We are passionate about working on health care challenges with a distinctive combination of world-class data, leading-edge data science and research capabilities, and the expertise of diverse partners. Our 2019 Year in Review shares the progress we have collectively made with research and innovation programs that advance the flow of science and help lead to evidence-based improvements in health care.
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In 2019, OptumLabs launched two new collaborative programs.

**KIDNEY COLLABORATIVE**

Chronic kidney disease (CKD) and end-stage renal disease (ESRD) have emerged as national priorities given the high cost and burden of years on dialysis, and the fact that nearly 40 million U.S. adults may have CKD and only 10% are aware they have it*. In 2019, OptumLabs convened multiple partner organizations to coordinate a series of studies across the CKD-ESRD continuum, aiming to improve disease detection, slow progression and improve care options for patients who reach ESRD, including increasing awareness of transplantation and conservative care options. With many partners engaged in CKD projects, we also convened a CKD collaborative to discuss research and policy interests, data challenges and shared learnings related to kidney disease. A number of partners are participating, including AMGA, Johns Hopkins University, NCQA, Optum, U.S. Department of Health and Human Services (HHS) and UC Health.

* Chronic Kidney Disease in the United States, 2019. CDC CKD Surveillance System.

**MATERNAL HEALTH**

Over the past 25 years, maternal health morbidity and mortality have increased at an alarming rate in the U.S. Leveraging key maternal morbidity analytics that have been developed by the Centers for Disease Control and Prevention (CDC) using clinical data, OptumLabs developed a set of claims-based key performance indicators (KPIs) that can help spotlight the issues across several risk and outcome areas ranging from preeclampsia to obstetric hemorrhage to cardiac risk. A maternal health consultant from Ariadne Labs and experts from Optum®/UnitedHealth Group® have participated in a “proof of concept” design of delivery-episode-centered metrics aimed at spotlighting modifiable risk factors.
OptumLabs has more than 20 research and translation collaborations aimed at improving opioid-related outcomes. Impactful projects that are in varying stages of the publication process include:

**BUILDING THE CASE FOR CONSERVATIVE TREATMENTS FOR LOW BACK PAIN**

A team from OptumLabs and Boston University School of Public Health examined physical therapy and chiropractic treatment for low back pain and the impact on opioid prescribing. The findings helped catalyze benefit design changes in employer-sponsored health plans at UnitedHealthcare®, incenting access to conservative therapies for back pain and reducing risk of opioid use.

The results from this project were also published in three papers in peer-reviewed journals: BMJ Open, American Journal of Managed Care and Physical Therapy Journal.

**OPIOID USE DISORDER (OUD) TREATMENT PATHWAYS**

OptumLabs completed a study in conjunction with addiction medicine experts at Massachusetts General Hospital and Boston Medical Center on the Comparative Effectiveness of OUD Treatment Pathways, sponsored by Optum® Behavioral Health. This work highlights the value of buprenorphine and methadone medications for OUD and resulted in two papers. One examines key clinical outcomes like overdose, emergency department/inpatient visits and detoxification stays, and was published in JAMA Network Open. The other reports on the total cost of care associated with various OUD treatment pathways and has been submitted for peer-reviewed publication.

Based on the findings, Optum Behavioral Health trained its behavioral health provider network on the value of medications for the treatment of opioid use disorder.

Findings from the OUD pathways project also helped build the clinical and business case for a new office based opioid treatment program at Reliant Medical Group, a large multi-site Optum practice. Reliant began conducting waiver training in 2019 to enable providers to become certified to prescribe buprenorphine, with more planned in 2020.
OPIOID DOSE TAPERING

A team led by University of California, Davis, started a new project to assess the frequency and rapidity of tapering opioid medication doses among adult patients receiving opioid therapy for chronic non-cancer pain. The results of this project were published in *JAMA Network Open* in November, with more work in the pipeline in 2020.

OPIOID PRESCRIBING

Mayo Clinic, OptumLabs and other partners completed a study sponsored by the FDA which focused on whether the prescribing of certain extended-release opioids and transmucosal immediate-release fentanyl (TIRF) was consistent with FDA labeling guidelines. Phase 1 of this study focused on whether opioid tolerance can be demonstrated and has been completed. A second phase focusing on adverse outcomes associated with the “on-label” and “off-label” use of these products was commissioned by the FDA.
In 2019, we made strides in several areas: projects funded by the AARP Quality Measures Innovation Grant program, collaborations with other partners on measure development and work to improve health care quality through OptumLabs Qualified Entity (QE) efforts.

