real-world patients and provider.
- Rapidly disseminate and implement research result.

Our Values

As part of the larger Health Care Systems Research Network (HCSRN), we share the values of:



Service to patients,
caregivers, clinicians, and
health system leaders



Relevance to
real-world
decisions



Scientific
excellence



Collaboration
and teamwork



Transparency



Efficiency



Innovation
and creativity

Annual Highlights

Predicting suicide death after emergency department visits with mental health or self-harm diagnoses

MHRN researchers used health records data to predict suicide death following emergency department visits. The study was led by Greg Simon (KPWA) in collaboration with investigators and staff at 6 MHRN sites: HPI, HFHS, KPSC, KPCO, KPNW, and KPHI.

Electronic health records and insurance claims from the seven health systems were used to: identify emergency department visits with mental health or self-harm diagnoses by members aged 11 or older; extract approximately 2500 potential predictors including demographic, historical, and baseline clinical characteristics; and ascertain subsequent deaths by self-harm. Logistic regression with lasso and random forest models predicted self-harm death over 90 days after each visit.

Machine learning models using coded data from health records have moderate performance in predicting suicide death following emergency department visits for mental health or self-harm diagnosis and could be used to identify patients needing more systematic follow-up.

Percentile Cut-Point	Sensitivity	PPV
50%	92.3%	0.080%
75%	73.7%	0.128%
90%	47.2%	0.205%
95%	34.8%	0.303%
99%	11.6%	0.503%
99.5%	6.7%	0.580%

Table 2
Classification performance of the best-fitting lasso logistic model at cut-points defined a priori.


Simon GE, Johnson E, Shortreed SM, Ziebell RA, Rossom RC, Ahmedani BK, Coleman KJ, Beck A, Lynch FL, Daida YG. Predicting suicide death after emergency department visits with mental health or self-harm diagnoses. *Gen Hosp Psychiatry*. 2024 Jan 22;87:13-19. doi: 10.1016/j.genhosppsy.2024.01.009. Epub ahead of print. PMID: 38277798.

Association Between Adverse Social Determinants of Health and Suicide Death

This multi-site collaboration was led by Elyse Llamocca, a Postdoctoral Fellow at Henry Ford Health Center, and included KPWA, KPGA, KPNW, KPCO and KPHI Georgia State University, Essentia Health, Harvard Medical School, Harvard Pilgrim Health System, Ohio State University, and Nationwide Children’s Hospital.

The research identified adverse social determinants of health (SDoH) International Statistical Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code prevalence among individuals who died by suicide and to examine associations between documented adverse SDoH and suicide.

Although documented SDoH prevalence was low, several adverse SDoH were associated with increased suicide odds, supporting calls to increase SDoH documentation in medical records. This will improve understanding of SDoH prevalence and assist in identification and intervention among individuals at high suicide risk.

TABLE 3 - Associations Between Reported Social Determinant of Health Categories and Suicide 

Social determinant of health category	aOR*	95% CI*
Any	2.76	2.38–3.20
Alcoholism/drug addiction in family	18.23	8.54–38.92
Encounter for mental health services for victim and perpetrator of abuse or history of abuse	2.53	1.99–3.21
Other problems related to primary support group, including family circumstances	1.91	1.32–2.75
Problems related to care provider dependency	1.34	0.76–2.38
Problems related to education and literacy	2.17	0.95–4.97
Problems related to employment and unemployment or occupational maladjustment	8.83	5.62–13.87
Problems related to housing and economic circumstances	6.41	4.47–9.19
Problems related to legal circumstances	27.30	12.35–60.33
Problems related to other psychosocial circumstances	2.58	1.98–3.36

Llamocca EN, Yeh HH, Miller-Matero LR, Westphal J, Frank CB, Simon GE, Owen-Smith AA, Rossom RC, Lynch FL, Beck AL, Waring SC, Lu CY, Daida YG, Fontanella CA, Ahmedani BK. Association Between Adverse Social Determinants of Health and Suicide Death. *Med Care*. 2023 Nov 1;61(11):744-749. doi: 10.1097/MLR.0000000000001918. Epub 2023 Sep 9. PMID: 37708352; PMCID: PMC10592168.

