Premier Healthcare Database:

Data That Informs and Performs

**Premier Applied Sciences®,
the Research Division of Premier Inc.**

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This white paper provides a detailed description of the attributes and capabilities of the Premier Healthcare Database (PHD), which has been utilized by the pharmaceutical and device industries, academia, healthcare insurers and healthcare policy makers for clinical, financial and outcomes analyses. Since the year 2000, more than 650 publications in peer-reviewed journals – *the gold standard for publishing research* – have included more than 110 articles written by Premier staff in multiple therapeutic and quality improvement/patient safety areas (**Premier Applied Sciences® website**). Details on data source, type and scope are outlined. Premier Applied Sciences® is the Research Division of Premier Inc. and is responsible for leveraging the HIPAA-compliant PHD through its highly professional and experienced team.

INTRODUCTION

Electronic healthcare databases house "big data" and offer several advantages as a robust research tool[1-3]. A comprehensive hospital-based healthcare history of each patient in the healthcare system may be available. Patients and physicians are not involved in data collection, thus eliminating potential bias that may come with being observed. Since data accrues from a large diverse population, rare outcomes and long-term effects can be studied. The data reflects the state of clinical practice in the general population. These real-world databases lend themselves to the creation of profiles of drug use and physician prescribing practices and the conduct of post-marketing studies on treatment effectiveness, safety issues and cost-effectiveness. Due to its electronic format, information is readily accessible. With appropriate approvals in place, healthcare databases from multiple sources including electronic medical records and claim databases may be able to be linked to provide additional analytic power. In addition, a new paradigm is emerging for use of real-world evidence from a variety of real-world data sources to supplement randomized clinical trials and support regulatory decision making for drugs and devices[4,5].

BACKGROUND

The Premier Healthcare Database (PHD) is one of the most comprehensive electronic healthcare databases. It originates from the merger of Premier with American Healthcare Systems and SunHealth in 1997, when the largest healthcare network of its time was created[6]. The Premier Alliance committed to investing significant financial resources into a database to improve quality of care[7]. Since that time, Premier Inc. has emerged as a leader in healthcare transformation. From Premier's early beginnings as a Group Purchasing Organization to its leadership in patient safety and quality improvement initiatives, the PHD has been a valuable resource to the pharmaceutical and device industries, academia, federal and national healthcare agencies (including the Centers for Disease Control and Prevention, Centers for Medicare Services[8], Food and Drug Administration[9], and National Institutes of Health), as well as to Premier's member hospitals and health systems to improve healthcare delivery, quality, and reduce costs. The PHD, formerly known as the Premier Research Database, Premier Hospital Database, Premier Perspective™ Database, Premier Perspective™ Comparative Hospital Database and Premier Analytical Database has more than 1,113 contributing hospitals/healthcare systems. The PHD provides a unique opportunity to use real-world data to

conduct evidence-based and population-based analyses of drugs, devices, other treatments, disease states, epidemiology, resource utilization, healthcare economics and clinical outcomes.

PREMIER HEALTHCARE DATABASE

Overview

The PHD is a large, U.S. hospital-based, service-level, all-payer database that contains information on inpatient discharges, primarily from geographically diverse non-profit, non-governmental and community and teaching hospitals and health systems from rural and urban areas. Hospitals/healthcare systems submit administrative, healthcare utilization and financial data from patient encounters. Inpatient admissions include over 127 million[*] visits with more than 11 million[*] per year since 2012, representing approximately twenty-five percent of annual United States inpatient admissions (https://www.aha.org/system/files/2018-05/2018-chartbook-table-3-1.pdf). Outpatient encounters include over 947 million[*] outpatient visits, with more than 102 million[*] visits per year since 2012. Outpatient visits to emergency departments, ambulatory surgery centers and alternate sites of care are included. The PHD contains data from over 244 million[*] unique patients. Using a unique masked identifier, patients can be tracked in the same hospital across the inpatient and hospital-based outpatient settings, with the ability to assess hospital length of stay and readmissions to the same hospital. The PHD contains a subset of data from the Premier QualityAdvisor™ Platform that offers de-identified, HIPAA compliant data. Depending upon the nature of the research, using PHD data may be considered exempt from Institutional Review Board (IRB) oversight as dictated by [Title 45 Code of Federal Regulations, Part 46 of the United States, specifically 45 CFR 46.101(b)(4)](). In addition, in accordance with the HIPAA Privacy Rule, disclosed data from the PHD are considered de-identified per [45 CFR 164.506(d)(2)(ii)(B) through the "Expert Determination" method]().

