Analyzing Pedestrian Service Areas Relative to Transit Stops and Sidewalks

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There are approximately 228 transit stops –specifically bus stops- in the Cities of Pocatello and Chubbuck, Idaho (the exact number varies seasonally). There are also approximately 381 miles of sidewalk in the same project area. The ability for a pedestrian to use public transportation depends upon a number of factors such as their proximity to a bus stop and their ability to travel from their home to the bus stop. In turn, the latter is highly influenced by the presence/absence and condition of sidewalks.

A study was conducted to characterize the population of Pocatello and Chubbuck Idaho that reside within a bus stop service area and similarly, characterize the population residing outside the bus stop service area. For the purposes of this study, a bus stop service area is an area with contiguous sidewalk and crosswalk connectivity within a 0.5-mile distance to a bus stop. The distance was calculated as the actually distance travelled along the sidewalk and not a Euclidean (as the crow flies) distance.

Methods
Quantifying Service Areas
To accurately portray a sidewalk network within a geographic information system, the sidewalks need to have connectivity. Thus, simply mapping sidewalks as a geographic feature will not allow for a network to be developed. This requires mapping crosswalks as well as the crosswalks provide the necessary connectivity between sidewalks. A sidewalks layer was used as the basis for this study. The sidewalks layer was edited to include crosswalks which were attributed as a crosswalk. This allows for future use in map development where only sidewalks should be shown but also allows for the development of a sidewalk network. Crosswalks were mapped if the delineated (painted) crosswalk was visible in current (2019) National Agricultural Imagery Program (NAIP) aerial imagery.

Using ArcGIS Pro, a sidewalk network dataset was created with rules of bi-directional travel allowed and no additional barriers present. The resulting network dataset was then analyzed to create service areas using bus stops as the facilities point feature class with a maximum travel distance of 0.5 miles (cutoff). The resulting polygon feature class contained one service area for each bus stop. This layer was simplified using the dissolve geoprocessing tool to create a single service areas layer. This is referred to as the Inside Service Area (ISA).

Areas outside the ISA –but still within the general study area-- were identified using the erase geoprocessing tool (the area of the ISA polygon layer was erased from the Study Area polygon layer). The resulting layer was named the Outside Service Area (OSA).
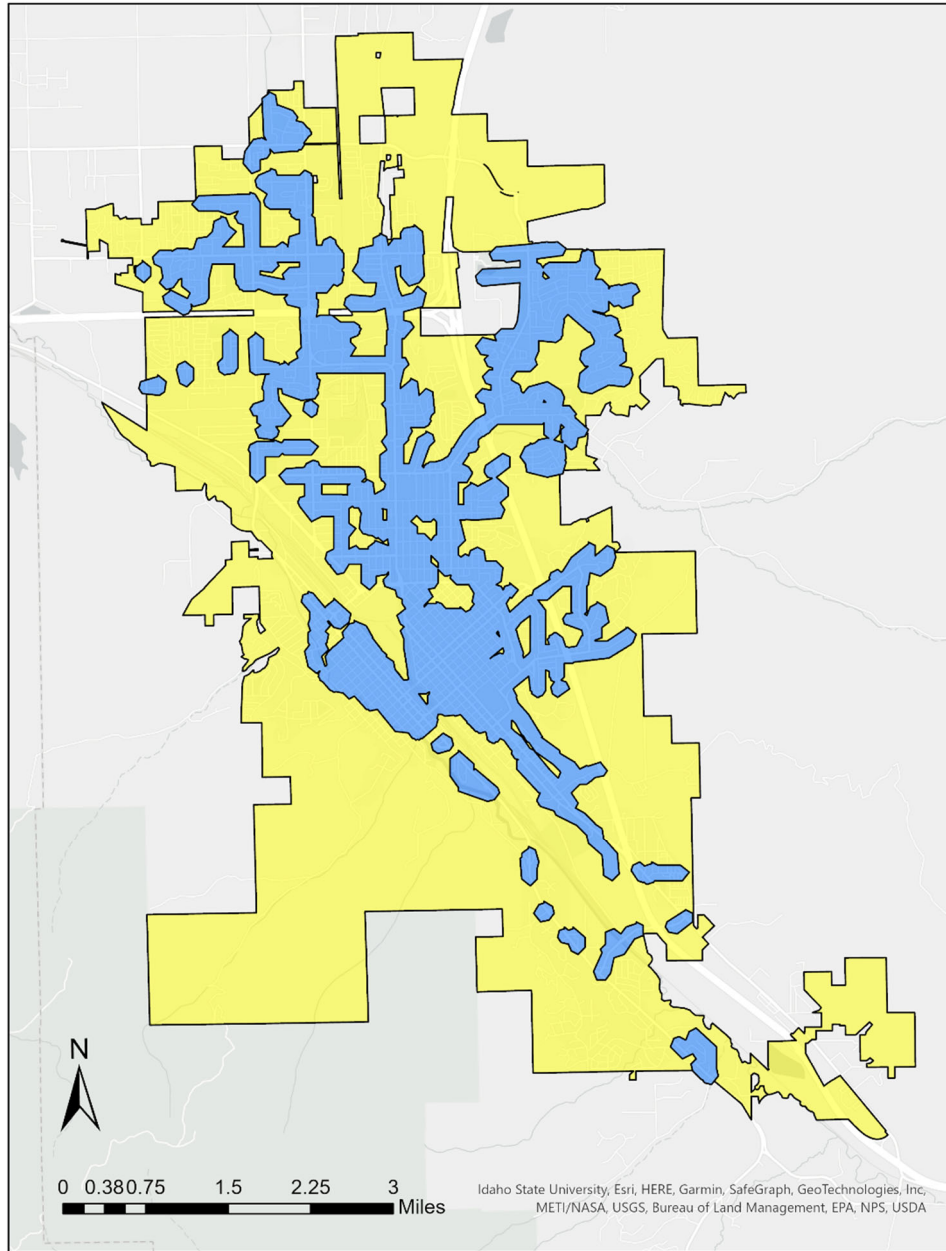
Figure 1. The Bannock County study area showing inside service areas (ISA in blue) and outside service areas (OSA in yellow).

