Sutter Health

Institute for Advancing Health Equity
Publications to Date

1. Dillon EC, Deng S, Li M., Huang Q, de Vera E, Pesa J., Nguyen T., KigerA., Becker DF, **Azar KMJ,** (2024) Analysis of Hospitals Switching From a "Danger to Self" Question to Universal Columbia Suicide Severity Rating Scale Screening: Impact on Screenings, Identification of Suicide Risk, and Documented Psychiatric Care; Psychiatric Research and Clinical Practice, April: 6(2)

   Abstract
   Sutter Health launched system-wide general population standardized suicide screening with the Columbia-Suicide Severity Rating Scale (C-SSRS) screen (triage) version in 23 hospitals in 2019, replacing a one-question "danger to self" (DTS) assessment. This study analyzed the impact of C-SSRS implementation on screening rates, positive screenings, and documented psychiatric care within 90 days for all patients and a subgroup diagnosed with Major Depressive Disorder (MDD).

2. Mudiganti S, Nasrallah C, Brown S, Pressman A, Kiger A, Casey JA, LaMori JC, Pesa J, Azar KMJ. Homelessness Among Acute Care Patients Within a Large Health Care System in Northern California. Population Health Management. 2024 Feb;27(1):13-25. doi: 10.1089/pop.2023.0190. Epub 2024 Jan 17. PMID: 38236711. https://www.liebertpub.com/doi/10.1089/pop.2023.0190

   Abstract
   Population Health Management published our findings on 'Homelessness Among Acute Care Patients Within a Large Health Care System in Northern California'. We conducted a Sutter Health study of patients who self-identified as homeless within our acute care facilities. We found that patients experiencing homelessness had higher emergency department utilization and lower utilization of outpatient and urgent care services. Serious mental health conditions and substance abuse resulting in higher ED utilization were more common among younger patients (<45yo) experiencing homelessness, and older patients (45yo) had other chronic illnesses resulting in increased hospitalization. More than half of our hospitals had greater than 5 percent of patients who identified as homeless. Some hospitals with higher proportions of patients experiencing homelessness are not located near many shelter resources.

3. Main E, Fuller M, Kovacheva V, Elkhateb R, **Azar K**, Caldwell M, Chiem V, Foster M, Gibbs R, Hughes BL, Johnson R, Kottukapally N, Rosenstein MG, Sanz Cortes M, Shields LE, Sudat S, Sutton CD, Toledo P, Traylor A, Wharton K, Bauer M (2024) Performance Characteristics of Sepsis Screening Tools During Delivery Admissions; Obstet Gynecol 2024 Mar 1;143(3):326-335. doi: 10.1097/AOG.0000000000005477. Epub 2023 Dec 12 https://pubmed.ncbi.nlm.nih.gov/38086055/

   Abstract
   As a result of a collaborative effort, we published two papers and an accompanying editorial in the high-impact and well-regarded Green Journal. The work was led by Elliott Main, MD, founding director of the California Maternal Quality Care Collaborative (CMQCC) at Stanford University, and Melissa Bauer, MD, Associate Professor of Anesthesiology at Duke University. Dr. Main sought our partnership two years ago to address important questions regarding disparities in maternal sepsis mortality. Given the infrequency of this outcome, health systems needed to collaborate and share data.

4. Bauer M, Fuller M, Kovacheva V, Elkhateb R, **Azar K**, Caldwell M, Chiem V, Foster M, Gibbs R, Hughes BL, Johnson R, Kottukapally N, Rosenstein MG, Sanz Cortes M, Shields LE, Sudat S, Sutton CD, Toledo P, Traylor A, Wharton K, Main E. (2024) Performance Characteristics of Sepsis Screening Tools During Antepartum and Postpartum Admissions; Obstet Gynecol 2024 Mar 1;143(3):336-345.Epub 2023 Dec 12. https://journals.lww.com/greenjournal/fulltext/2024/03000/performance_characteristics_of_sepsis_screening.3.aspx

   Abstract
   (see above)

5. James C, Haley J, Allen E, Nelson T. Using Race and Ethnicity Data to Advance Health Equity: Examples, Promising Practices, Remaining Challenges, and Next Steps, The Urban Institute. 2023 Oct. 13 https://www.urban.org/research/publication/using-race-and-ethnicity-data-advance-health-equity

Abstract
This work is part of a series of publications that commemorates the 20th anniversary of the 2003 Institute of Medicine report, Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. This report found that people of color received lower-quality health care than white patients, even when access-related factors were held constant. Two decades later, we still observe the same inequities, which has motivated thought leaders to imagine how to redesign the health care system so it works equitably.

