

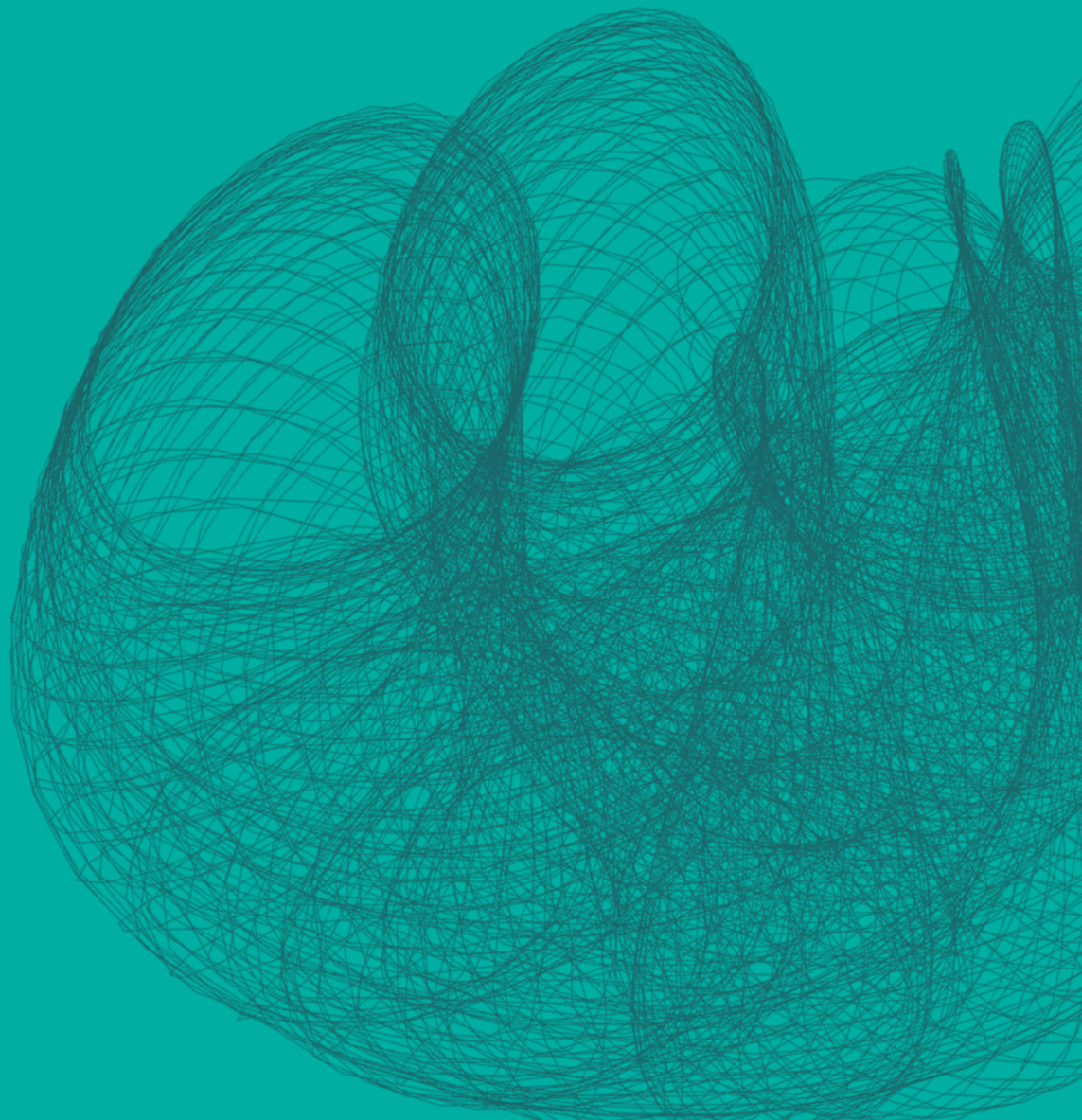


# Human Data Science Research Collaborative

ACCELERATING COVID-19-RELATED LEARNING



SEPTEMBER  
**2022**



# Introduction

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The IQVIA Institute for Human Data Science Research Collaborative has added significant knowledge and insights to the growing body of evidence about the short- and long-term impact of the COVID-19 pandemic. The Research Collaborative has to date resulted in 14 peer-reviewed publications across 13 unique medical journals. In addition, seven manuscripts are under consideration as of this writing.

The IQVIA Institute launched the Human Data Science Research Collaborative in May 2020 in an effort to support high quality academic research through the application of Human Data Science to advance the understanding of important therapeutic and health system issues arising in the era of COVID-19. Academic researchers who were approved to participate in the Collaborative were granted special access to select IQVIA data, with a waiver of traditional license fees and with the understanding that this information would only be used for studies relevant to the Research Collaborative objectives. The total estimated value of this data is \$7.6 million.

