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Title: Location Analysis of Healthcare Facilities within the Muscogee Creek Nation

Abstract: Access to healthcare is a problem facing many residents of rural communities in Oklahoma. When looking at a directory of providers and facilities across the state it can become overwhelming and difficult to determine what type of healthcare facility should be accessed. The aim of this study is to provide information that will aid the user in choosing which healthcare facilities are the best fit for them based on user inputs for location, tribal citizenship status, and type of care facility required. The implementation of the program created, accurately provided users with a directory of healthcare facilities that meet their specific requirements. This information can become useful in deciding where to pursue healthcare treatment and ultimately provides better access to healthcare.

Introduction:

Rural communities face many challenges in accessing adequate health care services. This limited access results in overall medical neglect and death due to undiagnosed, and untreated ailments. Rural counties in Oklahoma are faced with more challenging aspects of accessibility to healthcare. Rural residents often have to travel long distances to access the already limited facilities that are available to them. In Oklahoma, we must also be mindful of the residents that are members of the tribal nation and depend on the use of the Indian Health Services (IHS). The IHS has an even more limited number of service stations in Oklahoma. There are 20 healthcare facilities across the 77 counties that serve members of the tribal nations.

The Muscogee Creek Nation reservation is a unique area of Oklahoma that encompasses all or part of 11 counties in the state and is largely rural. The reservation was

never disestablished, therefore maintains established sovereignty and territorial boundaries. Within this study area, there are citizens of the tribal nation as well as non-tribal citizens. Tribal citizens have access to specific healthcare facilities that are not accessible to the non-tribal citizens.

The Muscogee Creek nation is the focus area of this study because this area is made up of rural and urban areas and has a large population of tribal citizens. The rural counties have a small number of operational healthcare facilities. When looking at a directory of healthcare facilities in the state, the decision of choosing a proper facility can become overwhelming. Especially for rural residents who will likely have to travel long distances to receive healthcare. The program created serves as a framework that will help the user determine which facilities are the best fit for them, based on their specific criteria.

Materials and Methods:

The data being used for this project includes a shapefile that shows the boundary for the Muscogee Creek Nation. This shapefile has been obtained from the GIS department of the Muscogee Creek Nation. The shapefile consists of a polygon layer that shows the boundary of the Muscogee Creek Nation. This shapefile also shows a polygon layer for the county boundaries located within the Muscogee Creek Nation boundary. I was able to obtain a directory of healthcare facilities that is provided from data.ok.gov. This file contains the facility name, address, phone number, and coordinates in decimal degrees. I visited the Indian Health Services website and created a spreadsheet that contains up to date information on healthcare facilities specifically for tribal citizen use. This spreadsheet has identical formatting to the Oklahoma healthcare facilities spreadsheet from data.ok.gov, including facility name, address, coordinates in decimal degrees.

The process for this analysis begins with gathering and cleaning the data. I will use OpenRefine to clean duplicates I have observed within the data.ok.gov facilities file. I am creating a data file with updated information for facilities that are a part of the Indian Health

Services. These facilities offer health care services to tribal citizens only. After the data is cleaned and collected, the two excel files can be transformed into point shapefiles. The two new shapefiles will then be merged into one point layer that contains information on all healthcare facilities within the study area, which is the Muscogee Creek Nation (MCN) boundary.

The spatial reference for each layer was listed and every file was projected to the NAD UTM 14 N coordinate system. Once all files are in the same coordinate system, the healthcare facility point layer is spatially joined to the county layer, and the output provides us with facility by county. A statement is printed which provides information for the selection process. In order to select facilities within a specific county, each county is assigned a value. The list is as followed: ["Creek", 1] , ["Hughes", 2], ["Seminole", 3], ["McIntosh",4], ["Muskogee", 5], ["Okfuskee" ,6], ["Okmulgee", 7], ["Tulsa", 8], ["Rogers" , 9], ["Mayes", 10], ["Wagoner", 11]. The next selection is performed by identifying the type of facility required. The values have been coded as 1 for a clinic and 2 for a hospital. The next selection process inquires about tribal citizenship status. The facilities are codes with a 1 for non tribal citizen, and 2 for tribal citizen. The selection analysis acts as a filter and chooses the best fit facilities. The best fit facilities are intersected from the county and a list of the name and address of the facilities is displayed for the user.

