

UNIVERSITY
OF
CALIFORNIA
HEALTH



Annual Report

Center for Data-driven Insights and Innovation

2022-2023

Table of Contents

LETTER of INTRODUCTION..... 3

EXECUTIVE SUMMARY..... 4

Impact - UC Davis Health

CDI2 TEAM..... 6

Impact - UC Irvine Health

SYSTEMWIDE PARTNERSHIPS & PROJECTS..... 8

- Executive Leadership & Strategy
- Leveraging Scale for Value (LSfV) & Pharmacy
- Clinical Strategy & Operations
 - UC Population Health
 - UC Cancer Consortium
- Supporting Local Analytics Teams

Impact - UC Los Angeles Health

RESEARCH SUPPORT & ENGAGEMENT 15

Impact - UC Riverside Health

HEALTH DATA GOVERNANCE..... 18

Impact - UC San Diego Health

EXTERNAL PARTNERSHIPS & PROJECTS..... 20

Impact - UC San Francisco Health

CONCLUSION 23

- Looking ahead to FY 2024

Appendix 1 – Oversight Board Membership 25

Appendix 2 – CDI2 Team 26

Appendix 3 – Campus & Health Partners 27

Appendix 4 – Publications..... 28

Letter of Introduction

We are delighted to present the annual report of the Center for Data-driven Insights and Innovation (CDI2) for the fiscal year 2022-2023. Under the leadership of Executive Vice President Carrie Byington, the team achieved significant growth and expansion of our portfolio. We would also like to extend a warm welcome to Laura Barde, who joined CDI2 as Senior Advisor this year.

CDI2 made tremendous progress in advancing our data-driven initiatives and partnerships under the guidance of the Oversight Board, chaired by Tom Andriola. The Oversight Board brings valuable expertise and perspectives to guide our strategic direction. We extend our gratitude to all members of the Board, and welcome new members Parag Agnihotri, Kay Burke, Elizabeth Boyd, Medell Briggs-Malonson, Helen Lau, and Thu Quach. Chris Longhurst has a new role on our Board as an at-large appointee representing Chief Medical and Quality Officers.

Since its inception in 2018, CDI2 has used University of California Health (UCH) systemwide data to improve the quality of care and patient outcomes and reduce costs across the entire health system. The primary function of CDI2 is the maintenance and growth of the data analytics capabilities and technical infrastructure for the UCH Data Warehouse (UCHDW), a unique system-level data asset that contains electronic health records (EHR) from the six academic health centers—UC Davis, UC Irvine, UC Los Angeles, UC Riverside, UC San Diego, and UC San Francisco. The UCHDW also includes claims data from the UC self-funded health plans, as well as other data from external sources including Vizient and the California Department of Health Care Access and Information (HCAI), formerly the Office of Statewide Health Planning and Development (OSHPD).

At this writing, the UCHDW contains data on 8.9 million patients receiving care at a UC facility. Since 2012, these patients received care in over 400 million encounters. In those encounters, UCH conducted over one billion procedures, ordered or prescribed nearly 1.4 billion medications, made more than 5.3 billion vital signs and test result measurements, including 40,000 sequenced cancer genomes, and assigned more than 1.2 billion diagnosis codes. Over 800,000 of these patients receive primary care through UCH.

CDI2 collaborates closely with various teams and departments in the UC Office of the President, including Executive Leadership, Leveraging Scale for Value, Clinical Strategy and Operations (UC Population Health and the UC Cancer Consortium), as well as with each health campus. Our work extends beyond the pandemic, even as we continue to provide essential data support for COVID-19 tracking and reporting to key stakeholders at both the state and national levels. The data and analytics provided by the CDI2 team also enabled two abstracts and 24 published peer-reviewed articles, demonstrating our commitment to advancing research and clinical care.

CDI2 plays a vital role in supporting strategic decision-making by providing rapid data insights to UC Executive Leadership. We have been actively involved in addressing racial and ethnic bias in healthcare, working closely with Executive Leadership to provide narratives and examples from our data that may inform policy and decision-making.

We express our gratitude to all the CDI2 team members for their hard work, dedication, and contributions to these accomplishments. We also extend our deep appreciation to President Michael Drake, CDI2 directors Andenet Emiru, Lisa Dahm, and Pagan Morris, our UC campus and health partners, Oversight Board members, stakeholders, and other esteemed colleagues for their trust, collaboration, and support. We look forward to another year of progress, innovation, and data-driven decision-making as we continue to advance excellence across UC Health.

Fiat Lux,

Atul Butte, MD, PhD

Chief Data Scientist

Cora Han, JD

Chief Health Data Officer and Executive Director

Executive Summary

Now in its fifth year, CDI2 continues to lead systemwide efforts in the safe and responsible use of healthcare data to improve clinical and business operations, patient care quality, innovative research, and mission-driven partnerships. This annual report shares our success in collaborative projects at a pivotal time post-pandemic and charts our future course in the advancement of a data-driven, learning healthcare system.

CDI2 TEAM

Following the promotion of Pagan Morris to Director of Research Initiatives, the CDI2 team hired Laura HF Barde, PhD, to serve as Senior Advisor. Dr. Barde works directly with the Chief Data Scientist and Chief Health Data Officer in initiating and developing new strategic direction, short- and long-range plans, and innovative projects in furtherance of CDI2's goals.

SYSTEMWIDE PARTNERSHIPS & PROJECTS

Beyond the pandemic, CDI2 continues to work closely with local IT teams to refine dashboards and reporting on COVID-19. Key analytics, shared with Executive Leadership and state/national government officials as well as posted on Twitter, follow a different cadence while still offering timely insights. CDI2 has additionally supported UCH Executive Leadership by coordinating expert feedback and guidance on health information exchange and other legislative proposals; input crucial to UCH patients in a post-Dobbs landscape.

CDI2 is particularly proud of our continued collaborations systemwide, providing data and analytics to projects that improve operational and clinical care. Highlighted accomplishments in this area include:

- ***Building our Medicare Programs.*** CDI2 added Medicare Advantage and commercial managed care claims processing metrics to local dashboards, allowing identification of excess cost and utilization to local leadership.
- ***Optimizing Inpatient Medication Use.*** CDI2 added information to the Pharmacy team dashboards regarding inpatient drug costs, leveraging

health data to help evaluate dosing protocols and potentially realize additional savings in Sugammadex, a medication given to patients after surgery.

- ***Identifying Drivers of Health Disparities.***

CDI2 conducted an analysis of diabetes care metrics to investigate the drivers of disparities in glycemic control among Hispanic and non-Hispanic populations.

RESEARCH SUPPORT & ENGAGEMENT

CDI2 fostered exciting growth of our research portfolio, increasing systemwide utilization of the UC Data Discovery Platform by 35%. Over 200 UC researchers now use the UC CORDS database, a HIPAA-limited dataset focused on our patients tested for SARS-CoV-2, which has already led to 20 peer-reviewed publications. CDI2 has also expanded work with the California Department of Public Health (CDPH), receiving funding for a project focused on hospital surveillance for SARS-CoV-2 and other new and emerging respiratory diseases.

HEALTH DATA GOVERNANCE

CDI2's leadership of the Systemwide Task Force on Health Data Governance produced a draft report incorporating expert insights and feedback from stakeholders across UC. The final report will include recommendations for safe and responsible data sharing collaborations with nonprofit, government, and for-profit industry partners. This work demonstrated UC's ongoing commitment to maintaining trust and transparency in the collection, analysis, and use of health data.

EXTERNAL PARTNERSHIPS

CDI2 is proud of the external partnerships built over the past fiscal year with those who share UCH's vision and values. Key to the management of these important relationships was the successful creation and roll-out of a Salesforce Customer Relationship Management software, enabling UCH to work efficiently and better manage our external partnership and projects and enhance customer satisfaction. CDI2 and the Systemwide RWE Collaborative presented an in-person conference in April 2023 focused on the usage of Real-World Data to assess the potential benefits and risks of a medical product, therapy, or intervention.



UCDAVIS HEALTH

IMPACT

CDI2 identified opportunities to save \$705K on drug spend between 2017-2022

CDI2 dashboards facilitated 139% increase in provision of cardioprotective drug treatments to eligible patients

CDI2 analytics drove 31.5% increase in optimal care for patients with diabetes

CDI2 Team

Atul Butte, MD, PhD (Chief Data Scientist) and Cora Han, JD (Chief Health Data Officer and Executive Director) led the CDI2 team through additional growth and expansion of its portfolio during this past fiscal year. New to the CDI2 team this year is Laura HF Barde, PhD (Senior Advisor).

