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Pediatric subspecialty outreach clinics: reach and impact on access to care

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Abstract

Background Recent research highlighting a shortage of pediatric subspecialists in the United States has shown wide variations in the distance from children to the nearest subspecialists but has not accounted for subspecialty outreach clinics, in which specialists may improve access in rural areas by periodically staffing clinics there. This study aimed to determine the impact of pediatric subspecialty outreach clinics on the driving times to the nearest pediatric subspecialists for children in Maine.

Methods This cross-sectional study utilized administrative data on the schedule and location of pediatric subspecialty clinics in Maine in 2022 to estimate the driving time from each ZIP-code tabulation area to the nearest subspecialist, with and without the inclusion of outreach clinics. Using 2020 census data, we calculated the median and interquartile ranges of driving times for the state's overall child population, as well as for children living in urban and rural areas.

Results Of 207,409 individuals under 20 years old in Maine, 68% were located closer to an outreach location than to a clinical hub. Across the seven subspecialties offering outreach clinics, outreach clinics decreased median driving times to the nearest pediatric subspecialist by 5 to 26 minutes among all children, and by 16 to 46 minutes among rural children.

Conclusions Pediatric subspecialty outreach clinics can substantially reduce the driving time to the nearest pediatric subspecialist , especially for children living in rural areas. The use of outreach clinics should be accounted for in research describing the geographic access or barriers to care. Expanding the number of outreach clinics should be considered by policymakers hoping to improve access.

Keywords Access, Pediatrics, Rural Health, Health Care Disparities, Health Workforce

Background

In its 2023 report, "The Future Pediatric Subspecialist Physician Workforce," the National Academy of Sciences, Engineering and Medicine warned that the United States' subspecialty workforce may be increasingly inadequate, and inadequately distributed, to meet the health needs of children [1]. Among families reporting a need for pediatric subspecialty care in the United States, 24% report difficulty accessing this care [2]. Children referred to pediatric subspecialists may wait multiple months [3, 4] or travel hundreds of miles [5] before reaching care. Subspecialists are particularly inaccessible for children

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in rural areas, [6] in part because of the concentration of pediatric subspecialists in urban centers [1].

Multiple access strategies with the potential to reduce geographic barriers to care exist, including telemedicine, electronic consultations, and outreach clinics, in which subspecialists travel to secondary sites on an intermittent basis to provide more accessible care. Outreach clinics in particular have the potential to improve rural access since they may be targeted to rural or other areas where care is otherwise limited [7]. However, although electronic consultations and telemedicine have been studied extensively in recent years, [8–11] comparatively little is known about outreach clinics in the pediatric setting, including how widely they are used or how much they impact access [12]. In the most recent (2020) major assessment of geospatial access to pediatric subspecialty care, Turner et al. described the national state of children's access to care based on their distance to the nearest subspecialists, the location of which was based on the most recent home or business address on file with the American Board of Pediatrics, an approach which does not account for multiple practice locations or outreach clinics [5].

Details regarding the current availability (and ideally, utilization) of outreach clinics will facilitate more accurate assessments of the true state of geographic access to pediatric subspecialty care, and may also support decisions, both at the level of health systems and states, around supporting these potentially costly initiatives. Here, we utilize administrative data from the two health systems providing pediatric subspecialty care in the rural state of Maine to describe the frequency of pediatric subspecialty outreach clinics and the impact of these clinics on driving times throughout the state. We hypothesized that outreach clinics would substantially decrease travel times for children across the state.

Methods

Setting and study design

Maine is the second most rural of the United States, and also contains geographic barriers to care including mountains, lakes, and famously jagged coastlines [13, 14]. Two major health systems provide all pediatric subspecialty care in the state. In this cross-sectional analysis,we obtained from administrators at each system scheduling information and street addresses for pediatric subspecialty clinics held by pediatric divisions in 2022, both at the systems' "hubs" and at outreach clinic locations. We did not include any surgical subspecialties or mental health specialties, which were not administered or scheduled through pediatric divisions in either health system. Data on the pediatric population in Maine was obtained from the United States Census Bureau 2020 estimates of the population of individuals 0–19 years old in each ZIP-code tabulation area (ZCTA) [15].

Calculation of travel times

All analyses were performed in R v4.2.1 [16]. For each pediatric subspecialty for which there were outreach clinics, we used the *gmapsdistance* package to calculate the Google Maps estimated driving time in minutes (without traffic) from each ZCTA centroid in the state to the nearest "hub" at which the subspecialty provided care. We also calculated the driving time from each ZCTA centroid to the nearest clinic location of any kind (hub or outreach). For each ZCTA and subspecialty, we subtracted the driving time to the nearest clinic of any kind from the driving time to the nearest hub to calculate the decrease in driving time attributable to the presence of outreach clinics.