Premier's hospital [quality improvement technology solution](), Quality Advisor™, contains 45 percent of all United States discharges. Premier Quality Advisor™ measures and analyzes performance to improve patient outcomes and reduce costs by integration of quality, safety and financial data. This is accomplished through benchmarking clinical and financial outcomes against peer hospitals; comparing internal and external performances in shaping best decisions; identifying care practice variations; reducing mortality, complications, readmissions and hospital-associated conditions; monitoring ongoing efforts to improve quality, resource utilization, and efficiency; and complying with regulatory reporting requirements.

[*]Note: All metrics reported within the White Paper are based upon 2000 – December 31, 2019) data available September 7, 2020

The PHD is a dynamic database that is updated weekly, with data accruing since January 2000. Since 2012, there have been more than 740 hospitals contributing data each year. To date, the PHD now maintains cumulative information from more than 1,113 hospitals. The number of years that hospitals/healthcare systems have been providing data to Premier, Inc. is represented in the longitudinal graph below.

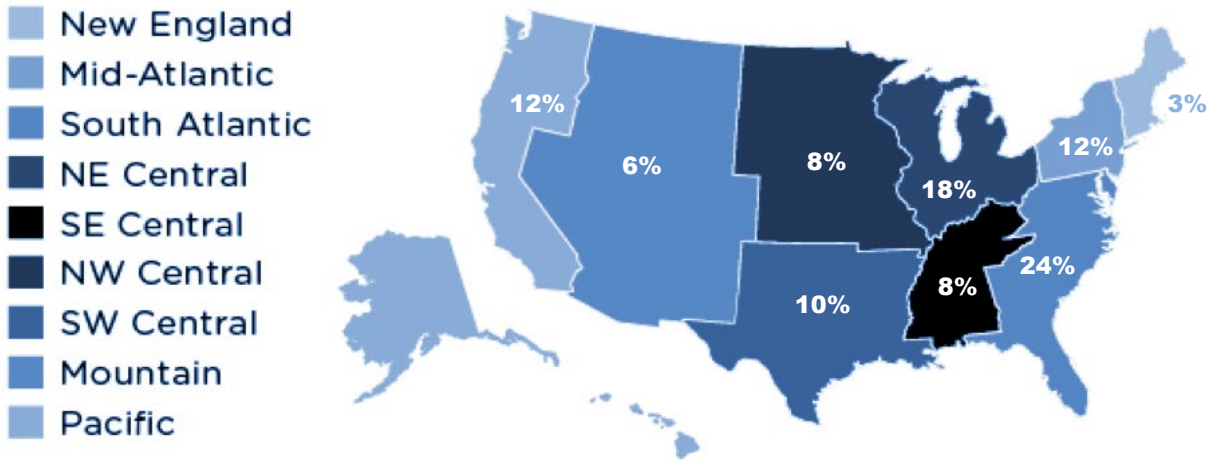**NUMBER OF YEARS BY NUMBER OF HOSPITALS CONTRIBUTING DATA (2000-2019)**