Analyzing Service Areas

The ISA and OSA layers were shared to ArcGIS Online (AGOL) and used within Esri's Community Analyst to characterize the population residing within the ISA and OSA.

Community analyst (CA) is a robust data source that displays counts of total people specific matters apply to. It can also identify total expenditure of variables in detail. The main focus of the reports generated in community analyst for this project was to look at statistics that may have an influence on whether or not one would use public transportation. Households with vehicles owners, a person with a disability, as well as number of households in poverty were all variables looked at. Another focus was transportation related expenditures, whether that be car maintenance, registration fees, or transportation tolls. Reports were

generated for both inside and outside service areas and were compared. Two info graphs (ISA and OSA) were also created to have a quick summary of important information.

Results and Discussion

Service Areas

The resulting service areas were different in size, with the ISA (6,133 acres, 28% of the total area) being substantially smaller than the OSA (15,961 acres, 72% of the total area). It is interesting however, that a similar number of structures was found within each area; 13,172 (ISA) and 12,218 (OSA)[1] (note: there are 13,476 household in the ISA and 14,913 households in the OSA). A higher structure density exists in the ISA (2.14 structures/acre) than in the OSA (0.76 structures/acre).

Population

The total population in the ISA is 43,860 in 2021 with an expected population of 45,794 in 2026. This is more than the population residing in the OSA with 31,928 and an expected 33,512 population in 2026. It is important to note the OSA has a higher annual growth rate at 0.97% compared to ISA at 0.87%. With such a large portion of people in the OSA along with its higher growth rate, expanding bus service into these areas may be necessary.

Age Demographics

Age of the population also needs to be considered. There is a higher percentage of the age group 15-24 residing in the ISA than the OSA (cf., appendices). The opposite can be said for age group 25-34. Individuals aged 15-24 could be relying on parents, friends, biking, walking, or using the bus, to get to school or work. In contrast, ages 25-34 are much more likely not to have these alternative resources. However, since a greater percentage of this population resides in the OSA they do not have as much access to the bus, and in extreme weather, it may be difficult to bike or walk to their destination.

Community Tapestry

Tapestry segmentation[2] is also another feature of CA that provides a description about what "type" of people reside in the ISA and OSA. Table one gives the type of groups (and percent) found in both ISA and OSA as well as the national percentage.

Table 1. Tapestry segmentation of the population residing inside bus stop service areas (ISA) and outside bus stop service areas (OSA). The "Set to Impress" type refers to older single college students. The "Middleburg" type refers to traditional, family-oriented individuals. The "College Towns" type refers to younger college students that are renting and have roommates while the "Old and New Comers" type refers to people that are starting careers as well as people who are retired.