CDI2 reports on a quarterly basis to an Oversight Board. The current Chair of the Oversight Board is Tom Andriola, MS (Vice Chancellor of Information, Technology and Data at UC Irvine). Since our last annual report, the following new members joined the board:

Riverside

Helen Lau, RN, MROD
Director, Quality, Patient Safety, Risk & Population Health

San Diego

Parag Agnihotri, MD
Chief Medical Officer, Population Health Services

San Francisco

Kay Burke, MBA, RN, NE-BC
Chief Nursing Informatics Officer, Health Informatics

CMO/CQO

Chris Longhurst, MD, MS
Chief Medical and Digital Officer, UCSD Health

Research

Elizabeth Boyd, PhD
Director, UC BRAID, UCSF

Equity, Diversity, and Inclusion

Medell Briggs-Malonson, MD, MPH, MSHS
Chief of Health Equity, Diversity, and Inclusion,
UCLA Health

Patient Voice

Thu Quach, PhD, MPH
President, Asian Health Services

The entire CDI2 and UCHDW team can be found in Appendix 2, and our campus and health center partners are listed in Appendix 3.

Accomplishments. The CDI2 team is proud share these honors and achievements from the past fiscal year:

- Atul Butte named a 2022 fellow of the American Association for the Advancement of Science (AAAS)
- Atul Butte appointed to the Editorial Board of the Journal of the American Medical Association
- Two abstracts accepted to AcademyHealth Research with UC Population Health and UCLA researcher Kimberly Narain, MD, PhD, MPH
- A list of recent peer-reviewed publications can be found in Appendix 4

The full current membership of the Oversight Board is shown in Appendix 1.



UCI Health

IMPACT

Supported by a \$500K grant, CDI2 worked with UCI Health to transfer COVID-19 dataset to the N3C

CDI2 dashboards facilitated 177% increase in provision of cardioprotective drug treatments to eligible patients

UCI has 70+ UC CORDS users, a CDI2 limited dataset, and 13 peer-reviewed publications

Systemwide Partnerships & Projects

CDI2 supports data-driven initiatives across UCH with projects ranging from cost-reduction to patient-care optimization. CDI2 works closely on these projects with UCH Executive Leadership, teams in Leveraging Scale for Value (Pharmacy), Clinical Strategy and Operations (UC Population Health, UC Cancer Consortium), and locally with each health campus.

Executive Leadership & Strategy

CDI2 operates closely with UC Executive Leadership, rapidly providing data to support strategic, legal, and policy-driven decisions.

***Providing Data and Analytics to Inform
Decisions Through the Pandemic and Beyond.***

The CDI2 team continues to closely partner with local IT teams, producing COVID-19 tracking dashboards. These dashboards are shared on a cadence that varies as needed depending on COVID inpatient volume with UC President Michael Drake, California Health and Human Services Agency Secretary Mark Ghaly, the California Department of Public Health (CDPH), the United States Food and Drug Administration, the Orange County Health Care Agency, and the California Medical Association.

Figures 1 and 2 below are illustrative dashboards related to the COVID-19 virus. Figure 1 shows how UCH tracks the ways in which each health campus orders a viral test. Figure 2 reports the number of inpatients across the academic health system with a positive SARS-CoV-2 viral test.

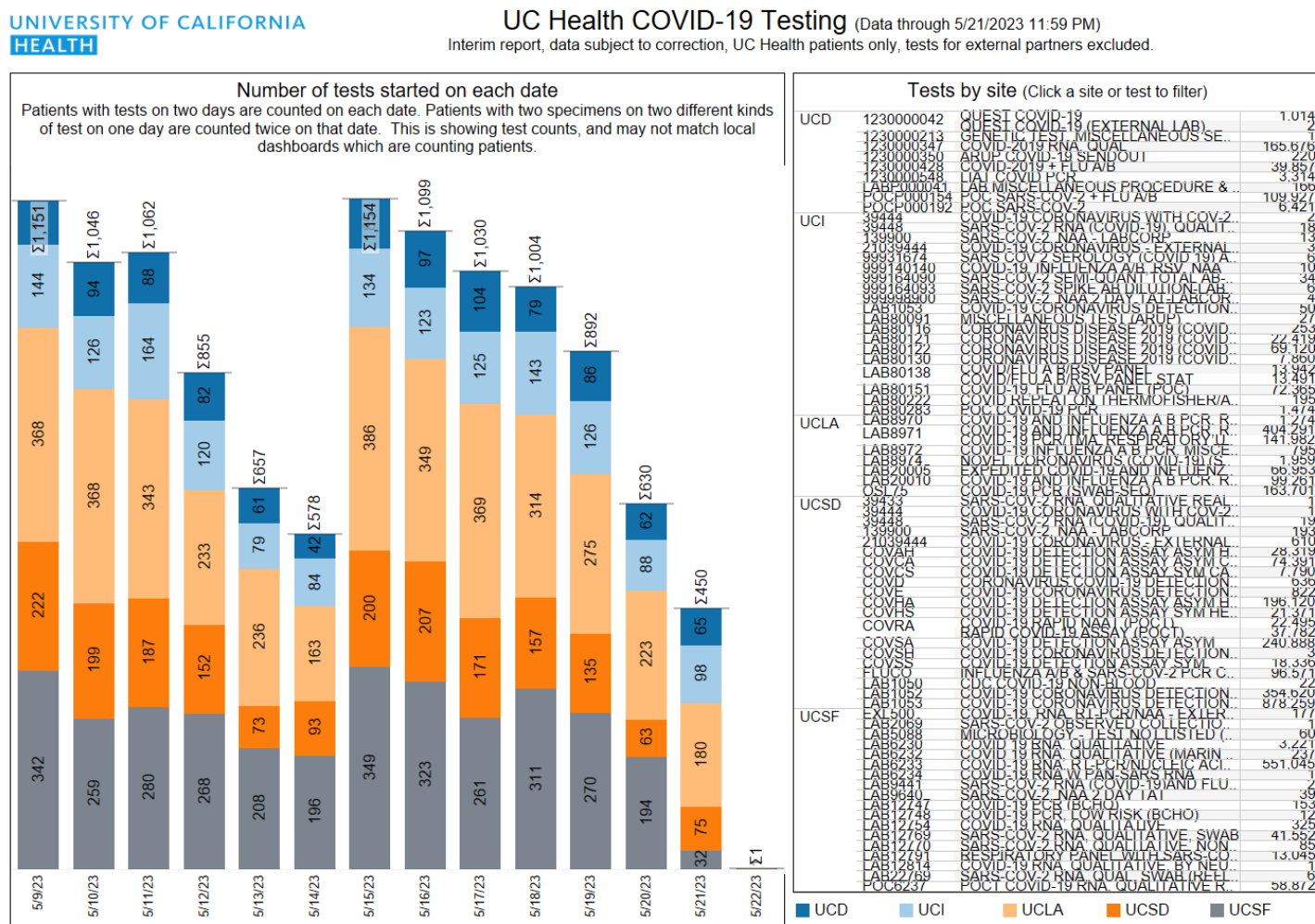


Figure 1. Tracking the volume and type of viral tests across the UC Health system

COVID-19 Inpatients (Data through 5/21/2023 11:59 PM)

Inpatient admissions are considered COVID-19 related if a qualifying event occurs at or up to 14 days prior to the admission. A qualifying event happens if an internally administered SARS-CoV-2 PCR test is positive, or if clinical observation of SARS-CoV-2 infection is documented. Counting inpatient admitted patients, and excluding patients with pending COVID-19 tests, in emergency departments, or in observation. These numbers may not directly match local dashboards. Interim report, data subject to later change.