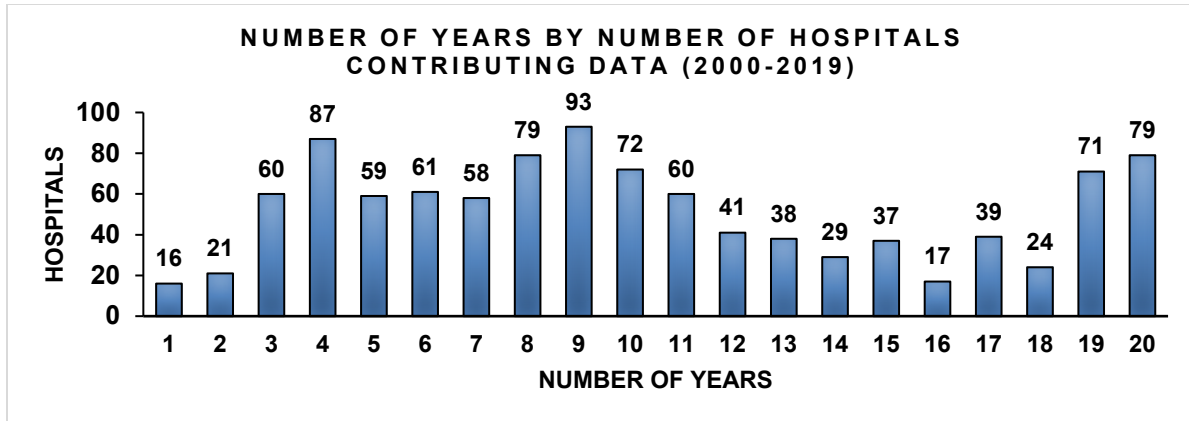
The PHD contains information on hospital and visit characteristics; admitting and attending physician specialties; healthcare payers; and patient data from standard hospital discharge billing files. This data includes demographics and disease states; admission and discharge diagnoses; information on billed services including costs at the departmental level such as medications and devices, laboratory tests performed, diagnostic and therapeutic services; microbiology test results (for a subset of hospitals); and patient disposition and discharge health status. For most data elements, less than one percent of patient records having missing information and for key elements, such as demographics and diagnostic information, less than 0.01 percent have missing data[10].
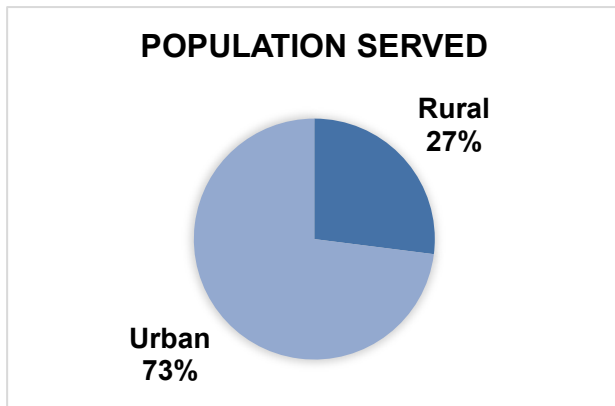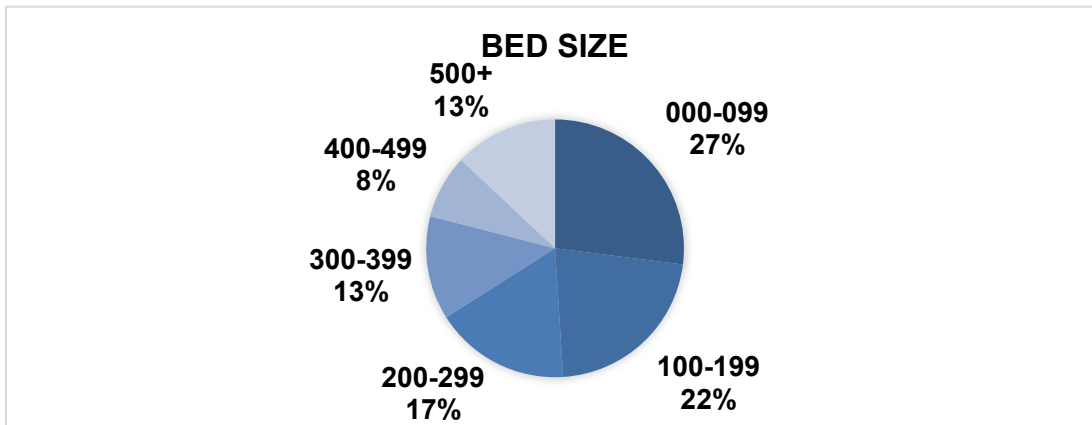
Hospital and Visit Characteristics

The PHD utilizes member hospital statistics provided through a combination of self-report and the American Hospital Association Annual Survey Database™. Hospitals in the PHD represent the four geographic regions and their respective divisions defined by the United States Census (Northeast: *New England, Middle Atlantic*; Midwest: *East North Central, West North Central*; South: *South Atlantic, East South Central, West South Central*; West: *Mountain, Pacific*).

