# Healthcare Deserts: Identifying Areas of Limited Access in Washington State

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## Abstract

Health disparities among both rural and American Indian (AI) populations have been well documented (Jones, 2006), with rural communities experiencing significantly lower health outcomes than urban opulations. One of the possible factors that may affect these negative health outcomes is limited access to healthcare resources. This research introduces the concept of "healthcare deserts" to describe the gap between urban, rural and AI populations located within Washington State, and levels of emergency medical services and primary care services. Using GIS, we identified the shortest network route queries from every residential parcel on Federally Recognized American Indian Reservations in the State of Washington to the nearest hospital and nearest primary care health clinic. These types of medical facilities were chosen based on observed and documented heath disparities found in both rural and AI populations, as well as, concerns of equality in relation to accessibility to healthcare resources. The results highlight perceived gaps in primary care, emergency health services, and possible gaps in access to specialized care for specific ailments that disproportionately affect Al

# Background

Though proximity (or distance) is often treated as being synonymous with access to resources, access is a multidimensional concept. Theories of access take into account prices, rights, reciprocity networks, ability of resource providers to accommodate needs of resource uses, and the social acceptability of the resource in a community, among other factors (Bernard et al., 2007; Penchansky & Thomas, 1981). Indeed, proximity may not even be the most influential factor in health care access (Buzza et al., 2011). Buzza and team (2011) note that distances to health care facilities are mediated and/or moderated by: 1) patient financial constraints; (2) the type of care required (routine, specialty treatment, or diagnostic services); and (3) emergency services. Likewise, Arcury et al. found that the ability to travel (whether it be through having a driver's license, interpersonal networks, or public transportation) was associated with increased visits to health care facilities (Arcury et al., 2005). Further complicating the concept of access is the quality of transportation infrastructure, which is inconsistent across tribal communities nationwide (National Congress of American Indians, 2013). On the one hand, poor road conditions may exacerbate the effects of distance on access. On the other, many tribes manage transit programs to help residents travel to and from health care facilities (National Congress of American Indians, 2013).

This research introduces the concept of "healthcare deserts" to describe the gap between the needs of American Indian populations located within Washington State, and levels of emergency medical services, primary care services and specialty care services.. We performed routing queries to obtain the street-network distance from every residential parcel in Washington State (excluding Whitman County) to the nearest hospital and primary care health clinic. These measures were based on concerns of equality in relation to accessibility to healthcare resources.

his poster documents the first steps of a larger research project that looks to explore the concept of access and health care deserts at the parcel level within the entire state of Washington. Our goal is to provide a comparative analysis between rural, urban, and tribal lands within the state, providing both public health and planning professionals data that will assist in the identification of health care deserts in Washington State.

# Methodology

The OD Cost Matrix Analysis option in ArcMap 10.6's Network Analysis Tool was used to compute the shortest-path distances between residential parcels and health care facilities along the Environmental Systems Research Institute's (Esri) Street Map North America database (Esri, 2017). Distances are measured in both miles and travel times. Travel times are based on posted speed limits and takes into account current roads restrictions including one way roads, alleyways, four wheel drive roads, and turn restricted roads. The parcel data consist of all 36,127 residential parcels on all American Indian reservations within Washington State, and were obtained through the Washington State Parcel Database Project, developed by the University of Washington Geographic Information Service at the School of Environmental and Forest Sciences (University of Washington, 2017). The locations of all 118 hospitals and 1,462 primary health care clinics in Washington state were provided by the Washington State Department of Health (Washington State Department of Health, 2018). The geospatial data for the American Indian Reservations in Washington State was obtained from the US Census data portal. Parcel data was available for 26 of the 28 American Indian Reservations in Washington State. Data for Shoalwater Bay and Quileute Reservations were unavailable.