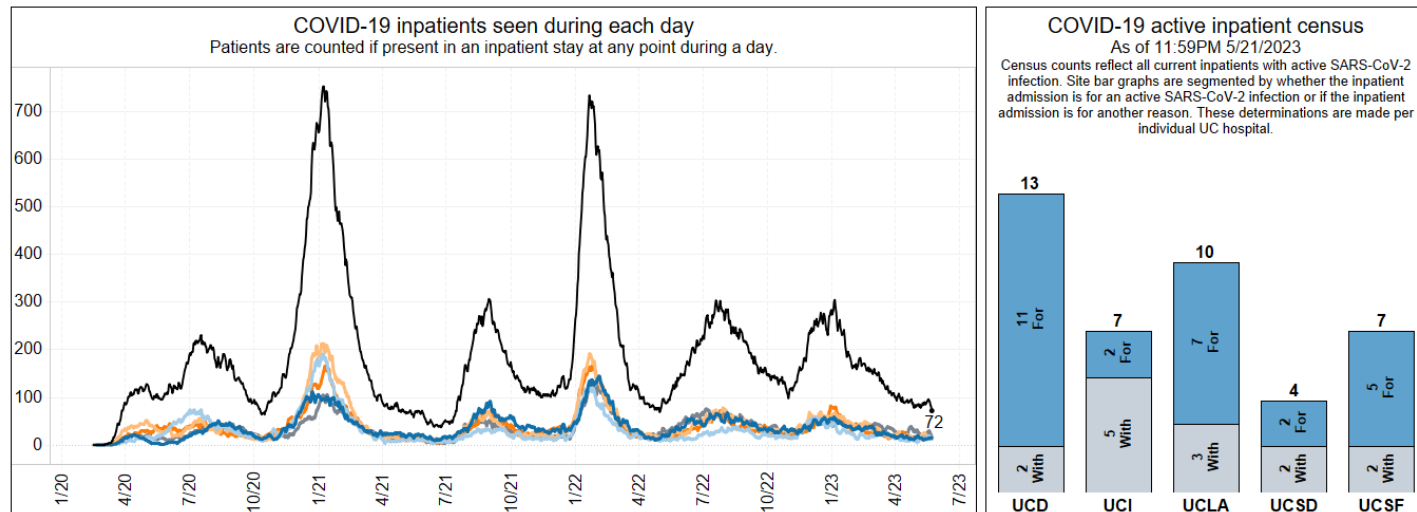


Figure 2. Number of SARS-CoV-2 positive patients admitted to UC Health academic medical centers to date.

As we move beyond the pandemic, CDI2 also produces data visualizations for other existing and emerging viruses, including influenza, and Respiratory Syncytial Virus (RSV), and shares this data with UCH Executive Leadership and the CDPH.

Supporting Executive Leadership, Policy, and Strategy Teams.

CDI2 is readily available to senior leadership in the UC Office of the President, providing timely and insightful data, analytics, and narratives so that the system may respond to various requests from media and government. CDI2 also provides analytics and guidance to UCH leadership on legislative and policy topics including health information exchange, artificial intelligence, and reproductive health services.

For example, CDI2 created a dashboard to use in efforts to educate UC stakeholders about the depth of the University's healthcare services for people with Medi-Cal coverage. The dashboard includes measures from all UC-owned health locations, including both its hospitals and faculty practices, an approach made viable through use of the UCHDW and CDI2 analysis. Dashboards like this support UCH's commitment to transparency and being a data-driven organization.

Where needed, CDI2 also convenes system experts in legal, data governance, regulatory compliance, cybersecurity, and clinical informatics. This input has been critical for decisionmakers particularly given the rapid advancements in artificial intelligence and the need to navigate the post-Dobbs landscape.

Leveraging Scale for Value (LSfV) & Pharmacy

During FY 22-23, CDI2 contributed to several key Leveraging Scale for Value (LSfV) initiatives designed to reduce costs, enhance revenue, and improve patient care quality across the UC academic health centers.

Improving Lab Testing Capability Across UCH.

CDI2 partners with the LSfV laboratory team to develop data feed and dashboards for operational Key Performance Indicators (KPIs). These KPI measures are critical systemwide datapoints that provide the laboratory team with valuable opportunities for both cost savings as well as quality of patient care and patient satisfaction. Initial goals include identifying send-out tests that could be brought in-house and reducing turnaround times.

Increasing Compliance and Savings in the Medicare/Medicaid 340B Program.

CDI2 provides a custom dashboard to the LSfV 340B team, providing insights that help to audit and achieve compliance with the 340B program. Care quality and integrity metrics provided in the dashboard also ensure that each campus in the health system obtains maximum financial savings; these savings reduce the price of life-saving pharmaceuticals for our most vulnerable patients and allow UCH to expand health services.

Improving Efficacy of Care in Patients with HIV, Rheumatoid Arthritis.

CDI2 continues a successful partnership with the LSfV Pharmacy team with the creation of two dashboards and statistical analysis of key metrics for selected health conditions. Examples from this past fiscal year include human immunodeficiency virus (HIV) and rheumatoid arthritis (RA).

The HIV dashboard characterizes the population by relevant demographics, patients' viral load, and HIV drug type. The goals of the team are to assess which drugs relate to lower viral loads, ensure HIV viral load labs are done annually, and assess which pharmacies (UC/non-UC) patients are using and how that may or may not impact outcomes.

The RA dashboard characterizes the population by REALS (Race, Ethnicity, Age, Language, Sex) data along with financial class and social vulnerability index. A novel aspect of this project is the ability to present the Rapid3 Score, which is a patient reported outcome and currently available as structured data at 3 UC sites. The goals of the team are to improve collection of the Rapid3 Score, assess RA drugs and their relationship to remission, and to ensure TB tests are conducted for patients on Tumor Necrosis Factor (TNF) inhibitors. In both projects, CDI2 and the Pharmacy team ensure analytics include under-represented groups to ensure full representation of our patients.

Optimizing Inpatient Medication Use. CDI2 expanded the information provided to the Pharmacy team regarding inpatient drug costs. Additional data fields were added to a dashboard, allowing costs to be filtered by provider, department, service line, and number of days in the hospital. These details provided by CDI2 offer insights for the Pharmacy

team to target cost reductions across all health centers. Chief Pharmacy Officers had a goal, reported previously, of using data to facilitate transition from high-cost intravenous to lower cost oral acetaminophen. CDI2's support of this goal resulted in annualized savings of over \$630K. CDI2 again leveraged health data to help visualize cost savings opportunities on another high-impact medication. Sugammadex is a medication given to patients following surgery to promote successful extubation. This lower cost, high volume medication is used extensively throughout UCH centers and medication stewardship efforts can result in novel approaches to sensible use. These data were presented at the UC Pharmacy collective in May 2023 and local sites are working to implement suggested changes and reduce medication spend systemwide.

Analyzing Immunosuppressant Medication Use in Kidney Transplants.

In this project, CDI2 is providing data and analysis for a Pharmacy project that compares timing and dosage of antithymocyte globulin injection post kidney transplant. This immunosuppressant drug, along with other medications, helps to prevent a patient's body from rejecting the transplanted kidney. The goal of the project is to connect medication protocols with standard transplant outcomes.

Clinical Strategy & Operations

CDI2 maintains a strong partnership with the Clinical Strategy and Operations team, which includes **UC Population Health (PH)** and the **University of California Cancer Consortium (UCCC)**. Over the past fiscal year, projects focused on health equity in both diabetes and hypertension care across the system, reporting of quality measures, cancer care, and genomic testing.

Providing Metrics to the Clinical Quality

Council. CDI2 draws upon data from Vizient to create dashboards showing rates of readmission, mortality, length of stay, and case mix index for the Clinical Quality Council, a systemwide team comprised of Chief Medical, Chief Nursing, and Chief Quality Officers. This group reviews these data and reports on these quality metrics to the UC Regents Health Services Committee.

By providing these dashboards and analyses, CDI2 plays a crucial role in improving the quality of patient care as well as accountability to UC leadership.

UC Population Health

CDI2 has continued to partner closely with PH to support data-driven population health management strategies, including analyses aimed at reducing health inequities and improving clinical quality of care.

Last year, CDI2 supported PH and UC health equity experts in efforts to identify and understand health disparities in the control of hypertension. CDI2 produced dashboards and statistical analyses, revealing that some of the elevated risk of hypertension observed in African American/Non-Hispanic Black patients could be explained by disparities in neighborhood disadvantage and smoking status. This information provided key insights to clinical experts across UCH, and in turn supported local interventions to improve hypertension care. UCSF Health was named a Quality Excellence Award winner by the National Association of Accountable Care Organizations for their effort.

Understanding Health Disparities as Part of Diabetes Care Management. Building upon its work with PH analyzing disparities in hypertension care, CDI2 conducted an analysis of diabetes care metrics to investigate the drivers of disparities in glycemic control among Hispanic and non-Hispanic populations. Figure 3 shows an example p-chart, or statistical control analysis, which helps teams identify lowers rates of A1C control in patients who identify as Hispanic or Latino.