UNITED STATES CENSUS GEOGRAPHIC DIVISIONS

Legend:
- New England
- Mid-Atlantic
- South Atlantic
- NE Central
- SE Central
- NW Central
- SW Central
- Mountain
- Pacific

Map percentages: 12%, 3%, 6%, 8%, 12%, 18%, 24%, 10%, 8%

Hospital characteristics of bed capacity, urban and rural populations served, and teaching status are recorded for all hospitals contributing data.

BED SIZE
- 500+ 13%
- 400-499 8%
- 300-399 13%
- 200-299 17%
- 100-199 22%
- 000-099 27%

POPULATION SERVED
- Rural 27%
- Urban 73%

The United States Census defines an urban area as a territory whose core census block groups or blocks have a population density of at least 1000 people per square mile, and surrounding census blocks have an overall density of at least 500 people per square mile. Rural areas are considered territory outside the definition of urban (https://www.census.gov/geo/reference/urban-rural.html).

TEACHING STATUS

Teaching 29%

Non-Teaching 71%
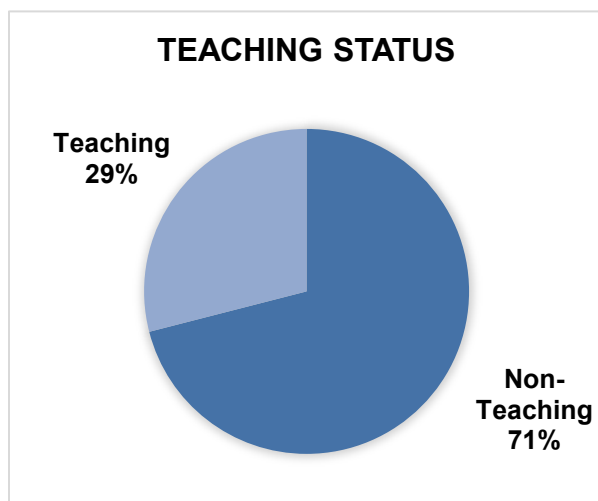
A teaching facility has either a Medical school affiliation reported to the American Medical Association or a documented affiliation agreement with a medical school accredited by the Association of American Medical Colleges Liaison Committee on Medical Education. These organizations must sponsor or participate significantly in at least four approved active residency programs. At least two of the approved residency programs should be in medicine, surgery, obstetrics/gynecology, pediatrics, family practice, or psychiatry.

Comparisons of the 2018 member hospital characteristics from the PHD with those from the American Hospital Association (AHA) demonstrate a similar distribution, although the AHA has a greater number of smaller member hospitals.

	PHD (2018)	AHA DATABASE (2018)*
	N (%)	N (%)
All Facilities	766 (100)	4,364(100)
Provider Region		
Midwest	204 (26.6)	1,320 (30.2)
Northeast	115 (15.0)	534 (12.2)
South	336 (43.9)	1,632 (37.4)
West	111 (14.5	878 (20.1)
Rural/Urban		
Rural	228 (29.8)	1,051 (24.1)
Urban	538 (70.2)	3,313(75.9)
Beds		
000-099	229 (29.9)	2,220 (50.9)
100-199	173 (22.6)	891 (20.4)
200-299	119 (15.5)	509 (11.7)
300-399	95 (12.4)	294 (6.7)
400-499	51 (6.7)	164 (3.8)
500+	99 (12.9)	286 (6.6)
Teaching Status		
Non-Teaching	549 (71.7)	2,582 (59.2)
Teaching	217 (28.3)	1,782 (40.8)

*Latest available data from the AHA

Hospital-Level Encounter Data

Visit level information available in the PHD includes admitting and attending physician specialties, point of origin, type of admission and discharge status (including mortality). Definitions are based on the elements found in hospital claims derived from the uniform billing form (UB-04) and categorized into Premier standard definitions, as well as Premier's proprietary Data Dictionary.