The Collaborative has two distinct purposes:

- Contributing to published, peer-reviewed research by studying the impact of the COVID-19 pandemic across stakeholders in health systems
- Demonstrating the utility of IQVIA information assets and technologies, while extending the network of academic researchers collaborating with IQVIA.

The research was also intended to apply a Human Data Science approach by generating insights at the intersection of breakthroughs in human health science and emerging data science.

Access to IQVIA data was limited, by design, to key sources determined to cover most research objectives: longitudinal prescription claims (LRx) and adjudicated medical claims (Dx) either directly through P360 or

delivered as traditional data files, and SMART for the national prescription audit, national sales perspectives, and MIDAS. Global real-world data for France, Germany and the United Kingdom was also offered but ultimately not utilized.

This status report as of September 2022 summarizes the key thematic areas addressed in the research, lists the researchers and their affiliations, provides the citation, data used and summary of each piece of published research, and describes the IQVIA data sources and platforms used by the Collaborative.

The important contributions of the Human Data Science Research Collaborative have laid the groundwork for future research initiatives with academic scholars with the dual objective of advancing the quality and impact of medical research and enhancing the application of IQVIA data assets and Human Data Science.

## Find Out More

If you wish to receive future reports from the IQVIA Institute for Human Data Science and hear about events and other activities, join our mailing list via the subscribe button at [www.iqvainstitute.org](http://www.iqvainstitute.org). If you have questions, contact us at [info@iqvainstitute.org](mailto:info@iqvainstitute.org)

## MURRAY AITKEN

*Executive Director*

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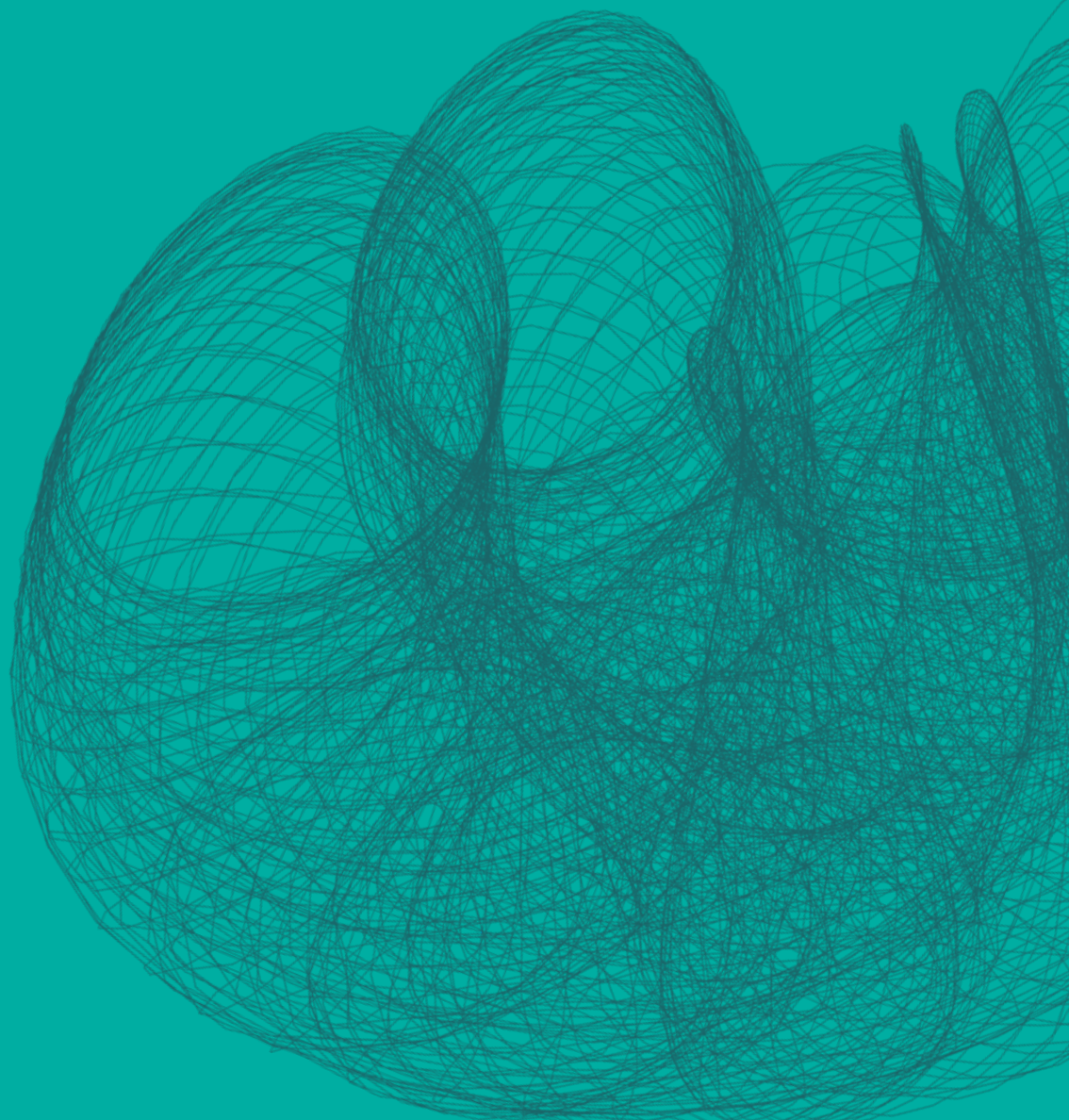
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## Key thematic areas in research