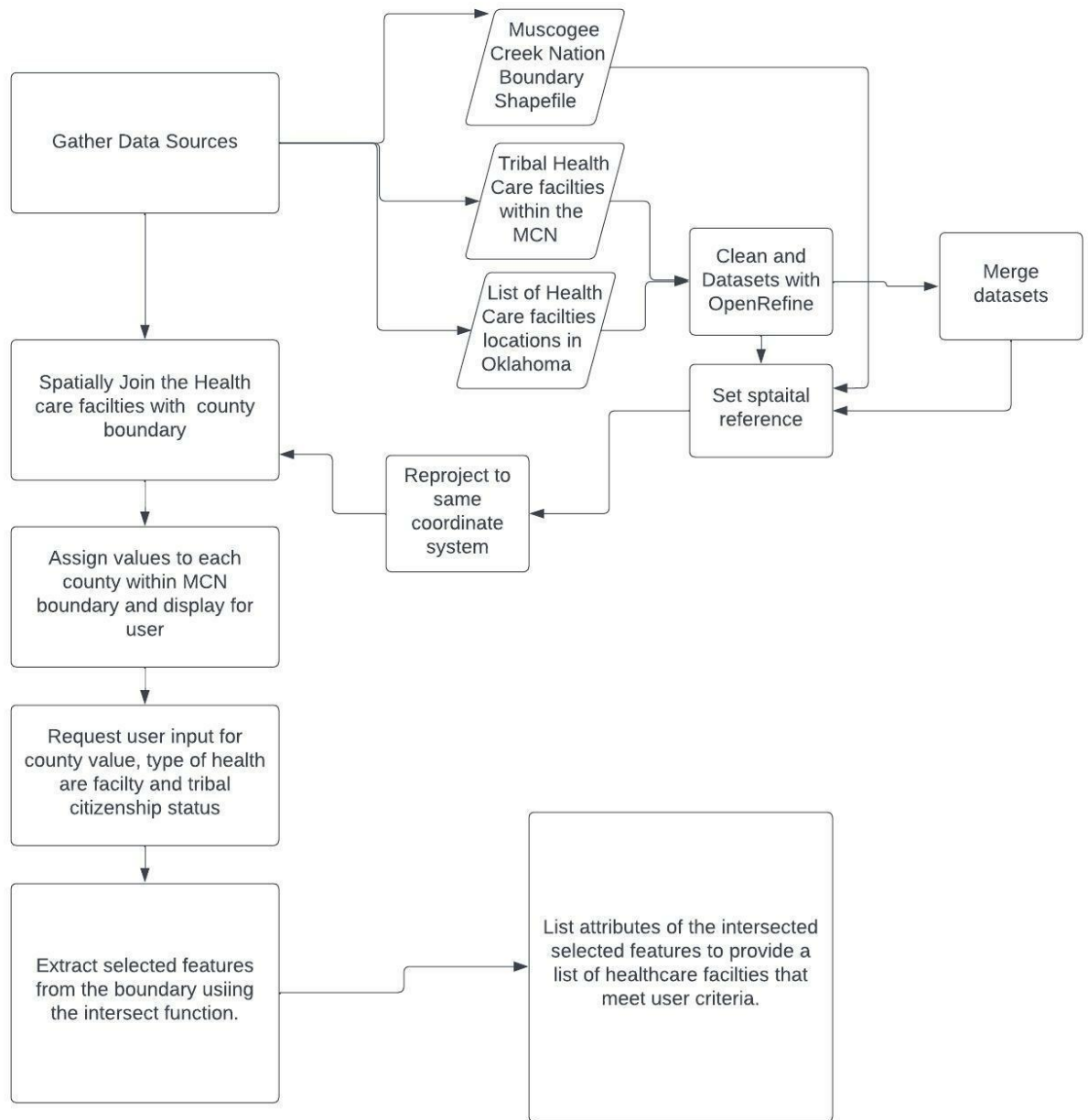


Chart 1: Flow chart showing steps of the program.

