Comparative Health System Performance Initiative: Compendium of U.S. Health Systems, 2018, Technical Documentation

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I. Introduction

In 2015, the Agency for Healthcare Research and Quality (AHRQ) created the Comparative Health System Performance (CHSP) Initiative to study how healthcare systems promote evidence-based practices in delivering care.[i] AHRQ's goal is to understand the factors that affect health systems' use of patient-centered outcomes research (PCOR) and to identify best practices in disseminating and using PCOR.

To this end, the initiative established three Centers of Excellence (CoEs) as well as a Coordinating Center to identify, classify, track, and compare health systems. AHRQ established CoEs at Dartmouth College, the National Bureau of Economic Research (NBER), and the RAND Corporation. Mathematica serves as the initiative's Coordinating Center, working collaboratively with AHRQ and the CoEs to facilitate synthesis of findings on comparative health system performance, build a Compendium of health system resources, and support dissemination of the CHSP Initiative findings.

A key goal of the initiative is to identify and enumerate health systems. To achieve this objective, AHRQ has developed a list of U.S. health systems. The 2016 and 2018 lists of systems consolidate information from several data sources, indicating system ownership and provider affiliations with systems and highlighting key system attributes. The 2018 consolidated list, referred to as the "list," is intended to be a resource for researchers, policymakers, and other stakeholders who want to identify and describe systems and examine changes over time with the ultimate goal of understanding how health systems can improve the cost and quality of healthcare.

The list forms the basis of the Compendium of U.S. Health Systems, which resides on AHRQ's website (https://www.ahrq.gov/chsp/index.html). This document summarizes the approach taken to create the list. In section II, we describe the Compendium's working definition of a health system and the two key data sources that contributed to the development of the list:

1. IQVIA OneKey[ii], and
2. American Hospital Association (AHA) Annual Survey Database.

In section III, we present the methodology used to create and refine the list, including changes from the methodology used in 2016. In section IV, we describe the variables used to identify system attributes. Finally, in section V, we present caveats and limitations of the methodology used to construct the list.

[i] Additional information on the CHSP Initiative can be found at: https://www.ahrq.gov/chsp/index.html.

[ii] IQVIA maintains two integrated databases relevant to the study of health system performance under the umbrella of Healthcare Relational Services: OneKey Organizations, formerly known as HCOS, and OneKey Professionals, formerly known as HCPS. Throughout the document, we refer to these databases jointly as OneKey with the exception of Appendix A, in which we use the full names of both OneKey databases because we describe how they are related to each other.

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II. Health System Definition and Data Sources

A. Working Definition of a Health System

The initial phase of developing the list aimed to operationally define "health system" within the context of the CHSP Initiative. Recognizing the importance of this question, the Coordinating Center convened a working group composed of members of the CoEs, Coordinating Center, and AHRQ. The working group held a series of meetings in the summer of 2016 and engaged the CHSP Technical Expert Panel (TEP) to formulate and refine a working definition of a health system. The proposed working definition for the Compendium is:

> *A health system includes at least one hospital and at least one group of physicians that provides comprehensive care (including primary and specialty care) who are connected with each other and with the hospital through common ownership or joint management.*[iii]

For the purposes of the list, the goal was to start with a simple and relatively unambiguous, albeit narrow, working definition of a health system that can be operationalized with available data. This approach allows the timely release of a list that is relatively current and describes organized health systems in the United States of a type important to stakeholders in many communities.

We recognize this definition has limitations, especially the "at least one hospital" requirement. This requirement excludes some well-established provider organizations that provide comprehensive management of their patient populations without an ownership or tight comanagement relationship with a hospital.

The expectation is that the identification and enumeration of health systems will evolve over time as research and new data sources reveal possible alternative definitions and methods to operationalize them. Therefore, the Compendium's working definition and the list of health systems informed by it will evolve as research clarifies the diverse formal relationships between and among healthcare providers. In addition, the CHSP Initiative includes a robust set of research activities that draw on several other definitions of health systems. For more information about these definitions, see: https://www.ahrq.gov/chsp/chsp-reports/resources-for-understanding-health-systems/defining-health-systems.html.

B. Data Sources

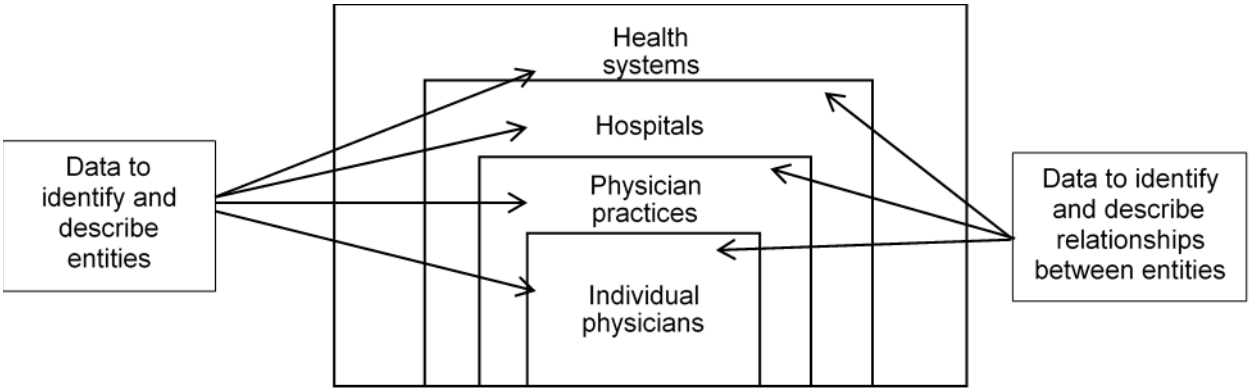
Multiple data sources are needed to identify health systems, characterize providers and affiliated organizations, and describe organizational and professional relationships (Figure II.1). Moreover, a host of data sources are available to study health system components and their attributes, such as the American Medical Association Masterfile and Medicare Data on Provider Practice and

[iii] Foundation models of health system organization are considered a form of joint management. Joint participation in an accountable care organization (ACO) is not by itself indicative of joint management. In addition, "group" is not synonymous with a separately organized medical group. A hospital that employs community-based physicians who provide comprehensive care (but were not organized as a medical group) would be considered a health system.

Specialty (MD-PPAS).[iv] However, only a handful of sources explicitly identify systems or indicate relationships among organizations that can be used to identify which groups of organizations constitute a system. These data sources include:

- IQVIA OneKey Database.
- AHA Annual Survey Database (AHA).
- Provider Enrollment, Chain, and Ownership System (PECOS).
- Internal Revenue Service (IRS) 990 forms.

Figure II.1. Data needs to study health systems



Source: Cohen GR, Jones DJ, Heeringa K, et al. Leveraging diverse data sources to identify and describe U.S. healthcare delivery systems. eGEMs 2017 Dec;5(3).

Table II.1 provides a brief description of each data source, including the name of the data holder, intended use of the data, extent of health system identifiers and components within the data file, and availability of the data.

When examining a data source, we sought to determine if it (1) contained health system identifiers; (2) included information on hospitals, medical groups, and physicians; and (3) was nationally representative and current. We opted to use OneKey and AHA data to inform the development of the list. Both data sources allow the identification of health systems and hospitals and are nationally representative. In addition, OneKey enables the identification of physicians and medical groups.

PECOS and IRS 990 data are timely and publicly available, and they contain information reported directly to the Federal Government. These data sources represent promising options for constructing a detailed list of health systems and the providers that make up those systems from information submitted by individual providers and provider organizations themselves. However, initial work by the CHSP team highlights challenges yet to be fully resolved when using these

[iv] MD-PPAS is a provider-level dataset that assigns Medicare providers to medical practices based on tax identification numbers (TINs). It contains provider National Provider Identifiers and offers information on provider specialty beyond the Centers for Medicare & Medicaid Services (CMS) provider specialty classification. Research identifiable files are available for the time period 2008–2017. These files are accessible at https://www.resdac.org/cms-data/files/md-ppas.

data sources to identify health systems that meet the working definition. For example, IRS 990 data are only applicable to provider organizations owned by not-for-profit organizations.

Table II.1. Potential data sources for health system identification

Source	Data Holder	Intended Purpose	Types of Systems Identified	System Components	Availability
OneKey	IQVIA	Reference database for sales and marketing purposes	Integrated healthcare delivery networks (IDNs)	Physicians, advanced practice clinicians, medical groups, hospitals, and nursing homes	Available for purchase
AHA Annual Survey Database	AHA	Hospital database for health services research and trend analyses	Common ownership among providers and organizations	Hospitals	Available for purchase
Medicare PECOS	Centers for Medicare & Medicaid Services (CMS)	Enrollment database enumerating Medicare program participation	Vertical integration among associated organizations	Chain home office and owner/ manager reported for providers/ hospitals	Public for a limited version; through data use agreement for the full version
IRS 990 and Schedule R	IRS	Financial database for the purpose of tax reporting	Vertical integration among associated organizations	Related organizations under not-for-profit systems	Publicly available

Source: Cohen GR, Jones DJ, Heeringa J, et al. Leveraging diverse data sources to identify and describe U.S. healthcare delivery systems. eGEMs 2017 Dec;5(3). Revised to reflect changes in potential data sources since publication of Cohen et al. (2017).

PECOS data submission requirements apply primarily to Medicare providers; furthermore, the submission requirements do not ensure that ownership linkages between individual clinicians and hospitals are reported in a complete and consistent manner. In addition, medical groups may be represented using a variety of approaches in PECOS, with some medical groups represented by a single tax identification number (TIN) but other groups clustering their physicians across multiple different TINs. Thus, for developing this list, we opted to not use IRS 990 or PECOS data. However, AHRQ, the CoEs, and the Coordinating Center continue to explore these and other approaches to enumerating health systems and the providers that are part of these systems.

OneKey maintains frequently updated databases that contain information on health systems, physicians, advanced practice clinicians, hospitals, and nursing homes nationwide. It contains system- and facility-level data on staffing, beds, and facility type, as well as physician-level data on specialty and affiliations. Data are collected through a combination of telephone surveys and administrative sources and describe relationships between providers and hospitals and group practices, as well as among facilities, via purchasing and contracting mechanisms.

AHA data are based on an annual survey of hospitals in the United States. The AHA Annual Survey Database provides facility-level data about organizational structure, services, staffing, expenses, system affiliations, and physician arrangements.

The data we used to construct the 2018 list differed in one major way from the data we used to construct the 2016 list. In 2018, we used OneKey and AHA data, whereas in 2016, we used Healthcare Organization Services (HCOS) and SK&A Healthcare Databases (both of which were constructed by QuintilesIMS) and AHA data. Since we created the 2016 list, QuintilesIMS became known as IQVIA; IQVIA produces OneKey, which is largely similar to HCOS. IQVIA stopped producing SK&A Healthcare Databases. Thus, in practical terms, the key difference between the data sources used in constructing the 2016 and 2018 lists is that the data sources used in 2018 do not include SK&A data.

Appendix A contains a brief overview of the data collection methods for OneKey and AHA. Information about how the Compendium's working definition of health system aligns with that of OneKey and AHA is contained in Table II.2.

Table II.2. Comparison of the Compendium's working health system definition with HCOS, SK&A, and AHA

	CHSP	OneKey	AHA
Unit of study	Health systems	Integrated delivery networks (IDNs) identified in the data	Hospital systems
Health system definition	A health system includes at least one hospital and at least one group of physicians that provides comprehensive care (including primary and specialty care) who are connected with each other and with the hospital through common ownership or joint management.	An organization that has direct responsibility for centralizing the purchasing or contracting of its affiliated hospitals and ancillary care facilities; it also offers a continuum of care through services at acute and nonacute sites. An IDN owns, leases, manages, or establishes a purchasing affiliation with two or more healthcare delivery sites. IDNs include at least one acute care hospital and one nonacute organization.	Either a multihospital or a diversified single hospital system. A multihospital system is two or more hospitals owned, leased, sponsored, or contract managed by a central organization.[v]
Required provider types	At least one hospital and one group of physicians	At least one hospital and one nonacute care provider	Multihospital or a diversified single hospital
Relationship among entities in system	System owns or manages included providers.	System owns, manages, leases, or establishes purchasing (contracting) affiliations with entities.	System owns, leases, religiously sponsors and/or manages health providers.

Each data source's definition of "health system" has similarities with the Compendium's working definition of health systems. At a high level, they include systems that integrate multiple

[v] AHA. Fast Facts on U.S. Hospitals. http://www.aha.org/research/rc/stat-studies/fast-facts.shtml. Accessed February 9, 2021.

providers, including hospitals and physicians. Both data sources emphasize inclusion of hospitals, but other included provider types vary. Similarly, both focus on system ownership or management of included providers and include purchasing or contracting affiliations.

To the extent that the definitions of systems in the data sources differ from the Compendium's working definition of health systems, the consolidated list will also reflect systems that do not quite align with the concept of systems included in the working definition. In subsequent sections, we describe steps taken to further align the systems in the list with the working definition.

Table II.3 presents the time periods reflected in the data and the number of systems included in the data sources before any matching or combining of systems across data sources and exclusions of systems that do not meet the Compendium's working definition.

Table II.3. Number of systems contained in each data source

	OneKey	AHA
Year of data used	2018	2017
Number of systems identified	973	424

Note: We incorporated the most current years of data available from the sources at the beginning of the effort to develop the list.

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III. Methodology

Due to differences in data collection methodologies, the data sources offer differing counts of health systems, as shown in Table II.3. The variation is due to differences in the underlying definition of health system in each data source, differences in the way that each data source treats subsidiary health systems (standalone vs. nested under a parent health system), and differences in data collection methods.

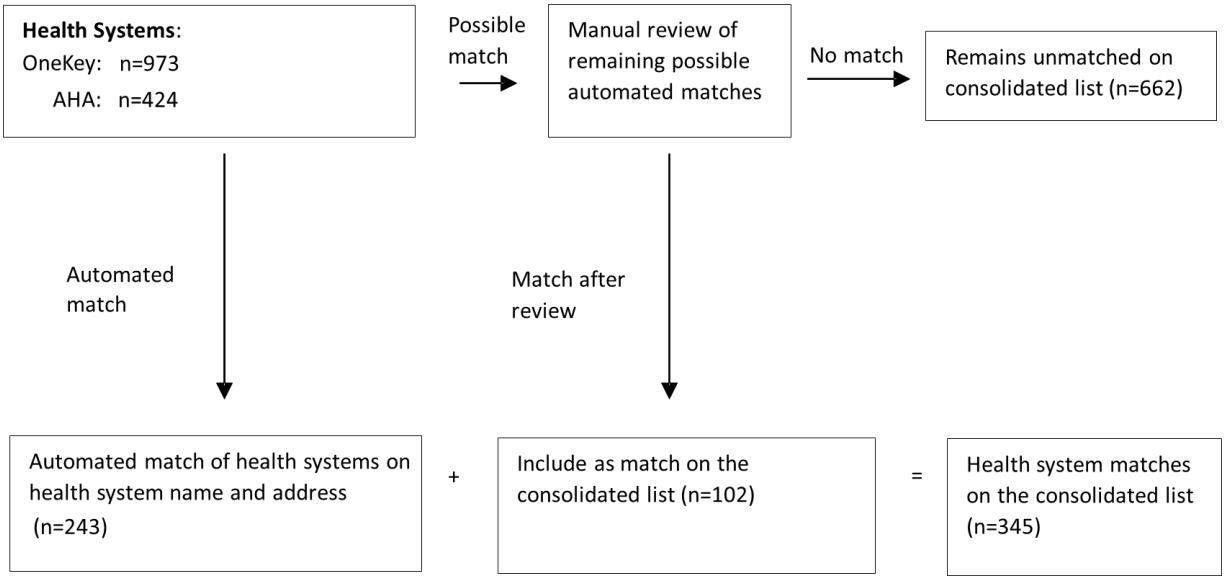
In this section, we provide a detailed description of the approach we took to combine the two data sources to develop a consolidated list of health systems that meet the Compendium's working definition of systems:

1. We begin by summarizing the automated and manual techniques we applied to identify and match systems across data sources and create a set of unique systems that are candidates for the final list (Step 1).
2. We describe how we linked OneKey and AHA data at the hospital level. We also explain how we aggregated physician and hospital counts within parent health systems (Step 2).
3. We then summarize the exclusion criteria we applied to further refine the list to include only health systems that meet the working definition (Step 3).
4. We close the section with a description of the final manual review and editing of the list (Step 4).

A. Step 1: Matching and Linking Health Systems Across Data Sources

In this section, we describe the approach used to match systems across the two data sources to form a deduplicated list of unique health systems. We first describe the automated matching techniques used to identify health systems and the results from that process. Then, we describe the approach we used to identify possible additional matches that required further review (manual matching) and the results from that process. Figure III.1 provides a high-level depiction of the matching process.

Figure III.1. Automated and manual matching process



1. Automated matching process

We compared names of health systems to identify systems that matched across at least two of the data sources. We first processed the names by:

- Removing all punctuation,
- Converting all text to uppercase,
- Removing "the," "and," and "of" from health system names,
- Removing "inc," "corp," "corporation," and "company" from health system names, and
- Normalizing common terms (that is, system = systems, health care = healthcare).

We then identified potential matches in an automated fashion using a combination of name and address matching, via character-string matching and distance-based matching using geocoding, respectively.

We used the SAS COMPGED function to compare the similarity of health system names across data sources. SAS COMPGED generates a score that reflects the number of deletions, insertions, or replacements needed to make two strings match—the lower the score, the better the match. If a string matches exactly, the SAS COMPGED score is zero. Inserting one character to derive a match results in a score of 100. Adding a punctuation character results in a score of 30.

We aggregated the scores for the different deletions, insertions, and replacements needed for health system names or addresses to match to yield a total score. For example, if a health system required the addition of one character to match, the SAS COMPGED score associated with the match would be 100. We considered only those matches between data sources that yielded a SAS COMPGED score of ≤150, reflecting an extremely close match.

We also used geocoding to determine the linear distance between health system addresses based on the geocoded latitude and longitude of the street addresses of the health systems. When

geocoding based on street address was not feasible, as is the case with post office boxes, we geocoded to the next lowest available level of geography (that is, ZIP Code or city).

If the SAS COMPGED score was ≤150 and the geocoded addresses were within 1 mile of each other, the health systems were considered an exact match. Of those remaining, if the linear distance between health systems' street addresses was less than one-half of a mile, the health systems were considered an exact match, regardless of name. Automated matching resulted in 243 health system matches (see Appendix B).

In addition to matching organizations identified as systems by OneKey and AHA, we matched unmatched systems in the AHA data to owner subsidiaries (that is, entities that are below the system level in the OneKey hierarchy of organizations) of unmatched systems in the OneKey data. The rationale for this step is that the name and address of an AHA system may be more similar to the name and address of an owner subsidiary in OneKey rather than the name and address of the parent system. This process identified six possible matches, two of which we identified as valid matches. In those two cases, we linked the AHA system to the parent system in OneKey.