While a diverse spectrum of topics was covered in IQVIA Research Collaborative projects, there were a number of common thematic areas:

### **IMPACT OF THE PANDEMIC ON HEALTHCARE UTILIZATION, SUPPLY, AND DELIVERY**

Some studies examined the impact of the COVID-19 pandemic on the utilization, supply, and delivery of patient care:

- One study focused on decreases in care delivery due to the pandemic, specifically the decrease in primary care delivery despite large increases in the use of telemedicine, which jumped from fewer than 2% of primary care visits during 2019 to more than 35% of patient visits in Q2 2020.
- Another study looking at longitudinal prescription claims (LRx) found that COVID-19 interrupted the delivery of mental healthcare in the U.S., with a decline in the prescription of new antidepressants by 7.5%, suggesting a large unaddressed need for mental health treatment in the U.S. since the onset of the pandemic.

### **DISPARITIES IN ACCESS TO MEDICINES**

Issues around the disparity in access to medicines and therapy were the subject of some studies:

- One study looked at the increases in purchases of ICU medicines at the start of the COVID-19 pandemic. Although this increase occurred in both developed and developing countries, global supply of these essential medicines continued to favor wealthier nations. More stable and equitable distribution strategies are essential to prepare for the next pandemic shock.
- Another study revealed the heterogenous impact of COVID-19 on vaccine sales across economies, underlining the substantial and consistent disparities in per capita vaccine sales before and during the first wave of the COVID-19 pandemic. Action to ensure equitable distributions of vaccines is needed.

### **IMPACT ON SPECIFIC DISEASES AND THERAPEUTIC AREAS**

Researchers studied the impact of the COVID-19 pandemic on specific diseases and therapeutic areas:

- The pandemic has been associated with important changes in the use of anticoagulants to prevent thrombotic complications associated with COVID-19, and the increased use of direct oral anticoagulants in atrial fibrillation to prevent exposure to healthcare facilities for blood monitoring required with warfarin. After the pandemic declaration in March 2020, there was a significant increase in sales of all anticoagulant products.
- The global pandemic has placed a significant strain on hepatitis programs and interventions (screening, diagnosis, and treatment) at a critical moment in the context of the hepatitis C virus (HCV). The global response to COVID-19 led to a large decrease in direct antiviral utilization globally, with significant declines for Canada, Germany, the United Kingdom, and the United States. Deliberate efforts to counteract the impact of COVID-19 on treatment delivery are needed to support the goal of eliminating HCV.

### **CHANGES TO THE ONGOING OPIOID EPIDEMIC**

The impact of changes to the ongoing opioid epidemic was the focus in studies:

- A cross-sectional study of prescriptions from more than 90 million patients found that prescriptions for opioid analgesics and buprenorphine for opioid disorder decreased among new, but not existing patients, during the COVID-19 pandemic.
- A study looking at longitudinal prescription of the availability of medications for Opioid Use Disorder (MOUD) in jails and prisons indicated increased availability of buprenorphine/naloxone, a safe and effective MOUD in prisons and jails since the start of the COVID-19 pandemic in the U.S. despite previous barriers in its use.
- Another study of the buprenorphine prescription rate showed a decrease in prescriptions among young adults aged 12-17, suggesting a possible unmet treatment need among this group.

## — Researchers and affiliations

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## Publication summary

### Use and Content of Primary Care Office-Based vs Telemedicine Care Visits During the COVID-19 Pandemic in the US

*JAMA Network Open.* 2020 Oct 1;3(10):e2021476-

<https://jamanetwork.com/journals/jamanetworkopen/article-abstract/2771191>

Alexander GC, Tajanlangit M, Heyward J, Mansour O, Qato DM, Stafford RS

**Data used:** National Disease and Therapeutic Index

**Summary:** More than 4 months after the US Department of Health and Human Services declared a public health emergency, widespread economic and social changes in the US during the COVID-19 pandemic are still occurring. The pandemic has been associated with substantial decreases in primary care delivery, despite large increases in the use of telemedicine, which accounted for fewer than 2% of primary care visits during 2019 yet more than 35% of visits during Q2 of 2020. Evaluations of cardiovascular risk factors such as blood pressure and cholesterol have decreased, owing to fewer total visits and less frequent assessment during telemedicine encounters. Thus, the COVID-19 pandemic has been associated with changes in the structure of primary care, with the content of telemedicine visits differing from that of office-based encounters.