Results:

The program ran successfully and returned the user with a list of facilities that fit the criteria. This list can act as a guide and help the user begin to decide on which facility they should access. Below, I tested the input for non tribal clinics in McIntosh county (input1) and tribal clinics in Creek county (input2).

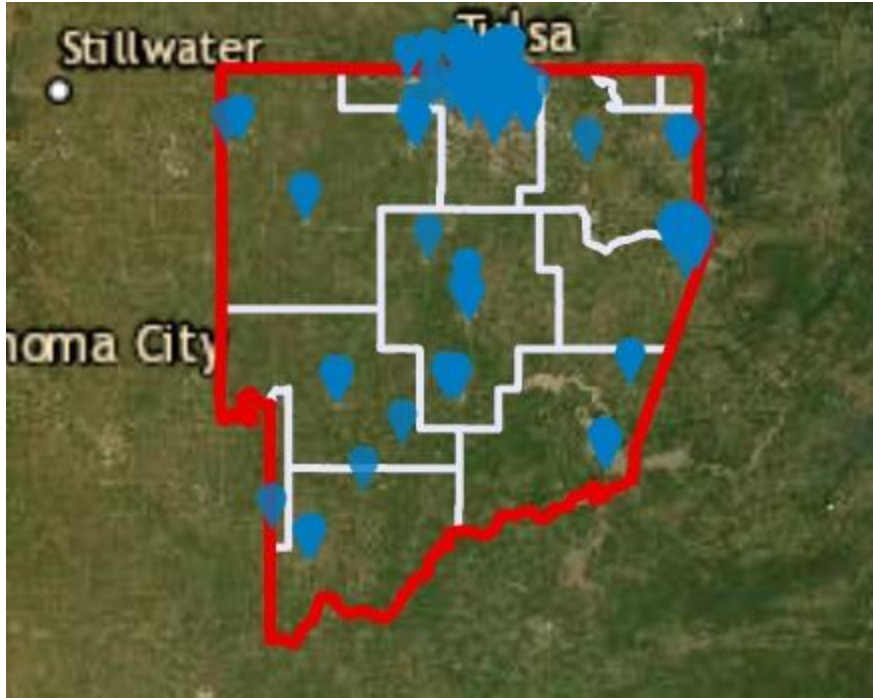


Fig 1. The spatial join of facility to county within the boundary.