HOSPITAL-LEVEL ENCOUNTER DATA
POINT OF ORIGIN
NON-HEALTHCARE FACILITY
• Patients coming from home or workplace, or patients receiving care at home (such as home health service)
CLINIC OR PHYSICIAN'S OFFICE
TRANSFER
• Ambulatory Surgery Center; another Home Health Agency
• Distinct unit to another in same hospital with separate claim
• Healthcare facility or Born outside hospital
• Hospice, under plan or enrolled
• Skilled nursing facility
• Hospital (different facility)
• Other/unknown such as born inside hospital, Court/Law Enforcement, Information not available
TYPE OF ADMISSION
EMERGENCY
• Patient requires immediate medical intervention as a result of severe, life threatening or potentially disabling conditions. Generally, the patient was admitted through the emergency room
URGENT
• Patient required immediate attention for the care and treatment of a physical or mental disorder. Generally, the patient was admitted to the first available and suitable accommodation
TRAUMA CENTER
• Visits to a trauma center/hospital as licensed or designated by the State or local government authority authorized to do so, or as verified by the American College of Surgeons and involving a trauma activation
ELECTIVE
• Patient's condition permitted adequate time to schedule the availability of suitable accommodations.
OTHER/UNKNOWN
• Newborn
• Information not available
DISCHARGE STATUS
TRANSFER TO ANOTHER HEALTH CARE FACILITY
• Discharged/transferred to another type of health care institution not defined elsewhere in this list with or without a planned acute care hospital inpatient readmission
• Nursing facility certified under Medicaid but not certified under Medicare with or without a planned acute care hospital inpatient readmission
• Facility that provides custodial or supportive care with or without a planned acute care hospital inpatient readmission
• Short term general hospital for inpatient care with or without a planned acute care hospital inpatient readmission
• Skilled nursing facility (SNF) with Medicare certification with or without a planned acute care hospital inpatient readmission
• Designated cancer center or children's hospital with or without a planned acute care hospital inpatient readmission
• Federal health care facility with or without a planned acute care hospital inpatient readmission
• Inpatient rehabilitation facility (IRF) including rehabilitation distinct part units of a hospital with or without a planned acute care hospital inpatient readmission
• Medicare certified long term care hospital (LTCH) with a planned acute care hospital inpatient readmission
• Critical Access Hospital (CAH)
• Other short term general hospital for inpatient care

TRANSFER TO ANOTHER CARE FACILITY (CONTINUED)
- Intermediate care facility (ICF)
- Another type of institution for inpatient care (including distinct parts); Psychiatric hospital or psychiatric distinct unit of a hospital
- Skilled nursing facility (SNF) with Medicare certification in anticipation of covered skilled care
- Within this institution to a hospital-based Medicare approved swing bed, nursing facility, designated cancer center or children's hospital; another type of health care institution not defined elsewhere in code list; long term care hospitals; another rehabilitation facility