6. Azar KMJ, Alexander M, Smits K, Tio A, deGhetaldi L. ACO Benchmarks Based On Area Deprivation Index Mask Inequities, Health Affairs Forefront. 2023 Feb. 17. DOI: 10.1377/forefront.20230215.8850 https://www.healthaffairs.org/content/forefront/aco-benchmarks-based-area-deprivation-index-mask-inequities

Abstract
Addressing the deeply seated inequities within health care is a tremendous challenge, but the Centers for Medicare and Medicaid Services (CMS), along with other payers, have taken bold action. This includes new CMS proposals and policies that rely on the use of the Area Deprivation Index (ADI) as a central tool for identifying underserved communities. In this article, we focus on how the ADI is being used in Medicare accountable care organization (ACO) initiatives to target support for organizations caring for disadvantaged and marginalized groups. Targeting support is important but complicated because of the great variety of communities across the country, including differences in cost of living and population density. The ADI has been a useful tool for many research efforts, and it offers several advantages including accessibility, timeliness, and ease of use. Nonetheless, as we discuss here, the first applications of ADI within Medicare payment policy have significant limitations that need to be addressed to ensure that Medicare is successful in its efforts to achieve health equity.

7. Guerra C, Pressman A, Hurley P, Garrett-Mayer E, Bruinooge SS, Howson A, Kaltenbaugh M, Williams JH, Boehmer L, Bernick LA, Byatt L, Charlot M, Crews J, Fashoyin-Aje L, McCaskill-Stevens W, Merrill J, Nowakowski G, Patel MI, Ramirez A, Zwicker V, Oyer RA, Pierce LJ. Increasing Racial and Ethnic Equity, Diversity, and Inclusion in Cancer Treatment Trials: Evaluation of an ASCO-Association of Community Cancer Centers Site Self-Assessment, JCO Oncology Practice. 2023 Jan. 11. https://ascopubs.org/doi/full/10.1200/OP.22.00560.

Abstract
Clinical trial participants do not reflect the racial and ethnic diversity of people with cancer. ASCO and the Association of Community Cancer Centers collaborated on a quality improvement study to enhance racial and ethnic equity, diversity, and inclusion (EDI) in cancer clinical trials. The groups conducted a pilot study to examine the feasibility, utility, and face validity of a two-part clinical trial site self-assessment to enable diverse types of research sites in the United States to (1) review internal data to assess racial and ethnic disparities in screening and enrollment and (2) review their policies, programs, procedures to identify opportunities and strategies to improve EDI. Overall, 81% of 62 participating sites were satisfied with the assessment; 82% identified opportunities for improvement; and 63% identified specific strategies and 74% thought the assessment had potential to help their site increase EDI. The assessment increased awareness about performance (82%) and helped identify specific strategies (63%) to increase EDI in trials. Although most sites (65%) were able to provide some data on the number of patients that consented, only two sites were able to provide all requested trial screening, offering, and enrollment data by race and ethnicity. Documenting and evaluating such data are critical steps toward improving EDI and are key to identifying and addressing disparities more broadly. ASCO and Association of Community Cancer Centers will partner with sites to better understand their processes and the feasibility of collecting screening, offering, and enrollment data in systematic and automated ways.

8. Azar KMJ, Taking an integrated approach to more equitable healthcare. Modern Healthcare. 2022 Nov. 21. https://www.modernhealthcare.com/opinion/kristen-m-j-azar-sutter-health-institute-for-advancing-health-equity-inequities-heathcare

Abstract

Inequity is undoubtedly the most persistent and pressing challenge facing the healthcare industry today. Health inequities are the result of unfair systems negatively affecting the living conditions, access to care and overall health status of individuals, usually those from disadvantaged or historically marginalized groups. The COVID-19 pandemic has severely exacerbated long-standing disparities in healthcare and health outcomes. As a society, we must move beyond reactive narratives toward proactive intervention.