	Value	CITY	STATE	ZIP	PHONE1	LONGITUDE	LATITUDE	LOCATION	Tribal	C.or.H	NAME
Ave...	8	Tulsa	OK	74104	(918) 749-8930	-95.96707	36.134609	(36.134609, -95.96707)	N	C	TULSA
Road	7	Okmulgee	OK	74447	(918) 756-9211	-95.961081	35.667923	(35.667923, -95.961081)	N	H	OKMULGEE
Mai...	7	Henryetta	OK	74437	(918) 652-4463	-96.016834	35.441155	(35.441155, -96.016834)	N	C	OKMULGEE
Ave...	8	Tulsa	OK	74104	(918) 579-1000	-95.967316	36.147304	(36.147304, -95.967316)	N	C	TULSA
East...	8	Tulsa	OK	74145	(918) 663-8183	-95.890058	36.116115	(36.116115, -95.890058)	N	H	TULSA
kefel...	5	Muskogee	OK	74401	(918) 682-5501	-95.406064	35.754011	(35.754011, -95.406064)	N	C	MUSKOGEE
reet...	8	Tulsa	OK	74137	(918) 477-5111	-95.953218	36.046181	(36.046181, -95.953218)	N	C	TULSA
et	8	Tulsa	OK	74127	(918) 587-2561	-96.058639	36.14643	(36.14643, -96.058639)	N	C	TULSA
reet...	8	Tulsa	OK	0	(918) 477-5000	-95.953218	36.046181	(36.046181, -95.953218)	N	H	TULSA
e	7	Okmulgee	OK	74447	(918) 756-4233	-95.95313	35.610463	(35.610463, -95.95313)	N	H	OKMULGEE
uite...	8	Tulsa	OK	74135	(918) 481-5280	-95.907892	36.117418	(36.117418, -95.907892)	N	C	TULSA
	8	Tulsa	OK	74136	(918) 665-2909	-95.922371	36.061615	(36.061615, -95.922371)	N	C	TULSA
reet...	8	Tulsa	OK	74145	(918) 743-9810	-95.889086	36.090032	(36.090032, -95.889086)	N	C	TULSA
Stree...	8	Tulsa	OK	74146	(918) 610-0089	-95.855382	36.099372	(36.099372, -95.855382)	N	C	TULSA
	1	Sapulpa	OK	74066	(918) 227-8390	-96.110008	35.998843	(35.998843, -96.110008)	N	C	CREEK
et	1	Bristow	OK	74010	(918) 367-5644	-96.391711	35.830678	(35.830678, -96.391711)	N	H	CREEK
iorial...	8	Tulsa	OK	74133	(918) 294-9760	-95.886444	36.047693	(36.047693, -95.886444)	N	C	TULSA
	5	Muskogee	OK	74402	(918) 686-6300	-95.363882	35.757299	(35.757299, -95.363882)	N	C	MUSKOGEE
re	4	Eufaula	OK	74432	(918) 689-2535	-95.595401	35.292999	(35.292999, -95.595401)	N	H	MCINTOSH
d	4	Eufaula	OK	74432	(918) 689-5352	-95.592342	35.299195	(35.299195, -95.592342)	N	C	MCINTOSH

Table 1: Shows The spatial join of the healthcare facilities to the appropriate county.

County value information needed for step 5.

County	Value
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Creek	1
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Hughes	2
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Seminole	3
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McIntosh	4
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Muskogee	5
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Okfuskee	6
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Okmulgee	7
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Tulsa	8
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Rogers	9
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Mayes	10
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Wagoner	11
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Please enter your county value: 4

What type of facility are you looking for (1 for clinic, 2 for hospital): 1

Are you a tribal citizen? (1 for NO or 2 for YES): 1

Fig 2: The user input that was tested. County value input was 4, which represents McIntosh county, the facility type is 1 for clinic, and the tribal citizen status is 1 for no.

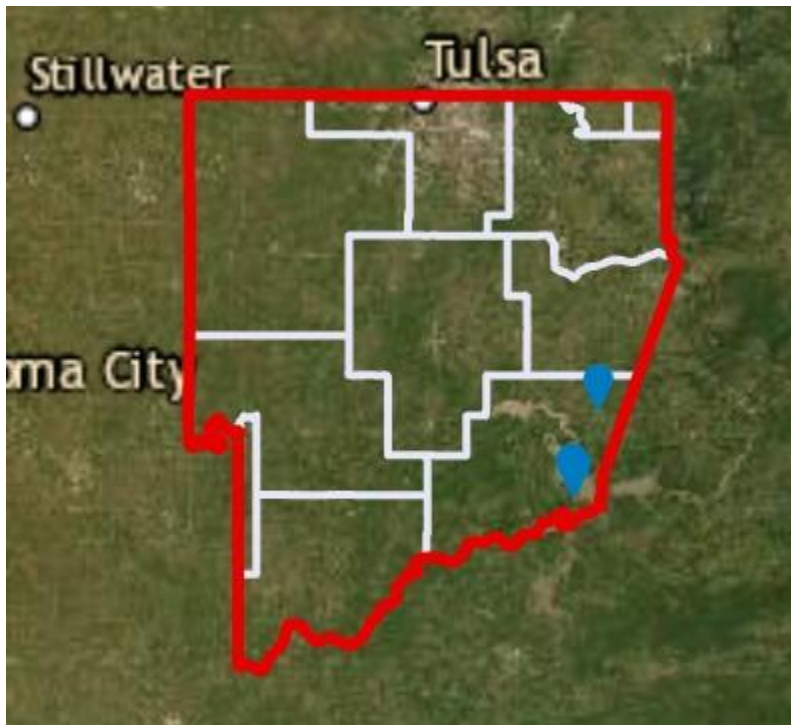


Fig 3. Facilities selected in McIntosh county input1.