### Impact of the COVID-19 Pandemic on Global Anticoagulant Sales: A Cross-Sectional Analysis Across 39 Countries

*American Journal of Cardiovascular Drugs.* 2021 Mar 26:1-3

<https://link.springer.com/article/10.1007/s40256-021-00475-9>

Hernandez I, Tadrus M, Magnani JW, Guo J, Suda KJ

**Data used:** MIDAS

**Summary:** The coronavirus disease 2019 (COVID-19) pandemic has been associated with important changes in the use of anticoagulants, including the recommendation of low-molecular-weight heparin (LMWH) or fondaparinux to prevent thrombotic complications associated with COVID, and the increased use of direct oral anticoagulants (DOACs) in atrial fibrillation to prevent exposure to healthcare facilities for blood monitoring required with warfarin. Before 2020, sales of anticoagulants increased by an annual average of 6%, driven by an annual average increase in sales of DOACs of 26%. Sales of vitamin K antagonists decreased by an annual average of 8%, and sales of injectable anticoagulants remained constant. After the pandemic declaration in March 2020, there was a significant increase in sales of all anticoagulant products (p-value for level change = 0.006) and DOACs (p-value for level change = 0.019). Global sales of injectable products remained constant, while sales of vitamin K antagonists increased after the pandemic declaration, but the change was not significant (p = 0.133).

## Prescribing of Opioid Analgesics and Buprenorphine for Opioid Use Disorder During the COVID-19 Pandemic

*JAMA Network Open. 2021 Apr 1;4(4):e216147-*

<https://jamanetwork.com/journals/jamanetworkopen/article-abstract/2778564>

Currie JM, Schnell MK, Schwandt H, Zhang J

**Data used:** Longitudinal Prescription Claims (LRx)

**Summary:** This cross-sectional study analyzed prescriptions from 90,420,353 patients and found that from March 18 to May 19, 2020, total morphine milligram equivalents of opioid analgesics prescribed to existing patients followed prepandemic trends; prescriptions to opioid-naive patients were 34% below projected levels but rebounded by August 2020. Prescribing of buprenorphine for opioid use disorder followed prepandemic trends for existing patients, while prescriptions to new patients were 18% below projected levels, rebounding to 90% of projected levels by August 2020. This study suggests that prescriptions for opioid analgesics and buprenorphine for opioid use disorder decreased among new, but not existing, patients during the COVID-19 pandemic.

## Decline in New Starts of Psychotropic Medications During the COVID-19 Pandemic: Study Examines New Starts of Psychotropic Medications During the COVID-19 Pandemic

*Health Affairs. 2021 Jun 1;40(6):904-9*

<https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2021.00028>

Nason I, Stein DT, Frank RG, Stein MB

**Data used:** Longitudinal Prescription Claims (LRx)

**Summary:** COVID-19 interrupted delivery of mental health care in the US. During the initial course of the COVID-19 pandemic new starts of antidepressants declined by 7.5 percent, anxiolytics by 5.6 percent, and antipsychotics by 2.6 percent compared with expected levels. Our findings suggest that there is large unmet need for mental health treatment in the US due to COVID-19.

## Changes in Short-Term, Long-Term, and Preventative Care Delivery in US Office-Based and Telemedicine Visits During the COVID-19 Pandemic

*JAMA Health Forum 2021 Jul 2 (Vol. 2, No. 7, pp. e211529-e211529). American Medical Association*

<https://jamanetwork.com/journals/jama-health-forum/fullarticle/278191>

Cortez C, Mansour O, Qato DM, Stafford RS, Alexander GC

**Data used:** National Disease and Therapeutic Index

**Summary:** In this cross-sectional study, there was a moderate rebound in office-based care during the second half of 2020, while telemedicine accounted for 23.9% of care observed. Office-based care during the pandemic (quarters 2-4 of 2020) involved 58.0% long-term, 23.0% short-term, and 25.6% preventive diagnoses, while telemedicine care involved substantially greater long-term (77.2%), modestly greater short-term (26.8%), and almost no preventive (2.7%) diagnoses. In contrast to office-based care, telemedicine was more commonly used for established patients and substantially greater delivery of psychiatric or behavioral treatments than preventive care.