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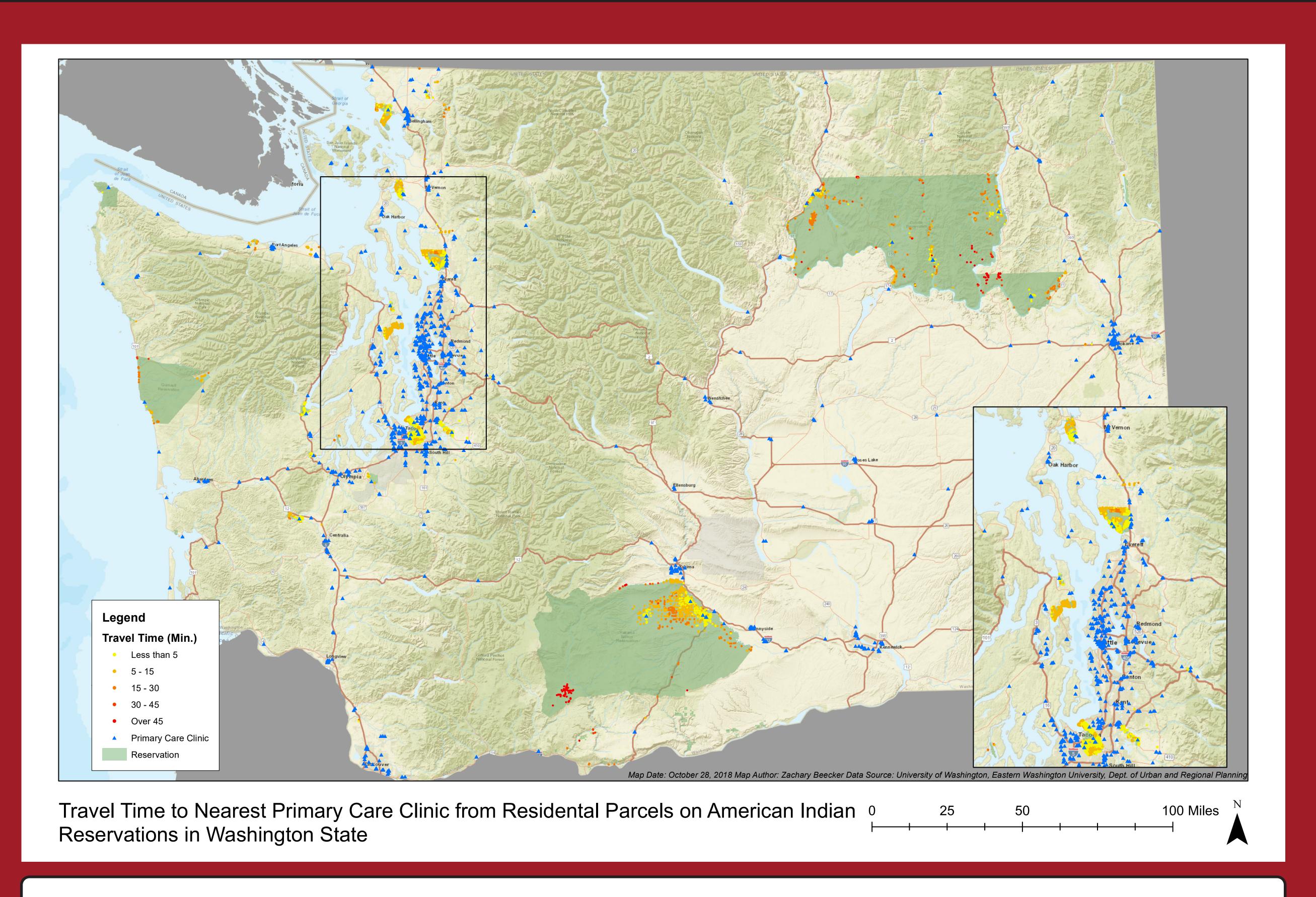


Figure 1: Travel Time to Nearest Primary Care Clinics from Residental Parcels on American Indian Reservations in Washington State