9. Hamad R, Lyman KA, Lin F, Modrow MF, Ozluk P, Azar KMJ, Goodin A, Isasi CR, Kitzman HE, Knight SJ, Marcus GM, McMahill-Walraven CN, Meissner P, Nair V, O'Brien EC, Olgin JE, Peyser ND, Sylwestrzak G, Williams N, Pletcher MJ, Carton T. The U.S. COVID-19 County Policy Database: a novel resource to support pandemic-related research. BMC Public Health. 2022 Oct 10;22(1):1882. doi: 10.1186/s12889-022-14132-6. PMID: 36217102; PMCID: PMC9548418. https://pubmed.ncbi.nlm.nih.gov/36217102/

Abstract
Background: It is increasingly recognized that policies have played a role in both alleviating and exacerbating the health and economic consequences of the COVID-19 pandemic. There has been limited systematic evaluation of variation in U.S. local COVID-19-related policies. This study introduces the U.S. COVID-19 County Policy (UCCP) Database, whose objective is to systematically gather, characterize, and assess variation in U.S. county-level COVID-19-related policies.

Methods: In January-March 2021, we collected an initial wave of cross-sectional data from government and media websites for 171 counties in 7 states on 22 county-level COVID-19-related policies within 3 policy domains that are likely to affect health: (1) containment/closure, (2) economic support, and (3) public health. We characterized the presence and comprehensiveness of policies using univariate analyses. We also examined the correlation of policies with one another using bivariate Spearman's correlations. Finally, we examined geographical variation in policies across and within states.

Results: There was substantial variation in the presence and comprehensiveness of county policies during January-March 2021. For containment and closure policies, the percent of counties with no restrictions ranged from 0% (for public events) to more than half for public transportation (67.8%), hair salons (52.6%), and religious gatherings (52.0%). For economic policies, 76.6% of counties had housing support, while 64.9% had utility relief. For public health policies, most were comprehensive, with 70.8% of counties having coordinated public information campaigns, and 66.7% requiring masks outside the home at all times. Correlations between containment and closure policies tended to be positive and moderate (i.e., coefficients 0.4-0.59). There was variation within and across states in the number and comprehensiveness of policies.

Conclusions: This study introduces the UCCP Database, presenting granular data on local governments' responses to the COVID-19 pandemic. We documented substantial variation within and across states on a wide range of policies at a single point in time. By making these data publicly available, this study supports future research that can leverage this database to examine how policies contributed to and continue to influence pandemic-related health and socioeconomic outcomes and disparities. The UCCP database is available online and will include additional time points for 2020-2021 and additional counties nationwide.

10. Azar KMJ, Pletcher M, Greene SM, Pressman A. Learning health system, positive deviance analysis, and electronic health records: Synergy for a learning health system. Learning Health Systems Journal. October 2022. https://doi.org/10.1002/lrh2.10348

Abstract
Introduction: Over the past decade, numerous efforts have encouraged the realization of the learning health system (LHS) in the United States. Despite these efforts, and promising aims of the LHS, the full potential and value of research conducted within LHSs have yet to be realized. New technology coupled with a catalyzing global pandemic have spurred momentum. In addition, the LHS has lacked a consistent framework within which “best evidence” can be identified. Positive deviance analysis, itself reinvigorated by recent advances in health information technology (IT) and ubiquitous adoption of electronic health records (EHRs), may finally provide a framework through which LHSs can be operationalized and optimized.
Methods: We describe the synergy between positive deviance and the LHS and how they may be integrated to achieve a continuous cycle of health system improvement.
Results: As we describe below, the positive deviance approach focuses on learning from high-performing teams and organizations.

Conclusion: Such learning can be enabled by EHRs and health IT, providing a lens into how digital clinical interventions are successfully developed and deployed.