In multivariate analyses of risk factors and specifically A1C control among Hispanic/Latino patients, CDI2 and PH found that some of the lower A1c control rates observed among Hispanic/Latino patients could be explained by non-English speakers and medication adherence when the data are pooled across the UCH system.

CDI2 further added a measure to track medication adherence as a proportion of days covered to help support reducing A1C control disparity in the Hispanic/Latino patient population. Taken together, these metrics, dashboards, and analyses provided key insights to population health leaders across the system, and supported improvement goals.

UC Cancer Consortium

CDI2 and the UCCC have collaborated over several years to develop and expand a systemwide Cancer Registry. Originally conceived at UCSF Health, the project aims to enhance the analysis of disease progression among cancer patients through the extraction of key concepts from pathology reports. Specifically, CDI2 extracts critical data points such as tumor staging from these reports, which will facilitate more in-depth analysis of patient outcomes and ultimately inform improvements in cancer treatment. This data will be incorporated into the UC Data Discovery Platform (UCDDP) for use in clinical research and operations, allowing healthcare professionals to track and analyze patient progress over time more effectively.

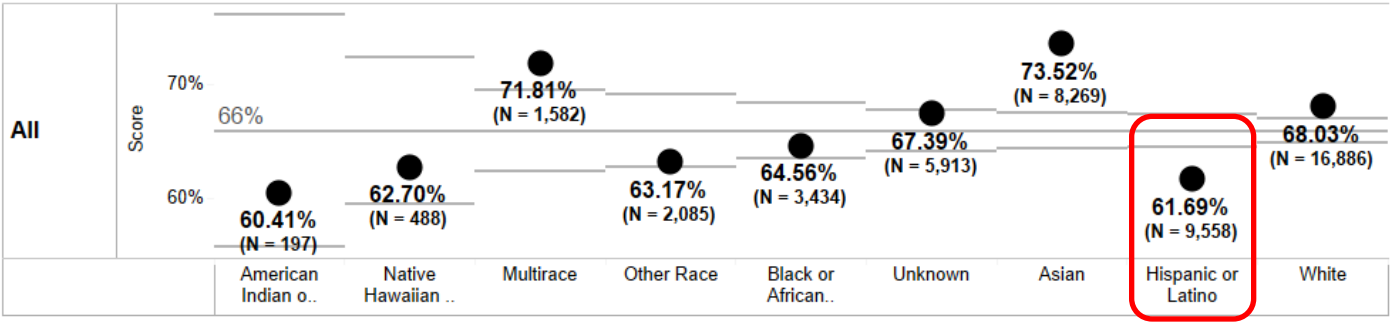


Figure 3. Pooled data from the UCH system revealed that patients who identify as Hispanic/Latino have lower A1C control, a measure of optimal diabetes control.

In addition to the extraction of critical data points from pathology reports, CDI2 and the UCCC also aim to leverage genomic test results to provide a more comprehensive understanding of cancer progression. To achieve this goal, CDI2 has incorporated Foundation Medicine data from five UC Health sites. Additionally, the project works to standardize the UCH data to OncoTree, an open-source cancer classification system. By integrating genomic test results with pathology report data, CDI2 and the UCCC aim to provide a more nuanced understanding of cancer progression and improve treatment outcomes for patients.

Last, the UC Lung Cancer Consortium, is working to expand lung cancer screening and improve patient outcomes. CDI2 supported the consortium by developing a dashboard to track the US Preventative Services Task Force guidelines for low dose CT screening and CMS quality measure on tobacco cessation. By improving the effectiveness of lung cancer screening and cessation programs, the consortium aims to reduce the incidence of lung cancer and ultimately improve outcomes for patients. Together, these initiatives represent an important step forward in the fight against cancer and the ongoing effort to improve patient outcomes through more effective treatment and analysis of disease progression.

Supporting Local Analytics Teams

In addition to population health efforts at the system-wide level, CDI2 coordinates quality measures reporting across all the academic health centers as part of the Quality Incentive Program and supports population health initiatives at individual academic health centers, including projects targeting cost and utilization reduction (claims processing) at UCSD and UCLA, as well as dashboards to understand chronic disease management.

Obtaining Maximum Payments from Medi-Cal Quality Incentive Program (QIP). CDI2's coordination efforts and the data from each of the local instances of the UCHDW enabled UCH to submit a cohesive dataset to California Department of Health Care Services (DHCS) for the most recently completed QIP Performance Year of the program. This effort led to all UC academic health centers successfully obtaining their maximum incentive payment of more than \$50 million.

All UCs had the following strengths listed in the External State Audit report:

- UCH leveraged coordination and collaboration between the other UC Health campuses to streamline processes and share best practices.
- All the UCH campuses would meet regularly to discuss any changes to report requirements and share successful interventions.
- Additionally, all reporting logic updates, and changes had been shared across all five UCH campuses with numerous validation checks.

In the upcoming program performance year, new measures and measure updates will be complete, allowing local analytics teams to focus on implementing targeted improvements.

Building our Medicare Programs through Claims

Processing. CDI2 expanded its work with local population health teams, adding additional Medicare claims processing metrics to local dashboards at UC San Diego Health and UCLA Health. This additional information allows local leadership to identify excess cost and utilization. First, CDI2 processed and added Medicare Advantage claims from Humana and Blue Shield to the UCSD dashboard. Second, the UCLA dashboard was expanded to include Medicare Advantage claims for the United Healthcare and Blue Shield plans, as well as commercial managed care claims for the Anthem and Cigna Accountable Care Organizations (ACOs). These new claims data were in addition to the CMS Medicare Shared Services, Primary Care First, and Kidney Care First data added last year. Together, these additional Medicare claims data provide a comprehensive analytics platform that enables local teams to view all their value-based contract data in one place. By leveraging these innovative solutions, CDI2 is enhancing population health management and driving better health outcomes for patients while reducing costs.

Improving Chronic Disease Management. UCSD and UCLA are taking steps to improve chronic disease management by implementing a new dashboard to track confirmatory blood pressure readings. This dashboard, which tracks cases where a confirmatory blood pressure reading was not taken when the initial reading was >140/90, is available at both the clinic and provider level. By providing local sites with the ability to monitor their performance against American Heart Association guidelines, the dashboard enables targeted intervention and retraining where necessary. This allows clinics and providers to identify areas for improvement and ultimately improve patient outcomes. The implementation of this dashboard represents an important step forward in chronic disease management, helping to ensure that patients receive the highest quality care possible.

Enhancing Participation in American Medical Group Association (AMGA) Programs. CDI2's expertise and rapid turnaround time have made them a valuable partner in the American Medical Group Association (AMGA) programs. Specifically, UCSD has approached CDI2 to provide analytic support for their participation in the Rise to Immunize program. CDI2 is helping UCSD track adult immunization measures, including pneumonia, flu, Td/Tdap, and zoster. Additionally, CDI2 is supporting UCSD's participation in the American Medical Group Association ASCVD (atherosclerotic cardiovascular disease) Best Practices Learning Collaborative by tracking statin therapy and LDL for UCSD Primary Care Patients with ASCVD. By leveraging CDI2's analytics capabilities, UCSD is better positioned to participate in these important programs and improve patient outcomes. The collaboration between CDI2 and UCSD represents a significant step forward in the effort to improve healthcare quality and promote best practices across the industry.



IMPACT

CDI2 dashboards for CMOs & CNOs saved local team 30-40 hours/month to track inpatient quality metrics

CDI2 identified opportunities to save \$1.2M on drug spend between 2017-2022

CDI2 utilized locally processed claims data to create a Primary Care First dashboard, empowering local team to enhance care quality

Research Support & Engagement

A primary function of CDI2 is enabling the next generation of clinical research. CDI2 has advanced this aim by expanding its research portfolio and further developing the data science environment that enables secure data analysis.

Growing the UC Data Discovery Platform

(UCDDP). To assist systemwide research and operational efforts, CDI2 implemented the UC Data Discovery Platform (UCDDP), a secure data science environment in 2020. The UCDDP contains tools to allow researchers to query and analyze a HIPAA limited data set generated from the UCHDW. The EHR data in the UCHDW includes diagnosis, medication and device usage, procedure, test result, and vital sign data on nearly nine million patients over 11 years.

Interested users work with their local UC academic health center—or a collaborating UC academic health center if they are not affiliated with one—to initially develop and run their queries in their local environment. Each project undergoes local review to evaluate the scientific merit of the project and to confirm the value of running the query centrally. Users agree to comply with all local processes and, upon access, sign an appropriate Data Use Agreement (DUA). Since its launch, usage of the UCDDP has grown significantly across all UC academic medical centers. As of June 2023, more than 170 UCH users have successfully accessed this platform for both clinical operations and clinical research purposes, which represents an increase in users of 35% over the previous year (see Figure 4).

