Project Description:

One-in-five American children live in rural areas, and one-quarter of these children – 2.95 million - have chronic health conditions. Survey data have documented several urban-rural disparities in healthcare quality: rural-residing children are more likely to report unmet healthcare needs and less likely to receive preventive healthcare than children who live in urban areas. In a study of hospitalizations at freestanding children's hospitals, rural-residing children had a higher prevalence of complex chronic conditions, higher inpatient costs, and greater risk of readmission than their urban-residing peers. However, at a population level we have extremely limited knowledge about the magnitude and determinants of urban-rural disparities in healthcare utilization and quality; this knowledge is essential to develop effective interventions that reach children at greatest risk of adverse health outcomes.

The overall objective of this proposal is to comprehensively evaluate urban-rural disparities in healthcare utilization and quality for children with social risk factors and chronic illnesses compared to children without these risk factors. Our Specific Aims include:

Aim 1) Identify disparities in home health, ambulatory and inpatient healthcare use between children who reside in urban and rural settings.

Aim 2) Identify urban-rural disparities in healthcare quality for children and identify individual-, family-, community- and health-system factors associated with these disparities.

Aim 3) Construct patient-sharing networks among physicians who care for children and determine whether network characteristics of their physicians are associated with urban-rural disparities in quality of care.

Request for 5-digit ZIP CODE

To achieve our goal of analyzing urban-rural disparities in healthcare quality, we are seeking 5-digit zip codes for 2 purposes: (i) to link these zip codes to the Rural-Urban Commuting Area database, which categorizes zip codes into the 4 categories shown in the table below based on travel distances and commuting patterns. We will use zip codes in member files to categorize children into one of the 4 groups below (urban core, suburban, large town, small town/rural). As a result, small cell sizes are not anticipated to be an issue; (ii) to calculate travel times from member zip-code centroid to their healthcare providers and hospitals where they receive care. This will allow us to examine how travel time may mediate disparities in healthcare outcomes between urban and rural residing children. This will be very important, given published research in adults that has shown the travel time to healthcare is associated with healthcare outcomes. To our knowledge, previous studies have not examined this in children. We will not be reporting any outcomes by zip-code, county, or other geographic subunits.

Rural will be defined using RUCA 3.10 Scheme 1, according to definitions below:

2-Tier Classification	4-Tier Classification	Definition
Urban	Urban Core	Contiguous built-up areas of 50,000 people or more. These areas correspond to the US Census Bureau's urbanized areas.
	Suburban	Areas, often in metropolitan counties, with primary high commuting flows to urban cores and all other areas with secondary commuting flows of 30%-49% of the population to urban cores.
Rural	Large town	Towns with populations of 10,000-49,999 and surrounding rural areas with 10% or more primary commuting flows to these towns, and towns with secondary commuting flows of 10% or more to Urban Cores.
	Small town/rural areas	Towns with populations below 10,000 and surrounding commuter areas with more than a one-hour driving distance to the closest city.

Evaluation Criteria

1. Is the request consistent with the Transparency Initiative's goals and purpose?

Yes – our goal is aligned with the Transparency Initiative's goals and purpose, with a specific focus on examining healthcare access and quality for children in Arkansas, and to determine if there are differences between urban- and rural-residing children in the state regarding their healthcare quality. This can directly inform initiatives to improve access and healthcare quality for children at greatest risk.

2. Are there real or potential conflicts of interest or anti-competitive concerns?

No – as a research team we are not affiliated with any group or organization that might create conflicts of interest in this work.

3. If IRB approval is required, has the approval been granted?

We anticipate that IRB approval will be required for this work; because this will include analysis of existing data, our Dartmouth College IRB anticipates that this will be reviewed as exempt. We have not yet applied for IRB approval, but are prepared to do so whenever this is requested by the data provider.

4. Does the data request contain the minimum information required?

Yes – we are requesting only the data required to complete our proposed aims.

5. Does the request minimize the risk of re-identification of individuals?

Yes – we will abide by all requirements to minimize risk of reidentification of individuals, including minimum cell size requirements, and publication of counts/aggregrate statistics only.

Qualifications and Experience

The principal investigator on this work is Dr. JoAnna Leyenaar, MD, MPH, MSc. Dr. Leyenaar is a pediatrician and health services researcher with extensive experience conducting research using health systems data, having published work in leading journals in her field including Pediatrics, JAMA Pediatrics, and Journal of Pediatrics. She is Associate Professor of Pediatrics and of The Dartmouth Institute of Health Policy and Clinical Practice. Dr. Leyenaar will take the leading role in all aspects of the project, including variable definition, study design, review of all preliminary, interim and final analyses, and drafting of manuscripts. She will assume ultimate scientific, ethical, and administrative responsibility for the study, including overseeing programmer/analysts, leading regular team meetings, and ensuring timely dissemination of results.

Co-investigators include Dr. David Goodman, Dr. Andrea Austin, and Dr. James O'Malley.