11. Sudat S, Wesson P, Rhoads K, Brown S, Aboelata N, Pressman A, Mani A, Azar KMJ. Racial Disparities in Pulse Oximeter Device Inaccuracy and Estimated Clinical Impact on COVID-19 Treatment Course, American Journal of Epidemiology, 2022 Sept 29, https://doi.org/10.1093/aje/kwac164

    Abstract
    Arterial blood oxygen saturation measured by pulse oximetry (SpO2) may be differentially less accurate for people with darker skin pigmentation, which could potentially affect COVID-19 treatment course. We analyzed pulse oximeter accuracy and association with COVID-19 treatment outcomes using electronic health record (EHR) data from Sutter Health, a large, mixed-payer, integrated healthcare delivery system in northern California, United States (US). We analyzed two cohorts: (1) 43,753 concurrent arterial blood gas (ABG) oxygen saturation (SaO2)/SpO2 measurement pairs taken January 2020-February 2021 for Non-Hispanic white (NHW) or Non-Hispanic Black/African American (NHB) adults, and (2) 8,735 adults who went to the emergency department (ED) with COVID-19 July 2020-February 2021. Pulse oximetry systematically overestimated blood oxygenation by 1% more in NHB individuals than in NHW individuals. For people with COVID-19, this was associated with lower admission probability (-3.1 percentage-points), dexamethasone treatment (-3.1 percentage-points), and supplemental oxygen treatment (-4.5 percentage-points), as well as increased time-to-treatment: +37.2 minutes before dexamethasone initiation and +278.5 minutes before initiation of supplemental oxygen. These results call for additional investigation of pulse oximeters, and suggest that current guidelines for development, testing, and calibration of these devices should be revisited, investigated, and revised.

12. Pressman A, Azar KMJ. Equity in Clinical Research: From Trials to Treatment. Journal of Clinical Pathways. May 2022;8(4):16-21. doi:10.25270/jcp.2022.5.2

    Abstract
    Health inequities among specific population subgroups have long been identified as a major deficiency of the US health care system. In principle, there is a societal consensus that everyone should have a fair and just opportunity to achieve healthy outcomes. However, there is no consensus on how to achieve this, stemming in part from the reality that the effort requires the coordi-nated actions of multisector institutions. These institutions each play different roles in—not only the provision of health care—but the development and distribution of novel and more effective treatments. Additionally, institutional incentives and priorities for promoting health equity may differ and at times misalign.

    During the past several years, health equity has been of heightened focus for health care delivery systems and those who deliver care to diverse populations. But it has also become a priority for research funding organizations, including public and private agencies and foundations. In addition, many pharmaceutical and medical device companies have made commitments to address health inequities as they exist in the realm of clinical trials. To achieve equity in clinical research, we must implement mechanisms to broaden access to trials, employ differential methods to increase engagement among people from underrepresented groups, develop metrics and standards to facilitate equitable inclusion and transparency, and implement policies aimed at increasing access to novel and effective treatments after they are brought to market. We discuss some of the obstacles, solutions, and implications for widespread efforts to improve health equity throughout the clinical research cycle.

13. Pressman A, Lockhart S, Wilcox J, Smits K, Etzell J, Albeiroti S, DeRee M, Flaherty C, Genolaga S, Goodreau M, Refai F, Restall A, Lanner-Cusin K, Azar, KMJ. COVID-19 in pregnancy by race and ethnicity: Implications for development of a vaccination strategy. Women's Health. January 2021. doi:10.1177/17455065211063300. https://journals.sagepub.com/doi/10.1177/17455065211063300

    Abstract
    Objective: COVID-19 and associated morbidity and mortality has disproportionately affected minoritized populations. The epidemiology of spread of COVID-19 among pregnant women by race/ethnicity is not well described. Using data from a large healthcare system in California, we estimated prevalence and spread during pregnancy and recommend a vaccination approach based on minimizing adverse outcomes.
    Methods: Patients delivering at Sutter Health are tested (molecular) for COVID-19. These results were combined

with antibody test results, using samples drawn at delivery. For each racial/ethnic group, we estimated prevalence of COVID-19, using logistic regression to adjust for known sociodemographic and comorbid risk factors. Testing for
immunoglobulin G and immunoglobulin M provided insight into timing of infections.
Results: Among 17,446 women delivering May–December, 460 (2.6%) tested positive (molecular). Hispanic women
were at 2.6 times the odds of being actively infected as White women (odds ratio = 2.6, 95% confidence interval = 2.0–3.3). August and December were the highest risk periods for active infection (odds ratio = 3.5, 95% confidence
interval = 2.1–5.7 and odds ratio = 6.1, 95% confidence interval = 3.8–9.9, compared with May, respectively). Among 4500 women delivering October–December, 425 (9.4%) had positive molecular or antibody tests, ranging from 4.0% (Asian) to 15.7% (Hispanic). Adjusting for covariables, compared with White patients, odds of infection was similar for Black and Asian patients, with Hispanic at 2.4 (1.8–3.3) times the odds.
Conclusion: COVID-19 prevalence was higher among Hispanic women at delivery and in the last trimester than their White counterparts. Higher rates in Black patients are explained by other risk factors. Resources should be directed to increase vaccination rates among Hispanic women in early stages of pregnancy.