AARP INNOVATION GRANTS

Three measures projects funded by the AARP Quality Measures Innovation Grant program were completed in 2019:

- **Appropriate glucose-lowering therapy for diabetes:**
  Awarded to Mayo Clinic

- **Bleeding events associated with anticoagulant use and hypoglycemic events associated with anti-hyperglycemic medications:**
  Awarded to Pharmacy Quality Alliance (PQA) and University of Maryland, School of Pharmacy

- **Measuring cancer-related adverse events:**
  Awarded to Tufts Medical Center and published in Cancer Medicine

In addition, two new projects were funded by AARP quality measure grants at the end of the year:

- **Stroke misdiagnosis in hospital emergency departments:**
  Awarded to Johns Hopkins Armstrong Institute for Patient Safety and Quality

- **Kidney health evaluation for adults with diabetes mellitus:**
  Awarded to National Kidney Foundation in collaboration with NCQA, AMGA, PCPI and University of California, San Francisco

DEVELOPING NOVEL QUALITY MEASURES

Our quality measures program convenes diverse project teams and stakeholders to foster novel measure development, innovate in measurement science and generate new insights from our data on ways to improve health care.

MEASURES WORK COLLABORATION

Other collaborative efforts focused on accelerating the development and evolution of a variety of measures under the stewardship of measures partners National Committee for Quality Assurance (NCQA) and PQA. NCQA and PQA have begun using OptumLabs data to support feasibility, development and testing of meaningful measures, and support measurement innovation more broadly.
QUALIFIED ENTITY EFFORTS
As a Centers for Medicare and Medicaid Services (CMS) Qualified Entity (QE), OptumLabs launched our public reporting in April 2019, using Medicare fee-for-service (FFS) data combined with OptumLabs data to showcase opportunity areas that may help improve the quality of care in the U.S.

With our national QE certification, OptumLabs received 100% of Medicare Parts A and B claims and Part D prescription drug event and enrollment data. We integrated that data with our commercial and Medicare Advantage claims and clinical data to report publicly on health system quality measures and further improve health care through other analyses and research.

PUBLIC REPORTING
Our dynamic online reporting tool explores novel industry themes around quality in two domains: “Comparing Processes and Outcomes” and “Transition to Medicare.”

EXPANDED USE AND RESEARCH
As a QE, OptumLabs makes the QE data available for non-public analyses and de-identified data licenses to authorized users for approved uses, as allowed through QE Certification Program regulations. This includes use to improve areas such as health care operations and quality. OptumLabs may also collaborate with partners to conduct research using the Medicare FFS data integrated with our data asset, subject to approval using CMS Research Data Assistance Center (ResDAC) guidelines.

DEVELOPING NOVEL QUALITY MEASURES
IN 2019:

- 35 Projects Initiated by Primary Investigators
- 33 Papers Published Using OLDW in High-Impact Journals
- 33 Delivered Conference Presentations on OptumLabs Work
- 49
CONDUCTING AND TRANSLATING RESEARCH

DIVERSE PROJECTS UNDERWAY

ACROSS RESEARCH CATEGORIES

- utilization
- epidemiology
- safety
- comparative effectiveness
- methods
- prediction
- economics
- policy

AND HEALTH DOMAINS

- heart and stroke
- kidney
- cancer
- diabetes
- pain management
- women’s health
- dementia
- mental health
PARTICIPATING IN GRANT FUNDING PROGRAMS

Key activities included:

- **Robert Wood Johnson Foundation Health Data for Action program.** OptumLabs participated in the Robert Wood Johnson Foundation (RWJF) signature research program, Health Data for Action (HD4A). HD4A strives to answer important research questions that can influence health policy by connecting interested researchers to owners of rich data sets. RWJF and Academy Health chose six research projects from 50 initial proposals submitted to use OptumLabs data:
  - **Ariadne Labs** will explore patterns in prenatal care utilization and quality to inform strategies to reduce maternal morbidity and mortality.
  - **Brown University** will characterize the impacts of severe storms on asthma exacerbation in children.
  - **The Congressional Budget Office** will examine patient, insurance and geographic factors associated with the types of treatment patients receive for opioid use disorder (OUD), as well as the association of those OUD treatments with patient outcomes.
  - **George Mason University** will apply machine learning techniques to identify optimal antidepressant medications based on patient history.
  - **University of California Berkeley** will probe the intersection between the opioid epidemic and labor market outcomes, and examine the role of economic policies designed to raise incomes for low-income Americans, looking for potential strategies to address this public health crisis.
  - **University of Nebraska Medical Center** will investigate the association between increases in patient out-of-pocket costs for insulin and the use of insulin and non-insulin antihyperglycemic medications, and other diabetes-related outcomes.