Facilitating COVID-19 Research Efforts. As detailed in previous Annual Reports, CDI2 created and deployed UC CORDS, a COVID-19 patient research HIPAA limited data set that combines the SARS-CoV-2 testing data for UCH patients with their prior history dataset. CDI2 was able to securely transfer this UC-wide COVID limited data set to each of the academic health centers for their use within their own secure virtual systems for research. To date, this dataset has been utilized by researchers at all six academic health centers, and currently has over 200 documented users. Additionally, to date, 20 research papers have been generated and are published or in press. A complete list of papers published is included in Appendix 4.

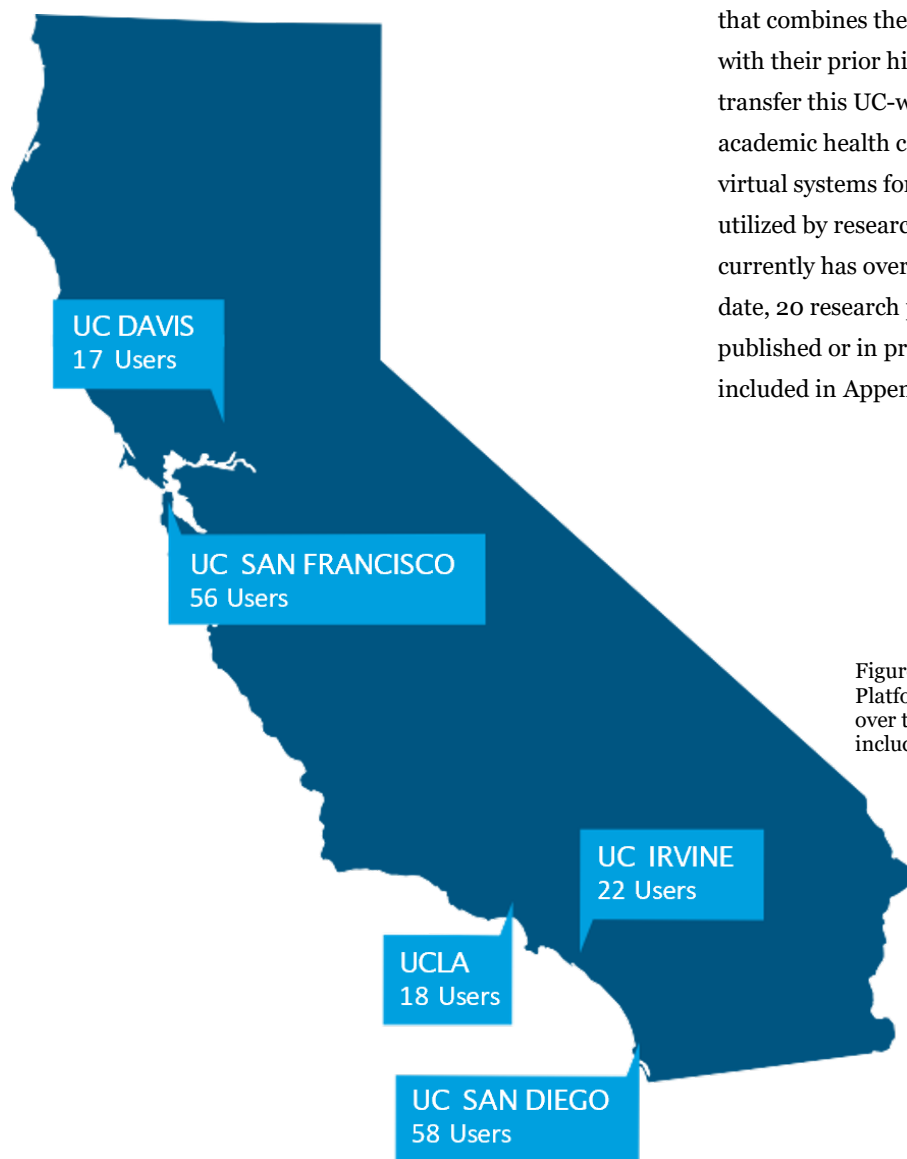


Figure 4. Number of UC Data Discovery Platform users by campus; an increase of 35% over the previous year. UCSD Health user count includes researchers at UC Riverside Health.

Contributing to Open Science with ODHSI. CDI2 continued its contribution to the Observational Health Data Sciences and Informatics Program (OHDSI). OHDSI is an international multi-stakeholder, interdisciplinary open-science community focusing on bringing out the value of health data through large-scale analytics. In 2023, CDI2 and OHDSI published a paper on the largest OHDSI network study to date, which assessed the incidence rates of 16 adverse events of special interest (AESI) related to COVID-19 vaccines among COVID-19 subjects. The study included over 23 million COVID-19 patients from 26 different data partners across the world along with data and analytic contributions from the CDI2 team. The results of this OHDSI network study indicated a considerable heterogeneity in incidence rates of AESIs across the databases. The reference for this publication can be found in Appendix 4.

Utilizing the UCHDW for Systemwide Clinical Trials. Building on the success of the KIDney Injury in Times of COVID-19 (KIDCOV) study, reported in the previous year’s annual report, CDI2 in partnership with University of California Biomedical, Research, Acceleration, Integration, and Development (UCBRAID) will be developing an expanded pilot to enable more systemwide clinical trials across UC Health. This effort will focus on diversifying clinical trial cohorts, as well as improving efficiency surrounding participant recruitment across the system, with a goal of providing a clinical trials recruitment service available to all sites.

Partnering with California Department of Public Health (CDPH). In this fiscal year, CDI2 received funding from CDPH for a project focused on hospital surveillance for SARS-CoV-2 and other new and emerging respiratory diseases. This work will evaluate disparities, differences and trends in treatment and outcomes for both hospitalized and non-hospitalized people diagnosed with COVID-19. Additionally, CDI2 provides data visualizations for SARS-CoV-2, influenza, and Respiratory Syncytial Virus (RSV) data points across UC Health (see Figure 5).

CDI2 also continues to support the UCH and CDPH Data Modeling Consortium, which started in February 2021 and includes nearly 150 UC faculty across all 10 UC campuses. The Consortium’s goal is to help guide policymaking with direct, timely engagement between policymakers and investigators on high-priority topics related to COVID-19.

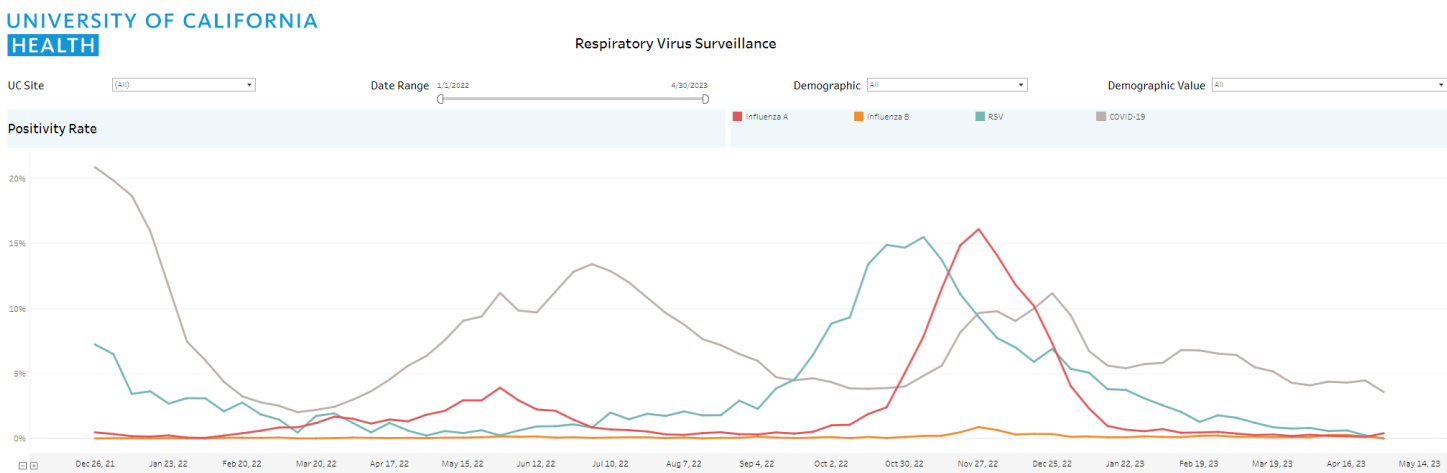


Figure 5. Dashboard represents the incidence of four respiratory viruses (SARS-CoV-2, Influenza A and B, and RSV) in the UC Health patient population from December 2021 to May 2023.