14. Azar KMJ. The Evolving Role of Nurse Leadership in the Fight for Health Equity. Nurse Lead. 2021 Dec;19(6):571-575. doi: 10.1016/j.mnl.2021.08.006. Epub 2021 Sep 14. PMID: 34539261; PMCID: PMC8438605. https://pubmed.ncbi.nlm.nih.gov/34539261/

    Abstract
    Devastating disparities in COVID-19 infection and outcomes among socioeconomically marginalized groups have resulted in a public outcry to address longstanding societal inequities that have contributed to the present situation. Nurse leaders have an opportunity and an obligation in this moment to lend their skills as scientists, innovators, advocates, and educators to lead in these efforts, advancing health equity for all.

15. Real-World Lessons from COVID-19: Driving Oncology Care Forward. *Oncology Issues*. Vol. 36, No. 6, 2021 https://www.accc-cancer.org/docs/documents/oncology-issues/articles/v36-n6/v36n6-complete.pdf?sfvrsn=4d1bcca7_2/

    Abstract
    One of the greatest impacts of the COVID-19 pandemic thus far is how it has shone light on racial and ethnic inequities in the American healthcare system. Find out how the Sutter Health Institute for Advancing Health Equity is making lasting change among its workforce and for patients through data-mining and implicit bias training.

16. Azar KMJ, Lockhart SH, Shen Z, Romanelli R, Brown S, Smits K, et al. Persistence of Disparities among Racially/Ethnically Marginalized Groups in the COVID-19 Pandemic Persist Regardless of Statewide Shelter-in-Place Policies: An Analysis from Northern California. Am J Epidemiol. 2021. https://doi.org/10.1093/aje/kwab191

    Abstract
    To measure disparities in coronavirus disease 2019 (COVID-19) hospitalization and intensive care unit (ICU) transfer among racially/ethnically marginalized groups before and after implementation of the California statewide shelter-in-place (SIP) policy, we conducted a retrospective cohort study within a health-care system in California. COVID-19 patients diagnosed from January 1, 2020, to August 31, 2020, were identified from electronic health records. We examined hospitalizations and ICU transfers by race/ethnicity and pandemic period using logistic regression. Among 16,520 people with COVID-19 (mean age = 46.6 (standard deviation, 18.4) years; 54.2% women), during the post-SIP period, patients were on average younger and a larger proportion were Hispanic. In adjusted models, odds of hospitalization were 20% lower post-SIP as compared with the SIP period, yet all non-White groups had higher odds (odds ratios = 1.6–2.1) than non-Hispanic White individuals, regardless of period. Among hospitalized patients, odds of ICU transfer were 33% lower post-SIP than during SIP. Hispanic and Asian patients had higher odds than non-Hispanics. Disparities in hospitalization persisted and ICU risk became more pronounced for Asian and Hispanic patients post-SIP. Policy-makers should consider ways to proactively address racial/ethnic inequities in risk when considering future population-level policy interventions for public health crises.

17. Berkowitz, R.L., Bui, L., Shen, Z., Pressman, A.R., Moreno, M., Brown, S., Nilon, A., Miller-Rosales, C., & Azar, K.M.J. (forthcoming). Evaluation of a Social Determinants of Health Screening Questionnaire and Workflow Pilot within an Adult Ambulatory Clinic. BMC Family Practice.