2. Manual review of possible matches based on name and location

We used the SAS COMPGED scores and distances between systems to identify additional possible matches for manual review. We manually reviewed health systems with the following characteristics:

- Possible matched systems within 0.5 miles of each other
- Possible matched systems with a SAS COMPGED score ≤150 but greater than 1 mile apart and in the same city
- Possible matched systems with a SAS COMPGED score >150 and ≤500 and in the same city and State
- Possible matched systems with a SAS COMPGED score ≤150 on truncated names (to increase the likelihood of a match based on the beginning portion of the name) and in the same State
- Possible matched systems within 10 miles of each other
- Possible matched systems in the same ZIP Code area or the same city

Manual review included comparison of the full system name and all address information associated with a health system (that is, street and mailing addresses). As part of the manual review, we conducted web searches to assist in identifying matches. When searching, we looked not only for name and address information but also for information about the health system's various locations, the breadth of the health system's services, and evidence of mergers or acquisitions.

The most useful approach to access this information was to select the "About" or "History" link on the health system's website. Historical information about systems and relationships between systems helped us understand discrepancies in the data—for example, 2015 AHA data would not have reflected health systems that merged in 2016, which we would learn about via web searching.

Table III.1 contains examples of manual matching using OneKey–AHA data. Sanford Health has a SAS COMPGED score of 0 across the two data sources, meaning that names matched exactly. However, it failed the automated match because the distance between the address listings of the two identically named systems is greater than 1 mile.

Allina Health had the same address in both datasets. However, it failed the automated match because its SAS COMPGED score was 500.

In the third case, Penn Medicine, a SAS COMPGED score of 500 was also generated. Penn Medicine and University of Pennsylvania Health System were in close proximity (1.1 miles) but not clearly a match based solely on name. Thus, we conducted a web search for University of Pennsylvania Health System and found that it is "doing business as" Penn Medicine, resulting in another match.

Table III.1. Examples of manually matched health systems

OneKey Health System Name	AHA Health System Name	Distance	SAS COMPGED Score
Sanford Health	Sanford Health	5.0	0
Allina Health System	Allina Health	0	500
Penn Medicine	University of Pennsylvania Health System	1.1	500

The manual review of the possible health system matches identified through the automated process yielded an additional 102 confirmed matches.

Summary of final automated matches. We identified 345 health system matches, 243 through automated means and 102 through automated means with manual review. After this phase of matching, 662 unmatched health systems remained (Table III.2).

Table III.2. Summary of matching results

Data	N
Number of health systems matched	**345**
Number of health systems unmatched	
OneKey only	596
AHA only	66
Total unmatched	**662**
Total health systems	**1,007**

B. Step 2: Matching Hospitals Across Data Sources and Aggregating Counts

As we developed the list, we were aware that some medium and large health systems have smaller, geographically defined health systems nested within them. In developing the list, we referred to the nested health systems as subsystems within parent systems. We identified possible nested relationships through automated health system-to-hospital and hospital-to-hospital matching across data sources, with subsequent manual review.

1. Identifying possible additional nested relationships for manual review

Hospital-to-hospital matching. We also matched hospitals across data sources, using CMS Certification Number (CCN). The purpose of this match was to identify health systems with previously unidentified relationships, including subsystem to parent system relationships. This step was particularly useful in identifying health systems that merged or were acquired by another health system. For example, in a few cases, a hospital name matched across two data sources, but the health system name for the two hospitals differed. Through web searching, we determined that one system acquired the other or the two health systems merged. In these cases, we updated the names to reflect the correct updated health system name. For more information about hospital-to-hospital matching, refer to the technical documentation for the 2018 hospital linkage file on the AHRQ CHSP website.[vi]

Health system-to-hospital matching. We identified potential nested relationships by performing name and address matching between unmatched health systems in one source and unmatched hospitals in the other source using the SAS COMPGED function and distance between the system and hospital addresses. The theory is that one data source might identify a health system that meets the Compendium's working definition of a health system, while another might identify it as an entity within a second health system. This process identifies such a system as a potential subsystem and the second system as a potential parent system. In addition, this process helps identify potential additional true matches; that is, systems that are in fact the same system across data sources (discussed above in Step 1).[vii] The unmatched health system to unmatched hospital matching identified only a handful of potential matches, and none were valid.

2. Aggregating physician and hospital counts within health systems

Once the automated matching and identification of nested relationships were complete, we aggregated the components of parent systems (physicians, medical groups, and hospitals) to obtain the total system-level counts before applying exclusion criteria (discussed below in Step 3).[viii] First, we assigned hospitals to health systems at the highest level (for example, hospitals of subsystems were assigned to its parent system). We then aggregated physicians, medical groups, and hospitals to the highest health system level. For example, we summed the total count of physicians across all hospitals in the health system and applied the count to the health system as the total number of physicians in the health system.

Assigning hospitals to health systems. To assign hospitals to health systems, we applied the following rules:

[vi] The Hospital Linkage File and technical documentation for the Compendium of U.S. Health Systems, 2018, are at https://www.ahrq.gov/chsp/Compendium/index.html.

[vii] Through this process, we identified a handful of system-level joint ventures in which two or more systems joined to form a new system, while still operating the original systems involved in the joint venture. In these cases, we treated the new system as well as the original systems as unique systems.

[viii] In a few cases, we determined that an entity defined as a system in the 2018 OneKey or AHA data should be treated as a subsystem and nested within a parent system after we compared a draft version of the 2018 consolidated list with a list of parent and subsystems in 2016.

1. First, we deduplicated hospitals across sources based on hospital name and location. This task was needed because not all hospitals in the AHA and OneKey data had CCNs or AHA IDs. We also removed hospitals that did not report a CCN or AHA ID and did not match another hospital based on name or location.
2. Hospitals reported as being affiliated with only one health system were assigned to that health system. Of the 6,741 unique hospitals with a CCN or AHA ID reported in the two data sources, 4,976 were contained in one health system only, and 429 were contained in two or more health systems. The remaining 1,336 were not affiliated with any health system.
3. We manually reviewed hospitals that were identified as being in more than one health system due to either discrepancies across data sources or multiple systems listed in a single data source to determine the system to which the hospital belonged. In most cases, the multiple systems were in fact the same system with a different name or systems that were nested within each other (that is, subsystems and parent systems). In the former case, we updated the list to indicate that these systems were a match, and the hospital belonged to this system; in the latter case, we assigned the hospital to the parent system.

   In some cases, the systems were system-level joint ventures, in which multiple systems have a formal relationship with a subsystem. In these cases, we assigned the subsystem to one of its two parent systems using the following decision rules (in order):

   - When it is clear based on a manual review of systems' websites that one parent system is the majority owner or taking responsibility for running the day-to-day operations of the subsystem, we assign the subsystem to this system.
   - In the absence of other information, we assign the subsystem to the system whose headquarters location is close to the location of the subsystem; that is, we aim to assign local systems over regional or national systems.

   The remaining cases were hospital-level joint ventures, in which multiple systems have a formal relationship with a hospital(s). In these cases, we assigned the hospitals using the following decision rules (in order):

   - When it is clear based on a manual review of systems' and hospitals' websites that one system is the majority owner or taking responsibility for running the day-to-day operations of the hospital, we assign the hospital to this system,
   - We assign the system based on investor-owned status; that is, if the hospital is investor owned as reported in the Healthcare Cost Report Information System (HCRIS) data[ix], and only one of the systems is investor owned, we assign the hospital to the investor-owned system, and
   - In the absence of other information, we assign the hospital to the system whose headquarters location is close to the location of the hospital; that is, we aim to assign local system over regional or national systems.

[ix] We describe the HCRIS data in more detail in section IV.

Aggregating hospital and physician counts within health systems. The next step after assigning hospitals to health systems was to create the aggregate counts needed to apply the exclusion criteria. This step included an aggregate count of non-Federal general acute care hospitals, all physicians, and primary care physicians. In cases of parent-subsystem relationships, we ensured that the counts for the parents reflected the total counts for the entire system, including the counts of the subsystems that compose the parent system. Table III.3 summarizes the data sources used to generate the aggregate counts.

Counts of the number of physicians affiliated with health systems varied substantially between OneKey and AHA. The variation represents several differences in the physicians included in the counts from the data sources. The highest counts were typically found in OneKey, which is in part because IQVIA attempts to enumerate both hospital-based physicians and those working in office-based practices. In addition, we limited the OneKey counts to physicians who had close affiliations with facilities in the system based on conversations with IQVIA staff. These close affiliations are identified as attending for hospitals; staff and treating for long-term care facilities; and all affiliations for other facility types. This approach excludes physicians from the counts with looser affiliations such as admitting privileges at hospitals.[x]

The AHA data do not enumerate individual physicians, but the survey asks about counts of physicians in various hospital-physician relationships; we sum physicians across integrated salary, equity, and foundation models. The data collection methods used by each source to count the number of physicians in a health system are described in Appendix A.

Table III.3. Data sources for generating aggregated counts of physicians and hospitals

Aggregate Counts	OneKey	AHA
Non-Federal general acute care hospital	(1) Not a government or veteran-owned/run facility and (2) flagged as an acute care general hospital, critical access hospital, or children's hospital.	(1) Not Air Force, Army, Navy, Public Health Service, veteran, Federal, Indian Health Service, or Department of Justice facilities and (2) the hospital provides one or more of the following services: general medical and surgical or children's general medical and surgical care or is a critical access hospital or a major or minor teaching hospital based on resident to bed ratio.
Physicians (total)	Aggregate count at the health-system level of all medical doctors and doctors of osteopathy, regardless of specialty who had attending, staff, or treating affiliations with facilities in the system.	Aggregate count of medical doctors and doctors of osteopathy across different hospital-physician alignment models: Integrated Salary Model, Equity Model, and Foundation Model.

[x] Although we include physicians' affiliations with all facility types in systems, over 90 percent of the physicians in systems in 2016 had affiliations with hospitals or outpatient centers (for example, clinics, medical groups, and outpatient surgical centers).

Aggregate Counts	OneKey	AHA
Primary care physicians	Aggregate count of all medical doctors and doctors of osteopathy within each health system in the following specialties: adolescent medicine, adolescent medicine/internal medicine, family medicine, family medicine/geriatrics, general practice, general preventive medicine, internal medicine, internal medicine/family medicine, internal medicine/geriatric medicine, internal medicine/pediatrics, internal medicine/preventive medicine, or pediatrics.	Variable not available[a]

[a] AHA includes data on the number of employed and contract primary care physicians with privileges at a given hospital. We do not use those data when counting primary care physicians in systems for two reasons: (1) they may not be comparable to how we count total physicians in AHA data, and (2) they may not be comparable to how we count primary care physicians in OneKey, in which we include physicians who are directly affiliated with systems (that is, not only through their affiliations with hospitals).

C. Step 3: Applying Exclusion Criteria

Through the data sources described above, we identified the hospitals and physicians included in each system (see Tables II.2 and III.3 for more detail regarding the methods each data source uses to identify the hospitals and physicians in systems) consistent with the Compendium's working definition of health systems. We then applied criteria that are intended to exclude health systems without a qualifying hospital or lack a sufficient number of physicians to plausibly provide to their patients comprehensive care (including primary and specialty care).

After hospitals were assigned to health systems and aggregate counts of physicians were generated, we sequentially applied three criteria to exclude systems that do not have a qualifying hospital or comprehensive care capability. First, we excluded health systems that did not have at least one non-Federal general acute care hospital based on either data source (Table III.4). Next, we excluded health systems that had insufficient numbers of physicians to plausibly offer a reasonably comprehensive range of services to their patients. Finally, we excluded health systems with only very small numbers of primary care physicians.

For the second exclusion criterion, we chose, somewhat arbitrarily, a total of 50 physicians as the threshold. When we constructed the 2016 list of systems, we explored the consequences of lowering or raising the threshold. Web searches of the potential new systems added after lowering the threshold suggested we risked adding some systems offering a limited scope of services in their community. Raising the threshold, we excluded some systems that seemed potentially important healthcare systems in their community. Therefore, we required at least 50 physicians from at least one of the two data sources.

Our approach may result in underrepresentation of health systems serving patients in rural or frontier areas, or other systems that use other networking approaches (including tele-consultation) to provide comprehensive care to their population and thus require fewer physicians in their employ. In developing future releases of the list, we may consider different

physician thresholds—for example, a lower one for health systems serving primarily rural areas with lower population density and a higher one for those serving more densely populated areas. In addition, we may consider alternative approaches that might more accurately identify systems providing comprehensive care.

Finally, we excluded health systems that had fewer than 10 primary care physicians in OneKey. While the estimated size of the population that can be managed by a single primary care physician varies based on patient complexity, range of services provided, and composition of the primary care team, estimates of primary care panel size suggests that a system would need at least 10 primary care physicians to offer basic primary care to 25,000 patients.[xi,xii] Increasing the threshold would have excluded some systems that manage practice locations providing primary care services. Therefore, we retained the threshold at 10.

It should be noted that the threshold of 10 primary care physicians may lead to exclusions of some health systems that serve populations smaller than 25,000 or that rely more heavily on advanced practice clinicians to provide primary care services. This threshold might particularly affect the enumeration of health systems serving rural or frontier populations. We may consider these issues in future efforts to refine the list of health systems.

Also, as cited in the preceding section, physician counts vary across data sources. We opted to use the largest counts when applying the exclusion criteria. If one source reported 40 physicians and another reported 70 physicians, we opted to use the count of 70, erring on the side of inclusion rather than exclusion.

Finally, when we constructed the 2016 list of systems, we considered additional criteria, including thresholds for key medical and surgical specialties. We found considerable variability across systems and communities, with no clear pattern that ensured these additional exclusions were helping identify systems providing comprehensive care.

We applied the exclusion criteria for the 2018 consolidated list of systems without regard to whether a system was on the 2016 list. One system on the 2016 list (Fort Healthcare) failed to meet the total physician criterion in 2018, and another system (Anna Jacques Hospital) failed to meet the primary care physician criterion in 2018. We did not include either system in the 2018 list.

[xi] Altschuler J, Margolius D, Bodenheimer T, et al. Estimating a reasonable patient panel size for primary care physicians with team-based task delegation. Ann Fam Med 2012;10(5):396–400.
[xii] Yarnall KS, Pollak KI, Østbye T, et al. Primary care: is there enough time for prevention? Am J Public Health 2003;93(4):635–41.

Table III.4. Definition of exclusion criteria by data source

Exclusion Criteria	OneKey	AHA
Non-Federal general acute care hospitals	Health system has no non-Federal general acute care, critical access, or children's hospitals.	Health system has no non-Federal hospitals providing general medical and surgical services for adults or children, no critical access hospitals, and no major or minor teaching hospitals.
Number of physicians	Health system has fewer than 50 medical doctors and/or doctors of osteopathy who had attending, staff, or treating affiliations with facilities in the system.	Health system has fewer than 50 physicians participating in the following: Integrated Salary Model, Equity Model, and/or Foundation Model.
Number of primary care physicians	Health system has fewer than 10 medical doctors and/or doctors of osteopathy practicing in the following specialty areas: adolescent medicine, adolescent medicine/internal medicine, family medicine, family medicine/geriatrics, general practice, general preventive medicine, internal medicine, internal medicine/family medicine, internal medicine/geriatric medicine, internal medicine/pediatrics, internal medicine/preventive medicine, or pediatrics.	Information not available in the AHA data.[a]

[a] AHA includes data on the number of employed and contract primary care physicians with privileges at a given hospital. We do not use those data when counting primary care physicians in systems for two reasons: (1) they may not be comparable to how we count total physicians in AHA data, and (2) they may not be comparable to how we count primary care physicians in OneKey, in which we include physicians who are directly affiliated with systems (that is, not only through their affiliations with hospitals).

Starting with 1,007 health systems, we first removed 140 systems that lacked at least one non-Federal general acute care hospital in one or more data sources (Table III.5). Next, across the remaining 867 health systems, we removed 214 systems that did not have at least 50 physicians in one or more data sources. Finally, of the remaining 653 systems, we removed 5 that lacked at least 10 primary care physicians in either the HCOS or SK&A data.

Table III.5. Number of systems excluded from the consolidated list

Exclusion Criteria	Data Source	Number of Systems Excluded	Number Remaining
No non-Federal general acute care hospitals	OneKey, AHA	140	867
Fewer than 50 physicians	OneKey, AHA	214	653
Fewer than 10 primary care physicians	OneKey	5	648

D. Step 4: Conducting Final Manual Review of Consolidated List

After completing all matching activities, identifying and implementing nested relationships, and applying exclusion criteria, we manually reviewed the list to confirm accurate implementation of the process described above and to identify any obvious misclassification.

In addition, we considered whether the list included entities that might not meet the Compendium's working definition of health systems even though at least one of the data sources included them as systems and they passed the exclusion criteria. For example, the list could include specialty systems, such as those that provide surgical care only. Or the list could include hospital management companies that might not provide comprehensive care through close connections between hospitals and medical groups but provide high-level management or consulting services to hospitals and their medical groups.

In an effort to identify these candidate specialty systems, we examined the list of systems and reviewed the corporate website of entities for which a member of the research team indicated that the system might provide specialty care only. In an effort to identify candidate hospital management companies, we reviewed the corporate website of entities for which the AHA data indicated they had a hospital under contract management and the management organization name matched the system name. We also reviewed systems classified as primarily investor owned.

To be retained as a system on the list, the corporation website had to either document: (1) common ownership of at least one acute care general hospital and one group of physicians providing comprehensive primary care and specialty care, or (2) tight joint management of at least one acute care general hospital and one group of physicians providing comprehensive primary and specialty care. For this website review we defined tight joint management as a foundation model, shared governance (for example, substantially overlapping board membership of a hospital and comprehensive medical group), or explicit co-branding of physicians with the system. We did not consider physician-hospital organizations, by themselves, to represent tight joint management.

Finally, we excluded one system that closed in December 2018 and one system in Puerto Rico.

Based on these criteria, 11 systems were excluded from the final list, which reduces the number of systems from 648 to 637 (Table III.6).

We note that the list may still include hospital management companies. It is not always possible to assess systems' business models based on the information available for our review, and we did not conduct a separate detailed review of each system on our list. Likewise, the list may include systems that could be considered specialty care systems, rather than systems devoted to providing comprehensive care for their patient population.

Table III.6. Potential data sources for health system identification

Excluded System	Reason for Exclusion
Acadia Healthcare Company, Inc.	Specialty care only
Adeptus Health	Specialty care only
AHMC Healthcare, Inc.	Hospital management company
Great Plains Health Alliance, Inc.	Hospital management company
HealthTechS3	Hospital management company
Little River Healthcare System	Closed in December 2018
Kindred Healthcare, Inc.	Specialty care only
Metro Pavia Health System	Located in Puerto Rico
National Surgical Hospitals, Inc.	Specialty care only
Surgical Care Affiliates	Specialty care only
Quorum Health Corporation	Hospital management company

We endeavored to exclude specialty systems through visual inspection and through such means as requiring that at least one data source indicate that the system included at least one general acute care hospital and the system include at least 10 primary care physicians. Nonetheless, it is possible some specialty care-focused systems remain in the final list. In developing future releases of the list, we will explore additional criteria that might allow us to further examine systems and consider whether they meet the Compendium's working definition. The current list contains 637 health systems, 496 matched across the two data sources and 141 unmatched systems (Table III.7).