HOME
- Home/self-care
- Home or self-care with a planned acute care hospital readmission
- Home care of organized home health service organization
- Home under care of organized home health service organization with a planned acute care hospital inpatient readmission
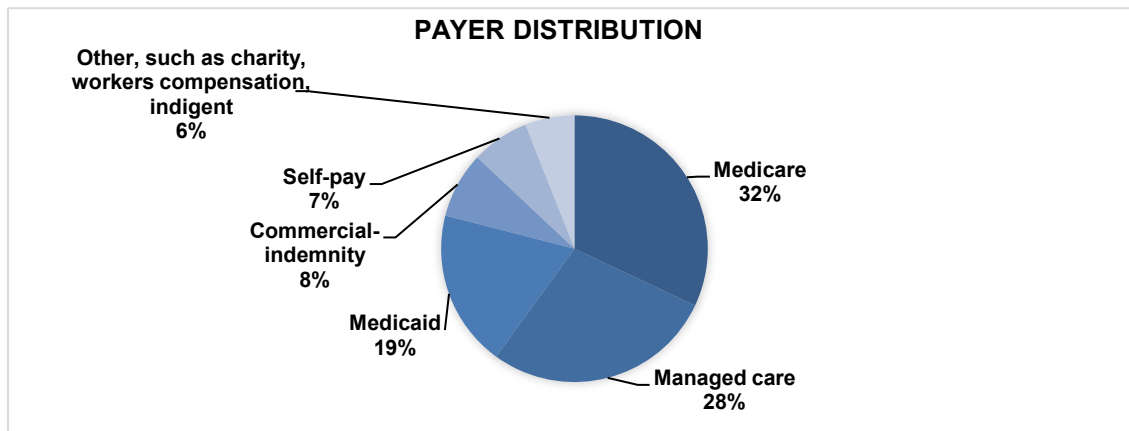
HOSPICE

EXPIRED

OTHER/UNKNOWN
- Left against medical advice
- Court/law enforcement with or without a planned acute care hospital inpatient readmission
- Still patient or expected to return for outpatient services
- Information not available

Type of primary payer coverage information adds an important dimension to the PHD and is a useful surrogate for socioeconomic status of patient.

PAYER DISTRIBUTION

- Medicare 32%
- Managed care 28%
- Medicaid 19%
- Commercial-indemnity 8%
- Self-pay 7%
- Other, such as charity, workers compensation, indigent 6%

Patient- and Service-Level Data

Patient demographics include age, sex, race (white, black, other) and ethnicity (Hispanic, non-Hispanic). International Classification of Diseases (ICD) Diagnosis Codes for each hospital encounter (ICD-9 for discharge dates prior to 10/1/2015 or ICD-10 for discharge dates on or after 10/1/2015) identify disease states and comorbid conditions. ICD procedure codes (version 9 and 10 as described above) as well as hospital submitted Current Procedural Terminology (CPT) and Healthcare Common Procedure Coding System (HCPCS) codes identify diagnostic and therapeutic procedures ordered during hospital encounters. There is no limit on the number of ICD diagnosis codes that are provided, therefore, all codes provided by the hospital are

contained within the PHD.

Detailed pharmacy data including brand/generic drug names, strength, dosing, route of administration, day of service charge, and quantity charged are available in the PHD. Medical devices and supply utilization can also be identified with day of service charge. The PHD also contains microbiology laboratory result data from over 400 hospitals, including specimen ID, test name, test day of service and time, specimen source, result, sensitivity data, and observation status (ie, final, corrected) cumulatively from 2009 forward. Since 2017, more than 365 hospitals provide in-hospital laboratory results. Patient vitals including height, weight, blood pressure, heart rate, and temperature are also available, with a select group of hospitals providing respiratory function.

The PHD has the required data necessary for the generation of several clinical algorithms. 3M™ All Patient Refined™ Diagnosis Related Group (APR™-DRG), Severity of Illness (APR-SOI), and Risk of Mortality (APR-ROM) accounts for age, procedures and clinical severity of primary diagnosis and all secondary diagnoses assigned in the course of hospitalization and are computed for each patient at the time of hospital discharge[11]. Elixhauser Comorbidity Index measures patient comorbidity based on ICD-9 and ICD-10 diagnosis codes and has been found to be predictive of hospital resource use and in-hospital mortality[12-14]. Charlson Comorbidity Index measures overall health status through assessment of comorbidities at time of discharge[14-16]. Each comorbidity category has an associated weight based on the adjusted risk of one-year mortality, and the sum of all the weights results in a single comorbidity score for a patient. A score of zero indicates that no comorbidities were found. The higher the score, the more likely the predicted outcome will result in higher resource use or mortality. Cunningham Bleeding Score identifies oral anticoagulant bleeding-related hospitalizations calculated from a primary discharge[17].

