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IMPORTANCE Understanding geographic and financial barriers to health care is an important step toward creating more accessible health care systems. Yet, the barriers to dermatological care access for American Indian populations in rural areas have not been studied extensively.

OBJECTIVE To evaluate the driving distances and insurance coverage for dermatological care and the current availability of teledermatological programs within the Indian Health Service (IHS) or tribal hospitals system.

DESIGN, SETTING, AND PARTICIPANTS This mixed-methods study was conducted from May 7, 2018, to September 1, 2018, and did not take place in any IHS or tribal health care facility in the continental United States. The study design involved a geographic analysis and a cross-sectional telephone survey with brick-and-mortar dermatology clinics (n = 27) and teledermatological programs (n = 49). Brick-and-mortar clinics were selected for their proximity to a rural IHS or tribal hospital.

MAIN OUTCOMES AND MEASURES Mean driving distance from rural IHS or tribal hospital to nearest dermatology clinic, number of dermatology clinics within a 35-mile or 90-mile radius of IHS or tribal hospitals, insurance and referral types accepted by dermatology clinics, and number of teledermatological programs collaborating with IHS or tribal hospitals or health centers.

RESULTS In total, 27 brick-and-mortar dermatology clinics and 49 teledermatological programs were identified and contacted for the survey. The median (interquartile range [IQR]) driving distance between rural IHS or tribal hospitals and the nearest dermatology clinic was 68 (30-104) miles. Of the 27 dermatology clinics in closest proximity to rural IHS or tribal hospitals (median [IQR] driving distance, 82.4 [31-114] miles), 25 (93%) responded to the survey, 6 (22%) did not accept patients with Medicaid, and 6 (22%) did not accept IHS referrals for patients without insurance. Of the 49 teledermatological programs, 45 (92%) responded and 14 (29%) were no longer active. Ten (20%) teledermatology programs were currently partnering (n = 6), previously partnered (n = 2), or were setting up services (n = 2) with an IHS or tribal site. Only 9% (n = 27) of the 303 rural IHS or facility in the continental United States reported receiving teledermatological services.

CONCLUSIONS AND RELEVANCE Substantial geographic and insurance coverage barriers to dermatological care exist for American Indian individuals in rural communities; teledermatological innovations could represent an important step toward minimizing the disparities in dermatological care access and outcomes.

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Author Audio Interview

Supplemental content

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Persons of American Indian and Alaska Native race/ethnicity experience substantial health inequities in the United States, including all-cause death rates that have stagnated or worsened since 1990 and are much higher than death rates among white persons.[1] These inequities persist for dermatological outcomes, in which American Indian and Alaska Native people are more likely to present with stage IV melanoma than white patients and have a greater risk of disease-specific mortality, even though the incidence of melanoma is lower among the American Indian and Alaska Native groups.[2] Access to the specialty care and close follow-up required to manage chronic dermatological conditions, such as autoimmune or allergic diseases, are also often inadequate.

Faced with long-standing health disparities, American Indian and Alaska Native communities have addressed some of the challenges of rural health care delivery, including pioneering telehealth programs, in collaboration with NASA (National Aeronautics and Space Administration) and the Indian Health Service (IHS), in the 1970s.[3] Telehealth has continued to evolve and to provide access to specialty care for American Indian and Alaska Native patients in rural areas, as exemplified by the IHS-Joslin Vision Network teleophthalmological program for diabetic retinopathy screening.[4] Partnerships between academic medical centers and IHS facilities offer another venue for bolstering both access to specialty care and education of IHS clinicians and specialists.[5]

According to Christopher Bengson, MD, chief clinical consultant for dermatology at the IHS; Timothy DeCapite, MD, dermatologist at Tuba City Regional Health Care; and Robert Pittman, BPharm, MPH, acting deputy director of the Office of Public Health Support at the IHS (written and verbal communication, July 2018), on-site dermatological services are provided at a small number of IHS and tribal hospitals. Teledermatological care has been reported to improve access for geographically and economically disadvantaged populations without compromising reliable, accurate diagnosis.[6,7] This mixed-methods geographic analysis and cross-sectional telephone survey seeks to better understand the barriers to dermatological care for American Indian patients in the continental United States and to characterize the current role of teledermatological programs in improving access for this at-risk population.