Field: Add Calculate Selection: Select By Attributes Zoom To Switch Clear Delete Copy

	FID	Shape *	OBJECTID_1	HEALTH_CAR	ADDRESS	Value	CITY	STATE	ZIP	PHONE1
1	0	Point	54	Community Hospital...	One Hospital Drive	4	Eufaula	OK	74432	(918) 689-253
2	1	Point	73	Community Hospital...	One Hospital Drive	4	Eufaula	OK	74432	(918) 689-253
3	2	Point	74	Country Style Health...	502 Industrial Blvd	4	Eufaula	OK	74432	(918) 689-535
4	3	Point	93	Access Health Team, I...	200 West Gentry	4	Checotah	OK	74426	(918) 473-409
5	4	Point	94	Access Home Care II	200 West Gentry	4	Checotah	OK	74426	(918) 473-185
6	5	Point	110	Horizon Healthcare	45 East Foley	4	Eufaula	OK	74432	(918) 689-580
7	6	Point	131	Trinity Hospice	201 West Okmulgee	4	Checotah	OK	74426	(918) 743-050
8	7	Point	133	Access Health Team, I...	200 West Gentry	4	Checotah	OK	74426	(918) 473-409
9	8	Point	143	Horizon Hospice, Inc.	45 E. Foley	4	Eufaula	OK	74432	(918) 689-580

Table 3: shows the county value selection. (input1)

	Value	CITY	STATE	ZIP	PHONE1	LONGITUDE	LATITUDE	LOCATION	Tribal	Type
1	4	Eufaula	OK	74432	(918) 689-5352	-95.592342	35.299195	(35.299195, -95.5923...	1	1
2	4	Checotah	OK	74426	(918) 473-4093	-95.522001	35.469801	(35.469801, -95.5220...	1	1
3	4	Checotah	OK	74426	(918) 473-1851	-95.522001	35.469801	(35.469801, -95.5220...	1	1
4	4	Eufaula	OK	74432	(918) 689-5800	-95.581992	35.286674	(35.286674, -95.5819...	1	1
5	4	Checotah	OK	74426	(918) 743-0505	-95.520879	35.471823	(35.471823, -95.5208...	1	1
6	4	Checotah	OK	74426	(918) 473-4093	-95.522001	35.469801	(35.469801, -95.5220...	1	1
7	4	Eufaula	OK	74432	(918) 689-5800	-95.581992	35.286674	(35.286674, -95.5819...	1	1
8	4	Eufaula	OK	74432	(918) 967-4000	-95.591383	35.29547	(35.29547, -95.591383)	1	1
9	4	Eufaula	OK	74432	(918) 426-1800	-95.583564	35.28943	(35.28943, -95.583564)	1	1

Table 4. Shows the selection of clinic choice and non tribal facilities. Represented by fields

“Type”=1 and “Tribal”= 1 (input1)