Using natural language processing to identify child maltreatment in health systems

Sonya Negriff (KPSC) led a project to examine whether using Natural Language Processing (NLP) can improve the identification of cases of child maltreatment (CM.) Rates of CM obtained from electronic health records are much lower than national child welfare prevalence rates indicate. There is a need to understand how CM is documented to improve reporting and surveillance.

The study included MHRN collaborators from KPWA and KPNW.

Use of NLP substantially increased the estimated number of children who have been impacted by CM. Accurately capturing this population will improve identification of vulnerable youth at high risk for mental health symptoms.

Table 1
Number of unique children identified by method (ICD code vs NLP).

	All children N	ICD code per 1000	NLP per 1000	Has any indication of CM (ICD and/or NLP) per 1000	Increase between ICD vs NLP-identified CM per 1000
Age group					
<1	21,241	1.98	27.16	29.14	25.19
1-4	33,524	3.01	27.68	30.69	24.67
5-12	70,292	4.03	37.33	41.36	33.30
13-18	74,028	3.16	44.75	47.91	41.59
Sex					
Female	98,279	4.49	45.64	50.12	41.15
Male	100,792	2.16	29.33	31.49	27.16
Race					
Asian	20,101	2.24	29.45	31.69	27.21
Black	13,481	6.45	66.17	72.62	59.71
Hispanic	3603	4.72	49.13	53.84	44.41
Native American/Alaskan native	2791	9.67	91.37	101.04	81.69
Other	6852	6.13	46.99	53.12	40.86
Unknown	69,900	0.80	7.87	8.67	7.07
White	82,357	4.69	56.51	61.20	51.82
Hispanic ethnicity	13,140	6.39	58.22	64.61	51.83
Insurance					
Commercial	115,587	2.81	35.23	38.04	32.42
Medicaid	22,933	8.07	80.32	88.39	72.25
Other	60,565	2.48	25.23	27.71	22.75
Total N	199,085	3.32	37.38	40.70	34.07

Negriff S, Lynch FL, Cronkite DJ, Pardee RE, Penfold RB. Using natural language processing to identify child maltreatment in health systems. *Child Abuse Negl.* 2023 Apr;138:106090. doi: 10.1016/j.chiabu.2023.106090. Epub 2023 Feb 8. PMID: 36758373; PMCID: PMC9984187.

MHRN Postdoctoral Fellowship Program

The past year of the MHRN T32 program has been outstanding, with our first cohort of trainees securing employment, our second cohort excelling in many areas, our third cohort starting off strong, and another successful recruitment season. Our initial cohort consisted of Drs. Geoff Kahn (Henry Ford Health) and Santiago Papini (KPNC). After a brilliant two years in the fellowship, which included over a dozen submitted papers, an equal number of accepted manuscripts, and multiple funded and scored grants, Dr. Kahn accepted a position as an Assistant Scientist at Henry Ford Health while Dr. Papini began a tenure-track position as an Assistant Scientist at the University of Hawaii! We are thrilled for the both of them and wish them the best in their new positions.

Our 2022-2024 fellows, Drs. Brianna Costales and Elyse Llamocca have also made outstanding progress on their training plans. Dr. Costales has published two papers in the last year, presented her work on antipsychotic prescribing in adolescents at a national conference, and received a grant from KPNC's Division of Research to examine antidiabetic medications and their role in suicide-related behaviors. Dr. Llamocca recently presented at the International Academy of Suicide Research (IASR)/American Foundation for Suicide Prevention (AFSP) International Summit on Suicide Research, where she was awarded the IASR Early Career Investigator award. She also has several papers under review and a recently publication in Medical Care.

Our 2023-2025 fellows, Drs. Erin Haley and Lauren Wilson have also started their first year off strong with papers in press, conference presentations accepted, and grants in preparation. Recruitment for the 2024-2026 cohort was outstanding this year, with 11 applications from around the country. We are excited that (soon to be Doctors) Carlisha Hall (UC-Merced) and Mason Breitzig (Penn State) will be joining us in the Summer/Fall!