The US government has a federal trust responsibility to provide health care to American Indian and Alaska Native persons because of past exchanges of tribal land and resources.[8] Underfunding and lack of resources have hindered the provision of health care since the late 1800s. Created in 1955, the IHS is a federal health system that serves more than 2 million of the country's 5.2 million American Indian and Alaska Native people.[9,10] Since the Indian Self-Determination and Education Assistance Act of 1975, any activity of the IHS can be assumed by a tribe through a compacting process, allowing tribes to self-administer health care and tailor services to local needs with federal funding.[8] Currently, more than 60% of the IHS appropriation is administered by tribes.[9]

The IHS is regarded as a payer of last resort for health care, meaning that the IHS charges a patient's insurance (Medicare, Medicaid, or private health plan) if a patient is insured.[11]

Key Points

Question What barriers do American Indian people in rural areas face in accessing dermatological care, and is telehealth compensating for these barriers?

Findings In this mixed-methods study of 27 dermatology clinics and 49 teledermatological programs, the mean distance between the closest dermatology clinic and a rural Indian Health Service or tribal hospital was 68 miles, 22% of the clinics did not accept any form of Medicaid coverage, and 22% did not accept Indian Health Service referrals for patients without insurance. Of the 303 rural Indian Health Service or tribal facilities in the continental United States, 9% were served by a teledermatological program.

Meaning Substantial geographic barriers to dermatological services exist for patients of American Indian race/ethnicity living in rural communities and this problem appears to be compounded by inconsistent access for those with Medicaid or without private insurance; teledermatological programs may help minimize the disparities in dermatological care access and outcomes.

Nevertheless, IHS funding constitutes annual per patient spending far below the spending of other federal health programs.[5] Many IHS sites are staffed primarily by generalist physicians; thus, patients must seek specialty care, such as dermatology, through the IHS Purchased/Referred Care (PRC) program. For primary care patients of an IHS service unit who are insured by Medicare, Medicaid, or a third-party payer, their referral is processed through PRC, as would occur in a traditional primary care practice. For patients without insurance, the payment for the referral must be deliberated on and approved by a committee through a priority system, which ranks referrals on the basis of urgency. The IHS sites do not always have funding to pay for nonurgent specialty referrals,[8] such as many of those associated with chronic dermatological diseases.

Methods

This study was determined to be exempt from review by the Partners Healthcare Institutional Review Board because it was a survey study under 45 CFR 46.101(b) (2). Verbal informed consent was obtained at initiation of contact.

For this mixed-methods study, we used the terms *IHS* or *tribal* as shorthand for federally funded health care facilities operated by the IHS or by tribes; this terminology does not include tribal health care facilities funded through other mechanisms, according to common practice.[8,12] We used *American Indian*, rather than Native American, to describe indigenous people of the continental United States given this term's more frequent and specific use in the literature, while also recognizing its fraught history and the variation in individual preference.[13-15]

Geographic Analysis

The primary analysis characterized geographic access to dermatological services for American Indian patients living in rural communities. Thirty-four of 38 IHS or tribal hospitals in the

Table 1. Geographic Accessibility of Rural Dermatology Clinics and Rural Indian Health Service or Tribal Hospitals

IHS Service Area	No. of IHS or Tribal Hospital in Service Area	Distance to Nearest Dermatology Clinic, Mean (SD), miles	Dermatology Clinic Within IHS Service Area, No. (%)	
			Within 35-Mile Radius of IHS or Tribal Hospital	Within 90-Mile Radius of IHS or Tribal Hospital
Navajo	7	82 (48)	2 (29)	3 (43)
Phoenix	5[a]	71 (NA)	2 (40)	4 (80)
Tucson	1	75 (NA)	0 (0)	1 (100)
Albuquerque	3[a]	85 (24)	0 (0)	2 (67)
Bemidji	2	26 (9)	2 (100)	2 (100)
Billings	3	108 (50)	0 (0)	1 (33)
Nashville	2	25 (9)	2 (100)	2 (100)
Oklahoma City	5[a]	28 (27)	4 (80)	5 (100)
Great Plains	6[a]	80 (32)	1 (17)	3 (50)
Total	34	68 (42)	13 (38)	23 (68)

Abbreviations: IHS, Indian Health Service; NA, not applicable.

SI conversion factor: To convert miles to kilometers, multiply by 1.6.