IMPACT

CDI2 enabled UC
Riverside Health
researchers to access and
benefit from research
platforms and dashboards

CDI2 provided data critical
for development of tailored
interventions for treatment
of hypertension

Health Data Governance

Ongoing advancements in cloud computing, artificial intelligence, and telehealth have made large scale data collaborations an ever more critical mechanism by which UC works to improve the public's health. Accordingly, the need for UC to build trust with under-served and disenfranchised communities about how their health data is collected, used, and shared, and to develop consistent, transparent processes for assessing the benefits and risk of data collaborations remains essential. CDI2 continued to lead a Presidential Systemwide Task Force on health data governance charged with developing recommendations for safe and responsible data sharing collaborations with nonprofit, government, and for-profit industry partners.

The Task Force is comprised of three work groups: (1) Work Group A, focused on developing a justice-based model of health data use, i.e., one that incorporates community input to shape scientific and health goals; (2) Work Group B, focused on developing a system to track data access agreements and develop systemwide resources for data sharing contracts; and (3) Work Group C, focused on updating interim processes for evaluating requests to access UC health data. Together, these Work Groups developed a draft report and recommendations and are in the process of incorporating feedback from stakeholders across UC to finalize the documents.

CDI2 has also continued to be an active participant in governance efforts around artificial intelligence (AI), including representing UCH on the Systemwide Artificial Intelligence Council. The AI Council is focused on implementing the recommendations in the UC AI Working Group Report, including designing a training and outreach program that explains AI and the benefits and risks posed; developing risk and impact assessment strategies, especially as they relate to the procurement or in-house development of AI-enabled technologies; establishing guidance on documentation of AI-enabled technologies that pose greater than moderate risk to individual rights in a public database; and additional strategies for operationalizing the UC AI Responsible AI Principles.

CDI2 also participates in the Coalition for Health AI, a community of academic health systems, organizations, and expert practitioners of AI and data science with the goal of developing guidelines and guardrails to promote the adoption of credible, fair, and transparent health AI systems.



UC San Diego Health

IMPACT

CDI2 dashboards facilitated 105% increase in provision of cardioprotective drug treatments to eligible patients

CDI2 increased local savings of \$900K on vendor analytics by processing claims and loading local dashboards

CDI2 identified opportunities to save \$519K on drug spend between 2017-2022

External Partnerships & Projects

Over the last year, CDI2 achieved goals in the assessment and pursuit of opportunities with third parties where there is demonstrated alignment of vision and shared values. To increase efficiency and management of these external partnerships and projects, as well as to enhance customer satisfaction, CDI2 successfully built, pilot-tested, and rolled out Salesforce Customer Relationship Management software.

Having created the Real-World Evidence (RWE) Collaborative last fiscal year, CDI2 communicated with campus Vice Chancellors of Research to increase awareness of the Collaborative and further build participation. This effort will enhance our systemwide ability to leverage RWE to improve healthcare outcomes and drive innovation.

The CDI2 team partnered with Bristol-Myers Squibb to secure \$450,000 in funding for the UCSF Hypertrophic Cardiomyopathy (HCM) Academic Research Collaboration Study. The study will leverage electronic health record data to identify risk factors for diagnostic delays in HCM, a highly treatable condition with a good prognosis if identified early. The results of this study could inform future interventions to reduce missed opportunities for early diagnosis.

CDI2 also facilitated a partnership between the UC Lung Cancer Consortium and Intuitive Surgical on lung cancer screening and early diagnosis.

Harnessing the Power of Real-World Evidence Conference. CDI2 and the Systemwide RWE Collaborative presented an in-person conference focused on the usage of Real-World Data to assess the potential benefits and risks of a medical product, therapy, or intervention in April 2023. The conference brought together key stakeholders and covered topics including UCH data capabilities and resources, current and potential Real World Evidence initiatives with government and for-profit entities, how to successfully conduct collaborations in a safe and responsible manner, and financial considerations and challenges in developing Real World Evidence projects. We thank our colleagues at UC Irvine and the staff at The Cove for their generous hospitality and look forward to future events on this important topic.



“The range and quality of content presented were very informative. I enjoyed hearing and learning about how the group is accessing, using, and analyzing data within and outside the health system to address a variety of questions and issues.”

Harnessing the Power of Real-World Evidence

presented by CDI2 and the Systemwide RWE Collaborative

April 19, 2023
The Cove at UC Irvine



- Presentations from all six UC Health centers on data and RWE capabilities
- Networking Lunch
- Fireside chat with academic and industry colleagues on navigating RWE partnerships
- Role of data governance and contracting in protection of health data
- Panel discussion on RWE-based decision making
- Poster session





UCSF Health

IMPACT

CDI2 dashboards facilitated 115% increase in provision of cardioprotective drug treatments to eligible patients

CDI2 identified opportunities to save \$685K on drug spend between 2017-2022

CDI2 partnered with Bristol-Myers Squibb to secure \$450K in funding for Hypertrophic Cardiomyopathy collaboration study

Conclusion

CDI2 is guided by the mission and values of the University of California and UC Health to foster collaborations and partnerships, provide data insights and analytics to improve patient care, advance clinical research, and lead in the areas of safe and responsible use of healthcare data. In the past fiscal year, the CDI2 team demonstrated success in achieving milestones and innovating across its portfolio. CDI2 remains grateful for the support of leadership, partners, stakeholders, and colleagues and we look forward to continuing our valuable work in 2024 and beyond.

Looking Ahead to FY2024 and Beyond

As we look ahead to the next fiscal year, CDI2 anticipates growth across several areas, including its technical infrastructure and analytic capabilities, support of systemwide projects, research support and engagement, data governance processes, and external partnerships.

In 2022-2023, CDI2 participated in the UCH Strategic Investment planning process, sharing the unique value of the UCHDW and the many accomplishments and contributions offered to date. In the coming years, CDI2 looks forward to carrying out the priorities identified in the Strategic Investment Plan, including advancing clinical operations and research excellence through analytics and clinical research consortia, and facilitating collaborative initiatives that increase fiscal resilience. Among the projects that CDI2 anticipates it will undertake over the next year and beyond are:

Exploring Radiology Proof-of-Concept. Following the UC Health system's move towards a single radiology picture archive and communicating system, CDI2 plans to support an operational improvement proof-of-concept pilot project. After a specific use case modality for this project is determined by Radiology chairs, CDI2 will support reconvening radiology AI faculty specialists to help develop a sandbox with images linked to the UCHDW for research and development, including potential development of AI tools.

Guiding Access to CDI2 Research Data, Services, and Tools. CDI2 plans to facilitate access to and utilization of its various research data, services, and tools by developing educational and outreach materials to be disseminated systemwide.

Finalizing Recommendations for Responsible

Data Governance. The three work groups of the Presidential Task Force on Data Governance anticipate that feedback from stakeholders across UC will be integrated into a final report and set of recommendations for Executive Leadership.

Offering UC Real-World Insights. This new offering will provide valuable insights into post-FDA approved devices and pharmaceutical products in real-world settings. The program generates information on patient demographics, safety and adverse events, treatment patterns, medication adherence, patient-reported outcomes, clinical outcomes, and comparative effectiveness. This information can help manufacturers understand if their products are being used as intended, their safety profile, how effective they are in treating targeted conditions, and their value proposition compared to other treatments on the market. UC Real-World Insights can provide a unique advantage for manufacturers to make data-driven decisions, optimize their products, and improve patient outcomes.