With new collaboration and funding models, active participation in policy dialogues and new applications of AI, OptumLabs expanded the scope and impact of our research.
CONTRIBUTING RESEARCH AND THOUGHT LEADERSHIP TO REAL-WORLD EVIDENCE DISCUSSIONS

Real-world evidence (RWE) has grown in importance in the last few years, fueled by a surge in the variety and volume of observational data, new analytic techniques to work with it and legislation mandating that the FDA develop guidance for using RWE to support regulatory decision-making. OptumLabs and our partners have been highly engaged in research and public forums to inform industry and policy discussions in this area:

• **CABANA*. Mayo Clinic collaborated with Tufts Medical Center and Duke Health to use OptumLabs data to analyze observational cohorts designed to mimic the CABANA trial and published results simultaneously with the trial results in Q1 2019, arriving at complementary conclusions.

• **OPERAND**. OptumLabs, in collaboration with the Multi-Regional Clinical Trials Center at Brigham and Women’s Hospital and a technical expert panel, awarded grants to Brown University and Harvard Pilgrim Health Care Institute to replicate two important clinical trials – ROCKET for Atrial Fibrillation and LEAD-2 for Type 2 diabetes. OPERAND is examining the principles, methodologies and appropriate utilization of real-world data in regulatory review and approvals of medical treatments. The program will also examine real-world treatment effects for the broader patient populations to better understand heterogeneity of treatment effects among patient subgroups.

• Clinical trial prediction project. Mayo Clinic, OptumLabs and Yale were awarded funding under the FDA CERSI program to predict the outcomes of clinical trials before they are published (similar to the CABANA project). Prediction of clinical trials outcomes is an even higher evidence bar than replication because the trial outcomes are not yet known.

• Friends of Cancer Research Real-World Evidence Pilot 2.0. OptumLabs is an active member of a multi-organizational collaborative convened by Friends of Cancer Research to develop innovative ways to apply real-world data to advance cancer treatments. This collaborative presented its findings and recommendations at the Annual Blueprint for Breakthrough Forum in September. A new phase of the project is currently in planning, to expand the analyses into specific patient populations and treatment options.

• Public forums. OptumLabs has participated in a variety of public meetings with experts from Duke Margolis, FDA, Harvard Medical School, ISPOR, National Academy of Medicine, Yale School of Medicine and more to share learnings and insights on the reliability of real-world data and how to apply it to inform health policy and care.

* Catheter Ablation vs Antiarrhythmic drug therapy in Atrial fibrillation.
** Observational Patient Evidence for Regulatory Approval and Understanding Disease.
ADVANCING THE SCIENCE OF AI

We are using machine learning and other forms of artificial intelligence (AI) in our research programs via our partners and OptumLabs data scientists, and are also providing thought leadership to advance the field.

We completed the second phase of our work on Alzheimer’s disease using deep learning to push the boundaries of how models are created to predict Alzheimer’s and dementia. Alzheimer’s disease is challenging to predict using longitudinal claims and clinical data, given limitations in clinical coding and cognitive assessment data from these sources. Using innovative “label learning” techniques to overcome this challenge, supplemented by information from de-identified clinical notes, OptumLabs data scientists were able to increase the predictive power of risk models developed in an earlier phase of the project.

A paper on label learning has been published in Alzheimer’s & Dementia: Translational Research & Clinical Interventions. Two other papers have been submitted for publication on use of clinical notes and machine learning to predict the onset of dementia, and deep neural network models for identifying incident dementia using claims and EHR data sets, with a fourth in development on machine learning methods.

We are also contributing thought leadership to advance the science of AI through speaking engagements and participation in working groups. In 2019, activities by OptumLabs leaders included co-chairing the ISPOR Task Force on Machine Learning, focusing on best practices in the use of machine learning for health economics and outcomes research, and co-authoring the National Academy of Medicine Digital Health Action Collaborative’s special publication, Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril.
OptumLabs research is designed with translation in mind. That means building translation paths into our research from the outset that can support action on meaningful findings.

We identify project concepts that are relevant to the current health care landscape, convene experts to help shape the study design, and later execute coordinated communication of results that target key stakeholder constituencies. Examples of two 2019 translation programs follow.

TRANSLATION OF A PREDIABETES PREDICTIVE MODEL
Tufts Medical Center used OptumLabs data to build a multi-variable prediabetes predictive model that estimates the personalized risk of an individual with prediabetes developing diabetes within three years, and the benefit of intervention aimed at reducing that risk.