Billing and Financial Data

Costs (fixed and variable) to the hospital and charges to the payer can be determined from the PHD. The PHD charge master (CDM) is a comprehensive table of items billable to a hospital patient or a patient's health insurance provider. It includes hospital services, medical procedures, equipment fees, supplies, drugs and diagnostic evaluations such as imaging and laboratory tests. Days of services/supplies/drugs ordered, delivered/administered, and billed are documented. Each item in the CDM is assigned a unique identifier code and a set price that is used to generate patient bills. Each hospital system maintains its own CDM. Reimbursement data is unavailable within these data, as it remains proprietary information held by the hospitals

and payers.

Two versions of cost are available. Procedural costs are determined by each hospital using their own cost accounting systems. For hospitals that are identified as ratios of costs to charges (RCC), the hospitals provide Premier with the charge data, and teams at Premier work with the hospitals to assign Medicare Cost to Charge Ratios (MCCR) to the data provided. Regardless of the source of the cost and charge data, they are reviewed and validated against the data from the hospital at the visit and total numbers within certain variances, before use within the database.

Uses of Data

Data from the PHD provides insights into patient characteristics, patient care patterns, outcomes and burden of illness over time, and for a wide range of therapeutic areas and products/devices. Market assessments, comparative effectiveness analyses, cost analysis and cost-effectiveness studies are frequently conducted using the PHD. Data licensing permits external companies to perform analytics using the data. While the PHD data cannot be used for linking with other databases, additional approvals may be obtained for specific projects that would allow the healthcare database to be linked to other databases such as electronic medical records and claim databases. Member hospitals can assess resource utilization, patient outcomes and clinical and benchmark performances. These metrics satisfy ORYX® reporting requirements and core performance measurements of The Joint Commission, formerly known as Joint Commission on Accreditation of Healthcare Organizations (JCAHO). In response to COVID-19, the PHD provides biweekly updates on COVID-19 case counts and patient characteristics. Moreover, it can provide valuable real-world data related to COVID-19 management and facilitate retrospective analysis of healthcare utilization and economics before and during COVID-19.

To date, a total of 658 Premier Database publications appear in scholarly journals. 111 publications authored by a Premier researcher appear in 75 peer-reviewed journals between 2006 and December 2019. 547 publications that did not have a Premier researcher as an author appear in 203 peer-reviewed journals from 2000 to December 2019. The graph below highlights the progressive increase of publications using Premier data[†] from 2000 through 2019.

Premier Database Publications (2000-2019*)
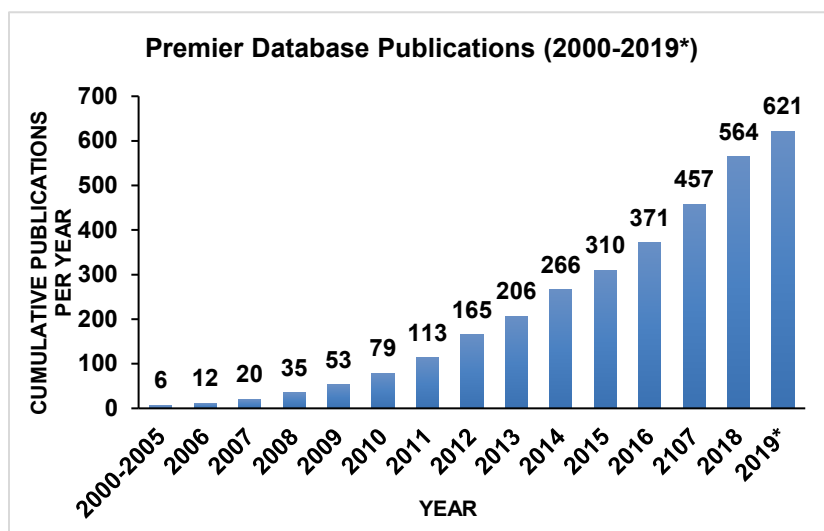
†*Small number of publications utilize Premier data sources (i.e., Operation Advisor, QUEST) other than the PHD*

ABOUT PREMIER APPLIED SCIENCES

Premier Applied Sciences (PAS) is the Research and Analytics Division of Premier Inc. with a dedicated staff of skilled professionals (https://www.premierinc.com/transforming-healthcare/healthcare-performance-improvement/premier-applied-sciences/) with diverse education, expertise and working experience.