Projects

Six competitive proposals were awarded federal or foundation funds in 2023:

[Syncing Screening and Services for Suicide Prevention across Health and Justice Systems](#)

- MHRN PI Brian Ahmedani (HFHS)

MHRN Diversity Supplement: Whose Depression Are We Measuring?: Considering the role of place on Black women's depression outcomes

- MHRN PI Kanetha Wilson (KPGA)

Pilot Testing Implementation of Suicide Risk Prediction Algorithms to Support Suicide Prevention in Primary Care

- MHRN PI Julie Richards (KPWA)

Computational Strategies to Tailor Existing Interventions for First Major Depressive Episodes to Inform and Test Personalized Interventions

- MHRN PI Kathryn Erickson-Ridout (KPNC)

Understanding Structural Social Determinants of Suicidal Trajectories

- MHRN PI Yunyu Xiao (Cornell)

Information about all current and completed MHRN and related projects can be viewed here:

<https://mhresearchnetwork.org/current-mhrn-projects/>

Feasibility Pilots

The MHRN infrastructure funded **two feasibility pilot projects** in 2023:

[INSPIRED: INtegrating Social determinants and Policy In REducing Disparities](#)

PI Yunyu Xiao
(Cornell)



Yunyu Xiao

[Trauma and PTSD in Medical Records](#)

PI Vanessa Simiola
(KPHI)



Vanessa Simiola

Information about the feasibility pilot program and all funded pilots can be viewed here:

mhresearchnetwork.org/resources/feasibility-pilot-program/

Publications

MHRN and related projects published 35 peer-reviewed papers in 2023.

1. Miller-Matero LR, Knowlton G, Vagnini KM, Yeh HH, Rossom RC, Penfold RB, Simon GE, Akinyemi E, Abdole L, Hooker SA, Owen-Smith AA, Ahmedani BK. The rapid shift to virtual mental health care: Examining psychotherapy disruption by rurality status. *J Rural Health*. 2023 Dec 26. doi: 10.1111/jrh.12818. Epub ahead of print. PMID: 38148485.
2. Papini S, Iturralde E, Lu Y, Greene JD, Barreda F, Sterling SA, Liu VX. Development and validation of a machine learning model using electronic health records to predict trauma- and stressor-related psychiatric disorders after hospitalization with sepsis. *Transl Psychiatry*. 2023 Dec 18;13(1):400. doi: 10.1038/s41398-023-02699-6. PMID: 38114475; PMCID: PMC10730505.
3. Arias SA, Sperber K, Jones R, Taxman FS, Miller TR, Zylberfuden S, Weinstock LM, Brown GK, Ahmedani B, Johnson JE. Managed Care Updates of Subscriber Jail Release to Prompt Community Suicide Prevention: Clinical Trial Protocol. *Res Sq [Preprint]*. 2023 Sep 25:rs.3.rs-3350204. doi: 10.21203/rs.3.rs-3350204/v1. Update in: *BMC Health Serv Res*. 2023 Nov 16;23(1):1265. PMID: 37841869; PMCID: PMC10571633.
4. Vekaria V, Patra BG, Xi W, Murphy SM, Avery J, Olfson M, Pathak J. Association of opioid or other substance use disorders with health care use among patients with suicidal symptoms. *J Subst Use Addict Treat*. 2024 Jan;156:209177. doi: 10.1016/j.josat.2023.209177. Epub 2023 Oct 9. PMID: 37820869.
5. Ferber M, Chrusciel T, Cantwell S, Salas J, Christopher KM. Pre-pregnancy weight loss associations with prenatal and postpartum mental health conditions: A retrospective cohort study. *Res Sq [Preprint]*. 2023 Sep 5:rs.3.rs-3232490. doi: 10.21203/rs.3.rs-3232490/v1. PMID: 37720051; PMCID: PMC10503832.