[a] One IHS hospital was excluded from each of these service areas owing to its urban location.

continental United States were based in rural areas. We counted both rural and urban dermatology clinics within a specific driving radius of each rural IHS or tribal hospital using an open-source mapping tool[16] (Free Map Tools) and the American Academy of Dermatology Find a Dermatologist search engine,[17] maintained by the American Academy of Dermatology to be current and comprehensive. Ranges studied were 35 miles (chosen to coincide with the defining minimum distance between a critical access hospital and any other hospital[18]) and 90 miles (chosen as a plausible extreme distance that may be traveled for nonemergent care). The driving distance between each rural IHS or tribal hospital and the nearest rural or urban dermatology clinic was calculated with Google Maps, even if the nearest clinic was located beyond 90 miles.

Telephone Survey and Teledermatological Evaluation

We conducted a cross-sectional telephone survey in which one of us (A. M. M.) made telephone calls to 27 brick-and-mortar rural dermatology clinics in June 2018 to inquire about the clinic's insurance and referral acceptance. Respondents included front desk staff and office managers. We surveyed up to 3 rural dermatology clinics located closest (by driving distance) to each of the 34 rural IHS or tribal hospitals, which were identified with the American Academy of Dermatology search engine[15] and Google Maps. Dermatology clinics in urban areas (n = 36), per the US Census Bureau definition,[19] were excluded and used as survey end points. This exclusion was based on urban clinics' farther distance compared with rural clinics; larger numbers; greater diversity in services; and greater number of methods of accessing, including through safety net systems and the Urban Indian Health system.

In addition, we evaluated teledermatological programs to understand the alternative (not in-person) dermatological resources available for American Indian patients. To identify these programs, we used a list of active teledermatological programs (n = 38) posted by the American Telemedicine Association[20] as well as snowball sampling (n = 11), which elicited from respondents suggestions of 11 additional programs, including newer and rurally focused programs. Program coordinators or operations leadership responded to a semistructured telephone survey (survey instruments are shown in eAppendixes 1 and 2 in the Supplement).

We contacted each brick-and-mortar clinic or teledermatological program 4 times by telephone, and by email if available, before deeming it nonresponsive. Descriptive statistics were performed in Microsoft Excel. Research activities were conducted from May 7, 2018, to September 1, 2018, and did not take place in any IHS or tribal health care facility.

Results

The median (interquartile range [IQR]) distance from an IHS or tribal hospital to the nearest dermatology clinic was 68 (30-104) miles (to convert miles to kilometers, multiply by 1.6). Twenty-one IHS or tribal hospitals (62%) did not have a dermatology clinic within a 35-mile driving radius, and 11 (32%) lacked a dermatology clinic within a 90-mile driving radius (**Table 1**).

Twenty-seven rural brick-and-mortar clinics were in closest proximity to rural IHS or tribal hospitals in 10 states (driving distance median [IQR], 82.4 [31-114] miles). Twenty-five clinics (93%) responded to the survey, providing information on accepted insurance and referral types (**Table 2**).

Sixteen clinics (59%) accepted patients with Medicaid as a primary form of insurance, and 3 (11%) accepted patients with only certain forms of Medicaid or who were dual-eligible for Medicare and Medicaid. Six clinics (22%) did not accept patients with Medicaid, and 17 (63%) accepted patients without insurance who could self-pay or offered a payment plan. Six clinics (22%) did not accept patients referred via the IHS PRC program. Two clinics (7%) accepted patients with IHS PRC referrals but not those with Medicaid. No dermatologist from the clinics traveled to provide care at an IHS or tribal site. However, 1 clinic (Dermatology Associates in Kalispell, Montana) recently opened a satellite clinic on the Flathead Reservation in Polson, Montana, that operates 2 days per month. One teledermatological partnership (between the Navajo Nation and

Table 2. Characteristics of Surveyed Dermatology Clinics and Teledermatological Programs