Rank	ISA Type and %	OSA Type and %
1	"Set to Impress" 23.8%	"Middleburg" 20.5%
2	"College Towns" 38.4%	"Set to Impress" 16.2%
3	"Old and New Comers" 10.6%	"Old and New Comers" 10.1%

Housing and Home Value

Though data on housing may not sound like it directly affects bus usage, it could say something about income and therefore may influence who uses public transit. The median home value in the ISA and OSA differs by approximately $20,000 with OSA being higher. By 2026 median home value is expected to nearly double in both ISA and OSA. What will this mean for property taxes and buying a new home? Will people be renting more frequently than owning a home? According to the US Census Bureau, a slight increase (1%) in home ownership is projected. Whether this actually occurs is yet to be seen. This

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[1] Note: the number of structures is a different metric than the number of households
[2] Cf., https://www.esri.com/en-us/arcgis/products/data/data-portfolio/tapestry-segmentation

slight shift could be attributed to people staying in a house they already own versus moving due to the large increase in housing prices currently seen.

Jobs and Education
Details of education and employment indicate if people are needing transportation to get to and from school or work. Nearly 30% of people both the ISA and OSA have some college education but no degree. This indicates they are either still in school or changed direction and are now employed. This segment of the population will likely need transportation. People 16+ years of age had an unemployment rate of 5.2% (ISA) and 4.8% (OSA). These values are very similar, yet a pertinent question asks "Are these people able to job search and get to interviews using a car or bus and are those employed able to get to their job without problems?"

Income
The most common household income class in both the ISA and OSA is $50,000 – $74,999 with this class found for 19.7% of those residing in the ISA and 21.3% of those residing in the OSA. The second most common income class in the ISA is $15,000 – $24,999 (14.0%) compared to the OSA where the second most common income class is $100,000 – 149,999 (16.9%). The approximate number of households at or below poverty within the ISA is 2,535 (6%) while the OSA has 2,006 (4%)[3]. This means that households in the OSA overall have a higher income than ISA households, suggesting OSA residents are more likely able to afford a car and use their own transportation (note: OSA residents have a larger household size (2.8) compared to ISA (2.5)).

Transportation Expenditures
Comparing total dollars spent on personal transportation versus public transportation, it is suggested that people spend a lot more money driving and maintaining their own vehicles compared to taking the bus. Of course, this value does not include the cost of time and convenience as buses do not run 24 hours/day seven days/week. For example, in 2021 people living in the ISA spent a total of $20,718,538 on gasoline alone (note: this doesn't include other expenses such as parking fees, registration fees, maintenance, and repairs). The money spent on public transportation on the other hand is a fraction of these costs. In 2021 people residing in the ISA spent only $1,667,783 on public transportation. Though there are likely many more vehicle owners than bus users, when one considers all the cost factors in owning a vehicle, public transportation is much more affordable, albeit less convenient.

Vehicles owned
There are 675 households (6%) in the OSA that do not own a vehicle. This is likely an issue when one considers most schools, restaurants, and grocery stores are located within the ISA, therefore necessitating personal vehicle ownership. One might assume these households are walking, biking, or relying on other vehicle owners for their transportation needs or perhaps using public transportation. Expanding bus service in the OSA could benefit these households in regards to cost, convenience, and time.

Persons with Disabilities
There are also more households in the OSA that have one or more persons with a disability. Knowledge of if households with a disabled person have a vehicle would be valuable, but is currently unknown. For example, if this most of these households do not have a personal vehicle then this raises a concern regarding the presence and quality of sidewalks.

Please see the accompanying Excel spreadsheet containing results from all community analyst reports created for this study.
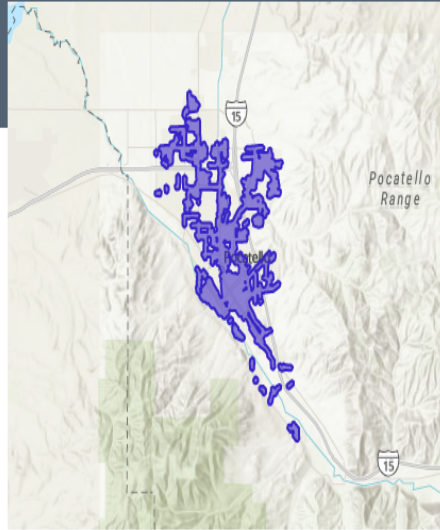
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[3] Cf., https://www.healthcare.gov/glossary/federal-poverty-level-fpl/

AT RISK POPULATION PROFILE
Service areas 25 (Inside SA)

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Area: 9.59 square miles

34,583	**13,467**	**2.50**	**31.8**	**$44,944**	**$176,384**	**47**	**136**	**40**
Population	Households	Avg Size Household	Median Age	Median Household Income	Median Home Value	Wealth Index	Housing Affordability	Diversity Index

