

Geography as a Healthcare Barrier:

How Isolation and Underfunding Drive Health Inequality

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In the United States, where you live, can determine whether you live. For Native Americans (NA) living on reservations in the United States, geography is not just a backdrop, it is a structural force which appears to influence access to healthcare. This paper seeks to identify the relationship between reservation life and access to healthcare through three barriers: geographic isolation, underfunding of the Indian health Service (IHS), and limited provider availability. Geographic isolation suggests a decrease in available providers, underfunding of the IHS suggests lower healthcare quality and availability, and poverty in reservations suggests decreased utilization. The expected result of these three barriers would be worse health outcomes for NA populations living on reservations in the United States. By comparing high NA population counties (greater than 13.4%) with reservations to low NA population counties (7.4% or lower), we see that high NA population counties are consistently associated with worse health outcomes and suggest that the cause may be a lack of healthcare access due to isolation, underfunding, and poverty.

The structural barriers which NA individuals face produce negative health consequences. These barriers are not a choice, and almost all NAs face them. Donald Warne explains that the IHS has been principally responsible for providing health services to NA since 1955, but the IHS “is not a health insurance program” and “only provides care at its federal hospitals and clinics” (§ 11). This creates a large problem due to the number of IHS hospitals and clinics. Ruth J Katz details the underfunding of the IHS: “In 2003, the IHS received \$2.5 billion in federal appropriations for its services [...] an additional \$1.8 billion would be needed to provide active IHS users with services at the same level as services provided by the Federal Employees Health Benefits program” (§ 3). Such institutional underfunding lowers quality of care, number of

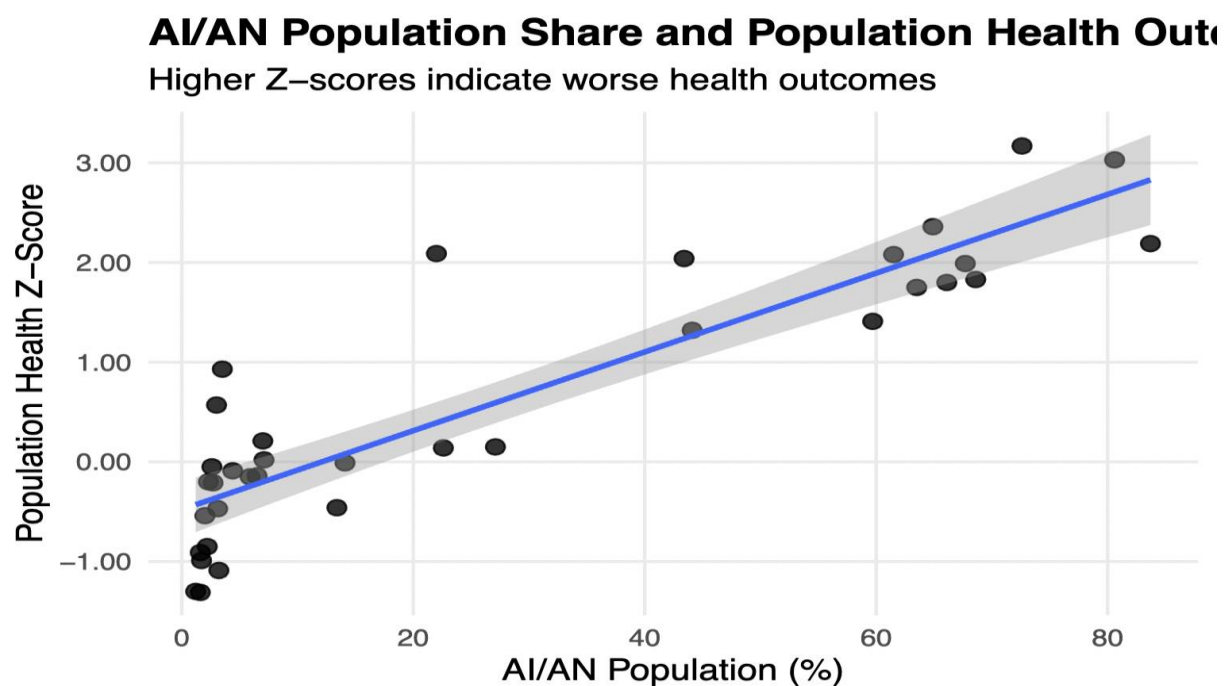
individuals with coverage, and scope of care because of fewer facilities, longer travel times, and lower eligibility (Katz, ¶ 4). It is important to highlight faults with the IHS because the United States Government and NA have historical experiences that put pressure on the U.S. to make up for past relationships. Instead of making up for past oppression, we see disparities between government programs for NA and for others that prolong the disparities.