Abstract
Background: There is increased recognition in clinical settings of the importance of documenting, understanding, and addressing patients' social determinants of health (SDOH) to improve health and address health inequities. This study evaluated a pilot of a standardized SDOH screening questionnaire and workflow in an ambulatory clinic within a large integrated health network in Northern California.
Methods: The pilot screened for SDOH needs using an 11-question Epic-compatible paper questionnaire assessing eight SDOH and health behavior domains: financial resource, transportation, stress, depression, intimate partner violence, social connections, physical activity, and alcohol consumption. Eligible patients for the pilot receiving a Medicare wellness, adult annual, or new patient visits during a five-week period (February-March, 2020), and a comparison group from the same time period in 2019 were identified. Sociodemographic data (age, sex, race/ethnicity, and payment type), visit type, length of visit, and responses to SDOH questions were extracted from electronic health records, and a staff experience survey was administered. The evaluation was guided by the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework.
Results: Two-hundred eighty-nine patients were eligible for SDOH screening. Responsiveness by domain ranged from 55% to 67%, except for depression. Half of patients had at least one identified social need, the most common being stress (33%), physical activity (22%), alcohol (12%), and social connections (6%). Physical activity needs were identified more in females (81% vs. 19% in males, $p<.01$) and at new patient/transfer visits (48% vs. 13% at Medicare wellness and 38% at adult wellness visits, $p<.05$). Average length of visit was 39.8 minutes, which was 1.7 minutes longer than that in 2019. Visit lengths were longer among patients 65+ (43.4 minutes) and patients having public insurance (43.6 minutes). Most staff agreed that collecting SDOH data was relevant and accepted the SDOH questionnaire and workflow but highlighted opportunities for improvement in training and connecting patients to resources.
Conclusion: Use of evidence-based SDOH screening questions and associated workflow was effective in gathering patient SDOH information and identifying social needs in an ambulatory setting. Future studies should use qualitative data to understand patient and staff experiences with collecting SDOH information in healthcare settings.

18. Bui LN, Berkowitz RL, Jilek W, Bordner AJ, Azar KMJ, Pressman A, Romanelli RJ. Public Protests and the Risk of Novel Coronavirus Disease Hospitalizations: A County-Level Analysis from California. Int J Environ Res Public Health. 2021 Sep 8;18(18):9481. doi: 10.3390/ijerph18189481. PMID: 34574407 https://www.mdpi.com/1660-4601/18/18/9481/htm

Abstract
The objective of this study was to assess the relationship between public protests and county-level, novel coronavirus disease (COVID-19) hospitalization rates across California. Publicly available data were included in the analysis from 55 of 58 California state counties (29 March-14 October 2020). Mixed-effects negative binomial regression models were used to examine the relationship between daily county-level COVID-19 hospitalizations and two main exposure variables any vs. no protests and 1 or >1 protest vs. no protests on a given county-day. COVID-19 hospitalizations were used as a proxy for viral transmission since such rates are less sensitive to temporal changes in testing access/availability. Models included covariates for daily county mobility, county-level characteristics, and time trends. Models also included a county-population offset and a two-week lag for the association between exposure and outcome. No significant associations were observed between protest exposures and COVID-19 hospitalization rates among the 55 counties. We did not find evidence to suggest that public protests were associated with COVID-19 hospitalization within California counties. These findings support the notion that protesting during a pandemic may be safe, ostensibly, so long as evidence-based precautionary measures are taken.

19. Moreno M, Sherrets B, Roberts DJ, Azar K. Health equity and quantifying the patient experience: A case study. 2021; 8(2): 94-99 https://pxjournal.org/cgi/viewcontent.cgi?article=1621&context=journal

Abstract
The COVID-19 pandemic has invigorated efforts to address health inequities disproportionately burdened by racial/ethnic groups and individuals of low socioeconomic status. Measuring and monitoring patient experience is crucial to understanding why the gaps exist and identifying mechanisms necessary to close them. Electronic

health records and digital health tools hold much promise in this regard and can lead to change. We present a case study describing the innovative efforts undertaken at Sutter Health, a large integrated health network in Northern California, to quantify gaps in health equity using electronic platforms and visualization modalities. More work is needed to identify and address barriers rooted in social context and structural inequities and ultimately impact health equity.