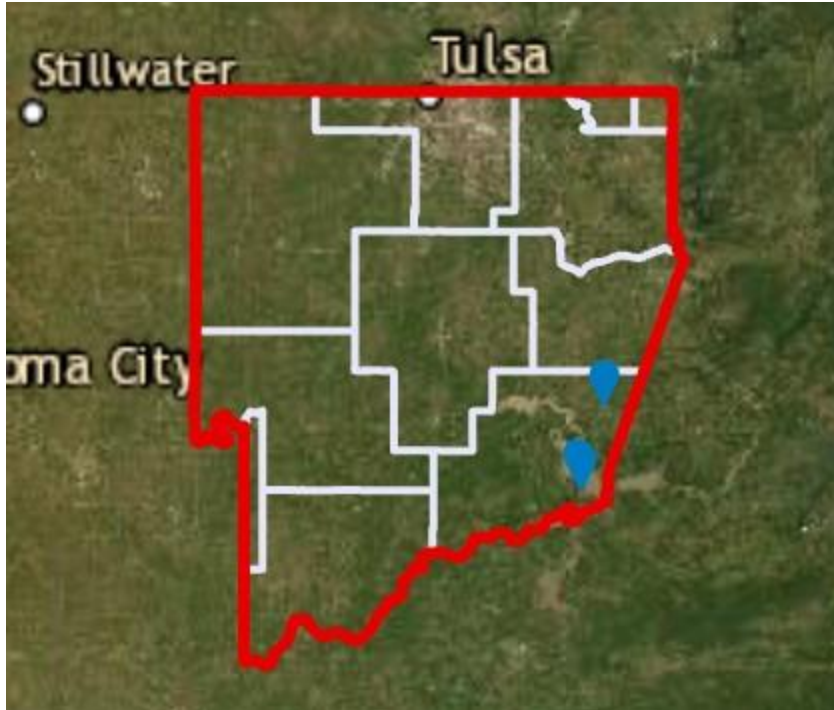


Fig 5: the final location of facilities in McIntosh County, that are clinics for non tribal citizens.

(input1)

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( 'HEALTH_CAR', 'ADDRESS' )
( 'Horizon Healthcare', '45 East Foley' )
( 'Horizon Hospice, Inc.', '45 E. Foley' )
( 'Horizon Hospice, Inc.', '45 E. Foley' )
( 'McAlester Regional Rural Health Clinic -Longtown', 'Route 1 Box 51' )
( 'Health Management Rehab, PT', '1273 Birkes Road' )
( 'Country Style Health Care, Inc. IV', '502 Industrial Blvd' )
( 'Access Health Team, Inc.', '200 West Gentry' )
( 'Access Health Team, Inc.', '200 West Gentry' )
( 'Access Health Team, Inc.', '200 West Gentry' )
( 'Access Home Care II', '200 West Gentry' )
( 'Access Home Care II', '200 West Gentry' )
( 'Access Home Care II', '200 West Gentry' )
( 'Access Health Team, Inc.', '200 West Gentry' )
( 'Access Health Team, Inc.', '200 West Gentry' )
( 'Access Health Team, Inc.', '200 West Gentry' )
( 'Trinity Hospice', '201 West Okmulgee' )
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Fig 6: The printed list of facilities that meet the criteria of non tribal clinics in McIntosh county.