In this paper, we compare county-level public health between counties with reservations that contain a percentage of NA population over 13.4% to counties who have a percentage lower than 7.4%. The goal is to determine if there is a statistically significant difference between a sample of the two groups of counties. In addition, counties are analyzed by poverty level and rurality to examine the relationship between NA population share, economic conditions, and geographic isolation. To measure ‘health,’ we turn to County Health Rankings and Roadmaps (CHR&R), a program of the University of Wisconsin Population Health Institute. In 2025, CHR&R published County Health Release National Data. This dataset includes a z-score which is the standardization of health scores for each county, and this is the measure we will use to gauge ‘health.’ A higher z-score indicates worse overall county-level health outcomes. To measure rurality, we used data from the United States Department of Agriculture (USDA). Every decade since 1974, the USDA has published a dataset where it gave every county a Rural-Urban Continuum Code from 1-9. The USDA considers counties marked 1-3 metro areas and 4-9 as a non-metro area, and this is how we categorized counties by rural or urban.

The data collected supports the hypothesis that counties with higher NA populations have statistically significantly worse health outcomes. Model 1 establishes relationship between population health z-score and NA population percentage alone and yields a coefficient of 0.040 ($p < 0.001$) meaning that each additional percentage point of NA county population share is

associated with a 0.04 increase in the health z-score, where higher values indicate worse outcomes. The model explains nearly 79% of the variation in county-level health outcomes ($R^2 = 0.79$), which is a statistically significant amount. The intercept of -0.48 indicates that counties with minimal NA population tend to perform better than the national average on the composite health measure. In each model the counties with higher native populations see worse health outcomes even when controlling for rurality and poverty.

Main Figure: AI/AN Population Share and Health Outcomes



Model 1.

The t-test comparing high and low NA counties explains the extent of this gap. Counties classified as high NA (above 13.5%) had a mean health z-score of 1.58, compared to -0.37 for low NA counties, nearly two full standard deviations ($t = 6.63$, $df = 25.79$, $p < 0.001$). The disparity seen is not a function of being remote; when population composition and poverty are included, the effect of the USDA rural code becomes negligible, suggesting that geography

matters less than who lives there and under what economic conditions. The disparity is the result of being Native American and poor in a nation which neglects both.

This follows what we see in national level statistics at the individual level. NA infant mortality rates, uninsured rates, and self-reported health levels all vary from the national averages in a predictable way based on a model which correlates lower access to care with worse health outcomes.

Our regression models only finds a correlation, not causation but Akee and Simeonova bring in causal evidence in their analysis of casino-generated income to Native American households using a quasi-experimental design to isolate the effect of income on NA mortality. Using casinos as the catalyst to variations in household income, they found that increases in income significantly reduce NA mortality. This data backs our findings, poverty causally drives worse health, and if NA population percentage predicts higher poverty rates, then the observed county relationships are an underlying mechanism with established causal support.

Warne et al support this by finding barriers to specialty care and clinical trials for Native American communities, showing the gap exists beyond PCPs and basic treatment. Supporting causal evidence comes from research examining the staggered nationwide roll out of ACA Medicaid expansion by state. The difference-in-differences study published in *Health Affairs* compared childbearing-aged NA women in expansion versus non-expansion states before and after 2014. They found the expansion significantly increased coverage, dropping the uninsured rate in nonelderly adults living in expansion states from 23% to 15%, which was about twice the drop seen in non-expansion states. Critically, the study also found that coverage gains were more limited in counties with high reservation land concentration, where provider shortages and IHS underfunding constrained the practical value of expanded insurance. This finding suggests that

insurance coverage alone is insufficient when the underlying geographic and structural barriers remain in place. Even after removing the financial barrier, Native Americans still had worse outcomes because the other layers of barriers: distance, provider availability, and facility capacity were left intact. This is consistent with the county-level patterns documented here, where NA population share predicts worse health outcomes even after controlling for poverty.