Appendix 1 – Oversight Board Membership

COMMITTEE LEADERSHIP

Chair

Tom Andriola, MS
Vice Chancellor, Information, Technology & Data, UCI

CAMPUS APPOINTEES

Davis

Jason Adams, MD, MS
Director, Data and Analytics Strategy

Irvine

Lisa Gibbs, MD
Chief, Division of Geriatric Medicine, and Gerontology

Los Angeles

Albert Duntugan, MHA
Chief Data Officer

Riverside

Helen Lau, RN, MROD
Director, Quality, Patient Safety, Risk & Population Health

San Diego

Parag Agnihotri, MD
Chief Medical Officer, Population Health Services

San Francisco

Kay Burke, MBA, RN, NE-BC
Chief Nursing Informatics Officer, Health Informatics

Office of the President

Anne Foster, MD, MPH
Chief Clinical Officer, UC Health

AT-LARGE APPOINTEES

CMO/CQO

Chris Longhurst, MD, MS
Chief Medical and Digital Officer, UCSD Health

Research

Elizabeth Boyd, PhD
Director, UC BRAID, UCSF

Non-Health Campus

(open)

Ethics

Barbara Koenig, PhD, RN
Prof. Emeritus of Medical Anthropology & Bioethics, UCSF

Equity, Diversity, and Inclusion

Medell Briggs-Malonson, MD, MPH, MSHS
Chief of Health Equity, Diversity, & Inclusion, UCLA Health

Patient Voice

Ysabel Duron
President & Executive Director, The Latino Cancer Institute

Patient Voice

Thu Quach, PhD, MPH
President, Asian Health Services

EX-OFFICIO (OFFICE OF THE PRESIDENT)

Research Compliance

Shanda Hunt, JD
Associate Director, Systemwide Compliance

Healthcare Compliance

Noelle Vidal, JD
Healthcare Compliance & Privacy Officer

UC Legal

Hillary Kalay, JD
Senior Counsel, UC Legal

Appendix 2 – CDI2 Team

UC HEALTH TEAM

Atul Butte, MD, PhD Chief Data Scientist

Cora Han, JD Chief Health Data Officer, Executive Director

Monte Ratzlaff Director, Cyber Risk Program

Mike Kilpatrick Director, UC Health Technology Program

Pagan Morris, MPH Director, Research Initiatives

Andenet Emiru, MBA Director, External Partnerships and Projects

Laura HF Barde, PhD Senior Advisor

Emrica Agossa, MPH Project Manager

Jennifer Benbow Project Manager

Ana Maria Deluca Executive Assistant

Ellen Lenzi Executive Assistant

UC HEALTH DATA WAREHOUSE TEAM | UCI HEALTH

Lisa Dahm, PhD Director, Health Data and Analytics

Ayan Patel, MS Lead Data Scientist

Nadya Balabanova, MBA Data Scientist

Aiden Barin Data Scientist

Rob Follett Lead Data Architect

David Gonzalez Infrastructure Architect

Tim Hayes Technical Project Manager

Chaya Mohan Data Scientist

Ray Pablo Data Scientist

Teju Yardi, MS Data Scientist

Appendix 3 – Campus & Health Partners

TECHNOLOGY LEADERSHIP PARTNERS

Ashish Atreja, MD, MPH, FACP, AGAF Chief Information and Digital Health Officer *UCD Health*

Scott Joslyn, PharmD, MBA Chief Information and Innovation Officer *UCI Health*

Ellen Pollack, MSN, RN-BC Chief Information Officer *UCLA Health*

Josh Glandorf, MBA Chief Information Officer *UCSD Health*

Chris Longhurst, MD, MS Chief Medical and Digital Officer *UCSD Health*

Joe Bengfort Chief Information Officer *UCSF Health*

BUSINESS INTELLIGENCE PARTNERS

Kent Anderson, MS Director, IT Health Informatics *UCD Health*

David Merrill, MS Director, Enterprise Data and Analytics *UCI Health*

Dan Phillips Manager, Enterprise Data and Analytics *UCI Health*

Albert Duntugan, MHA Chief Data Officer *UCLA Health*

Andrew Weaver Director, Program Operations OHIA *UCLA Health*

Yael Berkovich Director, Enterprise Information Architecture OHIA *UCLA Health*

Jennifer Holland, MS Director, Enterprise Reporting *UCSD Health*

Rick Larsen Director, Research Informatics, EIA *UCSF Health*

CAMPUS TECHNICAL IMPLEMENTATION TEAM

Hemanth Tatiparthi ETL Developer *UCD Health*

Supraja Radhakrishnan ETL Developer *UCD Health*

Kathy Pickell Data Architect *UCI Health*

Leanie Mayor ETL Developer *UCI Health*

Vajra Kasturi Data Engineer *UCLA Health*

Subani Shaik Data Engineer *UCLA Health*

Myron Sztonyk IAM Architect *UCLA Health*

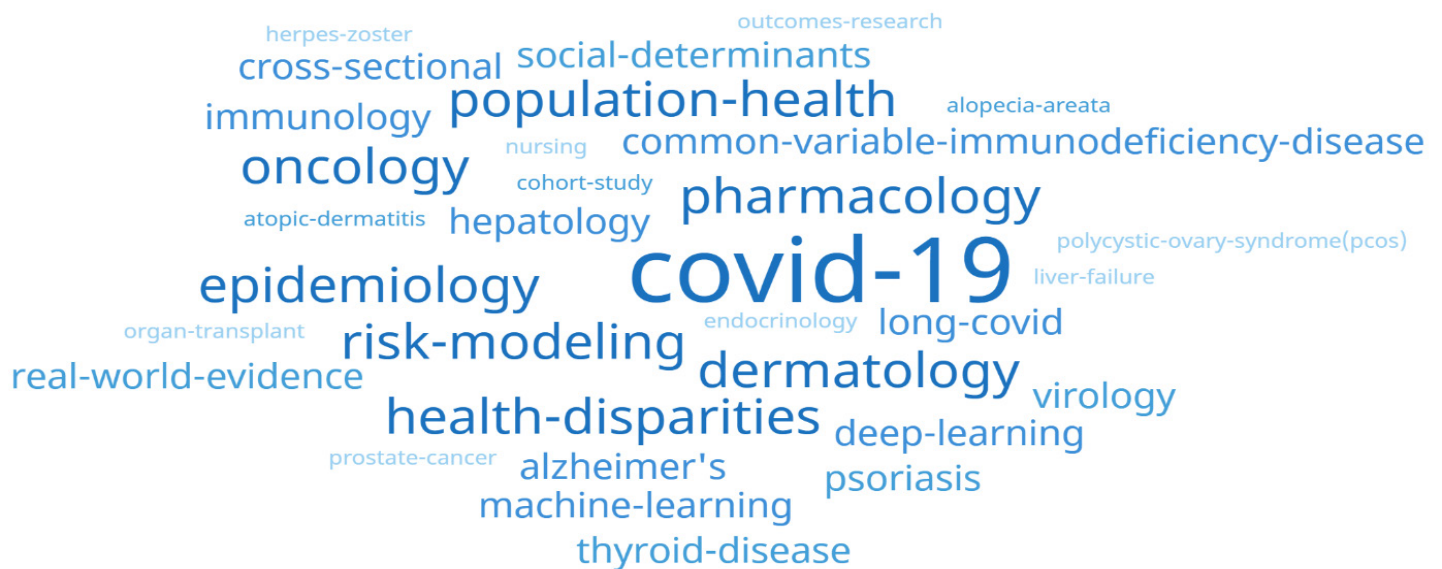
Hiram Cardoza Senior ETL Developer *UCSD Health*