20. Pressman AR, Lockhart SH, Shen Z, Azar KMJ (2021) Measuring and promoting SARS-CoV-2 vaccine equity: development of a COVID-19 vaccine equity index, Health Equity 5:1, 476–483, DOI: 10.1089/heq.2021.0047 https://www.liebertpub.com/doi/10.1089/heq.2021.0047

    Abstract
    Purpose: The coronavirus pandemic has created the greatest public health crisis in a century, causing > 500,000 deaths in the United States alone. Minoritized and socioeconomically disadvantaged groups have borne a disproportionate
    burden of severe illness, hospitalization, and death from COVID-19. Recently developed FDA approved vaccines have been shown to significantly reduce severe COVID-19–related outcomes. Vaccination campaigns have the potential to advance health equity by prioritizing allocation to those at highest risk while striving for herd immunity. Large integrated health systems have been faced with the daunting task of meeting the rapidly evolving needs of diverse patient populations for the provision of population-based testing, treatment, education, and now vaccine distribution. We have designed a COVID-19 vaccine equity index (CVEI) to
    guide health system vaccination strategy.
    Methods: We considered proportion unvaccinated within a health care system. We then used real-time readily available electronic health record (EHR) COVID-19 testing positivity and proportion hospitalized to measure burden
    of illness by race/ethnicity. We used conditional probability and statistical theory to measure equity for unvaccinated individuals and to derive an index to highlight these inequities for specific subgroups.
    Results: We present an illustrative hypothetical example using simulated data for which we calculated the CVEI for non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, and Hispanic patients. In the example, non-Hispanic Black and Hispanic patients had inequitable outcomes.
    Conclusion: The index can be widely implemented to promote more equitable outcomes among racial/ethnic groups, reducing morbidity and mortality within the overall population as we pursue the collective goal of herd immunity through mass vaccination.

21. Lockhart S, contributions from Smits K. Piloting and Scaling a Good Health Equity Evidence Base from Big Data. AMA J Ethics. 2021;23(3): E252-257. DOI: 10.1001/amajethics.2021.252. https://journalofethics.ama-assn.org/article/piloting-and-scaling-good-health-equity-evidence-base-big-data/2021-03

    Abstract
    Eliminating racial inequity in health outcomes has historically been complicated by a lack of clear methods to quantify the problems and study interventions' effects. Health care organizations' investment in electronic health record systems for millions of patients, however, presents opportunities to use data to research health inequity and respond to it. One health system's development and validation of a measure to identify and quantify outcomes inequity across patient groups demonstrates an approach that could be nationally scalable.

22. Lockhart S, Pressman A, Smits K (2021). Equitable healthcare requires equitable access to nature. Parks Stewardship Forum, 37(1). DOI: 10.5070/P537151712. https://escholarship.org/uc/item/7xc923gt

    Abstract
    A call to action for equitable access to nature and green spaces as a matter of healthcare.

23. Romanelli RJ, Azar KMJ, Sudat S, Hung D, Frosch DL, Pressman AR. The Learning Health System in Crisis: Lessons from the Novel Coronavirus Disease Pandemic. 2020 Oct 29. Mayo Clin Proc Innov Qual Outcomes

    Abstract
    The novel coronavirus disease (COVID-19) pandemic is the gravest public-health crisis that the United States has seen in more than a century. Healthcare delivery systems are the focal point for interfacing with COVID-19; however, many were and remain unprepared for this or similar outbreaks.

In this paper, we describe the Learning Health System (LHS) as an ideal organizing principle to inform an evidence-based response to public-health emergencies like COVID-19. We further describe barriers and challenges to the realization of the LHS and propose a call to action for a substantial investment in the LHS, with a focus on public health.

Specifically, we advocate for a Learning Health Network that promotes collaboration between health systems, community-based organizations, and government agencies, especially during public health emergencies. We have approached this commentary through the unique lens of researchers embedded within a large, integrated healthcare delivery system, with direct experience working with clinical and operational units in response to the COVID-19 pandemic.

24. Azar KMJ, Shen Z, Romanelli RJ, Lockhart S, Smits K, Robinson S, Brown S, Pressman A. Disparities in Outcomes Among COVID-19 Patients in a Large Health Care System in California. Health Affairs. [Epub ahead of print], 2020 May 21. https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2020.00598

    Abstract
    As the coronavirus disease (COVID-19) pandemic spreads throughout the United States, evidence is mounting that racial and ethnic minorities and socioeconomically disadvantaged groups are bearing a disproportionate burden of illness and death.