Analysis

To assess the overall burden of travel and impact of outreach clinics across the pediatric population in Maine, we created population-level distributions of driving times by weighting the driving times of each ZCTA by the child population within that ZCTA. For each specialty we calculated the median and interquartile range (IQR) of driving times for the child population in the state. In order to understand how outreach clinics might differently impact children's access based on their rurality, we repeated driving time calculations for children residing in urban (Rural–Urban Commuting Area (RUCA) codes 1–3) and rural (RUCA codes 4–10) [17] areas. Children in one ZCTA which was not included in RUCA files were included in overall population travel time calculations, but not in rural or urban calculations.

Ethical considerations and data availability

This study was reviewed by the MaineHealth Internal Review Board and determined not to be human subjects research – informed consent was not required. Because this study was based on administrative data privately owned by Northern Light Health and MaineHealth, these data are not available through the authors. However, the corresponding author may facilitate a direct data request from the entities above on request.

Results

Outreach clinic locations and frequency

We identified seven subspecialties for which outreach clinics were provided by at least one of Maine's two pediatric subspecialty groups (pediatric cardiology, gastroenterology, endocrinology, neurology, genetics, pulmonology, and nephrology). Outreach clinics were held in 7 locations throughout the state. At locations where

a given subspecialty held an outreach clinic, clinics occurred a median 11 times (IQR 4.5–23 times) in 2022. In contrast, subspecialty clinics were scheduled in each hub at least three days each week (or more than 150 times in 2022). Data on the locations and frequency of subspecialty outreach clinics is shown in Table 1 and Fig. 1.

Driving time

Of 207,409 children under 20 years old in Maine, 38.9% were located more than one hour from the nearest clinical hub. The driving time to the closest clinical hub was a median 50 min (IQR 37 -72) for all children and a median 70 (IQR 50–95) minutes for children living in rural areas. For pediatric pulmonology and nephrology (which were only provided at one hub), driving times to the nearest hub were as long as 397 min. 68% of children (87% of children in rural areas) were closer to at least one outreach clinic location than to a hub. The inclusion of outreach clinics decreased the median driving time by anywhere from 5 min (from 49 to 44 min, neurology) to 26 min (from 71 to 45 min, pulmonology, Table 2). Among rural children, the inclusion of outreach clinics decreased the median driving time by anywhere from 16 min (from 70 to 54 min, neurology) to 46 min (from 95 to 49 min, nephrology). The median and interquartile ranges of the driving times to the nearest hub and the driving times to the nearest clinic location of any kind among all children in Maine and among children in urban and rural areas are illustrated in Fig. 2.

Table 1 Frequency of clinics held in Maine at clinical hub (A, B) and outreach (a-g) locations in 2022

	Clinical hubs		Outreach clinics						
	A	B	a	b	c	d	e	f	g
Cardiology	> 150	> 150	10	6		11	5	1	11
Endocrinology	> 150	> 150			47	11	6	4	22
Gastroenterology	> 150	> 150	10	6	37			1	11
Genetics	> 150	> 150		2	25			2	24
Nephrology		> 150	2	2	23				
Neurology	> 150	> 150				23			
Pulmonology		> 150			39				19

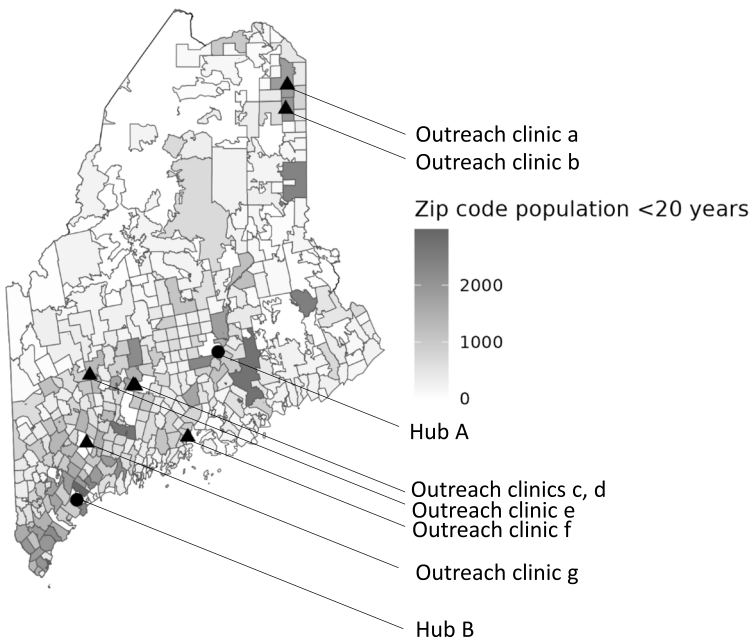

Fig. 1 Pediatric subspecialty clinical hub and outreach clinic locations in Maine