Table III.7. Final consolidated list

Data	Number of Health Systems
Matched health systems	496
Unmatched health systems	
OneKey	137
AHA	4
Total health systems	**637**

IV. Variables Included in the Consolidated List

The list contains the name and location (city, State, and ZIP Code) of each health system we identified through the process outlined above. In addition, we provide the numbers of total physicians, primary care physicians, nurse practitioners, physician assistants, medical groups, and hospitals (see Table III.3). We added the counts of nurse practitioners and physician assistants in a 2020 update to the list.

The list also contains contextual variables constructed by linking hospital cost report data available through the HCRIS data.[xiii] CMS requires Medicare-certified institutional providers to submit annual cost reports, which make up the HCRIS cost report data. HCRIS data are publicly available and contain information on facility characteristics, utilization data, revenue, and charges. The list uses HCRIS data for calendar year 2017 (January–December) for individual hospitals and provides summary information calculated at the system level.[xiv] These variables are described in Tables IV.1 and IV.2. A full data dictionary for the consolidated list is available in Appendix F.

In 2020, we updated the Compendium to include additional attributes related to the following: whether systems participated in alternative payment models, whether systems offered an insurance product, and number of system-affiliated nursing homes. We include summaries of the variables in Table IV.2 and Appendix F. We provide detailed information regarding the data and methods used to construct the variables in Appendixes C, D, and E.

Safety net systems. The list provides three indicators related to safety net systems. To identify systems serving low-income and potentially underserved populations, the list draws on two common measures used in the literature to define safety net hospitals. First, we flag systems that have at least one hospital with a high disproportionate share hospital (DSH) patient percentage, which is a measure of a hospital's overall caseload of low-income insured patients. Hospitals paid under the Medicare inpatient prospective payment system (IPPS) report the DSH patient percentage to CMS, which uses it to calculate Medicare DSH payments.[xv] Systems are categorized as having at least one hospital with a high DSH patient percentage if they have a non-Federal general acute care system hospital in the top quintile of DSH patient percentage among IPPS hospitals.

[xiii] CMS. Cost Reports. https://www.cms.gov/research-statistics-data-and-systems/downloadable-public-use-files/cost-reports/. Accessed February 9, 2021.

[xiv] For non-Federal general acute care system hospitals not matching 2017 data, we used HCRIS data for calendar year 2016. In our final list, 94 percent of non-Federal general acute hospitals with a CCN or AHA ID have HCRIS data. Two systems are missing HCRIS data for all of their non-Federal general acute hospitals.

[xv] The DSH patient percentage is equal to the sum of the percentage of Medicare inpatient days attributable to patients eligible for both Medicare Part A and Supplemental Security Income (SSI), and the percentage of total inpatient days attributable to patients eligible for Medicaid but not Medicare Part A. The DSH patient percentage is defined as: DSH Patient Percent = (Medicare SSI Days/Total Medicare Days) + (Medicaid, Non-Medicare Days/Total Patient Days). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/dsh.html. Accessed February 9, 2021.

In addition, the list provides two indicators of uncompensated care burden. Uncompensated care is defined as hospitals' total unreimbursed and uncompensated care costs (including charity care for uninsured and insured patients) as well as bad-debt expenses.[xvi] Uncompensated care burden is calculated as the ratio of uncompensated care to total operating expenses. Systems are categorized as having at least one hospital with a high uncompensated care burden if they have a non-Federal general acute care hospital in the top quintile of uncompensated care burden (the ratio of total uncompensated care to total operating expenses for an individual system hospital).

We also calculated a measure of systemwide uncompensated care burden defined as the ratio of total uncompensated care to total operating expenses across systems' non-Federal general acute care hospitals. Systems are flagged as having *systemwide uncompensated care burden* if they are in the top quintile of uncompensated care burden among U.S. health systems.

Teaching intensity. The list also includes three indicators of teaching intensity. Using system hospitals' ratio of residents to beds, systems are categorized as a *system that includes at least one major teaching hospital* if the system has at least one non-Federal general acute care hospital with a high (≥0.25) resident-to-bed ratio. Systems are categorized as a *system that includes at least one very major teaching hospital* if the system has at least one non-Federal general acute care hospital with a very high (≥ 0.60) resident-to-bed ratio.[xvii]

To categorize systems based on their systemwide teaching intensity, we calculated a measure of systemwide resident-to-bed ratio defined as total residents divided by total beds across systems' non-Federal general acute care hospitals. Using this measure, *systemwide teaching intensity* is categorized as nonteaching, minor teaching, or major teaching based on their systemwide resident-to-bed ratio. As noted in Table IV.1, a minor teaching system is defined as a resident-to-bed ratio greater than zero but less than 0.25 across system non-Federal general acute care hospitals. A major teaching system is defined as a resident-to-bed ratio greater than or equal to 0.25 across member hospitals. Systems with no residents reported among member non-Federal general acute care hospitals are considered nonteaching systems.

Children's systems. We also report on the degree to which a system primarily serves children. Children's hospitals are identified if the hospital facility type was listed as children in HCRIS.[xviii] To create a system measure, we calculated a ratio of system beds in children's general acute care hospitals to total system beds in general acute care hospitals. Specifically, systems are categorized as having no children's hospitals, having at least one children's hospital but not predominantly delivering care at children's hospitals, or predominantly delivering care at

[xvi] Bad-debt expenses include the cost of non-Medicare and nonreimbursable Medicare bad-debt expenses.

[xvii] Thresholds used to identify hospitals with high teaching intensity were selected to align with previous literature, including Patel MS, Volpp KG, Small DS, et al. Association of the 2011 ACGME resident duty hour reforms with mortality and readmissions among hospitalized Medicare patients. JAMA 2014;312(22):2364–73.

[xviii] Some children's hospitals do not care for a substantial number of Medicare patients and may not file Medicare cost reports. Thus, children's systems may be underreported in our list. This finding was noted by the Medicaid and CHIP Payment and Access Commission in their February 2016 report to Congress available here: https://www.macpac.gov/wp-content/uploads/2016/01/Report-to-Congress-on-Medicaid-DSH.pdf. Accessed February 9, 2021.

children's hospitals. Systems are categorized as predominantly delivering care at children's hospitals if a majority of hospital beds in the system are in children's hospitals.[xix]

Investor-owned systems. The list also provides information on whether the hospitals in the system are primarily investor owned. If most non-Federal general acute care beds in the system are in investor-owned hospitals, the system is categorized as predominantly investor owned (as noted in Table IV.1). Investor-owned hospitals are those in which the control or ownership status of the hospital is listed as proprietary (individual, corporation, partnership or other) in HCRIS.[xx] Across systems, 91 percent of systems are composed of either solely investor-owned general acute care hospitals or had no investor-owned general acute care hospitals.

Health system attributes. We describe additional health system attributes included in the list in Table IV.2. These variables describe the number of hospitals (acute and total), beds, discharges, and full-time-equivalent interns and residents per system. These variables are summed across system hospitals for all non-Federal general acute care hospitals. The list also includes the number of total physicians, primary care physicians, nurse practitioners, physician assistants, and medical groups per system.[xxi] In addition, the list includes an indicator for multistate systems. Specifically, systems are categorized as a *multistate system* if they have system hospitals in two States or system hospitals in three or more States. This variable includes all member hospitals, even if the member hospital is not acting as a local system in the market in which it is operating.

Finally, the list includes variables that indicate: (1) whether systems participated in Medicare alternative payment models (APMs) during 2018 (indirectly through participation by system-affiliated physicians and practices), including Medicare accountable care organizations (ACOs), episode-based payment models, or primary care transformation models, as well as counts of the system-affiliated physicians that participated in each of the three Medicare APM types; (2) whether systems offered an insurance product, including any insurance product, a Medicare Advantage (MA) plan, a Medicaid Managed Care plan, or a Health Insurance Marketplace plan; (3) the list of MA contracts offered by the system and total MA enrollment across these contracts; and (4) the count of nursing homes affiliated with each system.

[xix] We identified two systems (Shriners Hospitals for Children and East Tennessee Childrens Hospital Association) with missing HCRIS data for their hospitals as predominantly delivering care at children's hospitals based on a review of the systems' websites. In addition, we reviewed all non-Federal general acute care hospitals with CCNs and missing HCRIS data for "child" in the hospital name. We identified any systems with at least one such hospital with "child" in the hospital name as having at least one children's hospital but not predominantly delivering care at children's hospitals. This approach resulted in changing the values for six systems.

[xx] We compared HCRIS data on investor-owned status to AHA data on investor-owned status for individual hospitals. For cases in which the two data sources disagreed, we considered the hospital to be not investor owned.

[xxi] A small number of providers in systems were identified as both a nurse practitioner and a physician assistant. We counted these providers in both the count of nurse practitioners and the count of physician assistants. The result is that seven systems have one provider counted as both a nurse practitioner and a physician assistant.

Table IV.1. Health system types

System Type Variables	Definition
System includes at least one hospital with a high DSH patient percentage	The DSH patient percentage is defined as: DSH Patient Percentage = (Medicare SSI days/total Medicare days) + (Medicaid, non-Medicare days/total days). Hospitals paid under the IPPS report the DSH patient percentage to CMS, which uses it to calculate Medicare DSH payments. It is a measure of the hospital's overall caseload of low-income insured patients. Systems are categorized as having at least one hospital with a high DSH patient percentage if they have a non-Federal general acute care system hospital in the top quintile[xxii] of DSH patient percentage among IPPS hospitals.
System includes at least one hospital with a high uncompensated care burden	Uncompensated care is defined for system hospitals as the sum of charity care and bad-debt expense adjusted by the hospital-specific ratio of cost to charges. Uncompensated care burden is calculated as the ratio of uncompensated care to total operating expense. Systems are categorized as having at least one hospital with a high uncompensated care burden if they have a non-Federal general acute care hospital in the top quintile of uncompensated care burden (the ratio of total uncompensated care to total operating expense for a non-Federal general acute care hospital).
Systemwide uncompensated care burden	Uncompensated care is defined for the system as the sum of system hospitals' charity care and bad-debt expense adjusted by the hospital-specific ratio of cost to charges. The systemwide uncompensated care burden is calculated as the ratio of total uncompensated care to total operating expense across systems' non-Federal general acute care hospitals. Systems are flagged if they are in the top quintile of uncompensated care burden among U.S. health systems.[xxiii]
System includes at least one major teaching intensity hospital	Systems are categorized as having at least one major teaching intensity hospital if they have at least one non-Federal general acute care hospital with a resident-to-bed ratio greater than or equal to 0.25.
System includes at least one *very major* teaching intensity hospital	Systems are categorized as having at least one very major teaching intensity hospital if they have a non-Federal general acute care hospital with a resident-to-bed ratio greater than or equal to 0.60.
Systemwide teaching intensity	Systems are categorized as nonteaching, minor teaching, or major teaching. A minor teaching system will be defined as a resident-to-bed ratio greater than zero but less than 0.25 across the non-Federal general acute care system hospitals. A major teaching system will be defined as a resident-to-bed ratio greater than or equal to 0.25 across non-Federal general acute care system hospitals. Systems with no residents reported among non-Federal general acute care system hospitals will be considered nonteaching systems.

[xxii] Quintiles are used to align with prior health services research on defining the safety net, including: Office of the Assistant Secretary for Planning and Evaluation. Social risk factors and performance under Medicare's Value-Based Purchasing Programs: a report required by the Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014. Washington, DC: U.S. Department of Health and Human Services; December 2016.

[xxiii] This definition extends work from previous literature on defining safety net hospitals, including Zuckerman S, Bazzoli G, Davidoff A, et al. How did safety-net hospitals cope in the 1990s? Health Aff 2001;20(4):159-68; and Bazzoli GJ, Kang R, Hasnain-Wynia R, et al. An update on safety-net hospitals: coping with the late 1990s and early 2000s. Health Aff 2005;24(4):1047–56. In these studies, high uncompensated care burden for hospitals was defined as the top decile of uncompensated care burden.

System Type Variables	Definition
Degree to which system serves children only	Systems are categorized as having no children's hospitals, having at least one children's hospital but not predominantly delivering care at children's hospitals, or predominantly delivering care at children's hospitals. Systems will be categorized as predominantly delivering care at children's hospitals if a majority of non-Federal general acute care hospital beds in the system are in children's hospitals.
System is predominantly investor owned	Systems are categorized as predominantly investor owned if a majority of non-Federal general acute care hospital beds in the system are in investor-owned hospitals.

Table IV.2. Health system attributes included in list

Health System Attributes	Definition
Number of hospitals in systems	Provides a systemwide count of system hospitals of any type (including general, specialty, rehabilitation, and psychiatric) reported with a CCN or AHA ID in one or both data source.
Number of general acute care hospitals in systems	Provides a systemwide count of non-Federal general acute care system hospitals (defined in Table III.3) reported with a CCN or AHA ID in one or both data source.
Number of total physicians	Provides a systemwide count of system physicians (defined in Table III.3). We report the largest number of physicians reported across the two data sources to be consistent with the values used for the exclusion criteria.
Number of primary care physicians	Provides a systemwide count of system primary care physicians (defined in Table III.3). If a system was identified by AHA only (not also OneKey), then the number of primary care physicians is missing.
Number of nurse practitioners	Provides a systemwide count of nurse practitioners identified as affiliated with systems in the OneKey data. Affiliations are identified using the same approach used to identify physicians affiliated with systems in the OneKey data (described in section III.B and Table III.3).
Number of physician assistants	Provides a systemwide count of physician assistants identified as affiliated with systems in the OneKey data. Affiliations are identified using the same approach used to identify physicians affiliated with systems in the OneKey data (described in section III.B and Table III.3).
Number of medical groups	Provides a systemwide measure of the count of medical groups. We report the number of medical groups reported in the OneKey data (AHA data does not report the count of medical groups). In the OneKey data, medical groups are outpatient healthcare centers that provide general and/or specialized services to patients. Typically, they comprise two or more prescribers and one to many nonprescribers, such as nurses and medical technicians.
Multistate system	Systems are categorized as having system hospitals located in one State, having system hospitals located in two States, or having system hospitals located in three or more States. System hospitals were counted if they were reported with a CCN or AHA ID in one or both of the two data sources. The State for each hospital reflects the address listed in HCRIS unless that information was not available, in which case it reflects the address reported in AHA or IQVIA, in that order.
Number of beds in systems	Provides a systemwide measure of the total count of hospital beds in the system in non-Federal general acute care hospitals according to HCRIS.
Number of discharges in systems	Provides a systemwide measure of the total count of hospital discharges in the system from non-Federal general acute care hospitals according to HCRIS.
Number of residents in systems	Provides a systemwide measure of the total count of full-time-equivalent interns and residents in the system in non-Federal general acute care hospitals according to HCRIS.

Health System Attributes	Definition
System offers any insurance product	Indicates whether any of a system's non-Federal general acute care hospitals reported in the AHA data that the hospital or its system owns or jointly owns a health plan, or whether the hospital or its system has a joint venture or significant partnership with an insurer.
System offers an MA product	Indicates whether any of a system's non-Federal general acute care hospitals reported in the AHA data that the hospital or its system offers an MA plan via ownership or joint venture.
System offers a Medicaid managed care product	Indicates whether any of a system's non-Federal general acute care hospitals reported in the AHA data that the hospital or its system offers a Medicaid managed care plan via ownership or joint venture.
System offers a Health Insurance Marketplace product	Indicates whether any of a system's non-Federal general acute care hospitals reported in the AHA data that the hospital or its system offers a Health Insurance Marketplace plan via ownership or joint venture.
List of MA contracts offered by the system	Lists the MA Contracts that are offered by the system, including MA Cost plans, Program of All-inclusive Care for the Elderly (PACE), and demonstration plans, according to matches between systems or subsystems and MA data from CMS.
Total enrollment across all MA contracts owned by the system	Aggregates MA enrollment across all MA contracts offered by the system according to matches between systems or subsystems and MA data from CMS.
System participates in a Medicare APM	Systems are categorized as participating in a Medicare APM if any of the physicians affiliated with a system participated in a national Medicare APM that influenced payments to physicians during 2018 according to the CMS APM Management System.
Number of system-affiliated physicians participating in a Medicare ACO	Provides a systemwide count of unique system-affiliated physicians that were participating in one or more national Medicare ACO models during 2018 according to the CMS APM Management System.
Number of system-affiliated physicians participating in a Medicare episode-based payment model	Provides a systemwide count of unique system-affiliated physicians that were participating in one or more national Medicare episode-based payment models during 2018 according to the CMS APM Management System.
Number of system-affiliated physicians participating in a Medicare primary care transformation model	Provides a systemwide count of unique system-affiliated physicians that were participating in a national Medicare primary care transformation model during 2018 according to the CMS APM Management System.
Number of system-affiliated nursing homes	Provides a systemwide count of the number of system-affiliated nursing homes in the OneKey data.

ACO = accountable care organization; AHA = American Hospital Association Annual Survey Database; APM = alternative payment model; CMS = Centers for Medicare & Medicaid Services; MA = Medicare Advantage; OneKey = IQVIA OneKey Organizations, formerly known as HCOS, and OneKey Professionals.
Note: For the APM variables, physician affiliation with systems is identified in AHRQ's 2018 Group Practice Linkage File, which can be found on the CHSP Initiative website for the 2018 Compendium: https://www.ahrq.gov/chsp/data-resources/compendium-2018.html. Also, seven systems have one provider counted as both a nurse practitioner and physician assistant.

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V. Caveats and Limitations

This release of the consolidated list enables stakeholders to examine systems that meet the Compendium's working definition of health systems, counts of their members, and key attributes. There are a few caveats and limitations to the current approach for identifying health systems and creating the list that stakeholders should consider when using the list. AHRQ will continue to work closely with the CoEs, the Coordinating Center, the CHSP TEP, and other stakeholders to identify strategies to minimize limitations of this and future lists.

A. Narrow Working Definition of Health System

The working definition used in the development of the list excludes health systems that do not own hospitals. We recognize this approach excludes some well-established physician organizations that provide comprehensive management of their patient populations without an ownership or tight comanagement relationship with a hospital. In addition, the thresholds set for physician numbers may result in the exclusion of health systems using advanced practice clinicians, tele-consultation, or other innovative collaborations to provide comprehensive care to their population. This issue may be especially relevant to systems in rural and frontier communities.