The predictive model is now being used inside the electronic medical record of one of AMGA’s members, Premier Medical Associates, as part of a PCORI-funded implementation study. Of the 901 patients with prediabetes identified as high risk last year, 75% were either referred to a Diabetes Prevention Program (lifestyle intervention) or a prescription for metformin. Prior to the pilot, most hadn’t received any intervention. In addition, a significant number of patients were identified as having Type 2 diabetes, and could then be treated appropriately. Based on these results, AMGA is investigating ways to roll out the predictive risk models more broadly through cloud-based EHR integration technology.

TRANSLATION OF CONSERVATIVE TREATMENTS FOR LOW BACK PAIN
Low back pain (LBP) is a common condition, and 9% of those with low back pain are prescribed opioids. A research team from OptumLabs and Boston University School of Public Health were sponsored by UnitedHealthcare and American Physical Therapy Association to identify how initial care patterns for low back pain influence the risk of early and long-term opioid use. Findings that early-and long-term opioid use is significantly influenced by first provider type seen, combined with reduced odds that patients seeing chiropractors and physical therapists have early opioid use helped inform new benefits design at UnitedHealthcare. Plan participants enrolled in certain employer-sponsored health plans can pay $0 out-of-pocket for the first three visits if they select physical therapy or chiropractic care for LBP treatment.

The study findings and related benefits change were announced by press release in October 2019, and were communicated broadly in articles from UnitedHealthcare and OptumLabs.

SEE INFOGRAPHIC ON NEXT PAGE
LOW BACK PAIN (LBP) IS VERY COMMON AND COSTLY

~70% of people experience LBP at least once in their lifetime.

TREATMENT HAS BEEN A PATHWAY TO OPIOID USE

52% of prescribed opioids are for back pain.

9% of LBP patients are prescribed opioids.*

*Opioids are not recommended according to the latest guidelines

HOWEVER, LBP TREATMENT REMAINS HIGHLY VARIABLE IN PRACTICE.

The 2017 American College of Physicians LBP guidelines support the use of conservative therapies as first and second line treatments.

WE COLLABORATED WITH THOUGHT LEADERS AND RESEARCH PARTNERS

Established steering committee:

- American Physical Therapy Association
- OptumLabs
- Optum
- UnitedHealthcare

Selected research partner:

- BU School of Public Health

FINDINGS

Short- and long-term opioid use is significantly influenced by first provider type seen. Patients seeing chiropractors and PTs also had major decreased odds of long-term opioid use compared with those who initially saw PCPs.

CHIROPRACTOR

Short-term use: 90% decreased odds
Long-term use: 78% decreased odds

PHYSICAL THERAPIST

Short-term use: 85% decreased odds
Long-term use: 73% decreased odds
TRANSLATING LOW BACK PAIN RESEARCH

PUBLISHED IN PEER REVIEW JOURNALS
- Health insurance design — BMJ Open
- Early/long-term opioid use — American Journal of Managed Care
- Access to physical therapy — PTJ: Journal of APTA

SHARED RESULTS
- Stakeholder education
- Broad media reach

IMPLEMENTED BENEFIT DESIGN CHANGES
- $0 out-of-pocket when plan participants select physical therapy or chiropractic care for LBP treatment.
- Covers 3 free visits to outpatient, in-network physical therapist or chiropractor with additional visits normally covered under the plan.

EXPECTED PROJECT IMPACT
Based on a UnitedHealthcare analysis, by 2021 this new benefit design has the potential to lower the total cost of care:

- REDUCE SPINAL SURGERIES: 21%
- REDUCE SPINAL IMAGING TESTS: 22%
- REDUCE OPIOID USE: 19%
Our 6th annual Research & Translation Forum convened the largest array of partners and other industry thought leaders to date on November 18–19 in Boston.

Our theme was Evidence Generation and Impact in the 21st Century, which explored contemporary perspectives on medical evidence generation, evaluation of evidence and its application in the real world. Sessions showcased our research and translation work in the context of broad industry themes and honed in on maternal health on Day 2. Keynote talks at the forum included:

- **Producers and Consumers of Health Services Research: A Marriage Waiting to Happen;** Sachin Jain, MD, President, CareMore Health
- **Medicine in the Age of AI: Ethical Tensions;** Richard Sharp, PhD, Director, Biomedical Ethics Program, Mayo Clinic
- **Healthcare’s Digital Revolution: (Finally) A Time for Optimism;** Robert Wachter, MD, Chair, Department of Medicine, University of California San Francisco and author of *The Digital Doctor*
- **And Then She Was Gone: Advocating for Improved Maternal Health Care;** Charles Johnson, Founder, 4Kira4moms
- **Our Challenge to Improve Maternal Health in the U.S.;** Laura Riley, MD, Obstetrician-in-Chief, New York-Presbyterian/Weill Cornell Medical Center and Chair, Department of OBGYN, Weill Cornell Medicine
- **Better, Nuanced Conversations Between Women and their Doctors about Pregnancy and Early Childhood;** Emily Oster, PhD, Professor of Economics, Brown University and Author of *Expecting Better* and *Cribsheet*
“I really enjoyed the well-researched points of view that were supported by a lot of data I hadn’t seen, which was very informative. Overall a great event to attend.”

“I value most seeing concrete examples of translation — [it] was affirming as a researcher; the event provided an incredible opportunity to connect with others.”
ENHANCING OUR DATA AND PARTNER SUPPORT

We are constantly curating our data to make it a more robust asset to answer a variety of research questions. We are also supporting our partners in their efforts to work with our data via a range of learning programs and tools to accelerate research.

DATA ENHANCEMENTS
In 2019, we enhanced the OptumLabs Data Warehouse (OLDW) in a number of ways by introducing:

New data types:

– **Unified mortality**: We completed the rollout of the Unified Mortality table to the National and Mortality views. This allows our researchers to take advantage of many different sources of death data when evaluating a person’s mortality status.

– **Oncology survey**: We augmented the previous Oncology Survey data with information for approximately 30 new cancer types from a new prior authorization data source. We have also added 300 new oncology-related fields, which makes the OLDW a more robust data set for cancer research.

– **Provider linking re-architecture**: We implemented new provider linking logic that leverages the National Provider Identifier (NPI). Researchers can now obtain a better picture of the patient journey.

Data infrastructure improvements:

– **OLDW data dictionary explorer**: We piloted a new data dictionary tool with user interface (UI) that is available online. This new UI is more intuitive to use, easily accessible and allows researchers to drill down via a keyword search. Based on partner feedback, we will be releasing the tool to all partners in early 2020.

– **GPU infrastructure**: We delivered enhanced GPU infrastructure to partners to support their advanced analytics needs. This enabled researchers to more nimbly develop more complex algorithms such as deep-learning models to answer research questions.

– **Increased the storage foot print**: We doubled the capacity to store project related data to support larger research programs.
TRAINING AND KNOWLEDGE-SHARING

Research support:

– **Standard programs**: We introduced programs to create patient-level comorbidity scores (Charlson, Elixhauser, AHRQ and Chronic Condition Warehouse), and person-level utilization and cost metrics for inpatient, long-term care, emergency department, outpatient and office visits were added to the library of standard programs. These programs save time by eliminating the need to recode common variables.

– **New and updated FAQs**: We created new frequently asked questions (FAQs) resources that include information on 340B and the new ICD9 to ICD10 crosswalk. All existing FAQs are evaluated throughout the year to ensure that they are up to date. These documents serve as user guides that contain vital information about our data assets.

– **Technology user guides**: We developed “tips and tricks” resources for the OptumLabs research environment, available for SAS EG and R. These guides serve to get new users up and running, and can answer many common questions for new and existing users.

– **The Bridge**: continues to be the ‘go-to’ place to obtain information about OptumLabs work, upcoming partner events and resources for using the OLDW. In 2019, there were eight new instructional videos added to The Bridge to provide better training on how to conduct research projects using the OLDW. Videos cover areas such as Intro to DbVisualizer, Denominator Exercise, SAS support and others.

– **Data boot camps**: OptumLabs conducted four partner boot camps in 2019 to provide in-depth training for projects using the OptumLabs Data Warehouse. Boot camps were held in Eden Prairie, Cambridge, Irvine and San Francisco. Over 75 people attended across 17 partner organizations. In addition to our standard two-day boot camps, we also offered one-day deep dive trainings for those who needed a refresher on using the OLDW.
ALLERGY, ASTHMA AND LUNG


BIG DATA METHODS


BONE, JOINT AND MUSCLE


CANCER


DIABETES AND ENDOCRINE DISEASE


HEARING AND VISION

HEART AND STROKE


INFECTIONIOUS DISEASE


KIDNEY, LIVER, PANCREAS AND STOMACH


MENTAL HEALTH AND SUBSTANCE USE DISORDERS


2019 PUBLICATIONS

OPIOIDS AND PAIN MANAGEMENT

HEALTH SYSTEM AND POLICY

SPECIAL POPULATIONS AND AGING ISSUES

WOMEN’S HEALTH