Table 2 Driving time in minutes to nearest pediatric subspecialists among all Maine children

	Overall ($n=207,409$)[a]		Urban ($n=93,448$)		Rural ($n=113,916$)	
	Clinical Hubs only[b]	With Outreach Clinics[b]	Clinical Hubs only[b]	With Outreach Clinics[b]	Clinical Hubs only[b]	With Outreach Clinics[b]
Cardiology	50 (37–72)	34 (23–48)	38 (23–49)	27 (20–42)	70 (50–95)	37 (28–54)
Endocrinology	49 (36–71)	34 (23–48)	38 (22–48)	27 (20–40)	69 (49–93)	41 (29–67)
Gastroenterology	49 (36–71)	34 (22–48)	38 (22–48)	27 (20–41)	69 (49–93)	39 (29–55)
Genetics	48 (34–72)	34 (23–48)	35 (22–46)	26 (21–41)	69 (49–91)	39 (29–55)
Nephrology	71 (42–118)	46 (30–65)	45 (25–73)	42 (25–53)	95 (68–164)	49 (32–78)
Neurology	49 (36–72)	44 (30–61)	38 (23–48)	37 (23–47)	70 (52–93)	54 (36–80)
Pulmonology	71 (42–118)	45 (28–67)	45 (25–73)	38 (21–51)	95 (68–164)	53 (34–100)

Child population is based on 2022 ACS estimates

[a] 45 children live in a zip code tabulation area not contained in the RUCA files

[b] Median (IQR)

Discussion

Findings and implications

In this study we found that among all children in Maine, more than two thirds lived closer to an outreach clinic than to a pediatric specialty hub. The impact of these clinics varied by specialty and was concentrated among children in rural areas, who were located farthest from specialty hubs. This illustrates the potential of outreach clinics to improve access and urban–rural access equity. Within our state, our findings show that children in rural areas still face significant disparities in geographic access to care, particularly for specialties (such as pulmonology) which are only offered at one clinic hub or for specialties (such as neurology) which are offered at relatively few outreach sites. For other health systems and researchers, our findings have two important implications: first, they suggest that current assessments of access to pediatric specialty care which do not account for outreach clinics may underestimate access, especially in rural areas where outreach clinics have the greatest impact. Second, they suggest that outreach clinics should be considered by health systems and policymakers aiming to improve existing access to care in rural settings.

The impact of outreach clinics in improving access may be mitigated by the relative infrequency at which they are scheduled. Of the 25 subspecialty-location combinations, 16 clinics were held 12 or fewer times in 2022, and 10 were held 6 or fewer times. Waiting up to two months for the next clinic day may not be appropriate for all patients. In addition, prior research has shown that attendance of first subspecialty appointments decreases with greater interval to scheduled appointment, [4] although the same may not hold true for return subspecialty visits.

Strengths and limitations

Because the data for this study was collected directly from health systems and not extrapolated from other data sources, our data reflects the actual locations and intervals at which care is provided. Because we collected data from the only two health systems in Maine, our findings are likely to truly reflect the closest subspecialists to children throughout the state. There are limitations to our methods, however. We focus on one state only, and the potential and realized impacts of outreach clinics in other locations may be different based on the distribution of clinical hubs and the implementation of outreach clinics. We also did not account for travel across state lines, and although the impacts of interstate travel would likely be minimal in a state with mostly international and coastal borders, they may significantly decrease the driving time to the nearest specialist in other locations.

The most important limitation of this study is that our measures (on-road driving time to the nearest subspecialty clinic and frequency of subspecialty clinic days) only capture specific aspects of subspecialist access, which is a rich and multifaceted concept [18]. On-road driving time is one aspect of geographic access (or barriers) to care, but does not account for variations in geographic access that might result from public transportation, automobile ownership, or innovations such