Identifying local systems. In addition, health systems on the list are defined based on their structure aggregated to the highest level. For example, a national parent system operating multiple local subsystems is reported in the list as a national system rather than each local subsystem being identified and assessed separately to determine if it meets the Compendium working definition. The nesting of systems will preclude the identification of subsystems operating in specific States or local markets. Furthermore, the list might include systems that operate individual hospitals in local markets that are not co-owned or jointly managed with a comprehensive group of local physicians, and thus some parent systems may not function under AHRQ's definition of a system within each local market where it has a presence.

B. Discrepancies Across Data Sources

We have identified discrepancies in systems' attributes reported in the two data sources, including fairly substantial discrepancies in counts of physicians for some systems appearing in OneKey and AHA.[xxiv] Table V.1 provides examples of the largest discrepancies in physician counts across the two data sources. The discrepancies are, in part, due to the inclusion of hospital staff physicians in IQVIA. In addition, IQVIA uses Drug Distribution Data that enable quick identification of new organizations to investigate and potentially add to their database.[xxv] Therefore, the IQVIA data report the highest number of physicians for the vast majority of systems. The differences in the way the data are collected and the sets of physicians included in the data also contribute to the discrepancies (Table III.3).

[xxiv] Note, the physician counts reflect some double counting of physicians, as physicians can be attributed to more than one system.

[xxv] Information on the data collection methods was gathered through a conversation with staff at QuintilesIMS on May 19, 2017, and reviewed for accuracy by IQVIA in 2019.

Table V.1. Examples of discrepancies in physician counts across data sources

Health System	OneKey	AHA
Trinity Health	11,236	4,079
Hospital Corporation of America, Inc.	14,064	642
Kaiser Permanente	24,955	6,410

C. Data Collection Methods

Each data source has its own proprietary methodology for collecting data. However, both sources rely on some degree of self-report by representatives at hospitals and medical groups (see Appendix A). For example, IQVIA links professionals to organizations via a combination of a proprietary address algorithm and a manual process. IQVIA periodically calls practices and asks the practice managers to confirm or update the accuracy of the information contained within their database and uses hospital web data to enumerate physicians within hospitals once the hospital confirms the website is current.

AHA data are derived from a cross-sectional survey of more than 6,400 hospitals operating in the United States. Respondents self-report the characteristics and attributes of their hospital, including counts of affiliated physicians. As with all self-reported data, the accuracy of the information depends on the knowledge of the respondent, the salience of the task to the respondent, and the meaning the respondent ascribes to key terms such as affiliation and ownership.

D. Potential Misalignment of System Definitions Between the Data and the Compendium's Working Definition

It can be difficult to determine the exact nature of the relationships between systems and their members, which can make it challenging to precisely determine whether an entity meets the Compendium's working definition. For example, while we removed a handful of hospital management companies that might not meet the working definition, it is possible that the current list contains other such companies. Similarly, the data identify several systems as having a general acute care hospital that appears to focus on delivering specialty care to a select population, which might mean the system is not providing comprehensive care according to the working definition. Ultimately, while we take steps to refine the list of systems to better align with the working definition, the list is largely reliant on the data sources' definitions of systems aligning with the working definition.

E. Mergers and Acquisitions

The list reflects health systems in the United States at the end of 2018. However, since OneKey and AHA data vary in the periodicity of their updates, lags may occur in updating changes to systems, such as mergers, acquisitions, and name changes, that occurred before the end of 2018.

As we developed the current version of the list, we identified a host of health systems that were acquired by or merged with other systems, and it is conceivable others exist. Thus, the period represented by the list aligns with the periods covered by the data sources (2017 for AHA and 2018 for OneKey), with some level of updating accomplished through manual review of select

systems. We will continue to consider how we might systematically identify mergers and acquisitions on an ongoing and timely basis.

F. Differences Between 2018 and 2016 Consolidated Lists

The primary difference between the 2018 and 2016 consolidated lists is that we used only two sources of data in 2018 (OneKey and AHA), whereas we used a third source in 2016 (SK&A). IQVIA no longer produces SK&A data. Not having SK&A data limited our ability to identify subsystems systematically; in addition, we did not identify a few systems in 2018 that we identified by SK&A (but not AHA or HCOS) in 2016.

A second difference is that when constructing the 2016 list, we required that a single data source define an entity as a system and identify that entity as having at least one non-Federal general acute care hospital. For the 2018 list, we allowed different sources of data to define an entity as a system and identify that entity as having at least one non-Federal general acute care hospital.

In the 2018 list, 18 systems were defined by IQVIA (not AHA) as being systems as described in Table III.2, but only AHA (not IQVIA) identified the system as having at least one non-Federal general acute care hospital. We reviewed the websites of several of those 18 systems to confirm that they have a non-Federal general acute care hospital. Most of the 18 systems would have been on the 2016 list had we allowed different sources of data to define an entity as a system and identify that entity as having at least one non-Federal general acute care hospital.

A third difference is that the OneKey data we used for the 2018 list identified hospitalists separately from internists and other physicians, so our 2018 counts of primary care physicians do not include hospitalists. In contrast, the HCOS and SK&A data we used for the 2016 list did not indicate the setting in which physicians provided services. Thus, the 2016 list may have included systems that met the requirement for 10 primary care physicians but provided patients little or no outpatient primary care services. This limitation no longer exists for the 2018 list, because the 2018 OneKey counts of primary care physicians exclude hospitalists.

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Appendix A. OneKey and AHA Methodologies

IQVIA maintains two integrated databases relevant to the study of health system performance under the umbrella of Healthcare Relational Services (HCRS). The first, the Healthcare Professional Services (OneKey Professionals) database, focuses on health professionals (for example, physicians, residents, and advanced practice clinicians, such as nurse practitioners and physician assistants) and contains healthcare administrators.

IQVIA maintains OneKey Professionals by using manual stewardship and updates from industry source data (including American Medical Association, CMS' National Plan and Provider Enumeration System [NPPES], State Controlled Substance Registration, Drug Enforcement Administration [DEA] identifier, and other established industry source data). OneKey Professionals providers are integrated into the OneKey Organizations database, the second of the two OneKey databases.

The providers in OneKey Professionals are bridged to the organizations in OneKey Organizations as provider affiliations via a combination of a proprietary address intelligence algorithm and manual stewardship, in which individual provider addresses are processed against organizations in OneKey Organizations through established business rules to create a provider affiliation.

OneKey Professionals addresses are run through proprietary address intelligence software and given a rank from negative 5 to 10. A rank of 6 or higher triggers an attempt to match to organizations in OneKey Organizations. Most professionals in OneKey Professionals will have at least one address with a score of 6 or higher. Of the approximately 9.6 million professionals in OneKey Professionals, about 4 million have an association with an organization in OneKey Organizations.

OneKey Organizations contains information on approximately 702,000 medical group practices, hospitals, nursing homes, accountable care organizations (ACOs), and other organizations. Fields include organizational characteristics such as bed count, provider counts, health information technology infiltration, and finances.

OneKey Organizations is periodically verified via telephone; the timing of verification calls varies by organization type. Each time a medical group practice is verified, so too are the providers within that group. For hospital verification, IQVIA confirms with hospitals that their website is up to date. Then, IQVIA uses web-based information to determine which providers are affiliated with that hospital. They also break down affiliation types for physicians' relationships to hospitals—attending or admitting. All relationships between organizations in OneKey Organizations are researched and the relationship is verified with both entities to confirm that a relationship exists and to determine the nature of the relationship.

AHA fields an annual cross-sectional survey of the more than 6,400 U.S. hospitals; the survey typically has a response rate of more than 80 percent. The objective of the survey is to track and monitor the evolution of new systems of care, care coordination functions, and various payment models used in providing care to a population as they are experienced by hospitals. Data are supplied by hospital administrators online, as well as by paper and pencil. Although the survey

has a cross-sectional design, the unique hospital identifier (AHA ID) can be used for cohort studies to monitor changes in hospitals over time. Data from the survey are stored in the AHA Annual Survey Database.

The AHA survey provides several mechanisms for identifying healthcare delivery systems. The data may be used to identify horizontally integrated hospitals, identify hospitals that have vertical relationships with physicians, and characterize the nature of these relationships in a health system taxonomy. The relationships include hospital affiliations with physicians through integrated salary models or equity models; medical group or physician ownership of hospitals; hospital participation in foundation models; and hospital-physician alignment through management services organizations and physician hospital organizations. In creating the list, we used a system membership variable that identifies multihospital and diversified single hospital healthcare systems.

Appendix B. Automated Matches

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000001	AHMC Healthcare Inc	500 E MAIN ST, Alhambra, CA, 91801	AHMC & Healthcare, Inc.	55 SOUTH RAYMOND AVENUE, Alhambra, CA, 91801
HSI00000002	AMG Integrated Healthcare Management	101 LA RUE FRANCE, Lafayette, LA, 70508	AMG Integrated Healthcare Management	101 LA RUE FRANCE, Lafayette, LA, 70508
HSI00000008	Adena Health System	272 HOSPITAL RD, Chillicothe, OH, 45601	Adena Health System	272 HOSPITAL ROAD, Chillicothe, OH, 45601
HSI00000012	Adventist Healthcare	820 W DIAMOND AVE, Gaithersburg, MD, 20878	Adventist Healthcare	820 WEST DIAMOND AVENUE, Gaithersburg, MD, 20878
HSI00000025	Allegheny Health Network	30 ISABELLA ST, Pittsburgh, PA, 15212	Allegheny Health Network	30 ISABELLA STREET, Pittsburgh, PA, 15212
HSI00000026	Allegiance Health Management	504 TEXAS ST, Shreveport, LA, 71101	Allegiance Health Management	504 TEXAS STREET, Shreveport, LA, 71101
HSI00000041	Appalachian Regional Healthcare Inc	2260 EXECUTIVE DR, Lexington, KY, 40505	Appalachian Regional Healthcare, Inc.	2260 EXECUTIVE DRIVE, Lexington, KY, 40505
HSI00000042	Appalachian Regional Healthcare System	336 DEERFIELD RD, Boone, NC, 28607	Appalachian Regional Healthcare System	336 DEERFIELD ROAD, Boone, NC, 28607
HSI00000045	Archbold Medical Center	910 S BROAD ST, Thomasville, GA, 31792	Archbold Medical Center	910 SOUTH BROAD STREET, Thomasville, GA, 31792
HSI00000046	Ardent Health Services	1 BURTON HILLS BLVD, Nashville, TN, 37215	Ardent Health Services	1 BURTON HILLS BOULEVARD, Nashville, TN, 37215
HSI00000052	Arnot Health	600 ROE AVE, Elmira, NY, 14905	Arnot Health	600 ROE AVENUE, Elmira, NY, 14905
HSI00000054	Asante Health System	2650 SISKIYOU BLVD, Medford, OR, 97504	Asante Health System	2650 SISKIYOU BOULEVARD, Medford, OR, 97504
HSI00000055	Ascension Health	101 S HANLEY RD, Saint Louis, MO, 63105	Ascension Healthcare	101 SOUTH HANLEY ROAD, Saint Louis, MO, 63105
HSI00000057	Aspirus Inc	425 PINE RIDGE BLVD, Wausau, WI, 54401	Aspirus, Inc.	425 PINE RIDGE BOULEVARD, Wausau, WI, 54401
HSI00000060	Atlantic Health System	475 SOUTH ST, Morristown, NJ, 7960	Atlantic Health System	475 SOUTH STREET, Morristown, NJ, 7960
HSI00000065	Aultman Health Foundation	2600 6TH ST SW, Canton, OH, 44710	Aultman Health Foundation	2600 SIXTH STREET SW, Canton, OH, 44710
HSI00000067	Avanti Hospitals	222 N PACIFIC COAST HWY, El Segundo, CA, 90245	Avanti Hospitals	222 NORTH SEPULVEDA BOULEVARD, El Segundo, CA, 90245
HSI00000068	Avera Health	3900 W AVERA DR, Sioux Falls, SD, 57108	Avera Health	3900 WEST AVERA DRIVE, Sioux Falls, SD, 57108
HSI00000070	BJC Healthcare	4901 FOREST PARK AVE, Saint Louis, MO, 63108	BJC Healthcare	4901 FOREST PARK AVENUE, Saint Louis, MO, 63108
HSI00000074	Baptist Health	9601 BAPTIST HEALTH DR, Little Rock, AR, 72205	Baptist Health	9601 BAPTIST HEALTH DRIVE, Little Rock, AR, 72205
HSI00000075	Baptist Health	800 PRUDENTIAL DR, Jacksonville, FL, 32207	Baptist Health	841 PRUDENTIAL DRIVE, Jacksonville, FL, 32207
HSI00000076	Baptist Health Care	1717 N E ST, Pensacola, FL, 32501	Baptist Health Care Corporation	1717 NORTH 'E' STREET, Pensacola, FL, 32501

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000077	Baptist Health South Florida	6855 SW 57TH AVE, Coral Gables, FL, 33143	Baptist Health South Florida	6855 RED ROAD, Coral Gables, FL, 33143
HSI00000081	Baptist Memorial Health Care Corp	350 N HUMPHREYS BLVD, Memphis, TN, 38120	Baptist Memorial Health Care Corporation	350 NORTH HUMPHREYS BOULEVARD, Memphis, TN, 38120
HSI00000087	Bassett Healthcare Network	1 ATWELL RD, Cooperstown, NY, 13326	Bassett Healthcare Network	1 ATWELL ROAD, Cooperstown, NY, 13326
HSI00000096	Baylor Scott And White Health	4005 CRUTCHER ST, Dallas, TX, 75246	Baylor Scott & White Health	4005 CRUTCHER STREET, Dallas, TX, 75246
HSI00000097	Baystate Health	280 CHESTNUT ST, Springfield, MA, 1199	Baystate Health, Inc.	280 CHESTNUT STREET, Springfield, MA, 1199
HSI00000098	Beacon Health System	615 N MICHIGAN ST, South Bend, IN, 46601	Beacon Health System	615 NORTH MICHIGAN STREET, South Bend, IN, 46601
HSI00000107	Benefis Healthcare System	1101 26TH ST S, Great Falls, MT, 59405	Benefis Health System	1101 26TH STREET SOUTH, Great Falls, MT, 59405
HSI00000109	Berkshire Health Systems Inc	725 NORTH ST, Pittsfield, MA, 1201	Berkshire Health Systems, Inc.	725 NORTH STREET, Pittsfield, MA, 1201
HSI00000125	Bon Secours Health System Inc	1505 MARRIOTTSVILLE RD, Marriottsville, MD, 21104	Bon Secours Health System, Inc.	1505 MARRIOTTSVILLE ROAD, Marriottsville, MD, 21104
HSI00000139	Bronson Healthcare Group Inc	301 JOHN ST, Kalamazoo, MI, 49007	Bronson Healthcare Group	301 JOHN STREET, Kalamazoo, MI, 49007
HSI00000143	Bryan Health	1600 S 48TH ST, Lincoln, NE, 68506	Bryan Health	1600 SOUTH 48TH STREET, Lincoln, NE, 68506
HSI00000152	Christus Health	919 HIDDEN RDG, Irving, TX, 75038	Christus Health	919 HIDDEN RIDGE DRIVE, Irving, TX, 75038
HSI00000161	Cape Cod Healthcare Inc	27 PARK ST, Hyannis, MA, 2601	Cape Cod Healthcare, Inc.	27 PARK STREET, Hyannis, MA, 2601
HSI00000162	Cape Fear Valley Health System	1638 OWEN DR, Fayetteville, NC, 28304	Cape Fear Valley Health System	1638 OWEN DRIVE, Fayetteville, NC, 28304
HSI00000166	Care New England Health System Inc	45 WILLARD AVE, Providence, RI, 2905	Care New England Health System	45 WILLARD AVENUE, Providence, RI, 2905
HSI00000169	Carepoint Health	10 EXCHANGE PL, Jersey City, NJ, 7302	Carepoint Health	10 EXCHANGE PLACE, 15TH FLOOR, Jersey City, NJ, 7302
HSI00000170	Carilion Clinic	1906 BELLEVIEW AVE SE, Roanoke, VA, 24014	Carilion Clinic	1906 BELLEVIEW AVENUE SE, Roanoke, VA, 24014
HSI00000173	Atrium Health	1000 BLYTHE BLVD, Charlotte, NC, 28203	Atrium Health	1000 BLYTHE BOULEVARD, Charlotte, NC, 28203
HSI00000183	Catholic Health Initiatives	198 INVERNESS DR W, Englewood, CO, 80112	Catholic Health Initiatives	198 INVERNESS DRIVE WEST, Englewood, CO, 80112
HSI00000186	Catholic Health Services Of Long Island	992 N VILLAGE AVE, Rockville Centre, NY, 11570	Catholic Health Services Of Long Island	992 NORTH VILLAGE AVENUE, 1ST FLOOR, Rockville Centre, NY, 11570
HSI00000190	Cedars Sinai Health System	8700 BEVERLY BLVD, West Hollywood, CA, 90048	Cedars-Sinai Health System	8700 BEVERLY BOULEVARD, West Hollywood, CA, 90048
HSI00000192	Centra Health	1920 ATHERHOLT RD, Lynchburg, VA, 24501	Centra Health, Inc.	1901 TATE SPRINGS ROAD, Lynchburg, VA, 24501
HSI00000193	Centracare Health	1406 6TH AVE N, Saint Cloud, MN, 56303	Centracare Health	1406 SIXTH AVENUE NORTH, Saint Cloud, MN, 56303