The PAS Research and Analytics team consists of highly specialized professionals formally trained in disciplines spanning Medicine, Pharmacy, Epidemiology, Public Health, Economics, Mathematics, Statistics and Computer Sciences. This team provides an experienced and uniquely qualified interface and partnership between clients and the PHD to create robust analytic output in a timely manner. The *Research Scientists,* with complete knowledge of the data available from the PHD, work closely with our clients to create customized research protocols and statistical analysis plans ranging from descriptive studies to advanced statistical models used in adjusted analysis to provide high quality, real-world evidence. Reports summarizing the work and results are provided to our clients with slide decks, if requested. The *Analysts* on the teamwork in partnership with the *Research Scientists* to develop research protocols by combining their expertise and knowledge of the data, research study designs and methodologies, and programming skills to create data extracts and analytic files; generate tables, figures, and graphs; and provide statistical programming support. The *Research and*

Analytics Team provide publication support to develop abstracts, presentation posters/slides, and manuscripts.

The *PAS Design and Implementation (D&I) Team* develops, tests, implements, and measures improvement strategies that address healthcare challenges. Our experienced clinicians and management professionals have expertise in areas including quality improvement science, implementation, content management, health care education, population health management; provider, patient and family engagement; qualitative research, and evidence-based medicine. The *D&I* team works closely with clients to outline responsive project plans that include literature reviews; quantitative and qualitative research incorporating survey design to capture barriers and knowledge gaps at all levels of the health care system, user experience assessments, virtual and in-person educational content; solutions development to address gaps identified; adoption of clinical decision support tools, and compelling publications to disseminate findings broadly.

The *PAS Research Operations Team* is responsible for the execution of prospective research projects that include various study designs including, but not limited to, pre-post evaluation of an intervention, chart reviews, and observational/comparative effectiveness studies. Our highly skilled Research team, made up of research professionals, clinicians, and doctoral-level researchers, has a wealth of research experience. The *Research Operations* team works with clients to define research questions, design research protocols, and implement research projects within the regulatory boundaries. The *Research Operations* team also has extensive experience preparing Institutional Review Board submissions and responding to their queries to achieve approval. The *Research Operations* team's capabilities include creating theory-driven data collection instruments, quality measure development, study site management and oversight, development and deployment of performance management platforms, as well as preparation of research abstracts, posters and manuscripts.

The *Recruitment Team* serves as a liaison between PAS teams, the client, and Premier member hospitals/health systems that may wish to participate in projects. The *Recruitment* team consists of seasoned Premier staff who work closely with our member sites to garner interest and participation in the various projects brought forth by Industry. The *Recruitment* staff work closely with Customer Success Teams across PAS who have deep rooted relationships with Premier Members and who can connect these members to PAS projects.

The PAS teams work together to disseminate findings and outcomes through publications, conferences and existing Premier products and services. PAS expert staff includes a full-time

experienced *Medical Writer Communication Specialist* to assist with abstracts, poster/slide presentations, and manuscripts, and conference and journal submissions.

The *Commercial Team* are seasoned professionals who liaison between clients and the rest of PAS to ensure constant dialogue about current and future project needs. Their experience in the pharmaceutical, medical device, and healthcare industries enhances their ability to assist clients in utilizing data and analytics to support value-based propositions and drive behavior change through prospective interventions.

The PAS *Project Operations Management Team* is a group of skilled and experienced project management professionals who work across PAS to provide support for internal and external projects. The project managers use best practice standardized project management tools for client and team communications, milestone tracking, Sunshine Act reporting, and invoicing.

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