## Global Utilization Trends of Direct Acting Antivirals (DAAs) During the COVID-19 Pandemic: A Time Series Analysis

*Viruses*. 2021 Jul;13(7):1314

<https://www.mdpi.com/1999-4915/13/7/1314>

Shakeri A, Konstantelos N, Chu C, Antoniou T, Feld J, Suda KJ, Tadrus M

**Data used:** MIDAS

**Summary:** The 2019 novel coronavirus (COVID-19) pandemic has placed a significant strain on hepatitis programs and interventions (screening, diagnosis, and treatment) at a critical moment in the context of hepatitis C virus (HCV) elimination. We sought to quantify changes in Direct Acting Antiviral (DAA) utilization among different countries during the pandemic. We conducted a cross-sectional time series analysis between 1 September 2018 and 31 August 2020, and examined the percent change in DAA units dispensed (e.g., pills and capsules) from March to August 2019 to the same period of time in 2020 across the 54 countries. Interrupted time-series analysis was used to examine the impact of COVID-19 on monthly rates of DAA utilization across each of the major developed economies (G7 nations). Overall, 46 of 54 (85%) jurisdictions experienced a decline in DAA utilization during the pandemic, with an average of  $\square 43\%$  (range:  $\square 1\%$  in Finland to  $\square 93\%$  in Brazil). All high HCV prevalence (HCV prevalence  $> 2\%$ ) countries in the database experienced a decline in utilization, average  $\square 49\%$  (range:  $\square 17\%$  in Kazakhstan to  $\square 90\%$  in Egypt). Across the G7 nations, we also observed a decreased trend in DAA utilization during the early months of the pandemic, with significant declines ( $p < 0.01$ ) for Canada, Germany, the United Kingdom, and the United States of America. The global response to COVID-19 led to a large decrease in DAA utilization globally. Deliberate efforts to counteract the impact of COVID-19 on treatment delivery are needed to support the goal of HCV elimination.

## Prescription Drug Dispensing to US Children During the COVID-19 Pandemic

*Pediatrics*. 2021 Aug 1;148(2)

<https://www.publications.aap.org/pediatrics/article-split/148/2/e2021049972/179779/Prescription-Drug-Dispensing-to-US-Children-During>

Chua KP, Volerman A, Conti RM

**Data used:** National Prescription Audit

**Summary:** Prescription dispensing to children declined by one-quarter in April to December 2020 compared with April to December 2019. Declines were greater for infection-related drugs than for chronic disease drugs. Decreased dispensing of the latter is potentially concerning and warrants further investigation. Whether reductions in dispensing of infection-related drugs are temporary or sustained will be important to monitor going forward.

## Changes in Purchases for Intensive Care Medicines During the COVID-19 Pandemic: A Global Time Series Study

*Chest*. 2021 Aug 11

<https://www.sciencedirect.com/science/article/pii/S0012369221036321>

Kim KC, Tadrus M, Kane-Gill SL, Barbash IJ, Rothenberger S, Suda KJ

**Data used:** MIDAS

**Summary:** In this global study, we observed an increase in purchases for ICU medicines at the start of the COVID-19 pandemic. Although this increase occurred in both developed and developing countries, global supply of these essential medicines continued to favor wealthier nations. Although purchasing of cheap, generic drugs may not change as drastically during public health emergencies compared with other medicines, disparities still exist within the global drug supply chain. National and transnational organizations should focus on building more stable, equitable distribution strategies to prepare for the next pandemic shock.



## Mapping Global Trends in Vaccine Sales Before and During the First Wave of the COVID-19 Pandemic: A Cross-Sectional Time-Series Analysis

*BMJ Global Health.* 2021 Dec 1;6(12):e006874

<https://gh.bmj.com/content/6/12/e006874.abstract>

Zeitouny S, Suda KJ, Mitsantisuk K, Law MR, Tadrour M

**Data used:** MIDAS

**Summary:** In March 2020, global sales of vaccines dropped from 1211.1 per 100 000 to 806.2 per 100 000 population in April 2020, an overall decrease of 33.4%; however, the vaccine sales interruptions recovered disproportionately across economies. Between April 2020 and August 2020, we found a significant decrease of 20.6% ( $p < 0.001$ ) in vaccine sales across high-income countries (HICs), in contrast with a significant increase of 10.7% ( $p < 0.001$ ) across lower middle-income countries (LMICs), relative to the same period in 2019. From August 2014 through August 2020, monthly per capita vaccine sales across HICs remained, on average, at least four times higher than in LMICs and nearly three times higher than in upper middle-income countries. Our study revealed the heterogeneous impact of COVID-19 on vaccine sales across economies while underlining the substantial consistent disparities in per capita vaccine sales before and during the first wave of the COVID-19 pandemic. Action to ensure equitable distribution of vaccines is needed.