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000197	Central Maine Healthcare Corp	300 MAIN ST, Lewiston, ME, 4240	Central Maine Healthcare	300 MAIN STREET, Lewiston, ME, 4240
HSI00000208	Childrens Health	1935 MEDICAL DISTRICT DR, Dallas, TX, 75235	Children's Health	1935 MEDICAL DISTRICT DRIVE, Dallas, TX, 75235
HSI00000212	Childrens Hospital And Health System	9000 W WISCONSIN AVE, Wauwatosa, WI, 53226	Children's Hospital And Health System	9000 WEST WISCONSIN AVENUE, Milwaukee, WI, 53226
HSI00000218	Christiana Care Health System	501 W 14TH ST, Wilmington, DE, 19801	Christiana Care Health System	501 WEST 14TH STREET, Wilmington, DE, 19801
HSI00000226	Citrus Valley Health Partners	210 W SAN BERNARDINO RD, Covina, CA, 91723	Citrus Valley Health Partners	210 WEST SAN BERNARDINO ROAD, Covina, CA, 91723
HSI00000248	Community Health Network Inc	7330 SHADELAND STA, Indianapolis, IN, 46256	Community Health Network	7330 SHADELAND STATION, Indianapolis, IN, 46256
HSI00000249	Community Health Systems Inc	4000 MERIDIAN BLVD, Franklin, TN, 37067	Community Health Systems, Inc.	4000 MERIDIAN BOULEVARD, Franklin, TN, 37067
HSI00000251	Community Hospital Corp	7800 DALLAS PKWY, Plano, TX, 75024	Community Hospital Corporation	7800 NORTH DALLAS PARKWAY, Plano, TX, 75024
HSI00000255	Community Memorial Health System	147 N BRENT ST, Ventura, CA, 93003	Community Memorial Health System	147 NORTH BRENT STREET, Ventura, CA, 93003
HSI00000263	Cone Health	1200 N ELM ST, Greensboro, NC, 27401	Cone Health	1200 NORTH ELM STREET, Greensboro, NC, 27401
HSI00000274	Cook County Health And Hospital System	1900 W POLK ST, Chicago, IL, 60612	Cook County Health And Hospitals System	1900 WEST POLK STREET, Chicago, IL, 60612
HSI00000278	Cornerstone Healthcare Group Inc	2200 ROSS AVE, Dallas, TX, 75201	Cornerstone Healthcare Group	2200 ROSS AVENUE, Dallas, TX, 75201
HSI00000286	Covenant Health	100 FORT SANDERS WEST BLVD, Knoxville, TN, 37922	Covenant Health	100 FORT SANDERS WEST BOULEVARD, Knoxville, TN, 37922
HSI00000290	Coxhealth	1423 N JEFFERSON AVE, Springfield, MO, 65802	Coxhealth	1423 NORTH JEFFERSON AVENUE, Springfield, MO, 65802
HSI00000295	Curae Health	121 LEINART ST, Clinton, TN, 37716	Curae Health	121 LEINART STREET, Clinton, TN, 37716
HSI00000297	DCH Health System	809 UNIVERSITY BLVD E, Tuscaloosa, AL, 35401	DCH Health System	809 UNIVERSITY BOULEVARD EAST, Tuscaloosa, AL, 35401
HSI00000300	Davis Health System	812 GORMAN AVE, Elkins, WV, 26241	Davis Health System	REED STREET AND GORMAN AVENUE, Elkins, WV, 26241
HSI00000305	Deaconess Health System	600 MARY ST, Evansville, IN, 47710	Deaconess Health System	600 MARY STREET, Evansville, IN, 47710
HSI00000314	Dignity Health	185 BERRY ST, San Francisco, CA, 94107	Dignity Health	185 BERRY STREET, San Francisco, CA, 94107
HSI00000323	Duke University Health System	2301 ERWIN RD, Durham, NC, 27705	Duke University Health System	201 TRENT DRIVE, Durham, NC, 27710
HSI00000330	Eastern Maine Healthcare Systems	43 WHITING HILL RD, Brewer, ME, 4412	Eastern Maine Healthcare Systems	43 WHITING HILL ROAD, Brewer, ME, 4412
HSI00000334	Edward Elmhurst Healthcare	801 S WASHINGTON ST, Naperville, IL, 60540	Edward-Elmhurst Healthcare	801 SOUTH WASHINGTON STREET, Naperville, IL, 60540
HSI00000342	Emory Healthcare Inc	1440 CLIFTON RD NE, Atlanta, GA, 30322	Emory Healthcare	1440 CLIFTON ROAD NE, Atlanta, GA, 30322
HSI00000346	Ephraim Mcdowell Health	217 S 3RD ST, Danville, KY, 40422	Ephraim Mcdowell Health	217 SOUTH THIRD STREET, Danville, KY, 40422

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000348	Ernest Health Inc	7770 JEFFERSON ST NE, Albuquerque, NM, 87109	Ernest Health, Inc.	7770 JEFFERSON STREET NE, Albuquerque, NM, 87109
HSI00000350	Essentia Health	502 E 2ND ST, Duluth, MN, 55805	Essentia Health	502 EAST SECOND STREET, Duluth, MN, 55805
HSI00000354	Excela Health	532 W PITTSBURGH ST, Greensburg, PA, 15601	Excela Health	532 WEST PITTSBURGH STREET, Greensburg, PA, 15601
HSI00000357	Fairview Health Services	2450 RIVERSIDE AVE, Minneapolis, MN, 55454	Fairview Health Services	2450 RIVERSIDE AVENUE, Minneapolis, MN, 55454
HSI00000358	Faith Regional Health Services	2700 W NORFOLK AVE, Norfolk, NE, 68701	Faith Regional Health Services	2700 WEST NORFOLK AVENUE, Norfolk, NE, 68701
HSI00000365	Firsthealth Of The Carolinas	155 MEMORIAL DR, Pinehurst, NC, 28374	Firsthealth Of The Carolinas	155 MEMORIAL DRIVE, Pinehurst, NC, 28374
HSI00000369	Floyd Healthcare Management Inc	304 TURNER MCCALL BLVD SW, Rome, GA, 30165	Floyd Healthcare Management	304 TURNER MCCALL BOULEVARD, Rome, GA, 30165
HSI00000375	Franciscan Health Inc	1515 W DRAGOON TRL, Mishawaka, IN, 46544	Franciscan Health	1515 DRAGOON TRAIL, Mishawaka, IN, 46544
HSI00000376	Franciscan Missionaries Of Our Lady Health System Inc	4200 ESSEN LN, Baton Rouge, LA, 70809	Franciscan Missionaries Of Our Lady Health System, Inc.	4200 ESSEN LANE, Baton Rouge, LA, 70809
HSI00000381	Freeman Health System	1102 W 32ND ST, Joplin, MO, 64804	Freeman Health System	1102 WEST 32ND STREET, Joplin, MO, 64804
HSI00000388	Geisinger	100 N ACADEMY AVE, Danville, PA, 17822	Geisinger	100 NORTH ACADEMY AVENUE, Danville, PA, 17822
HSI00000390	Genesis Health System	1227 E RUSHOLME ST, Davenport, IA, 52803	Genesis Health System	1227 EAST RUSHOLME STREET, Davenport, IA, 52803
HSI00000397	Gilliard Health Services	3091 CARTER HILL RD, Montgomery, AL, 36111	Gilliard Health Services	3091 CARTER HILL ROAD, Montgomery, AL, 36111
HSI00000407	Good Shepherd Rehabilitation Network	850 S 5TH ST, Allentown, PA, 18103	Good Shepherd Rehabilitation Network	850 SOUTH FIFTH STREET, Allentown, PA, 18103
HSI00000423	Greater Hudson Valley Health System Inc	707 E MAIN ST, Middletown, NY, 10940	Greater Hudson Valley Health System	707 EAST MAIN STREET, Middletown, NY, 10940
HSI00000424	Greenville Health System	701 GROVE RD, Greenville, SC, 29605	Greenville Health System	701 GROVE ROAD, Greenville, SC, 29605
HSI00000430	The Guthrie Clinic	1 GUTHRIE SQ, Sayre, PA, 18840	Guthrie Clinic	ONE GUTHRIE SQUARE, Sayre, PA, 18840
HSI00000439	Hackensack Meridian Health	343 THORNALL ST, Edison, NJ, 8837	Hackensack Meridian Health	343 THORNALL STREET, 8TH FLOOR, Edison, NJ, 8837
HSI00000452	Hartford Healthcare Corp	1 STATE ST, Hartford, CT, 6103	Hartford Healthcare	ONE STATE STREET, 19TH FLOOR, Hartford, CT, 6103
HSI00000454	Hawaii Health Systems Corp	3675 KILAUEA AVE, Honolulu, HI, 96816	Hawaii Health Systems Corporation	3675 KILAUEA AVENUE, Honolulu, HI, 96816
HSI00000455	Hawaii Pacific Health	55 MERCHANT ST, Honolulu, HI, 96813	Hawaii Pacific Health	55 MERCHANT STREET, Honolulu, HI, 96813
HSI00000461	Health First Inc	6450 US HIGHWAY 1, Rockledge, FL, 32955	Health First, Inc.	6450 US HIGHWAY 1, Rockledge, FL, 32955
HSI00000464	Healthpartners Inc	8170 33RD AVE S, Minneapolis, MN, 55425	Healthpartners	8170 33RD AVENUE SOUTH, Bloomington, MN, 55425
HSI00000475	Henry Ford Health System	1 FORD PL, Detroit, MI, 48202	Henry Ford Health System	ONE FORD PLACE, Detroit, MI, 48202

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000476	Heritage Valley Health System	1000 DUTCH RIDGE RD, Beaver, PA, 15009	Heritage Valley Health System	1000 DUTCH RIDGE ROAD, Beaver, PA, 15009
HSI00000478	Heywood Healthcare	242 GREEN ST, Gardner, MA, 1440	Heywood Healthcare	242 GREEN STREET, Gardner, MA, 1440
HSI00000491	Honorhealth	8125 N HAYDEN RD, Scottsdale, AZ, 85258	Honorhealth	8125 NORTH HAYDEN ROAD, Scottsdale, AZ, 85258
HSI00000492	HCA Healthcare	1 PARK PLZ, Nashville, TN, 37203	HCA Healthcare	ONE PARK PLAZA, Nashville, TN, 37203
HSI00000501	Hunt Regional Healthcare	4215 JOE RAMSEY BLVD E, Greenville, TX, 75401	Hunt Regional Healthcare	4215 JOE RAMSEY BOULEVARD, Greenville, TX, 75401
HSI00000507	Integris Health	3301 NW EXPRESSWAY, Oklahoma City, OK, 73112	Integris Health	3366 NW EXPRESSWAY, Oklahoma City, OK, 73112
HSI00000510	Indiana University Health	340 W 10TH ST, Indianapolis, IN, 46202	Indiana University Health	340 WEST 10TH STREET, Indianapolis, IN, 46202
HSI00000511	Infirmary Health System Inc	5 MOBILE INFIRMARY CIR, Mobile, AL, 36607	Infirmary Health System	5 MOBILE INFIRMARY CIRCLE, Mobile, AL, 36607
HSI00000513	Inova Health System	8110 GATEHOUSE RD, Falls Church, VA, 22042	Inova Health System	8110 GATEHOUSE ROAD, Falls Church, VA, 22042
HSI00000514	Inspira Health Network	165 BRIDGETON PIKE, Mullica Hill, NJ, 8062	Inspira Health Network	165 BRIDGETON PIKE, Mullica Hill, NJ, 8062
HSI00000516	Intermountain Healthcare	36 S STATE ST, Salt Lake City, UT, 84111	Intermountain Healthcare, Inc.	36 SOUTH STATE STREET, 22ND FLOOR, Salt Lake City, UT, 84111
HSI00000530	John Muir Health	1400 TREAT BLVD, Walnut Creek, CA, 94597	John Muir Health	1400 TREAT BOULEVARD, Walnut Creek, CA, 94597
HSI00000535	Kpc Healthcare Inc	1301 N TUSTIN AVE, Santa Ana, CA, 92705	Kpc Healthcare, Inc.	1301 NORTH TUSTIN AVENUE, Santa Ana, CA, 92705
HSI00000546	Kettering Health Network	3535 SOUTHERN BLVD, Kettering, OH, 45429	Kettering Health Network	3965 SOUTHERN BOULEVARD, Dayton, OH, 45429
HSI00000548	Kindred Healthcare Inc	680 S 4TH ST, Louisville, KY, 40202	Kindred Healthcare	680 SOUTH FOURTH STREET, Louisville, KY, 40202
HSI00000558	Lrghealthcare	80 HIGHLAND ST, Laconia, NH, 3246	Lrghealthcare	80 HIGHLAND STREET, Laconia, NH, 3246
HSI00000562	Lafayette General Health	1214 COOLIDGE BLVD, Lafayette, LA, 70503	Lafayette General Health	920 WEST PINHOOK ROAD, Lafayette, LA, 70503
HSI00000575	Lee Health	2776 CLEVELAND AVE, Fort Myers, FL, 33901	Lee Health	2776 CLEVELAND AVENUE, Fort Myers, FL, 33901
HSI00000576	Legacy Health	1919 NW LOVEJOY ST, Portland, OR, 97209	Legacy Health	1919 NW LOVEJOY STREET, Portland, OR, 97209
HSI00000582	Lifebridge Health Inc	2401 W BELVEDERE AVE, Baltimore, MD, 21215	Lifebridge Health	2401 WEST BELVEDERE AVENUE, Baltimore, MD, 21215
HSI00000584	Lifepoint Health	330 SEVEN SPRINGS WAY, Brentwood, TN, 37027	Lifepoint Health	330 SEVEN SPRINGS WAY, Brentwood, TN, 37027
HSI00000585	Lifespan	167 POINT ST, Providence, RI, 2903	Lifespan Corporation	167 POINT STREET, Providence, RI, 2903
HSI00000591	Loma Linda University Adventist Health Sciences Center	11234 ANDERSON ST, Loma Linda, CA, 92354	Loma Linda University Adventist Health Sciences Center	11175 CAMPUS STREET, Loma Linda, CA, 92350

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000608	Main Line Health	130 S BRYN MAWR AVE, Bryn Mawr, PA, 19010	Main Line Health	130 SOUTH BRYN MAWR AVENUE, Bryn Mawr, PA, 19010
HSI00000611	Mainehealth	110 FREE ST, Portland, ME, 4101	Mainehealth	110 FREE STREET, Portland, ME, 4101
HSI00000624	Mary Washington Healthcare	2300 FALL HILL AVE, Fredericksburg, VA, 22401	Mary Washington Healthcare	1001 SAM PERRY BOULEVARD, Fredericksburg, VA, 22401
HSI00000631	Mayo Clinic	200 1ST ST SW, Rochester, MN, 55905	Mayo Clinic	200 FIRST STREET SW, Rochester, MN, 55905
HSI00000636	Mclaren Health Care Corp	1 MCLAREN PKWY, Grand Blanc, MI, 48439	Mclaren Health Care Corporation	3373 REGENCY PARK DRIVE, Grand Blanc, MI, 48439
HSI00000637	Mcleod Health	555 E CHEVES ST, Florence, SC, 29506	Mcleod Health	555 EAST CHEVES STREET, Florence, SC, 29506
HSI00000639	Meadville Medical Center	751 LIBERTY ST, Meadville, PA, 16335	Meadville Medical Center	751 LIBERTY STREET, Meadville, PA, 16335
HSI00000640	Medstar Health	10980 GRANTCHESTER WAY, Columbia, MD, 21044	Medstar Health	10980 GRANTCHESTER WAY, Columbia, MD, 21044
HSI00000642	Medisys Health Network	8900 VAN WYCK EXPY, Jamaica, NY, 11418	Medisys Health Network	8900 VAN WYCK EXPRESSWAY, Jamaica, NY, 11418
HSI00000648	Memorial Health System	701 N 1ST ST, Springfield, IL, 62781	Memorial Health System	701 NORTH FIRST STREET, Springfield, IL, 62781
HSI00000649	Memorial Health System	401 MATTHEW ST, Marietta, OH, 45750	Memorial Health System	401 MATTHEW STREET, Marietta, OH, 45750
HSI00000653	Memorial Healthcare System	3501 JOHNSON ST, Hollywood, FL, 33021	Memorial Healthcare System	3501 JOHNSON STREET, Hollywood, FL, 33021
HSI00000654	Memorial Hermann Healthcare System	929 GESSNER RD, Houston, TX, 77024	Memorial Hermann Health System	929 GESSNER, Houston, TX, 77024
HSI00000661	Mercy Health	1701 MERCY HEALTH PL, Cincinnati, OH, 45237	Mercy Health	1701 MERCY HEALTH PLACE, Cincinnati, OH, 45237
HSI00000673	Methodist Health System	1441 N BECKLEY AVE, Dallas, TX, 75203	Methodist Health System	1441 NORTH BECKLEY AVENUE, Dallas, TX, 75203
HSI00000675	Methodist Le Bonheur Healthcare	1211 UNION AVE, Memphis, TN, 38104	Methodist Le Bonheur Healthcare	1211 UNION AVENUE, Memphis, TN, 38104
HSI00000682	Midmichigan Health	4000 WELLNESS DR, Midland, MI, 48670	Midmichigan Health	4000 WELLNESS DRIVE, Midland, MI, 48670
HSI00000691	Mission Health System	509 BILTMORE AVE, Asheville, NC, 28801	Mission Health System	509 BILTMORE AVENUE, Asheville, NC, 28801
HSI00000698	Mon Health System	1200 J D ANDERSON DR, Morgantown, WV, 26505	Mon Health System	1200 J. D. ANDERSON DRIVE, Morgantown, WV, 26505
HSI00000711	Mount Sinai Health System	1 GUSTAVE L LEVY PL, New York, NY, 10029	Mount Sinai Health System	ONE GUSTAVE L. LEVY PLACE, New York, NY, 10029
HSI00000714	Multicare Health System	315 MARTIN LUTHER KING JR WAY, Tacoma, WA, 98405	Multicare Health System	315 MARTIN LUTHER KING JR WAY, Tacoma, WA, 98405
HSI00000717	Nyu Langone Health	550 1ST AVE, New York, NY, 10016	Nyu Langone Health	550 FIRST AVENUE, New York, NY, 10016
HSI00000724	Navicent Health	777 HEMLOCK ST, Macon, GA, 31201	Navicent Health	777 HEMLOCK STREET, MSC 105, Macon, GA, 31201