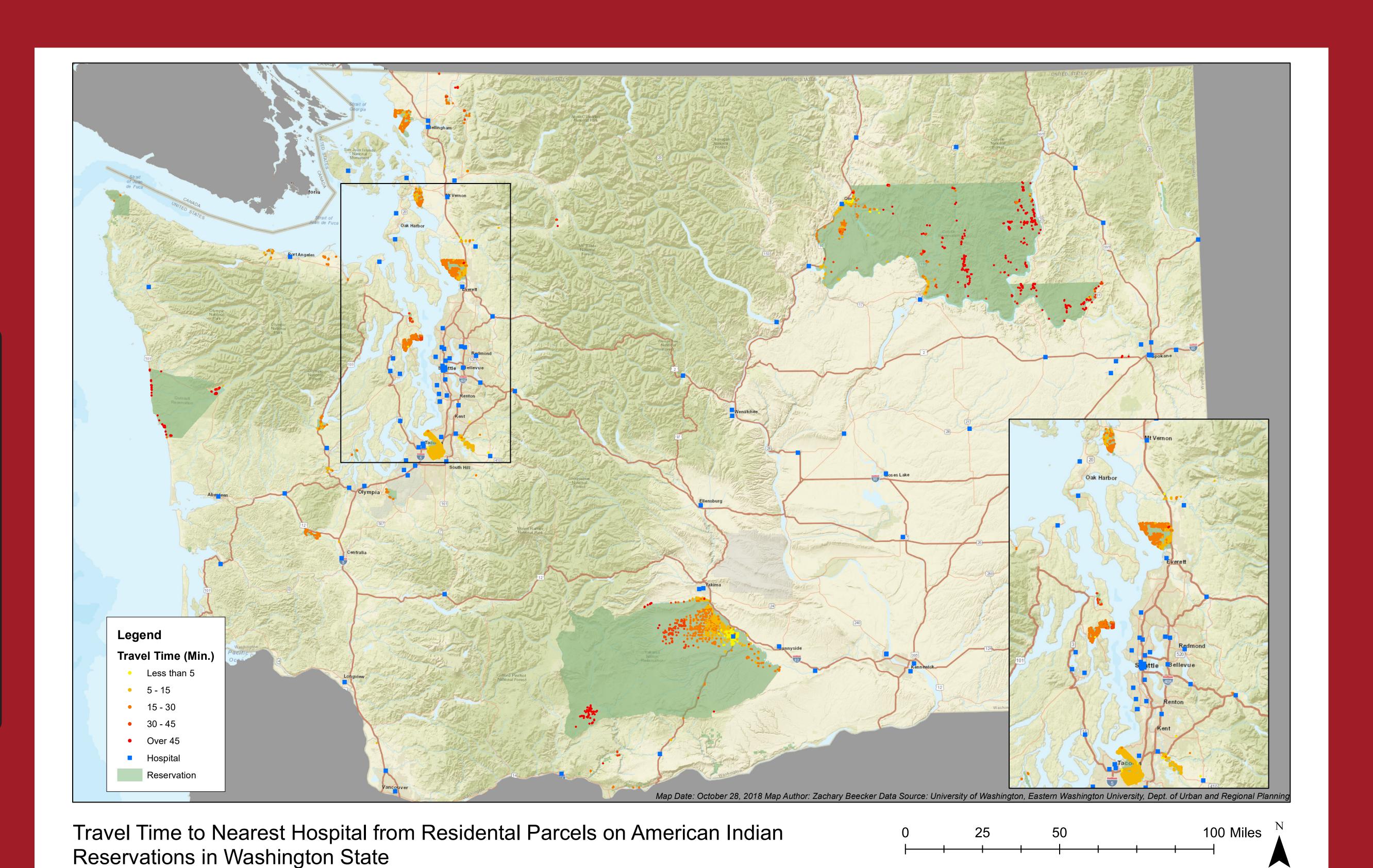


Figure 2: Travel Time to Nearest Hospital from Residental Parcels on American Indian Reservations in Washington State