## Changes in the Availability of Medications for Opioid Use Disorder in Prisons and Jails in the United States During the COVID-19 Pandemic

*Drug and Alcohol Dependence.* 2022 Jan 11:109291

<https://www.sciencedirect.com/science/article/pii/S037687162200028X>

Dadiomov D, Trotzky-Sirr R, Shooshtari A, Qato DM

**Data used:** National Sales Perspectives

**Summary:** The availability of MOUD in jails and prisons increased by 471.3% between January 2018 (52,784 EU) and October 2020 (333,226 EU). This increase was largely driven by increased volume of buprenorphine/naloxone and was not observed in other institutional facilities, including hospitals, clinics and long-term care, and. Specifically, the mean monthly volume of buprenorphine/naloxone at prisons/jails increased every month before the pandemic by 1860 EU (95% CI, 1110–2360). In March 2020, the mean volume of buprenorphine/naloxone increased by 81,930 EU (95% CI, 59,040–104,820) per month, followed by a significant increase of 24,010 EU (95% CI 19,530–28,490) per month during the pandemic vs before the pandemic. These findings may indicate increased availability of buprenorphine/naloxone, a safe and effective MOUD, in prisons and jails since the start of the COVID-19 pandemic in the U.S. despite previous barriers in its use.

## Effect of the COVID-19 Pandemic on Adversity in Individuals Receiving Anticoagulation for Atrial Fibrillation: A Nationally Representative Administrative Health Claims Analysis

*American Heart Journal Plus: Cardiology Research and Practice.* 2022 Feb 4:100096

<https://www.sciencedirect.com/science/article/pii/S2666602222000131>

Hernandez I, Gabriel N, He M, Guo J, Tadrour M, Suda KJ, Magnani JW

**Data used:** Longitudinal Prescription Claims (LRx), Unadjudicated Medical Claims (Dx)

**Summary:** Atrial fibrillation (AF) is strongly associated with clinical adversity, including increased hospitalization and bleeding and stroke events. We examined the effect of the SARS-2 Coronavirus 2019 (COVID-19) pandemic on such events in individuals with AF receiving oral anticoagulation. The dataset used included 1,439,145 individuals (half with age  $\geq 75$  years; 47.6% women) receiving oral anticoagulation. We determined a 19% decrease in emergency room visits following the pandemic declaration and 8% decrease in inpatient admissions. In contrast admissions for stroke and bleeding were not affected by the declaration of the pandemic. These results describe the temporal effect of the COVID-19 pandemic on clinical adversity – hospitalizations, strokes, and bleeding events – in individuals receiving oral anticoagulation for AF. Our analysis quantifies the decrease in clinical adversity accompanying COVID-19 in a large, highly representative U.S. health claims database.

## Global Consumption of Antimicrobials: Impact of the WHO Global Action Plan on Antimicrobial Resistance and 2019 Coronavirus Pandemic (COVID-19)

*Journal of Antimicrobial Chemotherapy.* 2022 Feb 18

<https://academic.oup.com/jac/advance-article/doi/10.1093/jac/dkac028/6530407?login=true>

Khouja T, Mitsantisuk K, Tadrour M, Suda KJ

**Data used:** MIDAS

**Summary:** A cross-sectional time-series analysis using a dataset of monthly purchases of antimicrobials (antibiotics, antivirals and antifungals) from August 2014 to August 2020. Antimicrobial consumption per 1000 population was assessed pre-pandemic by economic development status using linear regression models. Interventional autoregressive integrated moving average (ARIMA) models tested for significant changes with pandemic declaration (March 2020) and during its first stage from April to August 2020, worldwide and by country development status. The global decrease in antimicrobial consumption pre-pandemic suggests a positive impact of the WHO GAP-AMR. During the pandemic, an initial increase in antimicrobial consumption was followed by a decrease worldwide. AMR plans should specify measures to ensure full implementation of AMR efforts during health crises such as the COVID-19 pandemic.

## Treatment of Opioid Use Disorder with Buprenorphine Among US Adolescents and Young Adults During the Early COVID-19 Pandemic

*Journal of Adolescent Health.* 2022 May 17

<https://www.sciencedirect.com/science/article/pii/S1054139X22003834>

Alinsky RH, Prichett L, Chang HY, Alexander GC, Stein BD, Saloner B

**Data used:** Longitudinal Prescription Claims (LRx)

**Summary:** The monthly buprenorphine prescription rate increased 8.3% among AYAs aged 12–17 but decreased 7.5% among 18- to 24-year-olds and decreased 5.1% among 25- to 29-year-olds. In these age groups, Medicaid prescriptions did not significantly change, whereas commercial insurance prescriptions decreased 12.9% among 18- to 24-year-olds and 11.8% in 25- to 29-year-olds, and cash/other prescriptions decreased 18.7% among 18- to 24-year-olds and 19.9% in 25- to 29-year-olds ( $p < .001$  for all). Buprenorphine prescriptions paid with commercial insurance or cash among young adults significantly decreased early in the pandemic, suggesting a possible unmet treatment need among this group.