6. Yarborough BJH, Stumbo SP, Coleman MJ, Ling Grant DS, Hulsey J, Shaw JL, Ahmedani BK, Brusckke C, Carson CPA, Cooper R, Firemark A, Hulst D, Massimino S, Miller-Matero LR, Swanson JR, Leonard A, Westphal J, Coleman KJ. Suicide-related care among patients who have experienced an opioid-involved overdose. *Gen Hosp Psychiatry*. 2023 Nov-Dec;85:8-18. doi: 10.1016/j.genhosppsy.2023.09.006. Epub 2023 Sep 10. PMID: 37717389.
7. Costales B, Vouri SM, Brown JD, Setlow B, Goodin AJ. Incident mental health episodes after initiation of gabapentinoids vs. dopamine agonists for early-onset idiopathic restless legs syndrome. *Psychiatry Res*. 2023 Oct;328:115479. doi: 10.1016/j.psychres.2023.115479. Epub 2023 Sep 10. PMID: 37708806.
8. Llamocca EN, Yeh HH, Miller-Matero LR, Westphal J, Frank CB, Simon GE, Owen-Smith AA, Rossom RC, Lynch FL, Beck AL, Waring SC, Lu CY, Daida YG, Fontanella CA, Ahmedani BK. Association Between Adverse Social Determinants of Health and Suicide Death. *Med Care*. 2023 Nov 1;61(11):744-749. doi: 10.1097/MLR.0000000000001918. Epub 2023 Sep 9. PMID: 37708352; PMCID: PMC10592168.
9. Moodie EEM, Bian Z, Coulombe J, Lian Y, Yang AY, Shortreed SM. Variable selection in high dimensions for discrete-outcome individualized treatment rules: Reducing severity of depression symptoms. *Biostatistics*. 2023 Aug 31:kxad022. doi: 10.1093/biostatistics/kxad022. Epub ahead of print. PMID: 37660312.
10. Iturralde E, Rubinsky AD, Nguyen KH, Anderson C, Lyles CR, Mangurian C. Serious Mental Illness, Glycemic Control, and Neighborhood Factors within an Urban Diabetes Cohort. *Schizophr Bull*. 2023 Aug 19:sbad122. doi: 10.1093/schbul/sbad122. Epub ahead of print. PMID: 37597839.
11. Yeh HH, Peltz-Rauchman C, Johnson CC, Pawloski PA, Chesla D, Waring SC, Stevens AB, Epstein M, Joseph C, Miller-Matero LR, Gui H, Tang A, Boerwinkle E, Cicek M, Clark CR, Cohn E, Gebo K, Loperena R, Mayo K, Mockrin S, Ohno-Machado L, Schully S, Ramirez AH, Qian J, Ahmedani BK. Examining sociodemographic correlates of opioid use, misuse, and use disorders in the All of Us Research Program. *PLoS One*. 2023 Aug 18;18(8):e0290416. doi: 10.1371/journal.pone.0290416. PMID: 37594966; PMCID: PMC10437856.
12. Foti TR, Green A, Altschuler A, Iturralde E, Does MB, Jackson-Morris M, Adams SR, Goler N, Ansley D, Conway A, Young-Wolff KC. Patient Perceptions of Prenatal Cannabis Use and Implications for Clinicians. *Obstet Gynecol*. 2023 Nov 1;142(5):1153-1161. doi: 10.1097/AOG.0000000000005295. Epub 2023 Aug 10. PMID: 37562055; PMCID: PMC10592503.
13. Xiao L, Liu S, Wu Y, Huang Y, Tao S, Liu Y, Tang Y, Xie M, Ma Q, Yin Y, Dai M, Zhang M, Llamocca E, Gui H, Wang Q. The interactions between host genome and gut microbiome increase the risk of psychiatric disorders: Mendelian randomization and biological annotation. *Brain Behav Immun*. 2023 Oct;113:389-400. doi: 10.1016/j.bbi.2023.08.003. Epub 2023 Aug 8. Erratum in: *Brain Behav Immun*. 2024 Feb;116:422. PMID: 37557965.