Vijay Ryanker Data Engineer *UCSF Health*

Appendix 4 - Publications

- Ge, J., Digitale, J. C., Fenton, C., McCulloch, C. E., Lai, J. C., Pletcher, M. J., & Gennatas, E. D. (2023). *Predicting Post-Liver Transplant Outcomes in Patients with Acute-on-Chronic Liver Failure using Expert-Augmented Machine Learning* (p. 2023.03.03.23286729). medRxiv. <https://doi.org/10.1101/2023.03.03.23286729>
- Huang, Y., Pinto, M. D., Borelli, J. L., Mehrabadi, M. A., Abrihim, H., Dutt, N., Lambert, N., Nurmi, E. L., Chakraborty, R., Rahmani, A. M., & Downs, C. A. (2021). *COVID Symptoms, Symptom Clusters, and Predictors for Becoming a Long-Hauler: Looking for Clarity in the Haze of the Pandemic* (p. 2021.03.03.21252086). medRxiv. <https://doi.org/10.1101/2021.03.03.21252086>
- Johnson, R., Stephens, A. V., Knyazev, S., Kohn, L. A., Freund, M. K., Bondhus, L., Hill, B. L., Schwarz, T., Zaitlen, N., Arboleda, V. A., Butte, M. J., & Pasiuniuc, B. (2022). *Electronic health record signatures identify undiagnosed patients with Common Variable Immunodeficiency Disease* (p. 2022.08.03.22278352). medRxiv. <https://doi.org/10.1101/2022.08.03.22278352>
- Kwon, D., Vashisht, R., Borno, H., Aggarwal, R. R., Small, E. J., Butte, A., & Huang, F. W. (2021). Androgen deprivation therapy and risk of SARS-CoV-2 infection in men with prostate cancer: A University of California (UC) Health System registry study. *Journal of Clinical Oncology*, 39(6_suppl), 37–37. https://doi.org/10.1200/JCO.2021.39.6_suppl.37
- Ma, B., & Lu, Y. (2023). Racial Disparities in the Clinical Prognosis of Gastrointestinal Cancer Patients with COVID-19: A Retrospective Study in UC CORDS. *Journal of Racial and Ethnic Health Disparities*. <https://doi.org/10.1007/s40615-023-01512-w>
- Mehrabadi, M. A., Aqajari, S. A. H., Azimi, I., Downs, C. A., Dutt, N., & Rahmani, A. M. (2021). Detection of COVID-19 Using Heart Rate and Blood Pressure: Lessons Learned from Patients with ARDS. *2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, 2140–2143. <https://doi.org/10.1109/EMBC46164.2021.9629794>
- Nguyen, C., Shwe, S., Yale, K., Ghigi, A., Zheng, K., Mesinkovska, N. A., & Bhutani, T. (2022). The role of gender, race, and ethnicity in psoriasis patients with COVID-19 infection: A cross-sectional study. *International Journal of Women's Dermatology*, 8(1), e012. <https://doi.org/10.1097/JW9.000000000000012>
- Nguyen, C., Shwe, S., Yale, K., Ghigi, A., Zheng, K., Mesinkovska, N., & Bhutani, T. (2021). LB771 Racial and Ethnic Disparities in COVID-19-Related Infection in Patients with Psoriasis: A Cross-Sectional Study. *Journal of Investigative Dermatology*, 141(9), B15. <https://doi.org/10.1016/j.jid.2021.07.113>
- Nguyen, C., Yale, K., Casale, F., Ghigi, A., Zheng, K., Silverberg, J. i., & Mesinkovska, N. a. (2021). SARS-CoV-2 infection in patients with atopic dermatitis: A cross-sectional study. *British Journal of Dermatology*, 185(3), 640–641. <https://doi.org/10.1111/bjd.20435>
- Nguyen, C., Yale, K., Ghigi, A., Zheng, K., Mesinkovska, N. A., Wambier, C. G., Cadegiani, F. A., & Goren, A. (2021). SARS-CoV-2 infection in patients with thyroid disease: A cross-sectional study. *Annals of Thyroid*, 6(o), Article o. <https://doi.org/10.21037/aot-21-8>
- Nourmohammadi, N., Yale, K., Ghigi, A., Zheng, K., & Mesinkovska, N. A. (2020). A Cross-Sectional Study on Herpes Zoster Diagnosis in the time of COVID-19. *SKIN The Journal of Cutaneous Medicine*, 4(6), Article 6. <https://doi.org/10.25251/skin.4.6.9>
- Nuño, M., García, Y., Rajasekar, G., Pinheiro, D., & Schmidt, A. J. (2021). COVID-19 hospitalizations in five California hospitals: A retrospective cohort study. *BMC Infectious Diseases*, 21(1), 938. <https://doi.org/10.1186/s12879-021-06640-4>
- Reznikov, L. R., Norris, M. H., Vashisht, R., Bluhm, A. P., Li, D., Liao, Y.-S. J., Brown, A., Butte, A. J., & Ostrov, D. A. (2021). Identification of antiviral antihistamines for COVID-19 repurposing. *Biochemical and Biophysical Research Communications*, 538, 173–179. <https://doi.org/10.1016/j.bbrc.2020.11.095>
- Rodriguez-Watson, C. V., Louder, A. M., Kabelac, C., Frederick, C. M., Sheils, N. E., Eldridge, E. H., Lin, N. D., Pollock, B. D., Gatz, J. L., Grannis, S. J., Vashisht, R., Ghauri, K., Knepper, C., Leonard, S., Embi, P. J., Jenkinson, G., Klesh, R., Garner, O. B., Patel, A., ... Allen, J. (2023). Real-world performance of SARS-Cov-2 serology tests in the United States, 2020. *PLOS ONE*, 18(2), e0279956. <https://doi.org/10.1371/journal.pone.0279956>
- Rodriguez-Watson, C. V., Sheils, N. E., Louder, A. M., Eldridge, E. H., Lin, N. D., Pollock, B. D., Gatz, J. L., Grannis, S. J., Vashisht, R., Ghauri, K., Valo, G., Chakravarty, A. G., Lasky, T., Jung, M., Lovell, S. L., Major, J. M., Kabelac, C., Knepper, C., Leonard, S., ... Allen, J. (2023). Real-world utilization of SARS-CoV-2 serological testing in RNA positive patients across the United States. *PLOS ONE*, 18(2), e0281365. <https://doi.org/10.1371/journal.pone.0281365>
- Vashisht, R., Patel, A., Crews, B. O., Garner, O. B., Dahm, L., Wilson, C., & Butte, A. J. (2021). Age- and Sex-Associated Variations in the Sensitivity of Serological Tests Among Individuals Infected With SARS-CoV-2. *JAMA Network Open*, 4(2), e210337. <https://doi.org/10.1001/jamanetworkopen.2021.0337>
- Watanabe, J. H., Kwon, J., & Mehta, S. R. (2021). Association of Age and Hospitalization Amongst Those with Underlying High-risk Conditions at COVID-19 Diagnosis in a Large, State-wide Health System. *Journal of General Internal Medicine*, 36(9), 2906–2908. <https://doi.org/10.1007/s11606-021-06942-y>
- Watanabe, J. H., Kwon, J., Nan, B., Abeles, S. R., Jia, S., & Mehta, S. R. (2021). Medication Use Patterns in Hospitalized Patients With COVID-19 in California During the Pandemic. *JAMA Network Open*, 4(5), e2110775. <https://doi.org/10.1001/jamanetworkopen.2021.10775>
- Watanabe, J. H., Kwon, J., Nan, B., Abeles, S. R., & Mehta, S. R. (2022). Examination of Medication Use Patterns by Age Group, Comorbidity, and Month in COVID-19 Positive Patients in a Large Statewide Health System During the Pandemic in 2020. *Journal of Pharmacy Technology*, 38(2), 75–87. <https://doi.org/10.1177/87551225211068675>
- Woldemariam, S., Tang, A., Oskotsky, T., Yaffe, K., & Sirota, M. (2022a). *Utilizing Electronic Medical Records Identifies Similarities and Differences in Alzheimer's Disease Comorbidities Between Racialized Populations*. ResearchSquare. <https://doi.org/10.21203/rs.3.rs-1903045/v1>

21. Woldemariam, S., Tang, A., Oskotsky, T., Yaffe, K., & Sirota, M. (2022b, March 24). *Deep Clinical Phenotyping of Race and Ethnicity- Stratified Alzheimer's Disease Patients Leveraging Electronic Medical Records Data*. AMIA 2022 Informatics Summit, Chicago, IL.
22. Yale, K., Elsanadi, R., Ghigi, A., Zheng, K., Goren, A., & Mesinkovska, N. A. (2021). Androgens and women: COVID-19 outcomes in women with acne vulgaris, polycystic ovarian syndrome, and hirsutism. *International Journal of Dermatology*, 60(7), e267–e268. <https://doi.org/10.1111/ijd.15473>
23. Yale, K., Nguyen, C., Telep, S., Ghigi, A., Zheng, K., Subramanian, I., Feeney, C., & Mesinkovska, N. A. (2022). Is prior antithrombotic use protective against COVID-19 infection? A cross-sectional study of the University of California Health patient population. *Annals of Blood*, 0(0), Article 0. <https://doi.org/10.21037/aob-21-75>
24. Yale, K., Nourmohammadi, N., Casale, F., Ghigi, A., Zheng, K., & Mesinkovska, N. A. (2022). A year in review: A cross-sectional study of alopecia areata and risk of COVID-19 infection, hospitalization, and mortality from March 2020 – February 2021. *International Journal of Dermatology*, 61(3), e81–e83. <https://doi.org/10.1111/ijd.15970>



University of California Health

1111 Franklin Street
Oakland, CA 94607-5200

University of California Health Academic Health Centers

UC Davis Health
UC San Diego Health
UCI Health
UCLA Health
UCR Health
UCSF Health