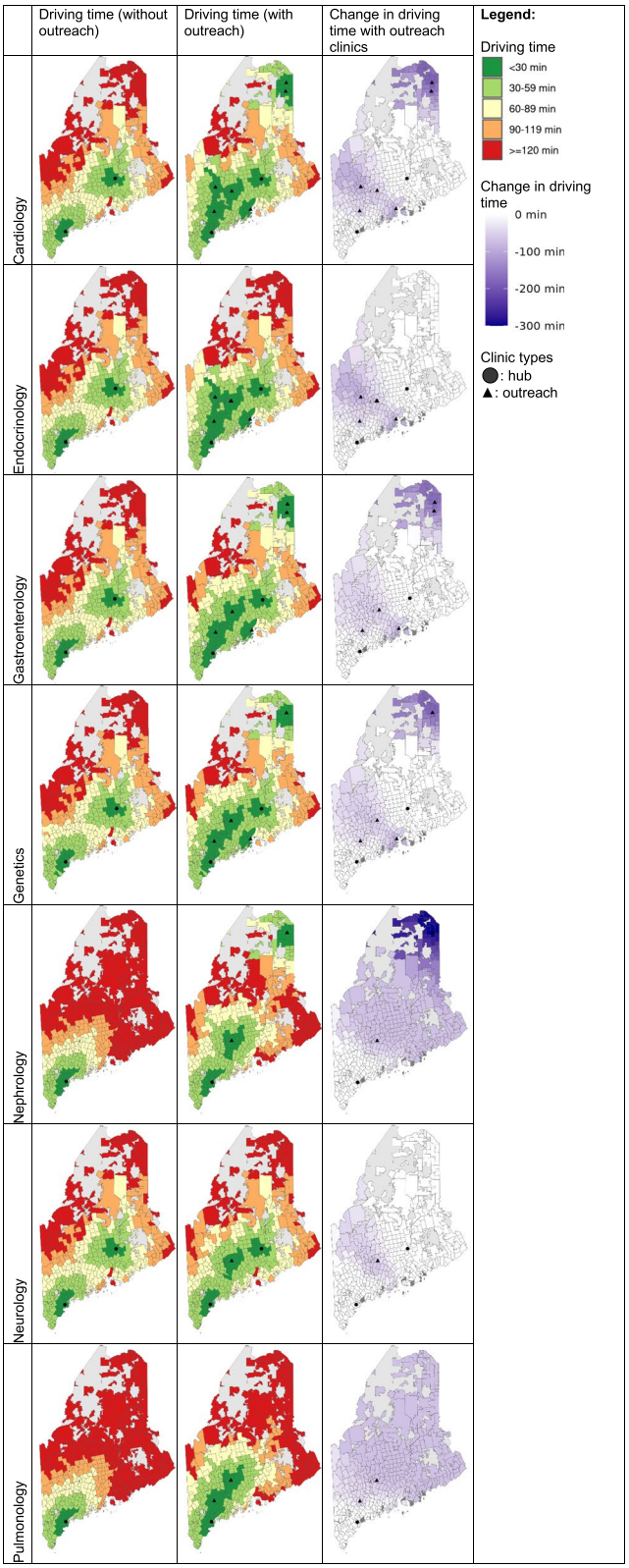

Fig. 2 Driving time to pediatric specialists from ZCTAs in Maine

as telemedicine. Similarly, the frequency of clinic days represents one aspect of availability of care, but may not capture the actual availability of appointments. We also did not capture patients' perceptions of need for care, desire to seek care, ability to pay for care or other aspects of access. Thus, this study provides only a partial description of access to subspecialty care in the state of Maine. It does, however, demonstrate that outreach clinics can in some settings substantially impact geographic access to care, particularly for children in rural areas, and we feel this is sufficient to recommend the inclusion of outreach clinics in future analyses of access to pediatric subspecialty care. Broader implementation of outreach clinics could further improve geographic access, but might depend on mechanisms to compensate health systems for the additional expenses of outreach clinics, which can include travel time and clinical space. Future research examining individual patients accessing outreach clinics and the patient experiences and outcomes associated with outreach clinics could better justify these costs.

Conclusions

This study found that the pediatric subspecialty outreach clinics in a rural state reduced the driving times to the nearest subspecialty care. These reductions in travel time were accentuated in rural areas, although this apparent improvement in access may be offset by the relative infrequency of scheduled outreach clinics compared to clinical hubs. Outreach clinics should be considered by policymakers hoping to improve access to care and should be accounted for in research describing the geographic access or barriers to care.

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Authors' contributions
James Bohnhoff contributed through study conceptualization and design, data analysis and interpretation, and initial manuscript drafting. Anya Cutler contributed through data analysis and interpretation, and critical manuscript review. Sean Hagenbuch contributed through study design, data acquisition and critical manuscript review. Kristen Kurland contributed through supervision, data interpretation, and critical manuscript review.

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Availability of data and materials
The datasets used and/or analyzed during the current study cannot be made available from the corresponding authors but can be requested from the originating institutions.

Data Availability
This study was based on administrative data privately owned by Northern Light Health and MaineHealth, these data are not available through the authors. However, the corresponding author may facilitate a direct data request from the entities above on request.

Declarations

Ethics approval and consent to participate
This study was approved by the Institutional Review Board of MaineHealth. We confirm that all our methods were conducted in agreement with the Declaration of Helsinki. Documentation of consent was not applicable to this study which relied on administrative data.

Consent for publication
N/A.

Competing interests
The authors declare no competing interests.

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