## Changes in Use of Oral Androgen Pathway Directed Medications During the COVID-19 Era

*Urology Practice.* 2022 Jul;9(4):279-83

<https://www.auajournals.org/doi/full/10.1097/UPJ.0000000000000310>

Rosen GH, Davies BJ, Murray KS

**Data used:** Longitudinal Prescription Claims (LRx)

**Summary:** Several studies describe changes in treatment and diagnosis of prostate cancer (PCa) due to the COVID-19 pandemic, with rapid decreases in screening, biopsy and management in early 2020. Oral androgen pathway directed medications (APDM) delay growth of PCa, though use is typically limited to subsets of patients with advanced PCa. We hypothesized that there would be changes in use of APDM during the first months of 2020 related to delayed diagnosis and attempts to mitigate risk related to postponed PCa treatment. We describe our analysis of a contemporary database of oral APDM dispensing during the COVID-19 pandemic. There was a downward shift in short course bicalutamide fills, with fewer patients on flare prevention. There was increased use of long course bicalutamide, potentially as a bridge while awaiting treatment. Future researchers should study the impacts of out-of-standard-sequence APDM administration and urologists should use caution when treating malignancy outside of the standard of care.

## Data sources and platforms

### **IQVIA Analytics Engine**

A web-based platform that allows users to extract, analyze and report complex patient studies with a robust selection of data query parameters and cohort selection options.

### **Longitudinal Prescription Claims (LRx)**

IQVIA receives nearly 4 billion prescription claims per year with history from January 2006 with coverage over 90% for the retail channel, 60–85% for mail service, and 75–80% for long-term care. Longitudinal data derives from electronic data received from pharmacies, payers, software providers and transactional clearinghouses. This information represents activities that take place during the prescription transaction and contains information regarding the product, provider, payer, and geography. Rx data is longitudinally linked back to an anonymous patient token and is linkable to events within the data set itself and across other patient data assets.

### **Unadjudicated Medical Claims (Dx)**

Dx data are pre-adjudicated claims collected from office-based physicians and specialists. These data are sourced from CMS-1500 form-based claim transactions, the standard reimbursement form for all non-cash claims. Medical claims data includes patient-level diagnosis and procedures for visits to U.S. office-based individual professionals, ambulatory and general healthcare sites. The medical claims data includes more than 205 million patients, over 1.7 billion claims and 3 billion service records obtained annually.

### **SMART**

A web-based analytics solution, bringing together the industry's leading syndicated information assets onto a robust, visually dynamic, business intelligence framework, enabling a blend of data and technology for flexible modeling of complex queries and informing critical decisions.

### **MIDAS**

A unique platform for assessing worldwide healthcare markets, MIDAS integrates IQVIA's national audits into a globally consistent view of the pharmaceutical market, tracking virtually every product in 693 therapeutic classes and provides estimated product volumes, trends and market share through retail and non-retail channels across 77 countries. MIDAS data is updated monthly and retains 12 years of history.

### **National Disease and Therapeutic Index**

A compilation of patterns and treatment of disease during patient encounters with office-based physicians, NDTI data includes prescriber, patient, product, and diagnosis variables with up to 72 months of history. Information is collected from a statistically representative sample of prescribers and projected to create a national estimate. Frequently used in the analysis of drug regimens, on or off-label prescribing, patient/physician characteristics and Rx/Sales allocation.

### **National Prescription Audit**

The industry standard source for national pharmaceutical prescription activity, NPA measures demand in terms of dispensed prescriptions to consumers across three unique pharmacy channels: retail, mail service, and long-term care. IQVIA collects new and refilled prescription data daily from sample pharmacies covering 93% of outpatient prescription activity, and projects this information to create a national estimate for all products, therapeutic classes and manufacturers.

### **National Sales Perspectives**

Measures dollar and unit sales for pharmaceutical products across multiple distribution channels, including retail, mail, and non-retail. Data is collected from a panel of wholesalers, distributors and pharmaceutical manufacturers representing 90% of the pharmaceutical market and projected to a national total.

# About the Institute

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The IQVIA Institute for Human Data Science contributes to the advancement of human health globally through timely research, insightful analysis and scientific expertise applied to granular non-identified patient-level data.

Fulfilling an essential need within healthcare, the Institute delivers objective, relevant insights and research that accelerate understanding and innovation critical to sound decision making and improved human outcomes. With access to IQVIA's institutional knowledge, advanced analytics, technology and unparalleled data the Institute works in tandem with a broad set of healthcare stakeholders to drive a research agenda focused on Human Data Science including government agencies, academic institutions, the life sciences industry and payers.

## Research Agenda

The research agenda for the Institute centers on 5 areas considered vital to contributing to the advancement of human health globally:

- Improving decision-making across health systems through the effective use of advanced analytics and methodologies applied to timely, relevant data.
- Addressing opportunities to improve clinical development productivity focused on innovative treatments that advance healthcare globally.
- Optimizing the performance of health systems by focusing on patient centricity, precision medicine and better understanding disease causes, treatment consequences and measures to improve quality and cost of healthcare delivered to patients.