14. Miller-Matero LR, Yeh HH, Maffett A, Mooney JT, Sala-Hamrick K, Frank CB, Simon GE, Rossom R, Owen-Smith AA, Lynch FL, Beck A, Waring S, Daida YG, Lu CY, Ahmedani BK. Racial-Ethnic Differences in Receipt of Past-Year Health Care Services Among Suicide Decedents: A Case-Control Study. *Psychiatr Serv*. 2023 Aug 9:0. doi: 10.1176/appi.ps.20220578. Epub ahead of print. PMID: 37554000.
15. Rossom RC, Crain AL, Waring S, Sperl-Hillen JM, Hooker SA, Miley K, O'Connor PJ. Differential Effects of an Intervention to Reduce Cardiovascular Risk for Patients With Bipolar Disorder, Schizoaffective Disorder, or Schizophrenia: A Randomized Clinical Trial. *J Clin Psychiatry*. 2023 Jul 5;84(4):22m14710. doi: 10.4088/JCP.22m14710. PMID: 37428030; PMCID: PMC10793875.
16. Simon GE, Richards JE, Whiteside U. Reframing the Key Questions Regarding Screening for Suicide Risk. *JAMA*. 2023 Jun 20;329(23):2026-2027. doi: 10.1001/jama.2023.7241. PMID: 37338888.
17. Loree AM, Hecht LM, Yeh HH, Gavrilova L, Furman K, Westphal J, Simon GE, Lynch FL, Beck A, Owen-Smith A, Rossom R, Daida YG, Lu CY, Boggs JM, Frank C, Waring S, Ahmedani BK. Factors associated with suicide mortality among reproductive age women: a case-control study. *J Reprod Infant Psychol*. 2023 Jun 13:1-12. doi: 10.1080/02646838.2023.2223636. Epub ahead of print. PMID: 37310021; PMCID: PMC10716360.
18. Schulz J, Moodie EEM, Shortreed SM. NO UNMEASURED CONFOUNDING: KNOWN UNKNOWN OR... NOT? *Am J Epidemiol*. 2023 Sep 1;192(9):1604-1605. doi: 10.1093/aje/kwad133. PMID: 37280737; PMCID: PMC10666970.
19. Chavez LJ, Richards JE, Fishman P, Yeung K, Renz A, Quintana LM, Massimino S, Penfold RB. Cost of Implementing an Evidence-Based Intervention to Support Safer Use of Antipsychotics in Youth. *Adm Policy Ment Health*. 2023 Sep;50(5):725-733. doi: 10.1007/s10488-023-01273-y. Epub 2023 Jun 1. PMID: 37261566.
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23. Harry ML, Sanchez K, Ahmedani BK, Beck AL, Coleman KJ, Coley RY, Daida YG, Lynch FL, Rossom RC, Waring SC, Simon GE. Assessing the differential item functioning of PHQ-9 items for diverse racial and ethnic adults with mental health and/or substance use disorder diagnoses: A retrospective cohort study. *J Affect Disord.* 2023 Oct 1;338:402-413. doi: 10.1016/j.jad.2023.04.091. Epub 2023 Apr 29. PMID: 37127116; PMCID: PMC10524453.
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26. Rose EJ, Moodie EEM, Shortreed SM. Monte Carlo sensitivity analysis for unmeasured confounding in dynamic treatment regimes. *Biom J.* 2023 Jun;65(5):e2100359. doi: 10.1002/bimj.202100359. Epub 2023 Apr 5. PMID: 37017498.
27. Shortreed SM, Walker RL, Johnson E, Wellman R, Cruz M, Ziebell R, Coley RY, Yaseen ZS, Dharmarajan S, Penfold RB, Ahmedani BK, Rossom RC, Beck A, Boggs JM, Simon GE. Complex modeling with detailed temporal predictors does not improve health records-based suicide risk prediction. *NPJ Digit Med.* 2023 Mar 23;6(1):47. doi: 10.1038/s41746-023-00772-4. PMID: 36959268; PMCID: PMC10036475.
28. Coulombe J, Moodie EE, Shortreed SM, Renoux C. Estimating individualized treatment rules in longitudinal studies with covariate-driven observation times. *Stat Methods Med Res.* 2023 May;32(5):868-884. doi: 10.1177/09622802231158733. Epub 2023 Mar 16. PMID: 36927216; PMCID: PMC10248307.
29. Owen-Smith AA, McDonald B, Sesay MM, Simon GE, McCracken CE. Depression Treatment Initiation Among Patients With Versus Without Chronic Pain. *Psychosom Med.* 2023 Apr 1;85(3):260-265. doi: 10.1097/PSY.0000000000001184. Epub 2023 Feb 26. PMID: 36917479; PMCID: PMC10073325.
30. Xi W, Banerjee S, Olfson M, Alexopoulos GS, Xiao Y, Pathak J. Effects of social deprivation on risk factors for suicidal ideation and suicide attempts in commercially insured US youth and adults. *Sci Rep.* 2023 Mar 13;13(1):4151. doi: 10.1038/s41598-023-31387-0. PMID: 36914764; PMCID: PMC10011396.

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32. Papini S, Hsin H, Kipnis P, Liu VX, Lu Y, Sterling SA, Iturralde E. Performance of a Prediction Model of Suicide Attempts Across Race and Ethnicity. *JAMA Psychiatry*. 2023 Apr 1;80(4):399-400. doi: 10.1001/jamapsychiatry.2022.5063. PMID: 36790780; PMCID: PMC9932941.
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