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000741	Nobilis Health Corp	11700 KATY FWY, Houston, TX, 77079	Nobilis Health Corporation	11700 KATY FREEWAY SUITE 300, Houston, TX, 77079
HSI00000742	Noland Health Services Inc	600 CORPORATE PKWY, Birmingham, AL, 35242	Noland Health Services, Inc.	600 CORPORATE PARKWAY, Birmingham, AL, 35242
HSI00000749	North Memorial Health Care	3300 OAKDALE AVE N, Robbinsdale, MN, 55422	North Memorial Health Care	3300 OAKDALE AVENUE NORTH, Robbinsdale, MN, 55422
HSI00000750	North Mississippi Health Services	830 S GLOSTER ST, Tupelo, MS, 38801	North Mississippi Health Services, Inc.	830 SOUTH GLOSTER STREET, Tupelo, MS, 38801
HSI00000751	North Oaks Health System	15790 PAUL VEGA MD DR, Hammond, LA, 70403	North Oaks Health System	15790 PAUL VEGA MD DRIVE, Hammond, LA, 70403
HSI00000759	Northeast Georgia Health System Inc	743 SPRING ST NE, Gainesville, GA, 30501	Northeast Georgia Health System	743 SPRING STREET NE, Gainesville, GA, 30501
HSI00000767	Northwell Health	2000 MARCUS AVE, New Hyde Park, NY, 11042	Northwell Health	2000 MARCUS AVENUE, New Hyde Park, NY, 11042
HSI00000771	Norton Healthcare Inc	4967 US HIGHWAY 42, Louisville, KY, 40222	Norton Healthcare	4967 US HIGHWAY 42, Louisville, KY, 40222
HSI00000773	Novant Health Inc	2085 FRONTIS PLAZA BLVD, Winston Salem, NC, 27103	Novant Health	2085 FRONTIS PLAZA BOULEVARD, Winston Salem, NC, 27103
HSI00000780	Ochsner Health System	1514 JEFFERSON HWY, New Orleans, LA, 70121	Ochsner Health System	1514 JEFFERSON HIGHWAY, New Orleans, LA, 70121
HSI00000784	Ohiohealth	180 E BROAD ST, Columbus, OH, 43215	Ohiohealth	180 EAST BROAD STREET, Columbus, OH, 43215
HSI00000796	Orlando Health	65 STURTEVANT ST, Orlando, FL, 32806	Orlando Health	1414 KUHL AVENUE, Orlando, FL, 32806
HSI00000802	Owensboro Health	1201 PLEASANT VALLEY RD, Owensboro, KY, 42303	Owensboro Health	1201 PLEASANT VALLEY ROAD, Owensboro, KY, 42303
HSI00000807	Palmetto Health	1301 TAYLOR ST, Columbia, SC, 29201	Palmetto Health	1301 TAYLOR STREET, Columbia, SC, 29201
HSI00000809	Palomar Health	456 E GRAND AVE, Escondido, CA, 92025	Palomar Health	456 EAST GRAND AVENUE, Escondido, CA, 92025
HSI00000813	Partners Healthcare System Inc	800 BOYLSTON ST, Boston, MA, 2199	Partners Healthcare System, Inc.	800 BOYLSTON STREET, Boston, MA, 2199
HSI00000814	Peacehealth	1115 SE 164TH AVE, Vancouver, WA, 98683	Peacehealth	1115 SE 164TH AVENUE, Vancouver, WA, 98683
HSI00000823	Phoebe Putney Health Systems	417 W 3RD AVE, Albany, GA, 31701	Phoebe Putney Health System	417 THIRD AVENUE, Albany, GA, 31701
HSI00000825	Physicians For Healthy Hospitals Inc	1117 E DEVONSHIRE AVE, Hemet, CA, 92543	Physicians For Healthy Hospitals	1117 EAST DEVONSHIRE AVENUE, Hemet, CA, 92543
HSI00000836	Post Acute Medical Llc	1828 GOOD HOPE RD, Enola, PA, 17025	Post Acute Medical, Llc	1828 GOOD HOPE ROAD, Enola, PA, 17025
HSI00000842	Premier Health	110 N MAIN ST, Dayton, OH, 45402	Premier Health	110 NORTH MAIN STREET SUITE 390, Dayton, OH, 45402
HSI00000843	Presbyterian Healthcare Services	9521 SAN MATEO BLVD NE, Albuquerque, NM, 87113	Presbyterian Healthcare Services	9521 SAN MATEO BLVD. NE, Albuquerque, NM, 87113
HSI00000845	Prime Healthcare Services Inc	3300 E GUASTI RD, Ontario, CA, 91761	Prime Healthcare Services	3300 EAST GUASTI ROAD, Ontario, CA, 91761

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000847	Prohealth Care	N17W24100 RIVERWOOD DR, Waukesha, WI, 53188	Prohealth Care, Inc.	N17 W24100 RIVERWOOD DRIVE, Waukesha, WI, 53188
HSI00000850	Promise Healthcare Inc	999 W YAMATO RD, Boca Raton, FL, 33431	Promise Healthcare	999 YAMATO ROAD, 3RD FLOOR, Boca Raton, FL, 33431
HSI00000852	Providence Saint Joseph Health	1801 LIND AVE SW, Renton, WA, 98057	Providence St. Joseph Health	1801 LIND AVENUE SOUTHWEST, 9016, Renton, WA, 98057
HSI00000860	Quorum Health Corp	1573 MALLORY LN, Brentwood, TN, 37027	Quorum Health	1573 MALLORY LANE, Brentwood, TN, 37027
HSI00000863	Rwjbarnabas Health	95 OLD SHORT HILLS RD, West Orange, NJ, 7052	Rwjbarnabas Health	95 OLD SHORT HILLS ROAD, West Orange, NJ, 7052
HSI00000866	Tower Health	420 S 5TH AVE, West Reading, PA, 19611	Tower Health	SIXTH AVENUE AND SPRUCE STREET, West Reading, PA, 19611
HSI00000868	Regional Health	353 FAIRMONT BLVD, Rapid City, SD, 57701	Regional Health	353 FAIRMONT BOULEVARD, Rapid City, SD, 57701
HSI00000874	Renown Health	50 W LIBERTY ST, Reno, NV, 89501	Renown Health	50 WEST LIBERTY STREET, Reno, NV, 89501
HSI00000881	Ridgeview Medical Center	500 S MAPLE ST, Waconia, MN, 55387	Ridgeview Medical Center	500 SOUTH MAPLE STREET, Waconia, MN, 55387
HSI00000883	Riverside Health System	701 TOWN CENTER DR, Newport News, VA, 23606	Riverside Health System	701 TOWN CENTER DRIVE, Newport News, VA, 23606
HSI00000896	Rush Health Systems	1314 19TH AVE, Meridian, MS, 39301	Rush Health Systems	1314 19TH AVENUE, Meridian, MS, 39301
HSI00000902	Ssm Health	10101 WOODFIELD LN, Saint Louis, MO, 63132	Ssm Health	10101 WOODFIELD LANE, Saint Louis, MO, 63132
HSI00000912	Saint Charles Health System	2500 NE NEFF RD, Bend, OR, 97701	St. Charles Health System, Inc.	2500 NE NEFF ROAD, Bend, OR, 97701
HSI00000917	Saint Elizabeth Healthcare	1 MEDICAL VILLAGE DR, Edgewood, KY, 41017	St. Elizabeth Healthcare	1 MEDICAL VILLAGE DRIVE, Edgewood, KY, 41017
HSI00000919	Saint Francis Health System	6161 S YALE AVE, Tulsa, OK, 74136	Saint Francis Health System	6161 SOUTH YALE AVENUE, Tulsa, OK, 74136
HSI00000930	Saint Lawrence Health System	50 LEROY ST, Potsdam, NY, 13676	St. Lawrence Health System	50 LEROY STREET, Potsdam, NY, 13676
HSI00000934	Saint Lukes Health System	190 E BANNOCK ST, Boise, ID, 83712	St. Luke's Health System	190 EAST BANNOCK STREET, Boise, ID, 83712
HSI00000935	Saint Lukes Health System	901 E 104TH ST, Kansas City, MO, 64131	Saint Luke's Health System	901 EAST 104TH STREET, MAILSTOP 900N, Kansas City, MO, 64131
HSI00000936	Saint Lukes University Health Network	801 OSTRUM ST, Bethlehem, PA, 18015	St. Luke's University Health Network	801 OSTRUM STREET, Bethlehem, PA, 18015
HSI00000948	Salina Regional Health Center Inc	400 S SANTA FE AVE, Salina, KS, 67401	Salina Regional Health Center	400 SOUTH SANTA FE AVENUE, Salina, KS, 67401
HSI00000951	Samaritan Health Services	3600 NW SAMARITAN DR, Corvallis, OR, 97330	Samaritan Health Services	3600 NW SAMARITAN DRIVE, Corvallis, OR, 97330
HSI00000968	Scripps Health	10140 CAMPUS POINT DR, San Diego, CA, 92121	Scripps Health	4275 CAMPUS POINT COURT CP112, San Diego, CA, 92121
HSI00000970	Select Medical Corp	4714 GETTYSBURG RD, Mechanicsburg, PA, 17055	Select Medical Corporation	4714 GETTYSBURG ROAD, Mechanicsburg, PA, 17055

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00000972	Sentara Healthcare	6015 POPLAR HALL DR, Norfolk, VA, 23502	Sentara Healthcare	6015 POPLAR HALL DRIVE, Norfolk, VA, 23502
HSI00000977	Sharp Healthcare	8695 SPECTRUM CENTER BLVD, San Diego, CA, 92123	Sharp Healthcare	8695 SPECTRUM CENTER BOULEVARD, San Diego, CA, 92123
HSI00000981	Shriners Hospitals For Children	2900 N ROCKY POINT DR, Tampa, FL, 33607	Shriners Hospitals For Children	2900 NORTH ROCKY POINT DRIVE, Tampa, FL, 33607
HSI00000987	Sinai Health System	1500 S CALIFORNIA AVE, Chicago, IL, 60608	Sinai Health System	1500 SOUTH FAIRFIELD AVENUE, Chicago, IL, 60608
HSI00000990	Sisters Of Charity Health System	2475 E 22ND ST, Cleveland, OH, 44115	Sisters Of Charity Health System	2475 EAST 22ND STREET, Cleveland, OH, 44115
HSI00000999	South Georgia Medical Center	2501 N PATTERSON ST, Valdosta, GA, 31602	South Georgia Medical Center	2501 NORTH PATTERSON STREET, Valdosta, GA, 31602
HSI00001006	Southeast Georgia Health System	2415 PARKWOOD DR, Brunswick, GA, 31520	Southeast Georgia Health System	2415 PARKWOOD DRIVE, Brunswick, GA, 31520
HSI00001007	Southeast Health	1701 LACEY ST, Cape Girardeau, MO, 63701	Southeasthealth	1701 LACEY STREET, Cape Girardeau, MO, 63701
HSI00001009	Southern Illinois Healthcare	1239 E MAIN ST, Carbondale, IL, 62901	Southern Illinois Healthcare	1239 EAST MAIN STREET, Carbondale, IL, 62901
HSI00001013	Southwest Health Systems	215 MARION AVE, Mccomb, MS, 39648	Southwest Health Systems	215 MARION AVENUE, Mccomb, MS, 39648
HSI00001018	Sparrow Health System	1200 E MICHIGAN AVE, Lansing, MI, 48912	Sparrow Health System	1215 EAST MICHIGAN AVENUE, Lansing, MI, 48912
HSI00001020	Spartanburg Regional Healthcare System Inc	101 E WOOD ST, Spartanburg, SC, 29303	Spartanburg Regional Healthcare System	101 EAST WOOD STREET, Spartanburg, SC, 29303
HSI00001021	Spectrum Health	100 MICHIGAN ST NE, Grand Rapids, MI, 49503	Spectrum Health	100 MICHIGAN STREET NE, Grand Rapids, MI, 49503
HSI00001033	Stanford Health Care	300 PASTEUR DR, Stanford, CA, 94305	Stanford Health Care	300 PASTEUR DRIVE, Palo Alto, CA, 94304
HSI00001037	Steward Health Care System Llc	1900 N PEARL ST, Dallas, TX, 75201	Steward Health Care System, Llc	1900 NORTH PEARL STREET, Dallas, TX, 75201
HSI00001045	Summit Health	112 N 7TH ST, Chambersburg, PA, 17201	Summit Health	112 NORTH SEVENTH STREET, Chambersburg, PA, 17201
HSI00001050	Sutter Health	2200 RIVER PLAZA DR, Sacramento, CA, 95833	Sutter Health	2200 RIVER PLAZA DRIVE, Sacramento, CA, 95833
HSI00001066	Tenet Healthcare Corp	1445 ROSS AVE, Dallas, TX, 75202	Tenet Healthcare Corporation	1445 ROSS AVENUE, Dallas, TX, 75202
HSI00001072	Texas Health Resources	612 E LAMAR BLVD, Arlington, TX, 76011	Texas Health Resources	612 EAST LAMAR BOULEVARD, Arlington, TX, 76011
HSI00001074	The Carle Foundation	611 W PARK ST, Urbana, IL, 61801	Carle Foundation	611 WEST PARK STREET, Urbana, IL, 61801
HSI00001087	The Queens Health Systems	1301 PUNCHBOWL ST, Honolulu, HI, 96813	Queen's Health Systems	1301 PUNCHBOWL STREET, Honolulu, HI, 96813
HSI00001089	The University Of Chicago Medicine	5841 S MARYLAND AVE, Chicago, IL, 60637	University Of Chicago Medicine	5841 SOUTH MARYLAND AVENUE, Chicago, IL, 60637
HSI00001092	Thedacare Inc	122 E COLLEGE AVE, Appleton, WI, 54911	Thedacare, Inc.	122 EAST COLLEGE AVENUE, Appleton, WI, 54911

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00001093	Thomas Health System	4605 MACCORKLE AVE SW, Charleston, WV, 25309	Thomas Health System, Inc.	4605 MACCORKLE AVENUE SW, South Charleston, WV, 25309
HSI00001106	Trinity Health	20555 VICTOR PKWY, Livonia, MI, 48152	Trinity Health	20555 VICTOR PARKWAY, Livonia, MI, 48152
HSI00001110	Truman Medical Centers	2301 HOLMES ST, Kansas City, MO, 64108	Truman Medical Centers	2301 HOLMES STREET, Kansas City, MO, 64108
HSI00001116	Uab Health System	500 22ND ST S, Birmingham, AL, 35233	Uab Health System	500 22ND STREET SOUTH, Birmingham, AL, 35233
HSI00001118	Uc Health	3200 BURNET AVE, Cincinnati, OH, 45229	Uc Health	3200 BURNET AVENUE, Cincinnati, OH, 45229
HSI00001122	Umass Memorial Health Care	365 PLANTATION ST, Worcester, MA, 1605	Umass Memorial Health Care, Inc.	1 BIOTECH PARK, Worcester, MA, 1605
HSI00001126	Upmc	600 GRANT ST, Pittsburgh, PA, 15219	Upmc	600 GRANT STREET, US STEEL TOWER, Pittsburgh, PA, 15219
HSI00001133	Uw Medicine	1959 NE PACIFIC ST, Seattle, WA, 98195	Uw Medicine	1959 NE PACIFIC STREET, Seattle, WA, 98195
HSI00001134	Union General Hospital Inc	35 HOSPITAL RD, Blairsville, GA, 30512	Union General Hospital, Inc.	35 HOSPITAL ROAD, Blairsville, GA, 30512
HSI00001138	United Health Services	10 42 MITCHELL AVE, Binghamton, NY, 13903	United Health Services	10-42 MITCHELL AVENUE, Binghamton, NY, 13903
HSI00001146	Unitypoint Health	1776 WEST LAKES PKWY, West Des Moines, IA, 50266	Unitypoint Health	1776 WEST LAKES PARKWAY, West Des Moines, IA, 50266
HSI00001148	Universal Health Services Inc	367 S GULPH RD, Norristown, PA, 19406	Universal Health Services, Inc.	367 SOUTH GULPH ROAD, King Of Prussia, PA, 19406
HSI00001151	University Health Care System	1350 WALTON WAY, Augusta, GA, 30901	University Health Care System	1350 WALTON WAY, Augusta, GA, 30901
HSI00001155	University Hospital And Health System	2500 N STATE ST, Jackson, MS, 39216	University Hospitals And Health System	2500 NORTH STATE STREET, Jackson, MS, 39216
HSI00001173	The University Of Kansas Health System	4000 CAMBRIDGE ST, Kansas City, KS, 66160	University Of Kansas Health System	4000 CAMBRIDGE STREET, Kansas City, KS, 66160
HSI00001175	University Of Maryland Medical System	250 W PRATT ST, Baltimore, MD, 21201	University Of Maryland Medical System	250 WEST PRATT STREET, 24TH FLOOR, Baltimore, MD, 21201
HSI00001176	University Of Miami Health System	1120 NW 14TH ST, Miami, FL, 33136	University Of Miami Health System	1400 NW 12TH AVENUE, Miami, FL, 33136
HSI00001178	University Of Missouri Health Care	1 HOSPITAL DR, Columbia, MO, 65212	University Of Missouri Health Care	ONE HOSPITAL DRIVE, DC 031, Columbia, MO, 65212
HSI00001179	University Of Rochester Medical Center	601 ELMWOOD AVE, Rochester, NY, 14642	University Of Rochester Medical Center	601 ELMWOOD AVE BOX 623, Rochester, NY, 14642
HSI00001213	Vcu Health System	1250 E MARSHALL ST, Richmond, VA, 23298	Vcu Health System	1250 EAST MARSHALL STREET, Richmond, VA, 23298
HSI00001228	Vibra Healthcare	4600 LENA DR, Mechanicsburg, PA, 17055	Vibra Healthcare	4550 LENA DRIVE, Mechanicsburg, PA, 17055
HSI00001230	Vidant Health	800 WH SMITH BLVD, Greenville, NC, 27834	Vidant Health	2100 STANTONSBURG ROAD, Greenville, NC, 27834
HSI00001232	Virginia Mason Health System	1100 9TH AVE, Seattle, WA, 98101	Virginia Mason Health System	1100 NINTH AVENUE, Seattle, WA, 98101

Health system ID	OneKey health system name	OneKey health system address	AHA health system name	AHA health system address
HSI00001233	Virtua Health	303 LIPPINCOTT DR, Marlton, NJ, 8053	Virtua Health	303 LIPPINCOTT DRIVE, 4TH FLOOR, Marlton, NJ, 8053
HSI00001236	Wakemed Health And Hospitals	3000 NEW BERN AVE, Raleigh, NC, 27610	Wakemed Health & Hospitals	3000 NEW BERN AVENUE, Raleigh, NC, 27610
HSI00001238	Washington Health System	155 WILSON AVE, Washington, PA, 15301	Washington Health System	155 WILSON AVENUE, Washington, PA, 15301
HSI00001243	Wellspan Health	45 MONUMENT RD, York, PA, 17403	Wellspan Health	45 MONUMENT ROAD, York, PA, 17403
HSI00001244	Wellstar Health System Inc	793 SAWYER RD, Marietta, GA, 30062	Wellstar Health System	793 SAWYER ROAD, Marietta, GA, 30062
HSI00001250	West Tennessee Healthcare	620 SKYLINE DR, Jackson, TN, 38301	West Tennessee Healthcare	620 SKYLINE DRIVE, Jackson, TN, 38301
HSI00001253	Western Connecticut Health Network Inc	24 HOSPITAL AVE, Danbury, CT, 6810	Western Connecticut Health Network	24 HOSPITAL AVENUE, Danbury, CT, 6810
HSI00001260	White River Health System Inc	1710 HARRISON ST, Batesville, AR, 72501	White River Health System	1710 HARRISON STREET, Batesville, AR, 72501
HSI00001263	Willis-Knighton Health System	2600 GREENWOOD RD, Shreveport, LA, 71103	Willis-Knighton Health System	2600 GREENWOOD ROAD, Shreveport, LA, 71103
HSI00001284	Ballad Health	303 MED TECH PKWY, Johnson City, TN, 37604	Ballad Health	303 MED TECH PARKWAY, Johnson City, TN, 37604
HSI00001300	Curahealth Hospitals	650 BEEBALM LN, Garland, TX, 75040	Curahealth Hospitals	650 BEEBALM LANE, Garland, TX, 75040
HSI00001355	Sisters Of Mary Of The Presentation Health System	1202 PAGE DR S, Fargo, ND, 58103	Sisters Of Mary Of The Presentation Health System	1202 PAGE DRIVE SW, Fargo, ND, 58103

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Appendix C. Health System Participation in Medicare Alternative Payment Models: Data and Methods

Introduction

This appendix describes the data and methods used to construct the variables that indicate whether a health system participated in a Medicare alternative payment model (APM). The appendix also describes the variables that report the number of physicians within each health system that participated in each of three different Medicare APM types (accountable care organizations; episode-based payment models; primary care transformation models). We first provide a high-level overview of our approach, and then we describe each of our steps in more detail in the subsequent section.