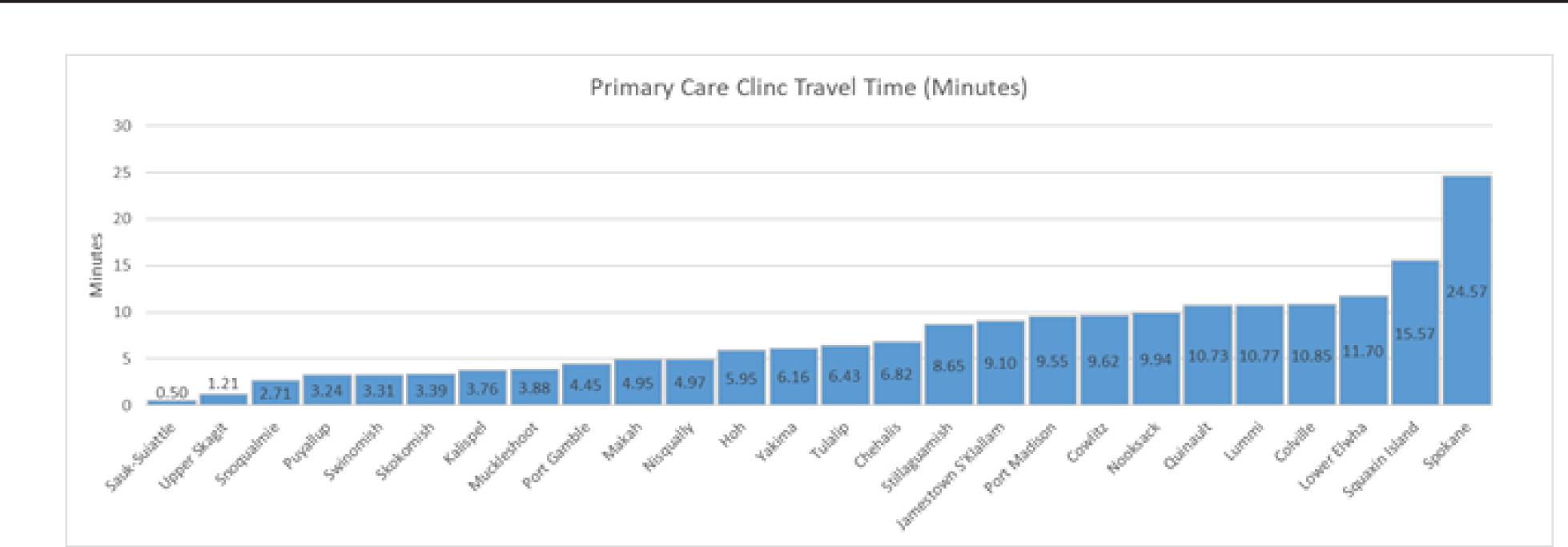


Figure 3: Primary Care Clinic Travel Time Averages by Reservation

### Results

For all residential parcels on Washington reservations, the average travel time to hospitals was 23.08 minutes (13.97 miles) and for clinics the time was 7.41 minutes (3.94 miles). Considering that there are more primary care clinics (n= 1,462 clinics) than there are hospitals (n= 118 hospitals), this finding is not surprising. For hospitals, these distances and travel times varied greatly by reservation with the Muckleshoot reservation having the shortest (an average 7.08 minutes) and the Quinault reservation having the longest (an average 57.28 minutes to hospital). For clinics, these distances and travel times also varied greatly by reservation with the Sauk-Suiattle reservation having the shortest (an average of 0.50 minutes) and the Spokane reservation having the longest (an average 24.57 minutes to hospital). In general, reservations with the shortest distances and travel times to the nearest hospital were located within urban areas around Puget Sound on the western side of the state. These reservations include the Muckleshoot, Puyallup and the Stillaguamish reservations. With the exception of the Yakima Nation, none of Washington's 28 reservations have a hospital located within the reservations boundaries. This makes proximity to urban areas a major factor when calculating travel time and distance to the nearest hospital and might also explain why the shortest travel times and distances are all found in and around the most urbanized portion of Washington State. All of the reservations with the shortest distances and travel times to primary health care clinics have health care clinics located within the boundaries of their reservations. Three of these reservations, Sauk-Suiattle, Upper Skagit, and Snoqualmie have a square mileage of less than one and only one primary health care clinic within their boundaries, which makes travel times and distances very short, while the next two reservations, Puyallup and Swinomish, each have over 20 square miles, but compensate the greater size with multiple clinics on their reservations.

One of the major advantages of parcel-level data is that it captures both variation within reservations, as well as, variation between reservations. The reservations with the largest areas also had the largest standard deviations. For example, residential parcels in the 255-square-mile Spokane Reservation had an average travel time to clinics of 24.57 minutes and a standard deviation of 18.25 minutes, with a maximum travel time of 55.41 minutes. Similarly, there are areas in the southeast portion of the Colville reservation, the northwestern portion of the Quinault reservation, the western edge of the Spokane reservation, and the southwestern portion of the Yakima Nation with travel times higher than 45 minutes. Analysis of the travel times and distances to the nearest hospital showed that areas similar to those mentioned above (the eastern portion of the Colville reservation; the western Yakima Nation, and the entirety of the Spokane reservation) have many parcels with long travel times. Additionally, portions of the Nooksack, Port Gamble, Port Madison, Quinault, and Sauk-Suiattle reservations, also have some residential parcels that are significantly isolated from the nearest hospital. Overall, the average travel times and distances from all residential parcels were greater than the average travel times and distances to the nearest primary care clinic.