AT RISK POPULATION

3,887 — Households With Disability

4,637 — Population 65+

970 — Households Without Vehicle

POVERTY AND LANGUAGE

21% — Households Below the Poverty Level

2,535 — Households Below the Poverty Level

36 — Pop 65+ Speak Spanish & No English

POPULATION AND BUSINESSES

40,044 — Daytime Population

1,803 — Total Businesses

20,855 — Total Employees

POPULATION BY AGE

- Under 18: 8,559
- 18 to 65: 21,704
- Aged 65+: 4,323

Language Spoken (ACS)	Age 5-17	18-64	Age 65+	Total
English Only	5,082	18,158	3,783	27,023
Spanish	193	885	106	1,184
Spanish & English Well	183	858	68	1,109
Spanish & English Not Well	10	9	2	21
Spanish & No English	0	17	36	53
Indo-European	37	408	113	558
Indo-European & English Well	25	398	85	508
Indo-European & English Not Well	12	5	28	45
Indo-European & No English	0	5	0	5
Asian-Pacific Island	71	321	32	424
Asian-Pacific Isl & English Well	60	263	28	351
Asian-Pacific Isl & English Not Well	11	25	3	39
Asian-Pacific Isl & No English	0	33	0	33
Other Language	17	297	3	317
Other Language & English Well	17	297	3	317
Other Language & English Not Well	0	0	0	0
Other Language & No English	0	0	0	0

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Figure 2. Inside service area (ISA) infographic summarizing key points about population.

AT RISK POPULATION PROFILE
Outside SA

Area: 24.95 square miles
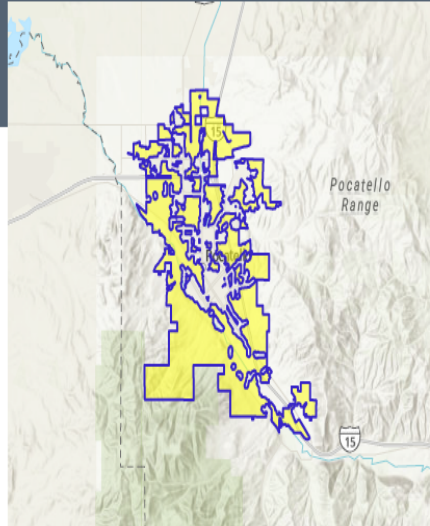
41,330	**14,913**	**2.71**	**33.4**	**$54,209**	**$190,702**	**61**	**153**	**36**
Population	Households	Avg Size Household	Median Age	Median Household Income	Median Home Value	Wealth Index	Housing Affordability	Diversity Index

AT RISK POPULATION

4,231	**5,974**	**675**
Households With Disability	Population 65+	Households Without Vehicle
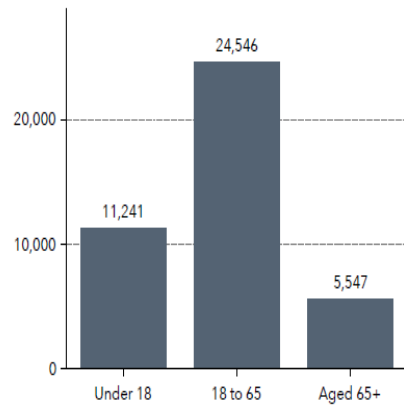
POVERTY AND LANGUAGE

15%	**2,006**	**15**
Households Below the Poverty Level	Households Below the Poverty Level	Pop 65+ Speak Spanish & No English

POPULATION AND BUSINESSES

36,803	**877**	**9,149**
Daytime Population	Total Businesses	Total Employees

POPULATION BY AGE

Age Group	Population
Under 18	11,241
18 to 65	24,546
Aged 65+	5,547

Language Spoken (ACS)	Age 5-17	18-64	Age 65+	Total
English Only	7,385	20,716	4,826	32,927
Spanish	229	1,050	89	1,368
Spanish & English Well	221	980	67	1,268
Spanish & English Not Well	8	35	7	50
Spanish & No English	0	35	15	50
Indo-European	13	294	74	381
Indo-European & English Well	13	286	58	357
Indo-European & English Not Well	0	3	16	19
Indo-European & No English	0	6	0	6
Asian-Pacific Island	126	369	46	541
Asian-Pacific Isl & English Well	109	288	41	438
Asian-Pacific Isl & English Not Well	17	24	5	46
Asian-Pacific Isl & No English	0	57	0	57
Other Language	13	323	8	344
Other Language & English Well	13	323	8	344
Other Language & English Not Well	0	0	0	0
Other Language & No English	0	0	0	0

Source: Esri forecasts for 2021, U.S. Census Bureau 2015-2019 American Community Survey (ACS) Data,

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Figure 3. Outside service area (OSA) infographic summarizing key points about population.

6