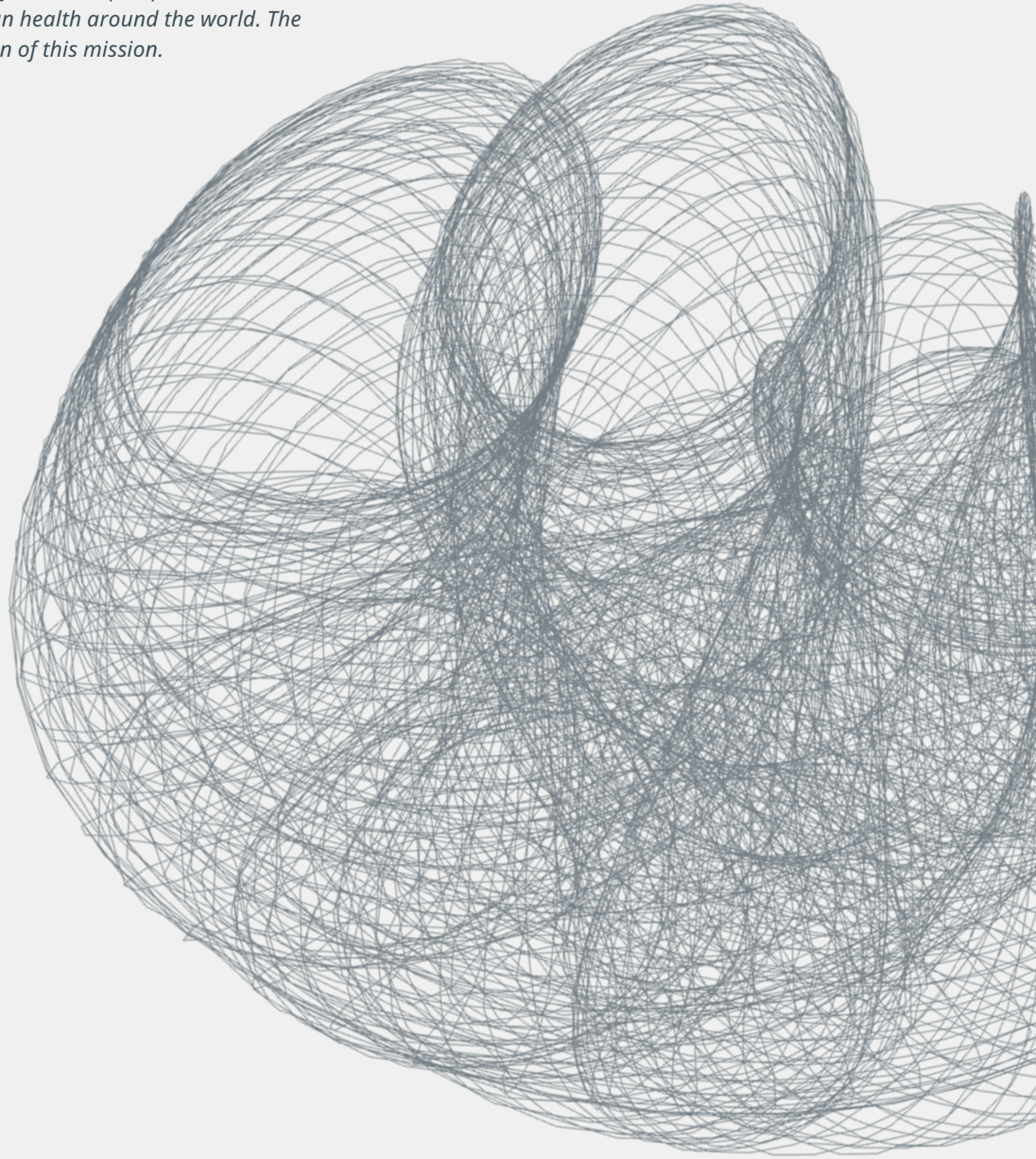
- Understanding the future role for biopharmaceuticals in human health, market dynamics, and implications for manufacturers, public and private payers, providers, patients, pharmacists and distributors.
- Researching the role of technology in health system products, processes and delivery systems and the business and policy systems that drive innovation.

## Guiding Principles

The Institute operates from a set of guiding principles:

- Healthcare solutions of the future require fact based scientific evidence, expert analysis of information, technology, ingenuity and a focus on individuals.
- Rigorous analysis must be applied to vast amounts of timely, high quality and relevant data to provide value and move healthcare forward.
- Collaboration across all stakeholders in the public and private sectors is critical to advancing healthcare solutions.
- Insights gained from information and analysis should be made widely available to healthcare stakeholders.
- Protecting individual privacy is essential, so research will be based on the use of non-identified patient information and provider information will be aggregated.
- Information will be used responsibly to advance research, inform discourse, achieve better healthcare and improve the health of all people.

*The IQVIA Institute for Human Data Science is committed to using human data science to provide timely, fact-based perspectives on the dynamics of health systems and human health around the world. The cover artwork is a visual representation of this mission.*



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