Characteristic	No. (%)[a]
No. of half-day clinic sessions per week, median (IQR)	9 (9-10)
New patient wait time, median (IQR), wk	3.25 (2.4-4.3)
Dermatology Clinic (n = 27)	
In close proximity	27
Responded	25 (93)
Accepted patients with Medicaid as primary insurance	16 (59)
Accepted only patients with certain Medicaid plans	1 (4)
Accepted only patients with dual eligibility (Medicare + Medicaid)	2 (7)
Did not accept patients with Medicaid	6 (22)
Accepted patients without insurance but who could self-pay or be on a payment plan	16 (59)
Accepted patients with free care and no expectation to pay	3 (11)
Accepted patients with IHS referral and no health insurance whose payment was approved through the IHS PRC program	17 (63)
Did not accept patients with IHS PRC referral	6 (22)
Accepted patients with IHS PRC referral but not patients with Medicaid	2 (7)
Clinic dermatologist traveled to IHS or tribal site to provide care	0
Teledermatological Program (n = 49)	
Identified	49
Responded	45 (92)
No longer active	14 (29)
Worked within a large, integrated health care system (Veterans Affairs, Kaiser Permanente, and US Army/Air Force)	9 (18)
University based	16 (33)
Worked with hospital or health center serving substantial % of American Indian patients (Blue Mountain Hospital in Blanding, Utah, and Sacramento Native American Health Center in Sacramento, California)	2 (4)
Previously provided teledermatological care to IHS or tribal site but not currently	2 (4)
Actively setting up teledermatological services with IHS or tribal site	2 (4)
Worked with IHS or tribal hospital or health center (n = 8)	
IHS or tribal dermatologist provided teledermatological care to another IHS or tribal site	2 (25)
External (non-IHS or tribal) dermatologist provided teledermatological care to IHS or tribal site	6 (75)
Volunteer clinician provided teledermatological care	2 (25)

Abbreviations: IHS, Indian Health Service; IQR, interquartile range; PRC, purchased/referred care.

[a] Percentages may not add to 100% given that a small number of clinics had never encountered the situation in question, such as an IHS referral or free care, and were thus unable to respond.

Brigham and Women's Hospital in Boston, Massachusetts) involved multiple dermatologists traveling to train local staff on site to be skin specialists and to see complex cases.

Of the 49 teledermatological programs we identified and contacted, 45 (92%) replied (Table 2). Fourteen programs (29%) were no longer active. Ten (20%) non-IHS programs were currently partnering (n = 6), previously partnered (n = 2), or were setting up services (n = 2) with an IHS or tribal site. The programs with active collaborations worked with a total of 10 IHS or tribal hospitals or health centers, and 2 full-time dermatologists employed by the IHS or tribal facility were providing teledermatological care for 17 IHS or tribal hospitals or health centers, for a total penetration of 9% into the 303 IHS and tribal hospitals and health centers in the continental United States. These 27 sites were primarily located in the Navajo, Phoenix, and Billings IHS service areas (**Figure**).

Two teledermatological programs each worked with a hospital or a health center to serve a substantial percentage of American Indian patients, although not through IHS or tribal contracts. Ten of the 12 teledermatological services operated with a store-and-forward (asynchronous) model, in which photos and patient history were transmitted to the consultant. Two other programs operated via live interactive video.

Discussion

This study highlights substantial barriers to dermatological care for the American Indian population in rural communities. Physical access was limited, with the mean driving distance between an IHS or tribal hospital and the nearest dermatology clinic of 68 miles suggesting substantial hidden costs to patients such as time spent driving, money required for the vehicle and fuel, and time away from work or family-caretaking responsibilities. Furthermore, not all families own cars; public transportation infrastructure is limited or nonexistent in rural areas; and some secondary roads surrounding patients' homes may be unpaved, through mountain passes, or impassable in inclement weather. Data on transportation access for patients served by the IHS or tribal health systems are lacking, but data on American Indian veterans, many of whom receive care through the IHS, indicated they were statistically significantly more likely to delay care because of lack of transportation compared with white veterans.[21] American Indian patients living in rural areas also had difficulty accessing tertiary care, for conditions such as acute myocardial infarction[22] and renal transplant.[23]

Figure. Geographic Distribution of Surveyed Dermatology Clinics and Indian Health Service (IHS) or Tribal Hospitals

The map presents the 11 regional IHS service areas (Albuquerque, Bemidji, Billings, California, Great Plains, Nashville, Navajo, Oklahoma City, Phoenix, Portland, and Tucson) in the continental United States, including surveyed rural dermatology clinics and urban dermatology clinics, which were excluded and treated as survey end points. Information on the IHS service areas retrieved from the US Department of Health & Human Services Open Data Site.