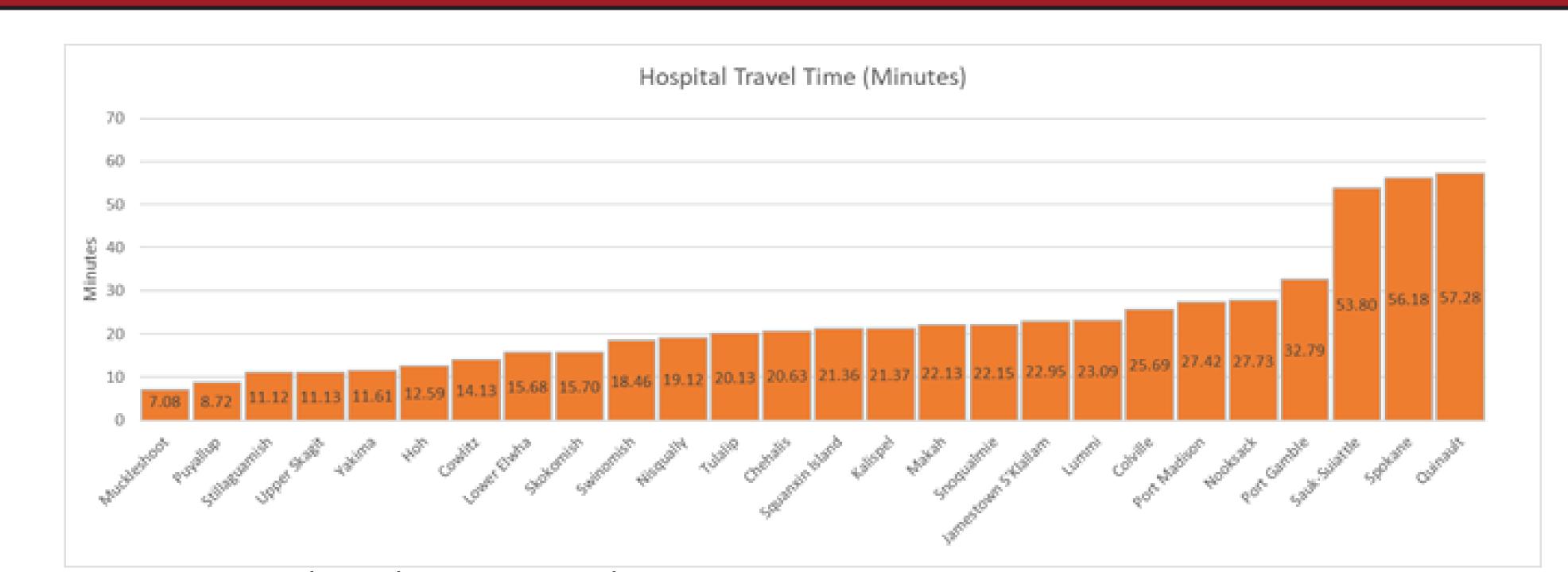


Figure 4: Hospital Travel Time Averages by Reservation

			Primary Care Clinic			nic	Hospital			
			Distance (Miles)		Travel Time (Minutes)		Distance (Miles)		Travel Time (Minutes)	
Reservation	<b>Pacel Count</b>	Square Milage	Mean	SD*	Mean	SD	Mean	SD*	Mean	SD*
Chehalis	146	7.48	3.78	1.43	6.82	2.41	14.93	1.22	20.63	2.09
Colville	1750	2229.65	5.69	5.63	10.85	11.71	14.98	16.63	25.69	27.45
Cowlitz	2	0.26	5.65	5.94	9.62	8.71	10.76	0.03	14.13	0.07
Hoh	1	1.39	3.66	NA	5.95	NA	8.17	NA	12.59	NA
Jamestown S'Klallam	50	0.46	5.06	2.45	9.10	4.70	14.58	2.70	22.95	2.72
Kalispel	3	10.98	1.84	1.15	3.76	1.68	12.57	12.83	21.37	21.25
Lower Elwha	41	2.85	5.84	1.58	11.70	3.40	9.11	2.18	15.68	3.42
Lummi	1848	38.47	5.32	1.88	10.77	4.03	13.34	1.44	23.09	2.73
Makah	2	48.00	2.56	2.04	4.95	4.03	13.21	0.04	22.13	0.10
Muckleshoot	627	6.23	2.02	0.95	3.88	1.85	3.94	2.10	7.08	3.54
Nisqually	83	8.34	2.63	0.65	4.97	1.26	11.60	0.48	19.12	1.00
Nooksack	77	4.60	6.33	5.41	9.94	7.36	15.93	5.04	27.73	8.84
Port Gamble	16	2.53	2.41	1.89	4.45	3.65	20.58	1.43	32.79	3.79
Port Madison	3289	12.30	5.19	0.86	9.55	1.37	17.16	2.05	27.42	4.26
Puyallup	15245	29.87	1.68	0.95	3.24	1.77	4.87	1.36	8.72	2.30
Quileute	N/A	1.66	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Quinault	566	329.34	6.01	2.51	10.73	5.64	36.63	5.10	57.28	4.22
Sauk-Suiattle	30	0.07	0.21	0.81	0.50	1.89	30.07	6.55	53.80	12.11
Shoalwater Bay	N/A	1.69	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Skokomish	184	8.56	2.26	0.91	3.39	1.11	10.66	1.05	15.70	1.41
Snoqualmie	5	0.09	1.21	0.23	2.71	0.61	14.39	2.38	22.15	4.15
Spokane	104	255.14	11.37	8.15	24.57	18.25	31.75	10.23	56.18	20.75
Squaxin Island	48	3.43	7.93	5.56	15.57	10.13	11.36	2.87	21.36	6.20
Stillaguamish	28	0.71	5.11	1.88	8.65	3.54	6.57	2.20	11.12	3.92
Swinomish	1491	21.49	1.80	1.14	3.31	1.87	11.57	1.45	18.46	2.69
Tulalip	4866	53.25	3.26	2.39	6.43	4.49	11.07	3.17	20.13	5.61
Upper Skagit	60	0.18	0.60	1.23	1.21	1.66	6.71	1.75	11.13	3.23
Yakima	5565	2212.60	3.14	5.49	6.16	11.77	6.78	6.53	11.61	12.92
Total	36127	5291.61	3.94	2.52	7.41	4.76	13.97	3.71	23.08	6.43