An honest evaluation would find the biggest issue this paper faces is causation. The paper only cross-sectionally observes 37 counties at a single point in time, which significantly reduces the strength; the models cannot prove that higher NA population share directly causes worse health outcomes. NA population share is related to poverty, geographic isolation, and historical underinvestment, all of which also affect health. Even after controlling for poverty and rurality there are still unknown or unmeasured county level factors which may influence results, for example local healthcare quality or environmental conditions. Without a natural experiment or instrumental variable like the casino-income design used by Akee and Simeonova, causation cannot be confidently established.

The strength of the conclusions is also limited by the sample size. We only used 37 counties, and a few especially high percentage NA counties could strongly influence the results limiting the generalization possible. There is also some aggregation bias; the analysis looks at counties, not individuals. A county with both poor health outcomes and a high NA population does not necessarily mean NA individuals are the sole cause of the association. County data can show overall data, not individual outcomes.

Another limitation is that AI/AN population percentage is only a proxy for healthcare access. It does not directly measure reservation residency, IHS reliance, or distance to healthcare providers. Two counties with similar AI/AN populations could still have very different levels of

healthcare access. More direct measures such as travel time to providers or IHS spending per capita would improve the analysis.

Finally, some important factors are missing from the data entirely. Medical mistrust, historical trauma, and cultural barriers to care are difficult to measure at the county level but likely play an important role in health outcomes. These missing variables do not invalidate the findings, but they do mean the models capture only part of the overall story.

The disparities in this paper were not random, instead they stem from generations of underfunding and neglect. Higher infant mortality, preventable chronic disease, and lower life expectancy are concentrated in the same communities that have experienced displacement and forced assimilation. The Medicaid expansion evidence us understand how these barriers can compound. While expanding insurance helped some, reservation heavy areas saw less improvement due to the foundational lack of healthcare infrastructure. Removing one barrier helped, but the larger structural problems still limited access to care for NA populations.

The federal government has a legal treaty obligation to provide healthcare to NA populations through the Indian Health Service. Yet IHS spending per capita remains far below programs like Medicare. The data shows that counties with larger AI/AN populations consistently experience worse health outcomes. This points to a structural problem rather than an issue of individual behavior.

Addressing these disparities requires full structural solutions rather than focusing solely on individual behavior. The most direct solution is increasing IHS funding. Bringing IHS spending closer to Medicare or Medicaid levels would improve staffing, facilities, provider retention, and healthcare availability for NA populations. The Medicaid expansion evidence

suggests that insurance coverage alone is not enough if the healthcare system itself lacks capacity.

Provider shortages is another issue Natives face. Rural locations cause frequent burnout and a high turnover of doctors, nurses and specialists in those locations. Offering incentives to providers working in tribal areas could possibly help to alleviate shortages. Geographic isolation also requires targeted solutions. Investments into internet or telehealth stations for patients is a realistic step towards accessibility. Another solution could be mobile clinics or shuttles to nearby care providers to increase the number of individuals who see a PCP.

Finally, economic development should also be viewed as a health policy; the findings from Akee and Simeonova suggest that higher income can directly improve health outcomes. Policies that support tribal employment, economic growth, and income stability could improve health even without direct healthcare reforms.

This paper tested the claim that counties with higher AI/AN population share experience worse health outcomes because of poverty and geographic isolation. The results strongly support that claim. Counties with higher AI/AN populations consistently had worse health scores, and poverty remained an important predictor even after controlling for rurality.

The evidence suggests that these disparities are not random. They reflect a healthcare system that underfunds NA communities, neglects healthcare facilities for many populations, and contains a history of institutional mistrust. The Medicaid expansion evidence reinforces this argument. Expanding insurance coverage helped, but reservation-heavy counties still saw weaker improvements because deeper structural barriers were still in place.

Reducing health inequality for NA populations requires structural changes: stronger IHS funding, better healthcare access in all areas, telehealth expansion, and economic investment in

tribal communities. The gap between high and low AI/AN counties is nearly two standard deviations on a composite health measure. That is not a rounding error or a data artifact. It is the measurable cost of decades of underfunding, and it will persist until the investment changes.

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