These findings are consistent with literature that has identified distance as a critical barrier to health care access for rural populations.[24] Medicare patients in rural areas travel 2 to 3 times farther to see medical or surgical specialists compared with their urban counterparts.[25] Most dermatologists and advanced practice clinicians who bill for dermatological care practice in urban counties.[26] Small differences in distance can have implications on access to care; traveling farther than 5 miles to a phototherapy session is associated with early nonadherence.[27]

Insurance may pose an additional barrier for American Indian patients who can commute to these distant clinics, in the form of the aforementioned challenges with approval and payment for IHS PRC referrals for specialty care. In this present study, 22% of the nearest dermatology clinics did not accept IHS PRC referrals, and 22% of clinics did not accept Medicaid insurance. The 70% of clinics who did accept some form of Medicaid were consistent with the 2013 National Electronic Health Records Survey data for all clinicians[28]; however, among dermatologists, previous studies estimated the rates to be as low as 32%.[29] Medicaid is an important insurer for American Indian and Alaska Native patients as it enables access to a broader array of services and increases revenues for the IHS and tribal facilities.[10] As of 2017, 27% of adults and 50% of children of American Indian and Alaska Native race/ethnicity were covered by Medicaid.[10] This poor access to rural specialty care is consistent with research showing that fewer than one-third of IHS physicians reported good access to specialty care and that more than half reported that the complexity of care they managed without specialty input was greater than it should be.[30] Additional research is required into the association of administrative, financial, and other interventions with improved Medicaid access at these sites.

Given the geographic barriers, telehealth innovations are an appealing intervention. However, our survey found minimal teledermatological access in IHS and tribal hospitals or health centers, such that telehealth practitioners reported providing teledermatological services in 27 (9%) of 303 IHS and tribal hospitals and health centers in the continental United States, primarily in the Navajo, Phoenix, and Billings IHS service areas. The most limited geographic access to in-person dermatological care was in the Navajo, Billings, Great Plains, and Albuquerque service areas (Table 1), suggesting that teledermatological services overlap incompletely with areas most remote from specialty care.

Since this survey was conducted, the IHS added teledermatological care to existing telespecialty services in the Great Plains Area.[31] Surprisingly, 29% of the teledermatological programs listed by the American Telemedicine Association were no longer active. Future research is needed to identify the reasons for these closures and to evaluate the key aspects of successful integration of telespecialty care. Top-down approaches to deploying teledermatological care appear to have been successful for other large health systems, such as the Veterans Health Administration, which cares for a substantial patient population in rural and American Indian communities and provides more than 100 000 teledermatological consults annually.[32]

Nevertheless, given the lack of telehealth capacity to adequately meet dermatological need in many of these rural communities, one promising innovation involves the training and support of on-the-ground clinicians to expand their capacity to provide dermatological care. Two programs, the MAVEN Project and Brigham and Women's Hospital Indian Health Service Outreach Program, focus on building local knowledge and capacity akin to Project ECHO (Extension for Community Healthcare Outcomes), a collaborative model of supporting and educating frontline practitioners that was developed at the University of New Mexico for hepatitis C treatment.[33] These programs differ from traditional telehealth models in that primary care of the patient remains with the frontline physician, and specialists provide remote consultation and education in the form of case conferences or in-person shadowing experiences, for example. Another model, sponsored by the American Academy of Dermatology, involves brief rotations for US dermatology residents at the IHS facility in Chinle, Arizona, to see complex cases and educate local clinicians.[34] Systematic investments in pri-

mary care clinicians' dermatological knowledge combined with access to experts on an ad hoc basis may be a promising long-term way to improve dermatological care for people of American Indian race/ethnicity.

Limitations

This study has several limitations. The results must be interpreted in the context of the study's cross-sectional design. Not all active teledermatological programs may have been identified. The data on accepted insurance and referral types may be limited by the exclusion of urban dermatology clinics from the telephone survey. Although the survey identified certain barriers to access, it did not measure patient-sided access and did not examine underlying factors in geographic barriers. In addition, it did not identify nongeographic barriers to care, such as language barriers or mistrust in the health care system owing to the historical precedence of unethical research and medical practice performed on the American Indian and Alaska Native population. Despite lacking dermatologists, IHS and tribal facilities may employ nondermatologist clinicians with dermatology expertise. Further research is required to understand the implications of these limitations and to evaluate the association between reduced access to specialty care and dermatological outcomes for American Indian patients.

Conclusions

This study identified several barriers to dermatological care for American Indian communities in rural areas, including geographic distance and inconsistent access for those with Medicaid coverage. Teledermatological care is not currently available widely, and many programs have recently closed. Focused efforts to address geographic and financial barriers in addition to improving the capacity of frontline dermatological practitioners may help minimize the disparities in outcomes for dermatological diseases.

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