*SD denotes Standard Deviation										

Figure 5: Primary Care Clinic and Hospital Distances and Travel Times by Reservation

### **Conclusions**

These data may be of use to both tribal planners and healthcare professionals who are attempting to improve the overall health of both rural and tribal populations within the state of Washington. We found that the distance dimension of healthcare for tribal populations in Washington State is very complex and varies from parcel to parcel within each of Washington's 28 American Indian reservations. Specifically, we found:

The reservations with the largest land areas (Spokane, Colville, Quinault and Yakima) also had the most parcels with long travel distances (over 45 minutes) to both hospitals and primary health care clinics.

Five of the six reservations with a mean distance of under ten miles to the nearest hospital were located within urban areas around Puget Sound on the western side of Washington State.• The Spokane reservation had the longest average distance to the nearest primary care facility at 11.37 miles (24.57 minutes), and the Quinault reservation had the longest average distance to the nearest hospital at 36.63 miles (57.28 minutes).

The Sauk-Suiattle reservation had the shortest average distance to the nearest primary care facility at .21 miles (.50 minutes), and the Muckleshoot reservation had the shortest average distance to nearest hospital at 3.94 miles (7.08 minutes).

This research assumes that the closest medical facility is equipped with the proper equipment to treat the ailment to which the patient is suffering from. When considering both Penchansky's and Bernards dimensions of accessibility (Bernard et al., 2007; Penchansky & Thomas, 1981), this research shows that there are many areas in Washington state that are located large distances from essential healthcare resources, as well as, emergency care services, but this is only one corner of the larger picture of the healthcare accessibility issues effecting the American Indian community of Washington State.

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