Health System Participation in Medicare APMs

We used data from the Centers for Medicare & Medicaid Services (CMS) Alternative Payment Model Management System (AMS) from 2018 to identify health systems and physicians participating in Medicare APMs. The AMS dataset contains the national provider identifiers (NPIs) and tax identification numbers (TINs) for providers and group practices participating in active Medicare APMs, as well as information about the specific Medicare APMs and model tracks they participated in.

While the AMS dataset includes information on all active Medicare APMs, we were specifically interested in APMs that influenced payments to clinicians and that had a national scope. Therefore, we excluded models that did not have a direct influence on healthcare payments or that were only available in a specific State.[xxvi] The one exception to this rule is the Vermont All-Payer ACO Model, because in 2018, the model only had one participating ACO, and that ACO was included in the AMS data as a Next Generation ACO participant. Table C.1 lists the final set of Medicare APMs used to generate the Compendium variables.

[xxvi] The Medicare models that we excluded include the Million Hearts Cardiovascular Disease Reduction Model, the Frontier Community Health Integration Project Demonstration, the Initiative to Reduce Avoidable Hospitalizations Among Nursing Facilities Residents: Phase 2, the Transforming Clinical Practice Initiative, the Accountable Health Communities model, and the Maryland All-Payer Model Care Redesign Program.

Table C.1. National Medicare alternative payment models

Model Name	Type	Scope
Medicare Shared Savings Program	Accountable care	National
Comprehensive End-Stage Renal Disease Care Model	Accountable care	National
Next Generation ACO Model[a]	Accountable care	National
Bundled Payment for Care Improvement	Episode-based payment	National
Comprehensive Care for Joint Replacement Model	Episode-based payment	Only for certain regions: 67 MSAs
Oncology Care Model	Episode-based payment	National
Comprehensive Primary Care Plus	Primary Care Transformation	Only for certain regions: 18 regions

ACO = accountable care organization; MSAs = Metropolitan Statistical Areas.

[a] In 2018, the AMS data for the Next Generation ACO Model included the one ACO that was part of the Vermont All-Payer ACO Model.

To construct the variables on health system participation in Medicare APMs, we began by limiting the AMS data to the seven Medicare APMs identified in Table C.1. We then matched combinations of NPIs and TINs in the AMS dataset to combinations of NPIs and TINs in the Compendium system-group practice linkage file (referred to as the "group practice linkage file" in this document).[xxvii] The group practice linkage file includes all group practices (identified by TINs) with at least two physicians billing Medicare. It links the group TINs and the physician NPIs in those TINs to health systems; NPIs are linked to a primary TIN listed in the Medicare Data on Physician Practice and Specialty (MD-PPAS).[xxviii]

When the NPI-TIN combinations from the AMS dataset did not match those in the group practice linkage file, we did not count the NPI as participating in a Medicare APM as part of the system that the TIN was associated with (unless the TIN from the AMS data had the same system assignment as the TIN that the NPI was linked to in the group practice linkage file). Therefore, we only counted a physician NPI from the AMS data as participating in a Medicare APM through a specific health system if that NPI was identified in the AMS data as participating in an APM through a TIN that is linked to that health system in the group practice linkage file. See Step 2 below for additional details.

Finally, we constructed a set of four system-level variables. The first variable identifies participation in any Medicare APM, and the remaining variables identify the number of physicians from a health system that participated in specific types of Medicare APMs (Table C.2).

[xxvii] The 2018 Compendium of U.S. Health Systems, the group practice linkage file, and their respective technical documentation files can be found at https://www.ahrq.gov/chsp/data-resources/compendium-2018.html.

[xxviii] See the technical documentation for the group practice linkage file for more detail, which can be found at https://www.ahrq.gov/chsp/data-resources/compendium-2018.html.

Table C.2. Medicare APM variables added to the 2018 Compendium of U.S. Health Systems

Variable	Description
System participation in any Medicare APM	Equal to one if any physician affiliated with a health system participated in one of the seven Medicare APMs identified in Table C.1
Number of physicians participating in a Medicare ACO[a]	Equal to the number of physicians affiliated with a health system that participated in a Medicare Shared Savings Program ACO, a Comprehensive End-Stage Renal Disease Care Model ACO, or a Next Generation ACO
Number of physicians participating in a Medicare episode-based payment model[a]	Equal to the number of physicians affiliated with a health system that participated in the Bundled Payment for Care Improvement model, the Comprehensive Care for Joint Replacement Model, or the Oncology Care Model
Number of physicians participating in a Medicare primary care transformation model[a]	Equal to the number of physicians affiliated with a health system that participated in the Comprehensive Primary Care Plus model

APM = alternative payment model; ACO = accountable care organization.
[a] We identified participating physicians from the set of system-affiliated physicians billing Medicare in 2018. To calculate the percentage of systems' physicians participating, users should determine the total number of system-affiliated physicians billing the Medicare program using AHRQ's 2018 Group Practice Linkage File and the 2018 Medicare Data on Physician Practice and Specialty file.

Step 1: Identifying physicians and group practices participating in Medicare APMs

We used two data files from the AMS dataset to identify physicians and group practices participating in Medicare APMs. The first file is a provider-level file that contains the NPI, TIN, and unique APM entity identification number for each participating provider. The second file is an APM-level file that contains the APM entity identification number as well as the APM and APM track that entity participated in. We merged the two files using the APM entity identification number and limited the resulting file to the Medicare APMs listed in Table C.1 to create a file with the physicians and group practices participating in each of those APMs. The data we used were from the third quarter of 2018.[xxix]

Step 2: Matching physicians and group practices in the AMS dataset and the Compendium

Next, we matched NPIs and the TINs they are linked to in the AMS data (N=663,542) to physician NPIs and the primary TIN they are linked to in the group practice linkage file (N=585,012). We were able to match 230,893 NPI-TIN combinations from the AMS dataset to the group practice linkage file. There were 432,649 NPI-TIN combinations from the AMS dataset that did not match the group practice linkage file.

One reason some NPI-TIN combinations from the AMS dataset did not match the group practice linkage file is that in the AMS dataset, a physician NPI can be associated with multiple TINs if that

[xxix] The AMS data for the Next Generation ACO Model includes NPIs for both participating and preferred providers.

physician bills under multiple group practices, whereas the group practice linkage file identifies the TIN for the group practice that each physician NPI bills under *most frequently*, meaning an NPI is only associated with one TIN. Another reason is that the group practice linkage file only contains NPIs for physicians, while the AMS dataset includes NPIs for other provider types, such as nurse practitioners and physician assistants. A third reason is that the group practice linkage file does not include TINs that only have one physician NPI billing under them to ensure the confidentiality of identifiable individuals.

Among the NPI-TIN combinations from the AMS data that did not match the group practice linkage file, there are four scenarios:

1. The AMS NPI is not in the group practice linkage file (n=293,465).
2. The AMS NPI is in the group practice linkage file but is linked to a different TIN, and the other TIN has the same system assignment as the one from the AMS data (n=44,689).
3. The AMS NPI is in the group practice linkage file but is linked to a different TIN, and the other TIN has a different system assignment or no system assignment (n=75,720).
4. The AMS NPI is in the group practice linkage file but the TIN is not (n=18,775).

For the AMS NPI-TIN combinations that did not match the group practice linkage file, we assumed that the TINs in the AMS data correctly identify the group practices through which the NPIs participated in Medicare APMs. Therefore, given that the group practice linkage file does not link these NPIs to the same TINs as the AMS data, we concluded that the AMS data do not indicate NPI participation in a Medicare APM *through the system*, unless the TIN from the AMS data had the same system assignment as the TIN in the group practice linkage file (scenario 2). In other words, we concluded that the NPIs affiliated with a health system in the group practice linkage file should only count as participating in a Medicare APM through that system if the AMS data identify the NPIs as participating through a TIN affiliated with that system.

Therefore, for NPIs in scenario 2, because the TIN in the AMS data and the TIN in the group practice linkage file had the same health system assignment, we counted those NPIs as participating in the Medicare APM identified in the AMS data through the health system that those TINs were affiliated with. However, we did not count the NPIs in scenario 3 as participating in the Medicare APMs identified in the AMS data *through a health system* because the TINs associated with those NPIs in the group practice linkage file were not identified as participating in the Medicare APMs in the AMS data.

We also excluded the NPI-TIN combinations from scenario 1. Most of these NPIs were for provider types that were excluded from the group practice linkage file (n=254,472) and another 12,435 of the NPI-TIN combinations were for solo practices, meaning the practice only had one physician NPI billing under it. For the remaining NPIs, we assumed that while the providers were likely participating in a Medicare APM, they were not participating *through a health system* since they were not included in the group practice linkage file. Therefore, we cannot determine if they are in a health system. Finally, we excluded the NPI-TIN combinations from scenario 4 because those TINs

were not in the group practice linkage file. Therefore, we cannot determine if they are in a health system.

Using this approach, in addition to the 230,893 NPI-TIN combinations from the AMS dataset that matched the group practice linkage file, we included the 44,689 NPI-TIN combinations from the AMS data for which the NPI is in the group practice linkage file and linked to a TIN with the same system assignment as the TIN from the AMS data (scenario 2), for a total of 275,582 NPI-TIN observations.

Step 3: Aggregating physician and group practice participation in Medicare APMs to the system level

To construct the system-level variables, we aggregated physician participation in Medicare APMs to the system level using the group practice linkage file. Specifically, we generated a count of unique physician NPIs from each health system that participated in any of three active Medicare ACO models, a count of unique physician NPIs from each system that participated in any of three active episode-based payment models, and a count of unique physician NPIs from each system that participated in the primary care transformation model (models listed in Table C.1).[xxx] Finally, we constructed a variable that was equal to one if any NPIs associated with a health system were identified as participating in any of the three types of APMs and was equal to zero if not.

Caveats and Limitations

Two Medicare APMs were active only in specific regions

Of the seven national Medicare APMs that we included when constructing system-level variables (Tables C.1 and C.2), two models (Comprehensive Primary Care Plus and Comprehensive Care for Joint Replacement) were only active in specific regions. In regions where these two models were not active, physicians, practices, and health systems did not have the opportunity to participate. In the case of Comprehensive Care for Joint Replacement, the other two episode-based payment models (Bundled Payment for Care Improvement and the Oncology Care Model) were active in all regions of the United States, meaning that systems in all regions had an opportunity to participate in a Medicare episode-based payment model. In addition, all three accountable care organization models were active in all United States regions. However, because Comprehensive Primary Care Plus was the only primary care transformation model active in 2018, systems that were not in regions where this model was offered did not have an opportunity to participate in a primary care transformation model.

Nonphysician providers and practices with only one billing physician were excluded

As described in Step 2 above, the group practice linkage file does not include NPIs for nonphysician providers, such as a nurse practitioner or a physician assistant, or TINs that only had a single

[xxx] These counts were based on the set of system-affiliated physicians, which were identified among physicians billing Medicare in 2018 using primarily the 2018 Medicare Data on Physician Practice and Specialty file. For more information on the set of physicians included in the development of the group practice linkage file (and thus the physicians who were assessed for participation in APMs), see the technical documentation for the group practice linkage file, which can be found at https://www.ahrq.gov/chsp/data-resources/compendium-2018.html.

physician billing under them. Therefore, while other types of providers from some practices and health systems were participating in Medicare APMs, these providers are not captured in the Medicare APM variables. However, we believe that it is unlikely that a nonphysician provider would be the only provider within a health system that participated in a Medicare APM, which means that it is unlikely that we miss any systems participating in Medicare APMs because of this issue. In addition, while there may be exceptions, in most cases, TINs with only one physician billing under them do not tend to be affiliated with health systems.

Some systems had low numbers of physicians participating

Twenty-three health systems had one or two physicians participating in one of the three types of Medicare APMs. For these health systems, we performed manual web searches to find additional information about each system's engagement in Medicare APMs. Specifically, we focused on information available on health system websites and information on CMS's "Where is Innovation Happening?" web page.[xxxi]

Using this approach, we were able to confirm that many of these systems were participating in the type of Medicare APM we identified based on the approach described above. In other cases, we could not find confirmatory information through web searches. Often, this difficulty arose because the health system was identified as participating in a Medicare ACO, and it was generally harder to find information about health system participation in Medicare ACOs.

Based on this review, we did not identify any information that would indicate that the group practice linkage file incorrectly identifies relationships between physicians, group practices, and systems. Therefore, the physician count, while low, was accurate based on the information in the AMS dataset. There was one exception to this conclusion. One health system that predominantly serves children was identified as having two physicians participating in a Medicare ACO model. Based on a web search, we could not find evidence that this health system participated in a Medicare ACO. Therefore, because it is unlikely that a health system that primarily serves children is participating in a Medicare APM, we updated the Medicare APM variables related to this system to indicate that no physicians within the system were participating in a Medicare ACO and to indicate that the system itself was not participating in any Medicare APMs. We also confirmed that no other health systems that predominantly serve children were identified as participating in a Medicare APM.

[xxxi] More information about CMS's "Where Innovation is Happening" website is available here: https://innovation.cms.gov/innovation-models/map#.

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Appendix D. Insurance Product Data and Methods

Introduction

This appendix describes the data and methods used to construct the variables indicating whether a health system offered any insurance product and insurance products by type, and the contract numbers and enrollment for a system's Medicare Advantage (MA) plans.

Systems Offering an Insurance Product

We used the 2018 American Hospital Association (AHA) Annual Survey Database to construct measures of whether a system in the 2018 Compendium offered any insurance product or one of the following types of products: MA, Medicaid managed care, or Health Insurance Marketplace. For 198 hospitals that were missing 2018 AHA data but not missing 2017 AHA data, we used 2017 data. As described in Chapter II, AHA data are based on an annual survey of hospitals in the United States. The AHA Annual Survey Database provides facility-level data about organizational structure, services, staffing, expenses, system affiliations, and physician arrangements.

We used responses to several 2018 AHA survey questions: (1) whether the hospital or system owns or jointly owns a health plan; (2) whether the hospital or system has a significant partnership with an insurer or insurance company/health plan; and (3) whether the hospital or system owns a product, has a joint venture in a product, or offers a new product for each of several types of insurance products (MA, Medicaid managed care, Health Insurance Marketplace, other individual market, large group, small group, other). In cases in which a hospital was missing 2018 data, we used responses to several 2017 AHA survey questions: (1) whether the hospital or system partners with an insurer to offer insurance products; (2) whether the hospital or system offers insurance products via ownership or joint venture; and (3) whether the hospital or its system owns or has a joint venture in a product for each of several types of insurance products (MA, Medicaid managed care, Health Insurance Marketplace, other individual market, large group, small group, other).

We constructed a system-level variable equal to one if at least one non-Federal general acute care hospital within the system reported owning an insurance product or offering an insurance product through a partnership or joint venture at the hospital level or system level. For example, a system could have been identified as offering an insurance product because one of its hospitals reported owning a plan, and another system could have been identified as offering an insurance product because one of its hospitals reported that its system offered an MA product through a joint venture. When we constructed system-level variables, we used data for a system's hospital in 2017 if that hospital had missing data in 2018. For example, if a system had two hospitals, and one hospital reported not offering an MA product in 2018 and 2017, and the other hospital had missing data in 2018 and reported offering an MA product in 2017, then we classified the system as offering an MA product. Out of 200 systems that we identified as offering an insurance product, only 5 systems were classified as such based on this particular scenario. The more common scenario in which we used 2017 data was that all hospitals in a system were missing data in 2018, but at least one hospital was not missing data in 2017.

The variable indicating whether a system offered any insurance product represents the broadest possible measure of activity as an insurer based on AHA data, and it produced three mutually exclusive groups:

- Systems that offered any insurance product; that is, at least one hospital in the system reported an insurance product at the hospital or system level or through a partnership or joint venture. These systems have a value of 1 for the any insurance product variable.
- Systems that had at least one hospital with nonmissing data on insurance products and zero hospitals that reported an insurance product at the hospital or system level or through a partnership or joint venture. These systems have a value of 0 for the any insurance product variable.
- Systems that had missing data on insurance products for all hospitals; either all of their hospitals that responded to the survey had missing data on insurance products, or their hospitals did not respond to the AHA survey. These systems have missing data for the any insurance product variable (details reported in caveat on Missing Data below).

We constructed the variables for offering an MA, Medicaid managed care, or Health Insurance Marketplace product using an analogous approach.

List of MA Contracts Owned by the System and MA Enrollment

We used the January 2018 MA Plan Directory and December 2018 MA enrollment data from the Centers for Medicare & Medicaid Services (CMS) website to construct variables that list all MA contracts offered by the system and enrollment in those contracts. The MA Plan Directory lists MA, cost, Program of All-inclusive Care for the Elderly (PACE), and demonstration plans.

To determine whether a system offered an MA plan, we began by identifying MA plans owned by a provider organization, such as a health system, hospital, or medical group. Then, we matched the MA Plan Directory to the Compendium's consolidated list of U.S. health systems, referred to in this appendix as "the list." In doing so, we identified systems that offered an MA plan and the MA contracts associated with each system. In the following sections, we refer to this multistep process as the CMS matching process to distinguish it from the MA variable constructed using AHA data that we describe earlier in this appendix.

Step 1: Identifying systems that offered the same MA contract in 2016 and 2018

We identified systems in the 2018 Compendium file that we categorized as offering an MA product in the 2016 Compendium based on matching 2016 CMS data to data on systems in the 2016 Compendium. For each of these systems, we checked whether the MA contracts associated with them in 2016 still existed in the 2018 MA Plan Directory. If the contracts existed in the 2018 MA Plan Directory under the same MA parent organization, we continued to categorize that system as offering an MA product, and we assigned it all of its previous contracts except those that terminated before 2018. Finally, for each of these systems, we assigned the remaining 2018 MA contracts that had the same MA parent organization to the system. Thus, our list at this point comprised all systems that owned MA products in both 2016 and 2018, along with all the contracts associated with them, whether they were 2016 contracts that were still active in 2018 or new contracts that were launched after 2016.

Next, we excluded from the MA Plan Directory all contracts that had already been matched to systems. We refer to the remaining contracts as the MA data.

Step 2: Identifying which Medicare Advantage plans were owned by a provider organization

Before matching the MA data to the list, we added a variable to the MA data that indicated whether the MA plan was owned by a provider organization. Johnson, et al. (2017) identified MA plans that operated between 2011 and 2015 and were owned by a provider organization, such as a health system, hospital, or medical group.[xxxii] We obtained the contract-level data from the authors and matched those data to the MA data using contract number.

Of the 580 MA plans in the MA data, we had data on ownership by a provider organization for 302 MA plans. We were missing data on ownership by a provider organization for 278 MA plans that were not examined by Johnson, et al. (2017) because the plan did not operate from 2011 to 2015 or the plan was not a local coordinated care plan such as an HMO or PPO.[xxxiii]

As we discuss in the next section, we used the measure of provider ownership when we matched the MA data to health systems in the list.