    We conducted a retrospective cohort analysis of COVID-19 patients at Sutter Health, a large integrated health care system in northern California, to measure potential disparities. We used Sutter's integrated electronic health record to identify adults with suspected and confirmed COVID-19, and used multivariable logistic regression to assess risk of hospitalization, adjusting for known risk factors, such as race/ethnicity, sex, age, health, and socioeconomic variables. We analyzed 1,052 confirmed cases of COVID-19 from January 1-April 8, 2020.

    Among our findings, we observed that, compared with non-Hispanic white patients, African Americans had 2.7 times the odds of hospitalization, after adjusting for age, sex, comorbidities, and income. We explore possible explanations for this, including societal factors that either result in barriers to timely access to care or create circumstances in which patients view delaying care as the most sensible option.

    Our study provides real-world evidence that there are racial and ethnic disparities in the presentation of COVID-19.

25. An Analytic Approach to Advancing Health Equity: Members in Action Case Study: American Hospital Association. July 2019.
    https://ifdhe.aha.org/system/files/media/file/2020/05/Sutter%20Health%20EOC%20Case%20Study.pdf

26. Romanelli RJ, Shen Z, Szwerinski N, Scott A, Lockhart S, Pressman AR. Racial and Ethnic Disparities in Opioid Prescribing for Long Bone Fractures at Discharge From the Emergency Department: A Cross-sectional Analysis of 22 Centers From a Health Care Delivery System in Northern California. Ann Emerg Med. 2019 Nov;74(5):622-631. doi: 10.1016/j.annemergmed.2019.05.018. Epub 2019 Jul 2. PMID: 31272820.
    https://pubmed.ncbi.nlm.nih.gov/31272820/
    Abstract
    Study objective: We examine racial and ethnic differences in opioid prescribing and dosing for long bone fractures at emergency department (ED) discharge.
    Methods: We conducted an electronic health records-based cross-sectional study of adults with long bone fractures who presented to the ED across 22 sites from a health care delivery system (2016 to 2017). We examined differences in opioid prescribing at ED discharge and, among patients with a prescription, differences in opioid dosing (measured as morphine milligram equivalents) by race/ethnicity, using regression modeling with statistical adjustment for patient, fracture, and prescriber characteristics.
    Results: A total of 11,576 patients with long bone fractures were included in the study; 64.4% were non-Hispanic white; 16.4%, 7.3%, 5.8%, and 5.1%, respectively, were Hispanic, Asian, black, and of other or unknown race; and 65.6% received an opioid at discharge. After adjusting for other factors, rates of opioid prescribing were not different by race/ethnicity; however, among patients with an opioid prescription, total morphine milligram equivalent units prescribed were 4.3%, 6.0%, and 8.1% less for Hispanics, blacks, and Asians relative to non-Hispanic whites.

Conclusion: Racial and ethnic minority groups with long bone fractures receive similar frequencies of opioid prescriptions at discharge, with a small potency difference. How this affects pain relief and why it happens is unclear.

27. Pressman A, Lockhart S, Petersen J, Robinson S, Moreno M, Azar KMJ. Measuring Health Equity for Ambulatory Care Sensitive Conditions in a Large Integrated Health Care System: The Development of an Index. Health Equity. 2019 Apr 3;3(1):92-98. doi: 10.1089/heq.2018.0092. PMID: 30963142; PMCID: PMC6450454 https://www.liebertpub.com/doi/pdf/10.1089/heq.2018.0092

Abstract
Disparities in outcomes for preventive and primary health care services often result when vulnerable patients rely on episodic encounters for emergency services that do not meet their long-term health needs. Understanding health outcomes in socially or economically disadvantaged subgroups is crucial to improving community health, and it requires innovative analytics and dynamic application of clinical and population data. While it is common practice to use proxy indicators, such as quality of life and mortality, when discussing health equity, these have shown limited utility and are rarely applied at a population-level within a health system. Therefore, we designed and implemented an index, calculated as the ratio of observed-to-expected encounters, to identify and quantify health inequalities in health care systems. Providing equitable care, as measured by health outcomes, is analogous to precision medicine applied to social determinants. For health systems, the use of this index will facilitate the development of specially-tailored interventions to address inequity and provides a tool to measure the impact of such programs.