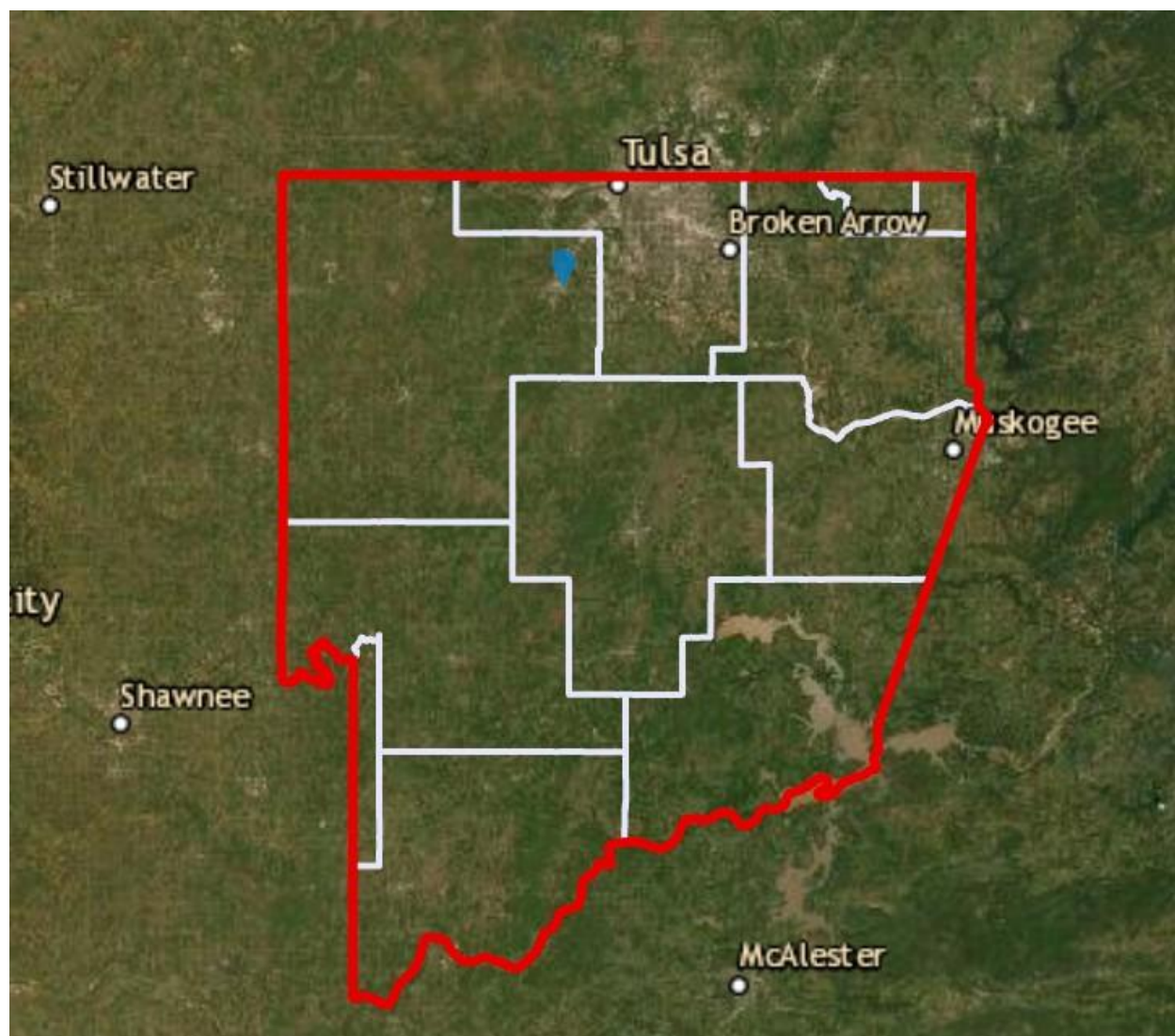


Fig 7. (input2) This map shows the selection of tribal clinics within Creek county.

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County value information needed for step 5.
County    Value
Creek      1
Hughes     2
Seminole   3
McIntosh   4
Muskogee   5
Okfuskee   6
Okmulgee   7
Tulsa      8
Rogers     9
Mayes     10
Wagoner    11
Please enter your county value: 1
What type of facility are you looking for (1 for clinic, 2 for hospital): 1
Are you a tribal citizen? (1 for NO or 2 for YES): 2

```

Fig. 8: (Input2) Selections 1 for Creek county, 1 for clinic, and 2 for tribal citizen

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('HEALTH_CAR', 'ADDRESS')
('Sapupla Indian Health Center', '1125 E Cleveland Ave')

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Fig 9: Results for input2. Tribal clinics in Creek county.

Conclusion:

The successful implementation of this program provides the user with information that can help make informed decisions about accessing health care. I think that there are limitations to this program and with more time, this program could be expanded to meet many more criteria. I think this program could be greatly improved by conducting a location allocation analysis. This analysis would use input locations more specific than county, and be able to calculate closest facilities. The input locations could be specified all the way down to the exact address and help choose the closest facility for users with limited transportation. We could also use network analysis using the public transport systems to solve transportation problems. I looked into the public transportation within the Muscogee Creek Nation, and the public transportation options were limited. Majority of the counties within the boundary are rural and

there are not many options for public transportation. The Muscogee creek nation does offer a different type of transportation system for members of the tribal nation. The shuttle services would also need to be included to conduct this analysis. There is room for improvement to the program. I think this program created can provide a framework and be improved upon to help make healthcare more accessible to all users in the future.

References

Muscogee (Creek) Nation Geospatial Department. (n.d.). Mcngis.com. Retrieved July

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Oklahoma Health Care Facilities - Oklahoma's Open Data. (n.d.). Data.ok.gov.

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