Dr. Goodman is Professor of Pediatrics and of Health Policy at The Dartmouth Institute for Health Policy & Clinical Practice at the Geisel School of Medicine and Co-Principal Investigator, *The Dartmouth Atlas of Health Care,* which uses Medicare data to examine healthcare variation and outcomes. His primary research interest is in geographic and hospital variation in health system performance. Dr. Goodman is Dr. Leyenaar's primary mentor for her Patient-Centered Outcomes Research Mentored Career Development Award (K08) from AHRQ, which focuses on evaluating the safety and effectiveness of direct admission to hospital as an alternative to hospitalizations initiated in the emergency department. For this project, Dr. Goodman will participate in study design, variable development, review of analysis and all manuscripts, sharing his expertise using this all-payer claims data in past projects.

Dr. O'Malley is Professor of Biostatistics, of Department of Biomedical Data Science and of The Dartmouth Institute for Health Policy & Clinical Practice at the Geisel School of Medicine. Dr. O'Malley's expertise lies in social network analysis, causal inference and comparative effectiveness research, and methods for hierarchical, multivariate, and longitudinal data. He has participated in several projects similar in scope to the project proposed using Medicare data. Dr. O'Malley will provide guidance regarding application of statistical and network analysis methods for this project, will join research team meetings, and will review all abstract and manuscript drafts prior to dissemination.

Dr. Austin is a PhD biostatistician and is a Research Scientist at The Dartmouth Institute for Health Policy & Clinical Practice at the Geisel School of Medicine. Dr. Austin's work is focused on using U.S. Medicare administrative data to study healthcare utilization and costs for various populations of interest, particularly focusing on applying social network methodologies to study disparities in vulnerable populations using claims data. For her role on Dr. Leyenaar's project, Dr. Austin will conduct the network analysis, working closely with Dr. Leyenaar and Dr. O'Malley in design and results interpretation.

FACILITIES AND OTHER RESOURCES

DARTMOUTH COLLEGE

Computer

The Data Analytic Core (DAC) at The Dartmouth Institute for Health Policy and Clinical Practice is a data service center providing programming and analytical support to investigators leading health services research projects. The DAC maintains a FISMA compliant environment to ensure the security and integrity of the highly confidential data with which it works. The information systems hardware is managed by Dartmouth College Information Technology Services, which provides 7-day, 24-hour access to its five interconnected Dell PowerEdge servers, running Red Hat Enterprise Linux. Each server contains four hexacore processors and 512 GB of RAM and is connected via a 10 GbE network switch to a scalable network-attached storage (NAS) appliance with a capacity of over 250 TB with backup to disk. All connections to this server are secured by Secure Shell (SSH), which encrypts all communications to and from the workstations on an isolated firewalled network and DUO multifactor authentication.

Dartmouth College houses its highly-confidential data in an offsite state-of-the-art data center featuring:

- FISMA compliance
- 2,110 square foot facility with raised floor for power and network
- 45 rack capacity
- Caterpillar 3512C 1500 KW Backup Power Generator
- x2) 500kVA UPS, current draw is ~58kVA, so about 12% utilization
- x5) Air handlers in current use, N+1
- Multi-level Lenel-based access system including access cards, keypads, and video monitoring
- FM-200 waterless fire suppression system

All DAC servers, data storage, switches, and other peripherals are stored in isolated rack cages limiting access to Dartmouth College Information Technology Services (Dartmouth Computing), the DAC Data Custodian and Privacy Officer, and the DAC

Network Systems Administrator. All DAC servers are maintained by Dartmouth Computing. All data traffic for the project is contained within a private, dedicated DAC VLAN network. All network traffic to the servers must pass through the Dartmouth hardware firewall. The only access to the servers is via SSH and requires 2-factor authentication (NetID/password and DUO). All networks located on switches are segmented and behind Dartmouth firewalls where the DAC data resides.

All Dartmouth faculty and staff have access to personal computers and software to support word processing and preliminary analysis as well as provide access to Dartmouth's electronic mail system. Backup of all computers is conducted automatically at frequent intervals over the College's high-speed network.

Analytic Capability

The Data Analytic Core supports the analytic needs of projects using large administrative datasets, including claims files, for investigators across the Geisel School of Medicine at Dartmouth and Dartmouth College. The Dartmouth Institute is the largest university-based repository of Medicare data in the world and has been working with these data to produce the Dartmouth Atlas and related research for 30 years. The DAC consists of 12 analysts, as well as 5 administrative and operational staff, with a combined experience-base of more than 150 years of healthcare claims analytic experience and a mastery of a broad range of programming and statistical methods. New analysts undergo a comprehensive training program to assure a strong foundation in Medicare data analytics.

The Dartmouth Institute also supports a joint spatial-epidemiology analytic core with the Norris Cotton Cancer Center that includes geo-spatial analysts and high-speed servers optimized to demanding GIS tasks coupled with licenses for ArcGIS, MapInfo, and other GIS software. The Core also has high-speed color laser printers and large format plotters suitable for printing 42 inch high x unlimited length color maps.