Step 3: Matching the Medicare Advantage Plan Directory to the Compendium's list of U.S. health systems

Data Preparation

To match MA plan parent organization and address in the MA data to health system name and address, we first processed names and addresses using the following steps:

- Removed all punctuation,
- Converted all text to uppercase,
- Removed multiple spaces in a row,
- Removed "the," "and," and "of" from names,
- Removed "inc," "corp," "corporation," and "company" from names,
- Removed terms such as "c/o" from addresses, and
- Normalized common terms (i.e., system = systems, health care = healthcare, N = north).

Next, we deduplicated the MA data using the variables we later used for matching: parent organization, street, city, and ZIP Code.

For each unique MA parent organization and address, we set the provider ownership variable equal to one if Johnson, et al. (2017) identified any of the individual plans with that MA parent

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[xxxii] Johnson G, Lyon Z, Frakt A. Provider-offered Medicare Advantage plans: recent growth and care quality. Health Aff 2017;36(3):539-47.

[xxxiii] Johnson, et al. (2017) measured provider ownership only for local coordinated care plans. In our work, we used all plans in the MA Plan Directory, including local coordinated care plans, section 1876 cost contracts, section 1833 health care prepayment plans, demonstration plans, PACE plans, regional coordinated care plans, and private fee-for-service plans. More information about MA organizations and other Medicare managed health plans is at https://www.cms.gov/Medicare/Health-Plans/HealthPlansGenInfo/index.html.

organization and address as being owned by a provider organization (even if another individual plan owned by the same parent organization and address was identified as not being owned by a provider organization). Otherwise, if Johnson, et al. (2017) data identified at least one contract offered by an MA parent organization at a given address as *not* being owned by a provider organization, we set the provider ownership variable to zero for all contracts offered by the MA parent organization and address. Finally, if data from Johnson, et al. (2017) on provider ownership was missing for all MA contracts offered by an MA parent organization at a single address, we set the provider ownership variable to missing.

Automated Matching

We identified possible matches between the list of health systems and the MA data. We used a combination of name and address matching, via character-string matching and distance-based matching using geocoding, respectively. Since an MA parent organization may match a subsystem of one of the 637 systems on the list, we used a list of subsystems of those systems identified in two ways: (1) when creating the 2018 Compendium, we identified a few cases in which an entity defined as a system in the 2018 OneKey or AHA data should be treated as a subsystem and nested within a parent system, and (2) owner subsidiaries identified by OneKey.

Using the approach described in Chapter III, we used the SAS COMPGED function to compare the similarity of health system name and MA parent organization name, and we used geocoding to determine the linear distance between health system address and the MA legal entity's address. As we discussed previously, SAS COMPGED generates a score that reflects the number of deletions, insertions, or replacements needed to make two strings match—the lower the score, the better the match. If a string matches exactly, the SAS COMPGED score is zero. Inserting one character to derive a match results in a score of 100. Adding a punctuation character results in a score of 30.

If the SAS COMPGED score was ≤150 and the geocoded addresses were within 1 mile of each other, then we considered the health system and the MA record to be an automated match. We did not identify any automated matches in 2018, largely because we excluded MA parent organizations already matched to systems in Step 1 before matching systems and MA parent organizations.

Manual Review of Possible Matches Based on Name, Location, or Name and Location

We used the SAS COMPGED scores and distances between systems to identify additional possible matches for manual review. We manually reviewed possible matches of health systems and MA parent organizations in the following seven categories, where the first category includes the most likely matches:

1. Possible match with a SAS COMPGED score >150 and ≤500 and within 1 mile of each other
2. Possible match with a SAS COMPGED score ≤150 and matching city and State
3. Possible match with a SAS COMPGED score >150 and ≤500 and matching city and State
4. Possible match with a SAS COMPGED score ≤150 on truncated names (to increase the likelihood of a match based on the beginning portion of the name) and matching State
5. Possible match with a SAS COMPGED score ≤150 on truncated names

6. Possible match within 0.5 miles of each other
7. Possible match within 10 miles of each other

For all seven categories of possible matches, we compared the full system name to the full MA parent organization name and compared address information for the system and the MA record. Relative to the first two categories of possible matches, we were less confident in the possible matches in categories three through seven, because their names or addresses were slightly less similar. Therefore, we conducted web searches for possible matches in categories three through seven that Johnson, et al. (2017) identified as being owned by a provider organization or had missing data on whether it was owned by a provider organization. We did not attempt to confirm possible matches that Johnson, et al. (2017) identified as not owned by a provider organization.

When web searching, we looked not only for name and address information but also for information about the health system's or MA parent organization's locations, breadth of the health system's services, and evidence of mergers or acquisitions. Our goal was to confirm that the health system had equity interest in the MA plan or that the MA plan itself was a joint venture between the health system and another organization such as an insurer.

The most useful approach to access this information was to select the "About" or "History" link on the website of the health system, MA parent organization, or MA plan owned by the MA parent organization. We also found corroborating evidence elsewhere, such as Modern Healthcare and news releases on the health system website. Table D.1 provides examples of possible matches that we determined to be valid based on manual review.

Table D.1. Examples of manually matched health systems and MA records

Health System or Subsystem Name	MA Parent Organization Name	Distance	SAS COMPGED Score for Full Name (Truncated Name)
Greenville Health System	Greenville Health System	2.6 miles	0 (0)
Allegheny Health Network	Highmark Health	0.5 miles	501 (501)
Randolph Hospital Inc	Randolph Hospital, Inc	2.9 miles	0 (0)
Cheyenne Regional Medical Center	Memorial Hospital of Laramie County	0 miles	501 (501)
AtlantiCare	AtlantiCare Health Services	0 miles	501 (0)

After matching using MA parent organization name, we repeated matching using MA organization marketing name and address. That process identified a small number of possible matches that required manual review.

Finally, for each system matched to an MA parent organization in Steps 2 and 3, we constructed a variable that included all contract numbers for the MA parent organization that was matched to a given health system and its subsystems (if applicable). By including contract numbers for the MA parent organization, a user can link the list to the MA Plan Directory to obtain information about the MA plans, such as the organization type, plan type, and enrollment.

Step 4: Constructing a variable for total enrollment in MA contracts offered by the system

We used December 2018 MA enrollment data from CMS's website to determine enrollment by MA contract. For each system linked to MA contracts, we aggregated enrollment across all contracts linked to the system and created a system-level MA enrollment variable. To ensure that the data reflected the status of MA contracts at the end of 2018, we excluded two contracts that matched to a system but were missing from the December 2018 MA enrollment data. That is, we did not identify those contracts as being part of a system.

Caveats and Limitations

Missing Data

Our analyses suggest that missing AHA data on insurance products was not a major problem for most systems on the list. Among the 637 systems on the list, only 6 percent (40 systems) had no reported information on insurance products for any of the system's non-Federal general acute care hospitals in 2018 or 2017. We examined the percentage of non-Federal general acute care hospitals within a system that were missing insurance product data from the AHA:

- Among the 397 systems that we classified as not having an insurance product, 77 percent (307 systems) were not missing data for any non-Federal general acute care hospitals. Another 11 percent (43 systems) were missing data for at least one hospital but fewer than half of all hospitals in the system. The remaining 12 percent (47 systems) were missing data for more than half of all hospitals in the system. It is possible that some of the 90 systems that were missing data for at least one hospital actually offered an insurance product, even though the non-missing AHA survey responses for their hospitals did not indicate that the system offered an insurance product.
- Among the 200 systems that we classified as offering an insurance product, 57 percent (114 systems) were not missing data for any non-Federal general acute care hospitals. Another 37 percent (74 systems) were missing data for at least one hospital but fewer than half of all hospitals in the system. The remaining 6 percent (12 systems) were missing data for at least half of all hospitals in the system. However, since we classified a system as offering an insurance product if at least one hospital in the system reported an insurance product at the hospital or system level or a joint venture with insurers, these missing data do not affect the insurance product variable.

Potential Misalignment of Health System Definitions

Some questions in the AHA Annual Survey asked whether the hospital or system offered an insurance product. In cases in which the respondent reported affirmatively based on the system offering an insurance product (rather than the respondent's hospital), we cannot confirm whether the entity that the respondent was thinking of is the system we identified in the Compendium. However, we do not have reason to think this type of misidentification was common.

Among the 200 systems that we classified as having an insurance product, 140 systems had at least half of their non-Federal general acute care hospitals report an insurance product. In other words, for most systems (70 percent) that had an insurance product, at least half of the non-Federal general

acute care hospitals within that system reported an insurance product at the hospital level or system level, or as a joint venture with insurers.

Further, close to half (45 percent) of the 200 systems that we classified as having an insurance product had at least one hospital that reported that the hospital itself had an insurance product. These data suggest that it is unlikely that we incorrectly identified a system as having any insurance product because of misalignment of health system definitions between the AHA respondent and the Compendium.

Reasons Data on Offering an MA Product May Differ Across Sources

Twenty systems offered an MA product according to the CMS matching process but not according to the AHA data, while 61 systems offered an MA plan based on responses to the AHA survey but not according to the CMS matching process. In some cases, the AHA-based measure identified systems that offered an MA product through a joint venture, partnership, or complex subsidiary arrangement, which we could not identify using the CMS matching process. However, as we discuss in this section, the AHA-based measure has other limitations. Data on offering an MA product can differ across the two sources for four reasons: (1) measurement error in the AHA data; (2) limitations of matching by name and address in the CMS matching process; (3) challenges in verifying ownership of an MA plan in the CMS matching process; and (4) potential misalignment of data source time periods.

Potential measurement error in AHA survey responses. AHA data are derived from a cross-sectional survey of more than 6,400 hospitals operating in the United States. Respondents self-report the characteristics and attributes of their hospital, including information on insurance products that their hospital or system owns or offers through a partnership or joint venture with insurers. As with all self-reported data, the accuracy of the measure depends on the knowledge of the respondent, the salience of the task to the respondent, and the meaning the respondent ascribes to key terms such as partnership, joint venture, system, and ownership. The AHA-based measure of offering an MA product could be incorrect for one of the following reasons:

- A system offered an MA product the respondent was unaware of, which was most likely to happen if an MA product was owned by the parent organization of the system or by a subsidiary other than the hospital the respondent worked for. For instance, Allegheny Health Network does not itself offer any MA products; however, its parent organization (Highmark Health) offers multiple MA products.

- A hospital or its system offered a health plan the respondent did not consider to be an MA product. Of the 20 systems that offered an MA product according to the CMS matching process but not according to the AHA data, several systems offered a PACE plan; examples include Franciscan Health and Greenville Health System. It is possible that some AHA respondents did not consider PACE plans to be an MA product.

- Respondents thought their hospital or system offered an MA product but this was not actually the case.

Limitations of matching by name and address in the CMS matching process. The MA Plan Directory lists one parent organization for each MA contract; it does not identify all entities

(systems, health insurance companies, or other organizations) that own a particular contract. Using the name and address of the parent organization limited our ability to identify systems that offer MA contracts through complex subsidiary relationships or through partnerships or joint ventures with an insurance company or another system. This limitation accounts for some of the cases in which the AHA data (which asks about these types of relationships) indicated that a system offered an MA product but the CMS matching process did not identify the system as owning an MA contract.

An example of this scenario is The Cleveland Clinic Health System and Humana. These entities partnered in 2017 to offer two MA plans; however, the addresses and names of the system and the parent organization listed in the MA Plan Directory were too dissimilar to be matched. Similarly, Mount Sinai Health System and Healthfirst offer an MA plan, but we did not link them using our matching algorithm.

In a few cases, we determined that two systems offered an MA contract through a joint venture because it was apparent from the web search we conducted to confirm the linkage of the MA parent organization and one of the two systems. In these cases, we listed the same MA contract number for both systems. However, there may be other cases in which a second system co-owned an MA contract, but co-ownership was not apparent based on web searches for the match between the first system and the MA parent organization.

Challenges verifying ownership of an MA plan in the CMS matching process. It can be difficult to determine the exact nature of the relationships between an MA parent organization or MA plan and a health system. In particular, it is challenging to determine precisely whether a health system has an equity interest in the MA plan. It is possible that we identified a system and MA parent organization as a potential match but could not confirm that the system should be matched to this particular CMS record and erroneously identified the system as not having an MA contract. Thus, our identification of systems that offer an MA contract as identified by matching and web searches is likely conservative.

Misalignment of data source time periods. The list reflects health systems in the United States at the end of 2018. That period differed slightly from the time periods represented by the insurance product variables. The AHA data were collected throughout 2018 and 2017. We used 2017 AHA data when 2018 data were missing. The MA data were from January 2018, but we limited our contract and enrollment variables to MA contracts that existed as of December 2018.

As we developed the variables, we identified a few cases in which a system sold its MA plan (or its stake in the plan) or closed the plan between when the AHA survey data were collected and the end of 2018. For example, Tenet Healthcare Corporation is identified as offering an MA product according to the AHA data; however, according to news reports, Tenet sold all of its insurance business by December 2018. In 2016, we linked Tenet Healthcare Corporation to an MA contract. However, manual searching of this match in 2018, along with not identifying new promising matches for Tenet Healthcare, led us to classify Tenet as not offering MA contracts in 2018; therefore, the MA contract and enrollment variables are missing. The alternative is also true: there could be cases where a system first offered an MA plan in 2018 and we identified a contract number for that plan, but the survey data reported no AHA plan because the data were collected in 2017. Thus, for some systems, it is possible we misclassified their ownership of insurance products as of the end of 2018 because the AHA data do not necessarily reflect the end of 2018.

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Appendix E. Nursing Home Data and Methods

Introduction

This appendix describes the data and methods used to construct a variable that reports the number of nursing homes affiliated with each health system in 2018.

Nursing Home Affiliation with Systems

We used data from the IQVIA OneKey Database to count the number of system-affiliated nursing homes. This data source is described in more detail in II.B.

To construct a count variable that indicates the number of nursing homes affiliated with each system, we first identified all nursing homes in the IQVIA OneKey data (N=15,518) and their corporate parent owners. According to the IQVIA OneKey data, a nursing home (cot_id = 94) is defined as "an extended-care facility that provides medical nursing or custodial care to people who cannot care for themselves but who do not require hospitalization." We used IQVIA's class of trade variables to identify nursing homes in the OneKey data: cot_clas_id = 20 (residential) and cot_fclt_type_id = 48 (nursing home). Next, we applied the crosswalk developed in Step 2 (see section III.B) to aggregate nursing homes linked to subsystems (smaller systems that are nested within larger systems) to their parent systems. For each corporate parent, we aggregated the nursing homes affiliated with each owner to determine a total count of nursing homes. Finally, we linked the count of nursing homes by corporate parent to the Compendium if the final corporate parent owner was included in the 2018 list of systems. In the final list of systems, 959 nursing homes (6 percent) were affiliated with 633 Compendium health systems.

Caveats and Limitations

Four health systems in the Compendium are not found in the IQVIA OneKey data and therefore have missing data for nursing homes. In addition, we rely on the relationships identified by OneKey, which may not capture all relationships between nursing homes and health systems.

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Appendix F. Data Dictionary

Variable name	Variable Type	Description
health_sys_id	Character	Unique system ID (assigned by Mathematica; links to 2016 Compendium of U.S. Health Systems[a])
health_sys_name	Character	Health system name
health_sys_city	Character	Health system city
health_sys_state	Character	Health system State
in_onekey	Numeric	Flag for whether the system appears in the OneKey data
in_aha	Numeric	Flag for whether the system appears in the AHA data
onekey_id	Character	OneKey system ID
aha_sysid	Character	AHA system ID
total_mds	Numeric	Total number of physicians
prim_care_mds	Numeric	Total number of primary care physicians
total_nps	Numeric	Total number of nurse practitioners
total_pas	Numeric	Total number of physician assistants
grp_cnt	Numeric	Total number of medical groups
hosp_cnt	Numeric	Total number of hospitals
acutehosp_cnt	Numeric	Total number of non-Federal general acute care hospitals
nh_cnt	Numeric	Total number of system-affiliated nursing homes
sys_multistate	Numeric	Multistate system flag: 1=system hospitals located in one State, 2=system hospitals located in two States, 3=system hospitals located in three or more States
sys_beds	Numeric	Number of beds per system
sys_dsch	Numeric	Number of discharges per system
sys_res	Numeric	Number of interns and residents per system in non-Federal general acute care hospitals
maj_inv_owned	Numeric	Predominantly investor-owned hospitals flag: 1=yes, 0=no
deg_children	Numeric	Degree to which health system serves children: 0=no children's hospitals, 1=at least one children's hospital but not predominantly delivering care at children's hospitals, 2=predominantly delivering care at children's hospitals
sys_incl_majteachhosp	Numeric	System includes at least one major teaching hospital: 1=yes, 0=no
sys_incl_vmajteachhosp	Numeric	System includes at least one very major teaching hospital: 1=yes, 0=no
sys_teachint	Numeric	Systemwide teaching intensity: 0=nonteaching, 1=minor teaching, 2=major teaching
sys_incl_highdpphosp	Numeric	System includes at least one high DSH patient percentage hospital: 1=yes, 0=no

Variable name	Variable Type	Description
sys_highucburden	Numeric	Systemwide uncompensated care burden flag: 1=yes, 0=no
sys_incl_highuchosp	Numeric	System includes at least one high uncompensated care burden hospital: 1=yes, 0=no
sys_anyins_product	Numeric	System includes at least one non-Federal general acute care hospital that reported in the AHA data that the hospital or its system owns or jointly owns a health plan, or that the hospital or its system has a joint venture or significant partnership with an insurer: 1=yes, 0=no
sys_mcare_adv	Numeric	System includes at least one non-Federal general acute care hospital that reported in the AHA data that the hospital or its system offers an MA plan via ownership or joint venture: 1=yes, 0=no
sys_mcaid_mngcare	Numeric	System includes at least one non-Federal general acute care hospital that reported in the AHA data that the hospital or its system offers a Medicaid managed care plan via ownership or joint venture: 1=yes, 0=no
sys_healthins_mktplc	Numeric	System includes at least one non-Federal general acute care hospital that reported in the AHA data that the hospital or its system offers a Health Insurance Marketplace plan via ownership or joint venture: 1=yes, 0=no
sys_ma_plan_contracts	Character	MA contract numbers offered by the system according to matches between systems or subsystems and MA data from CMS
sys_ma_plan_enroll	Numeric	Aggregate MA enrollment across all MA contracts offered by the system according to matches between systems or subsystems and MA data from CMS
sys_apm	Numeric	System has affiliated physicians who are participating in one or more Medicare alternative payment models: 1=yes, 0=no
sys_aco	Numeric	Number of system-affiliated physicians who are participating in one or more Medicare accountable care organizations
sys_ebpm	Numeric	Number of system-affiliated physicians who are participating in one or more Medicare episode-based payment models
sys_pctm	Numeric	Number of system-affiliated physicians who are participating in one or more Medicare primary care transformation models

[a] If a 2018 system had the same HCOS and/or AHA identification number as a 2016 system, then we assigned the 2018 system the same unique system identification number as 2016.